



Technical Assistance Consultant's Report

Project Number: 37597
December 2005

PRC: Wuhan Wastewater and Stormwater Management Project (Financed by the Technical Assistance Special Fund)

Prepared by Black & Veatch (Asia) Ltd.
PRC

For Wuhan Municipal Government

This consultant's report does not necessarily reflect the views of ADB or the Government concerned, and ADB and the Government cannot be held liable for its contents. (For project preparatory technical assistance: All the views expressed herein may not be incorporated into the proposed project's design.

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Asian Development Bank

ADB TA - 4436 - PRC

Project Preparatory Technical Assistance Wuhan Wastewater and Storm Water Management Project

**Final Report
December 2005**



**Volume 1
Project Analysis**

**Part 1 of 2
Main Report**

**Consultant
Black & Veatch (Asia) Ltd**

**Executing Agency
Wuhan Municipal Government**

ADB TA - 4436 - PRC

**Project Preparatory Technical Assistance
Wuhan Wastewater and Storm Water
Management Project**

Final Report

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Project Preparatory Technical Assistance

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FINAL REPORT

VOLUME I

PROJECT ANALYSIS

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CURRENCY EQUIVALENTS

(as of 2005)

Currency Units - Yuan (CNY)
 - US Dollar(\$)

CNY 1.00 = 0.123\$

\$ 1.00 = 8.11CNY

LIST OF ABBREVIATIONS USED

Abbrev	Full name/description
ADB	Asian Development Bank
AIFC	Average Incremental Financial Cost
AIEC	Average Incremental Economic Cost
BCA	Benefit-Cost Analysis
BCR	Benefit Cost Ratio
BOD	Biological Oxygen Demand
B&V	Black & Veatch (Asia) Ltd. (the appointed PPTA consulting firm)
CDC	Centre for Disease Control
CIECC	China International Engineering Consulting Company
COD	Chemical Oxygen Demand
CPC	Communist Party of China
CRP	Consolidated Resettlement Plan
DCF	Discounted Cash Flow
DFR	Draft Final Report
DI	Design Institute
DMS	Detailed Measurement Survey
EA	Executing Agency (which is WMG as represented by WPMO)
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
EPB	Environmental Protection Bureau
FIRR	Financial Internal Rate of Return
FMA	Financial Management Assessment
FNPV	Financial Net Present Value
FSR	Feasibility Study Report (all are draft at the present time)
FYP	Five Year Plans
GDP	Gross Domestic Product
GI	Glycemic Index
HDRC	Hubei Development and Reform Commission
HH	Household

HPG	Hubei Provincial Government
IA	Implementing Agency
ICB	International Competitive Bidding
IEE	Initial Environmental Examination (a short form of EA)
IFO	International Financing Organization
IS	International Shopping
LCB	Local Competitive Bidding
LIBOR	London Inter-bank Offered Rate
MLSS	Minimum Living Standard Scheme
NDRC	National Development and Reform Commission
NPV	Net Present Value
O & M	Operations and Maintenance
OCC	Opportunity Cost of Capital
OENV	Office of the Environment and Social Development
PDMF	Project Design & Monitoring Framework
PLG	Project Leading Group
PME	Project Monitoring and Evaluation
PMO	Project Management Office
PPMS	Project Performance Monitoring System
PPTA	Project Preparatory Technical Assistance
PRC	Peoples Republic of China
PSP	Private Sector Participation
RMB	Renminbi (Yuan)
RP	Resettlement Plan
SEIA	Summary Environmental Impact Assessment
SEPA	State Environmental Protection Administration
SIA	Social Impact Analysis
SS	Suspended Solid
TOR	Terms of Reference
USD	US Dollar
WACC	Weighted Average Cost of capital
WD	Waterborne Disease
WDC	Wuhan Drainage Company
WHO	World Health Organization
WL	Woman's League
WMEPB	Wuhan Municipal Environmental Protection Bureau
WMG	Wuhan Municipal Government
WMMP	Wuhan Municipal Master Plan
WMWC	Wuhan Municipal Wastewater Company
WPMO	Wuhan Urban Construction Utilization of Foreign Investment Project

	Management Office
WTP	Willingness to Pay
WUCF	Wuhan Urban Construction Foundation
WUIDC	Wuhan Urban Investment and Development Company
WWSMP	Wuhan Wastewater and Storm Water Management Project
WWC	Wuhan Water Supply Company
WWTP	Wastewater Treatment Plant
YRB	Yangtze River Basin

ADB TA – 4436 – PRC

Project Preparatory Technical Assistance Wuhan Wastewater and Storm Water Management Project

EXECUTIVE SUMMARY

ES.1 Introduction

ES.1.1 This report is the Final Report for ADB TA - 4436, the Project Preparatory Technical Assistance (PPTA) for the proposed Wuhan Wastewater and Storm Water Management Project (WWSMP). The report is presented in accordance with the requirements of the contract, dated May 10, 2005, between the Asian Development Bank (ADB) and Black & Veatch Asia Ltd (B&V).

PPTA Objective and Scope

ES.1.2 The overall objective of the PPTA is to prepare a project suitable for ADB financing, by assessment of five wastewater collection and treatment subprojects and four storm water management subprojects to serve eight districts of Wuhan Municipality. An important requirement is to provide an overall rationale for the Project as well as demonstrating the justification of individual subprojects. Sustainability of the proposed wastewater and storm water facilities is another key objective, which will require identification of the necessary institutional capacity building measures. The proposed subprojects are shown in Figure ES1-1 and are summarized in Table ES1-1.

ES.1.3 The Executing Agency (EA) for the WWSMP is the Wuhan Municipal Government (WMG) who has established a Project Leading Group (PLG) to oversee project preparation and implementation. The Municipal Government has assigned day to day responsibility for project preparations to the Wuhan Project Management Office (WPMO). The proposed Implementing Agencies (IAs) are the Wuhan Drainage Company (WDC, a corporate entity) for the wastewater subprojects and the Wuhan Urban Construction Foundation (WUCF, a government agency) for the non-revenue storm water subprojects.

Table ES1-1 Summary of Proposed Subprojects

District	Subproject	Sewers or Drains	Pumping Stations	Treatment Capacity	Estimated Cost	
					CNY million	\$ million (equivalent)
Wastewater Management Subprojects					737.9	90.99
Wuchang	Erlangmiao WWTP Expansion and Upgrade	Nil	Nil	Existing 180,000 m³/d (Primary) WWTP to be upgraded and expanded to 240,000 m³/d (Secondary)	182.0	22.44
Hanyang	Nantaizi Lake WWTP Expansion and Wastewater Collection System	7.43 km of new collection system	Three new pumping stations (0.31 m³/s, 0.53 m³/s, 2.1 m³/s)	Existing 100,000 m³/d (Secondary) WWTP to be expanded to 200,000 m³/d (Secondary)	182.4	22.49
Hankou	Huangpu Road WWTP Upgrade	Nil	Nil	Existing 100,000 m³/d (Screening) WWTP to be upgraded to Secondary	119.5	14.74
Dongxihu	Dongxihu Wastewater Collection System	25.35 km of new collection system	Five new pumping stations (0.3 m³/s, 0.5 m³/s, 1.5 m³/s, 1.8 m³/s, 2.0 m³/s)	Nil (Wastewater to be discharged to Hanxi WWTP)	159.1	19.62
Caidian	Caidian WWTP and Wastewater Collection System	4.59 km of new collection system	One new pumping station (1.0 m³/s)	New 50,000 m³/d (Secondary) WWTP	94.9	11.70
Storm Water Management Subprojects					919.2	113.35
Hangyang	Yangsigang Pumping Station and Drainage	1.34 km of new pipeline and 1.90 km of new box culvert	One new pumping station (20 m³/s)	Nil	83.4	10.29
Dongxihu	Three Gates Connection	3.91 km of new box culvert, 4.34 km of new open channel, and renovation of 4.48 km of existing open channel.	Nil	Nil	312.2	38.50
Dongxihu	Changqing Pumping Station Expansion	Nil	Existing pumping station to be increased by 135 m³/s	Nil	157.2	19.38
Wuchang	Luojia Road Pumping Station Expansion and	0.39 km of new box culvert and renovation of 8.81 km of existing open	Existing pumping station to be increased by 55 m³/s	Nil	366.4	45.18

Drainage channel

Source: Draft Feasibility Study Report. Costs are Base Costs (excluding Project Management, Contingencies and Financial Charges) and were further adjusted.

ES.1.4 With the strong support from the WPMO, the PPTA Team has substantially accomplished all of the required activities under the PPTA. The DFR was reviewed at a stakeholder workshop in late November 2005, and the Final Report will then be prepared to take into account feedback provided on the DFR. Through this cooperation and support, the PPTA has added significant value to the project as summarized in Table ES1-2. The value addition covers:

- recommendation of specific changes to improve the design or implementation of the Project;
- independent confirmation of the justification of the Project to facilitate the smooth processing; and
- identification of proposals for further investigations and studies.

Further details are provided in the relevant sections of the main report and supporting documents as noted.

Table ES1-2 Areas of PPTA Value Addition

Areas of PPTA Value Addition	Reference
Project Rationale	
<ul style="list-style-type: none"> • Urban and sector master plans have been reviewed and the proposed subprojects have been evaluated in the context of previous and ongoing interventions, and have been found to be complementary to these initiatives. 	Chapter 2, Chapter 9
Technical	
<ul style="list-style-type: none"> • The technical proposals as set out in the Draft Feasibility Study Reports have been refined, and strengthened. These recommendations will improve the performance of some of the subprojects and will avoid unnecessary expenditure. 	Chapter 3, Chapter 4
<ul style="list-style-type: none"> • The proposed capacity of the WWTPs has been assessed and some capacities have been revised. This will avoid unnecessary expenditure. 	Chapter 3
<ul style="list-style-type: none"> • The adoption of design-build procurement has been considered for Huangpu Road WWTP. This will facilitate implementation. 	Chapter 3
<ul style="list-style-type: none"> • A pilot inflow/infiltration study has been proposed for the Erlangmiao subproject, which will allow remedial measures to be identified which will reduce flow rates to WWTPs and will increase the strength of wastewater. This will reduce operational costs, improve wastewater treatment performance and will extend the life of the WWTPs. 	Chapter 3
<ul style="list-style-type: none"> • A strategic sludge management study has been proposed, which will allow an overall sludge management strategy to be developed for all WWTPs in the urban and suburban areas. This study will allow the identification of a least-cost approach to sludge treatment and disposal by optimizing the development of facilities. 	Chapter 3, Chapter 10
<ul style="list-style-type: none"> • Computer-based hydraulic modeling has been proposed for the detailed design phase of the storm water management subprojects. This will improve the understanding of the performance of the subprojects, and will allow the operation of pumping stations and gates to be optimized. 	Chapter 4
Environmental	
<ul style="list-style-type: none"> • The environmental benefits of the subprojects have been assessed in the context of other investments being undertaken. This provides independent confirmation of the justification of the Project. 	Chapter 5
<ul style="list-style-type: none"> • Public consultation has been undertaken allowing a wider understanding of the concerns of affected stakeholders. This will improve the design and implementation of the subprojects. 	Chapter 5, Appendix E
<ul style="list-style-type: none"> • Potential adverse environmental impacts have been identified and mitigation 	Chapter 5

Areas of PPTA Value Addition	Reference
measures proposed. This will improve the design and implementation of the subprojects.	
<ul style="list-style-type: none"> • A summary Environmental Impact Analysis has been prepared. This facilitates the smooth processing of the Project. 	Volume II
<ul style="list-style-type: none"> • An Environmental Management Plan has been prepared, which sets out the requirements for mitigation of impacts, environmental monitoring and associated responsibilities. This will improve the implementation of the Project by ensuring that impacts are mitigated and that anticipated benefits are realized. 	Volume II
<ul style="list-style-type: none"> • Sample Contract specifications for environmental management and monitoring have been prepared. This will improve the implementation of the subprojects. 	Appendix E
<ul style="list-style-type: none"> • The need for comprehensive water quality modeling has been supported to assist with water resource management. This will provide independent confirmation of the justification of the Project, will allow the project benefits to be assessed with greater confidence and will allow future investments to be effectively targeted to achieve the greatest improvements. 	Chapter 5
Poverty & Social Analysis	
<ul style="list-style-type: none"> • A socioeconomic & poverty profile has been completed and analyzed. This will improve the implementation of the Project by ensuring that proposed charges are affordable and that subsidies are provided to safeguard vulnerable groups. 	Chapter 6
<ul style="list-style-type: none"> • The social and health benefits of the subprojects have been estimated. This will facilitate the smooth processing of the Project. 	Chapter 6
<ul style="list-style-type: none"> • The attitudes of residents and businesses to the Project have been surveyed and assessed. This will improve the implementation of the project by ensuring that stakeholders concerns are addressed. 	Chapter 6
Resettlement	
<ul style="list-style-type: none"> • Resettlement proposals have been prepared and publicized. This will improve the implementation of the subprojects by avoiding potential delays, and will facilitate the smooth processing of the Project. 	Chapter 7
<ul style="list-style-type: none"> • Resettlement requirements and the associated costs have been quantified. This will improve the design of the subprojects by allowing resettlement to be minimized, and the implementation of the Project by ensuring that adequate financing is in place to compensate affected persons. 	Chapter 7
Financial Analysis	
<ul style="list-style-type: none"> • Cost estimates for the subprojects have been prepared. This will facilitate the processing and implementation of the Project. 	Chapter 8
<ul style="list-style-type: none"> • A Financial Management Assessment on WDC has been completed. This will facilitate the implementation of the Project by ensuring that the IA is suitable to manage their future financial obligations, and will facilitate the smooth processing of the Project. 	Chapter 8
<ul style="list-style-type: none"> • Proposed wastewater tariffs for the urban and suburban areas have been determined. This will facilitate the implementation of the project by ensuring that adequate financing is available to WDC. 	Chapter 8
<ul style="list-style-type: none"> • The FIRR of each subproject has been assessed. This provides independent justification for the Project. 	Chapter 8
Economic Analysis	
<ul style="list-style-type: none"> • The project benefits have been identified, the economic value of these benefits has been quantified, and the EIRR of each subproject has been assessed. This provides independent justification for the Project. 	Chapter 9
<ul style="list-style-type: none"> • Least-cost analysis has been completed. This provides independent justification that the most appropriate solutions have been identified. 	Chapter 9
Institutional	
<ul style="list-style-type: none"> • The proposed institutional arrangements for implementation have been reviewed. This facilitates the implementation of the Project. 	Chapter 10
<ul style="list-style-type: none"> • Scope for Private Sector Participation in the Project has been considered. This may 	Chapter 10

Areas of PPTA Value Addition	Reference
improve the implementation of the subprojects if O&M services are out-sourced	
<ul style="list-style-type: none"> The proposed scope of consulting services for the implementation phase has been prepared. This will improve the implementation of the subprojects and will facilitate smooth processing, minimizing the risks of delay to the Project benefits being realized. 	Appendix J
Other	
<ul style="list-style-type: none"> Policy dialogue has been undertaken and notes prepared for further dialogue. This will strengthen future wastewater and storm water management. 	Chapter 11
<ul style="list-style-type: none"> A Project Design & Monitoring Framework has been developed. This will improve the implementation of the Project by determining if the anticipated project benefits are being realized which allows corrective actions to be taken if required. 	Chapter 12

ES.2 Project Rationale

ES.2.1 Wuhan, located in central PRC, is the capital of Hubei Province and a center of communications, education, culture, economy, trade, transportation and industry. Wuhan covers an area of 8,467 square kilometers (km²), which includes an urban built-up area of 211 km². As of 2004, the Municipality had a population of approximately 7.8 million. Wuhan urban area is divided into three parts (Wuchang, Hankou and Hanyang) by the Yangtze River and the Han River. The Municipality includes seven urban and six suburban districts. Wuhan has abundant water resources, including the Yangtze, Han and Fu rivers, and many lakes, which together take up one-quarter of the urban and suburban areas (the total area of surface water, rivers and impounded areas is 2,144 km²).

ES.2.2 However, rapid economic growth and continuing urbanization, particularly in the outer urban and suburban areas, have resulted in inadequate urban infrastructure and placed pressure on overloaded facilities. This has caused continued water quality problems in the Wuhan section of the Yangtze River and serious deterioration of water quality in many lakes and other water bodies due to lack of sufficient wastewater collection and treatment facilities. The monsoonal climate results in heavy summer rains that place particular stress on the urban drainage system as development continues to reduce permeable areas, and combined sewer overflows also become major sources of water pollution.

ES.2.3 The main issues involved in the deterioration in surface water quality and urban environmental quality are: ineffective regulatory control of municipal and industrial wastewater discharges; inadequate water resource management; and financial weakness of municipal service providers. Demand for water for domestic and industrial use has been steadily increasing, particularly in the outer urban and suburban areas, and this has imposed increasing pressure on water resources. At the same time, quantities of wastewater have increased as have the associated pollution loads. In 2004, only 26.8% of wastewater flows were treated to comply fully with discharge standards, largely the result of ineffective enforcement of environmental regulations and inadequate environmental infrastructure investments with only four WWTPs operational.

ES.2.4 The WWSMP seeks to address these issues. Specifically, the proposed Project will assist the Municipal Government in developing further a practical approach to provide improved urban wastewater treatment and storm water drainage services, incorporating the principles of integrated water resource management and pollution control. The proposed wastewater subprojects complement and are well integrated with the other recent and ongoing initiatives to implement the city's wastewater master plan, including support from the World Bank, the ADB and other bilateral donors.

ES.2.5 The Project will help improve the urban environment, public health and safety through improved wastewater and storm water management, and to improve the quality of surface and groundwater in and downstream of the project areas. It will also help improve the quality of life for urban poor by reducing waterborne diseases and alleviating urban flooding.

ES.3 Technical Analysis – Wastewater Subprojects

Wastewater Master Plan

ES.3.1 The proposed wastewater subprojects contribute to the progressive implementation of the city's wastewater master plan as illustrated in Figure ES3-1 and as summarized in Table ES3-1 which gives the current status of each of the planned WWTPs in the urban area of Wuhan.

Table ES3-1: Wastewater Treatment Plants in Wuhan Urban Area

No.	Location	WWTP	Capacity (10,000 m ³ /d)	Treatment			WWTP Status				Completion Time	Funding Source	Receiving Water
				P	1 st	2 nd	P	C	S	O			
1		Sanjintan	30								2008	ADB	Fu River
2	Hankou	Hanxi	40								2006	WB	Fu River
3		Huangpu Road	P1 10								1999	Finland	Yangtze R.
			P2 10								2010	ADB	
4	Hanyang	Nantaizi Lake	P1 10								2005	Poland	Yangtze R.
			P2 20								2010	ADB	
5		Zhuankou	6								2008	BOT	Yangtze R.
6		Huangjiahu	10								2008	ADB	Yangtze R.
7		Erlangmiao	P1 18								2002	WB	Yangtze R.
			P2 24								2010	ADB	
8		Luobuzui	12								2008	ADB	Yangtze R.
9	Wuchang		P1 5								1990	Finland	Yangtze R.
		Shahu	P2 10								1998	WB	
			P3 15								2002	WB	
10		Longwang-zui	P1 15								2003	WB	South Lake
			P2 15								2005	WB	
11		Tangxunhu	5								2004	BOT	Tangxun L.
12		Beihu	2								Pending	Pending	Yangtze R.
13		Huangjiadawan	1.5								Pending	Pending	East Lake
Other WWTPs Outside the Urban Area													
	Caidian	Caidian	5								2010	ADB	Han River

Source: Draft FSR. P1 – Phase 1; P2 – Phase 2; P3 – Phase 3

Dongxihu wastewater subproject discharges wastewater to Hanxi WWTP.

Treatment: P – Preliminary, 1st – Primary, 2nd – Secondary

WWTP Status: P – Planned, C – Under Construction, S – Start-Up, O – In Operation

WB - World Bank; ADB - Asian Development Bank

ES.3.2 The draft FSR has been prepared by the Wuhan Municipal Engineering Design and Research Institute and the Wuhan Urban Planning Research Institute in May 2005. A revised FSR was then issued in late September. The technical review has been undertaken of these proposals as summarized below, and the subprojects have been revised accordingly.

Population Estimates and Flow Projections

ES.3.3 Within the accuracy of the wastewater flow predictions and the assumptions made on per capita water consumption, industrial growth and water use, and the rate of development of the wastewater collection systems, it was concluded that the proposed capacities of the WWTPs for each subproject,

except Huangpu Road WWTP, are excessive for Year 2010 flows, and have been adjusted.

ES.3.4 Should actual population and/or economic growth be less than assumed, the design life of the facilities would be extended and the need for a further phase expansion could be delayed. Further, the PPTA team recommends that ADB obtain government's assurance on reaching the targeted collection system coverage and household connection percentages on all wastewater management subprojects.

Wastewater Characteristics

ES.3.5 The wastewater characteristics have generally been established from a review of wastewater characteristics elsewhere with limited sampling and analysis having been carried out for most subprojects. The data that has been made available indicates relatively weak wastewater, potentially resulting from high per capita water consumption, use of septic tanks, coupled with high inflow and infiltration into the collection system. In future it can be anticipated that wastewater strengths will increase.

Wastewater Collection

ES3.6 It is proposed that new sewerage will be provided along most major streets within the existing urban area, suggesting that either numerous interception points will be required or that considerable additional secondary sewerage will be required to collect wastewater from existing properties within the urbanized area. While new developments are required to make connections to the wastewater collection system, proposals for secondary sewerage will need to be developed further during the detail design stage to ensure that the collection of wastewater is effective.

Wastewater Treatment

ES.3.7 In the draft FSR a comparison is made of two wastewater treatment processes for each of the four subprojects that include WWTPs, usually an oxidation ditch and an activated sludge process. Generally the oxidation ditch process has been selected as the preferred process for ease of operation.

ES.3.8 For Huangpu Road WWTP Upgrade Subproject, the biologically aerated filter (BAF) process is proposed to fit in the limited space available for the secondary upgrading requirements. This BAF process should be able to achieve the required Class 1B treated effluent standard.

ES3.9 Comprehensive odor control will be required for Erlangmiao WWTP and Huangpu Road WWTP to minimize potential odor nuisance to existing and proposed residential development close to the WWTP sites.

Effluent Reuse

ES.3.10 The project area is rich in natural water resources and therefore wide-scale effluent reuse is unlikely to prove economic. Scope for effluent reuse seems limited for most of the subprojects, but it has been suggested that effluent from Nantaizi WWTP could be used to recharge a proposed wetland area close to the site during the dry season.

Sludge Management

ES.3.11 It is estimated that about 75 t/d of sludge will be produced by the WWTPs, which should be disposed of in an environmentally safe manner. Beneficial reuse should be considered if the sludge quality is acceptable, but other methods of disposal will also be required as it cannot be expected that all sludge can be reused beneficially. Generally it is anticipated that sludge will be disposed of to existing or planned sanitary landfill sites, but incineration is also being considered. It should be noted that for sludge from WWTPs to be incinerated will require additional treatment (sludge drying) to reduce the water content of the sludge prior to incineration. It is concluded that a sludge management study to address sludge disposal from the existing and planned WWTPs in the city is required, and it is understood that such a study is being considered.

ES.4 Technical Analysis – Storm Water Subprojects

Drainage Master plan

ES.4.1 The built-up areas in Wuhan are mostly below the average flood levels of the Yangtze and Han Rivers and are protected by flood control bunds. During wet seasons, storm water is discharged to the rivers by pumping. Being located in the subtropical monsoon climate zone, distinct seasonal variation and heavy summer rains place particular stress on Wuhan's urban drainage system. The Wuhan Municipal Master plan provides the framework for the future development of storm water drainage infrastructure in Wuhan, requiring storm water to be drained into nearby rivers and lakes. It provides a target for the future storm water drainage system of 11.5 – 12.5 km/km² by 2010. The master plan also proposes that storm water should be segregated from wastewater within 85% of the service area by 2020.

ES.4.2 Approximately 55% of the most severely flood-prone areas in Wuhan are within the service areas of the four storm water management subprojects, based on historical flooding records of the Wuhan Municipal Water Bureau, with the depth of recorded floods varying from 0.5 – 0.8m. The proposed storm water subprojects are identified in the master plan. The proposed storm water subprojects are shown in Figure ES4-1.

Storm Water Flow Predictions

ES.4.3 Storm water flow predictions have been undertaken in accordance with the Wuhan Storm Water Drainage Handbook, using return periods of 30 years for the urban areas and 20 years for the Luojia Road urban and Dongxihu suburban areas, with complete drainage of flood water within one day in urban areas and three days in suburban areas.

Storm Water Networks

ES.4.4 The proposed storm water subprojects retain the concept of pumping storm water flows into adjacent rivers, and have considered some alternative alignments for the upgraded drainage networks and pumping stations. Generally alignments have been selected which follow existing drainage routes.

Pumping Stations and Gates

ES.4.5 The capacity of the proposed pumping stations have been determined by the hydraulic analysis, and the layout of the pumping stations have then been established to provide the required pumping capacity while minimizing land requirements to avoid unnecessary resettlement. It is considered that computer-based hydraulic modeling could be used to refine the proposed configuration of the drainage systems and pumping stations during subsequent development of the designs.

ES.5 Environmental Impact Assessment

Description of the Environment

ES.5.1 Although the project location is now mostly heavily urbanized, the urban areas of Wuhan contain numerous lakes, ponds and water bodies (which cover 25% of the city area) that are deteriorating in quality as a result of the ongoing discharge of untreated wastewater. This wastewater eventually drains to the Han River, in the Fu River (both are the tributaries of the Yangtze River) and to the Yangtze River. Fishery resources are abundant, including the famous Wuchang fish, while the reaches of the Yangtze River within Wuhan are migration channels for the endangered white-flag dolphin and Chinese paddlefish, which are Class I protected species in the PRC.

Regulatory Context and Processing

ES.5.2 The procedures for environmental impact assessment of construction projects in the PRC using credits and loans from International Financing Organizations (IFOs) are described in the Circular on Strengthening Environmental Impact Assessment Management for Construction Projects Financed by IFOs (June 1993), as well as the Environmental Impact Assessment Law of PRC (September 2003). There are also numerous related national

regulations and standards, as well as some local regulations and guidelines. The domestic EIAs have been prepared for each of the subprojects and they were approved by Hubei Provincial EPB in early January 2006.

ES.5.3 In ADB's classification system the Project is a "Category A" project in terms of its potential environmental impact. A summary EIA (SEIA) has been prepared in accordance with the Environmental Policy of the ADB (2002) and the ADB's Environmental Guidelines (2003). The SEIA was posted on ADB's website in January 2006, for at least 120 days prior to Board approval. The draft SEIA and associated Environmental Management Plan (EMP) are provided in Volume II of this report.

Anticipated Benefits, Impacts and Mitigations

ES.5.4 The Project can be anticipated to bring significant benefits to the urban and suburban areas of Wuhan and the water systems downstream through water quality improvements associated with the collection and treatment of wastewater in accordance with the progressive implementation of the City's overall wastewater master plan. These project benefits will be cumulative with those achieved through other earlier and ongoing interventions in the sector.

ES.5.5 Significant health benefits can be anticipated, particularly through the increased collection of wastewater leading to improvements in water quality and the improved management of storm water. Reductions in the frequency and severity of flooding will bring other substantial benefits too through improvements to the urban environment, reduced disruption to commercial and social activities and improved economic activity.

ES.5.6 The adverse impacts generated by the Project will be avoided or reduced to acceptable levels by taking appropriate mitigation and compensation measures. The main measures include: (i) careful selection of WWTP sites to avoid sensitive locations; (ii) control of noise, dust, and release of wastewater during construction; (iii) soil erosion control during earthworks; (iv) odor and noise control during operation; (v) landscaping after project completion; and (vi) appropriate compensation to persons affected by resettlement.

Environmental Management

ES.5.7 There are a number of organizations which will be involved with various roles and responsibilities in regulatory enforcement, environmental supervision, environmental monitoring, mitigation measures execution and other environmental management aspects in the project implementation. Training programs will be developed to provide the necessary knowledge and skills for mitigation measures implementation and to perform the required regular monitoring and reporting.

ES.5.8 Monitoring programs are mandatory based on national regulations, and will also be required by ADB. The project environmental monitoring program will be two-tier: compliance monitoring and regular monitoring. The objective of the compliance monitoring is to take samples and measurements to determine compliance status with the applicable regulations and standards, while the regular monitoring ensures proper execution of mitigation measures. The WPMO will report regularly the environmental performance to WMEPB and ADB.

ES.6 Poverty and Social Analysis

Household Size

ES.6.1 The average household size for survey respondents was 2.95 persons. Where children were present, there was almost always only one (98%). The number of employed or self employed persons averaged 1.4 per household, and there were on average 1.4 dependent persons and 1.0 adult dependent person per household. Only 4.8% of respondents (22 households) were elderly persons living alone and 5.7% were in female headed households. Two thirds (68%) of survey respondents lived in apartment blocks and 95% owned their homes.

Household Income

ES.6.2 The average monthly household income was estimated to be CNY 2,300 and average monthly per capita income CNY 830. On average, food accounts for just over one third of living expenditures, while total basic expenditures (food, clothing, shelter, utilities) account for 55% of living expenditures.

ES.6.3 Low income households in the Project area resemble low income households described in the ADB's poverty profile of PRC and include:

- head of household is retired or laid off, often with children of school age;
- female-headed households; and
- floating population, usually from rural areas living in poor housing conditions.

ES.6.4 The poorest households have the greatest number of persons per household but the lowest number of persons with income and the highest number of income earners relying on the informal economy for their income. The dependency ratio for the lowest income group is more than 40% higher than for the highest. Basic expenditures on food, clothing and housing represent 71% of the total expenditures of the poorest HHs.

ES.6.5 Vulnerable households include female-headed households (4.6%), elderly living alone (4.8%), households with disabled or chronically sick persons (1.1%), and the floating population (13%).

ES.6.6 The government of Wuhan has been a leader in poverty alleviation policies including the Temporary Residence Certificate allowing temporary workers to stay in Wuhan and the granting of legal status to private schools for the children of non-resident households. Under the Lowest Living Security program, families below the official poverty line receive subsidies that make up the difference between the official poverty line and their income. In addition, a monthly subsidy of CNY 5 per household plus CNY 2 per capita is provided to poverty households to offset the cost of wastewater services.

ES.6.7 The Women's League is involved with the floating population through the 'Three Hearts Action' program, which helps women adjust to urban living and find housing. It also provides job training, and a legal advisory service. Their employment programs help 3,000 to 4,000 women find work each year in Wuhan.

Impact of Service Deficiencies

ES.6.8 Wastewater and storm water service deficiencies cause foul odors, unsightly conditions in local drains, increased risk of infection, disruption of commerce and the daily routines of residents and soiling and other damage to property. Household survey respondents and focus group participants expressed high levels of support for wastewater and storm water service improvements ranking the need for investments in these services at or near the top priority. One third of households indicated being 'dissatisfied' or 'very dissatisfied' with the current service levels. Business survey respondents also expressed dissatisfaction with wastewater and storm water services and just over half indicated a 'high' need for wastewater and storm water service improvements.

ES.6.9 The impact of service deficiencies on low income and vulnerable households is disproportionately high. Lower income households are less likely to live in areas provided with covered storm or sanitary sewers and far more likely to live in areas where wastewater is discharged directly into open drains. Their children experienced higher rates of absenteeism from school due to illness.

ES.6.10 The adverse impacts of service deficiencies affect men and women differently. Women are more likely to be responsible for general cleaning and the care of sick family members, and so are more severely affected.

Project Benefits

ES.6.11 The project will have a direct beneficial impact on the lives of over three million people including 0.26 million with incomes below the official poverty line. Over three million more people will benefit indirectly as a result of the Project. The project benefits are:

- improved environment due to wastewater subprojects — 1.61 million direct beneficiaries;

- improved living environment due to storm water subprojects — 1.56 million direct beneficiaries;
- Reductions in water related disease by an average of 8,000 cases per year. This impact is associated with an annual reduction of 5,800 days of lost work and a net present value of savings in medical costs and avoidance of lost earnings of CNY 7.7 million;
- reductions in morbidity due to decreased exposure to water borne and water washed disease — 37,000 cases of illness avoided each year;
- direct creation of 5,000 person years of work over the 5 year period of construction and 220 permanent jobs in the new Project facilities;
- reduction in women's work by reducing time spent cleaning after flooding;
- increase in disposable income by reduction of lost work days, the direct costs of flooding, and medical treatment costs; and
- poverty-cycle interventions such as reduction in school days lost due to water borne and water washed disease.

Willingness to Pay and Affordability

ES.6.12 A majority of household survey respondents are willing to pay a higher wastewater tariff and higher taxes for the wastewater and storm water service improvements. Business survey respondents were even more receptive than households to a higher wastewater tariff.

ES.6.13 Current water and wastewater bills represent less than 1% of household income for households below the official poverty line. After Project implementation the water and wastewater bill is estimated to be below 2% for this group. Existing measures to ensure affordability are well designed but their implementation should be periodically evaluated to assure continued affordability to poor households.

ES.6.14 Measures can be taken to help ensure that project benefits are realized and that resistance to tariff increases does not jeopardize Project viability. In particular, the drainage company should establish consumer committees to provide advice on matters relating to consumer confidence, public complaints, service levels, tariff adjustments and facility investment plans. These committees should have adequate representation of women and poor households. In addition, the drainage company should implement a health awareness program targeted to poor households to promote good hygiene.

ES.7 Resettlement

ES.7.1 Among the nine subprojects, the land for Erlangmiao WWTP Expansion & Upgrade and for Huangpu Road WWTP Upgrade has been reserved in their Phase I stage. The other subprojects will require land acquisition and resettlement. In order to avoid or minimize land acquisition and

resettlement, there was close consultation with the local officials and village committees/street committees during the Feasibility Study stages, and the proposed sites were selected by comparison of alternative.

ES.7.2 The two IAs prepared separate Resettlement Plans (RPs) for the wastewater and storm water components. The WPMO on behalf of the EA and IAs engaged the services of Wuhan University to assist with the preparation of the RPs. The PPTA Consultants provided guidance to the RP preparation and prepared a summary RP for the Project.

ES.7.3 The RPs were prepared on the basis of the relevant project design documents, land acquisition and resettlement legal documents, ADB's Handbook on Resettlement. Account was also taken of the project impacts survey and the results of public consultations that investigated 20% of the affected households (60 households) and 50% of the seriously affected enterprises and shops. The RPs include a description of the project, an assessment of the potential project impacts, the objectives of the RP, socioeconomic studies, legal framework for resettlement, institutional arrangements, definition of Affected Persons (APs) and their eligibility, valuation of and compensation for losses, restoration strategies and measures, feasibility of resettlement measures, public participation and grievance procedures, monitoring arrangements, implementation schedule and the resettlement budget.

Resettlement Impacts

ES.7.4 The proposed Project will affect 8 townships/streets and 15 villages in Hanyang, Dongxihu, Hongshan and Caidian Districts. In total, 351 households with 1,747 persons (including 161 persons classified as floating population) will be affected directly by land acquisition and/or house demolition. A land area of 938.3 mu (62.5 ha) will be permanently occupied, of which 59.4% is classified as cultivated land. In addition, 390.7 mu (26.0 ha) of land will be occupied temporarily during the construction phase. A total of 39,288 m² of residential housing (including 4,157 m² of unlicensed housing) will be demolished, among which 34,638 m² (88.2%) are rural residents' housing, and 4,650 m² (11.8%) are urban residents' housing. 43 enterprises and institutions with 18,881 m² of structures to be demolished, and 19 shops with 10,912 m² (among which 4,070 m² are unlicensed) of structures to be demolished will also be affected.

Policy and Legal Framework

ES.7.5 For people unavoidably affected by the project, the objective of the RP is to achieve equal, or better, income and living standards in line with not only the PRC laws and regulations, but also ADB's "Policy on Involuntary Resettlement". The compensation for permanent land loss and house demolition is based on:

- Land Administration Law of PRC (2004);
- State Council Decision to Deepen Reform and Strictly Enforce Land Administration (2004);
- Regulation of Land Administrative Law of Hubei Province (1999);
- Method of Collective Land Acquisition and Compensation for Housing Demolition on Collective Land of Wuhan Municipality (2004); and
- Management & Implementation Method of Urban Housing Demolition of Wuhan Municipality (2002).

ES.7.6 Compensation for land acquisition, and residential houses and non-residential properties (enterprises and shops) will be paid to all users with or without legal papers, including APs settled on the land, provided that they are included in the final AP list or are able to prove their occupation of affected plots before the cut-off date determined by WMG. Payment will be made in cash according to the class and type of land and dwellings. Relocated households will also receive a transfer and transportation allowance. Compensation for standing crops and other assets, income lost from production/sales and wages will be paid in cash to the APs. The loss of enterprises and shops will also be compensated by cash payment.

ES.7.7 In order to minimize the impacts to APs and restore their living standards, detailed programs of restoration and relocation have been provided in the RPs. APs can choose from the available programs according to their requirements. In addition, more attention will be paid to vulnerable groups for their compensation and rehabilitation.

Resettlement Costs

ES.7.8 The estimated cost of the land acquisition and resettlement is CNY 355 million (16.6% of the total project cost), including contingencies, taxes and duties. These land acquisition and resettlement cost will be included as part of the total project cost. The RPs for each component contains a detailed budget, together with a compensation matrix. According to the compensation policies and standards defined in the RP, the payment and usage of compensation funds will be carried out under the supervision of the internal monitoring agencies, with regular review by the external monitoring agency. Detailed Measurement Surveys (DMS) will be conducted in each village, enterprise, shop, and the compensation contracts will be negotiated and signed with village committees, households, enterprises and shops owners.

Organizational Arrangements and Monitoring

ES.7.9 WPMO will assume the overall responsibility for implementing resettlement. The IAs will undertake resettlement compensation payment and supervision. A Resettlement Office within WPMO will coordinate the planning, implementation, financing and reporting of land acquisition and resettlement, with

the assistance of Wuhan Land Administrative Bureau. The RO will appoint a qualified agency to carry out the demolition of property affected by the Project.

ES.7.10 APs will be notified about the key elements of the RP prior to ADB loan appraisal. The RPs will be disclosed to the affected townships and serious affected villages, and resettlement information booklets (RIBs) will be disseminated to affected households including vulnerable groups and women. In accordance with ADB's Public Communications Policy, the draft RPs will be posted on ADB's website prior to loan appraisal and the approved RPs will be posted prior to Board approval. The IAs will establish project resettlement units for supervising implementation, continuing public consultation, monitoring progress and responding to grievances.

ES.7.11 Internal and external monitoring of RP implementation will be conducted. Monitoring methodologies and indicators are specified in the RPs. Each IA will undertake internal supervision and monitoring to ensure compliance with the provisions of the RP. The WPMO and IAs have agreed to a set of supervision milestones with ADB, to ensure timely and effective implementation of resettlement activities. WPMO and IAs will engage an independent agency for semi-annual monitoring and annual evaluation of land acquisition and resettlement until two years after the completion of land acquisition and resettlement. External monitoring reports will be forwarded directly to both the WPMO and ADB.

ES.8 Financial Analysis

Cost Estimates and Financing Plan

ES.8.1 Cost estimates from the FSRs have been reviewed, and information on physical quantities and unit costs in the FSRs for the subprojects, with some supplementary unit costs and physical quantities information have been used to define the direct and indirect foreign exchange components. To keep ADB loan amount limited to \$100 million, the Project cost is further revised to \$ 266.43 million equivalent for the nine subprojects. This Project cost includes a foreign exchange cost of \$ 139.65 million (52.4 %) and a local currency cost of \$ 126.78 million equivalent (47.6 %). Revised cost estimates are given in Table ES8-1 as the results of further review and discussion with WPMO, DIs and the IAs during ADB's Loan Fact-Finding Mission to strengthen and update the project cost estimates presented in the FSRs.

ES8.2 The financing plans proposed in revised FSR issued in late September 2005 are at a relatively early stage in that although an overall financing plan was prepared indicating major sources of funds for the Project, firm commitments from government and domestic commercial banks were in place. The Wuhan Municipal Finance Bureau issued a commitment letter on 5 December 2005 to commit timely provision of local counterpart funds for smoothly implementing the Project.

ES8.3 The proceeds of the ADB loan, as initially estimated, will be used to finance the direct and indirect foreign exchange cost of \$100 million (about 37.6%) for the project, including base cost of the Project and financial charges during construction on the loan. Counterpart funding will provide about 62.4% of the total project costs and will be used to finance 100% of the local currency costs, and \$39.01 million of the foreign exchange base costs and contingencies costs. Local costs will be financed by WMG's wastewater tariff, WMG budget sources, State Development Bank loans, and domestic commercial bank loans. The financing plan for the Project is summarized in Table ES8-2.

Table ES8-1 Project Cost Estimates (\$ million)

Component	Foreign Exchange	Local Currency	Total Cost
A. Base Costs a			
I. Wastewater Treatment Facilities in Main Urban Area			
Erlangmiao WWTP	14.56	7.88	22.44
Nantaizi Lake WWTP	11.39	11.10	22.49
Huangpu Road WWTP	9.38	5.36	14.74
II. Wastewater Treatment Facilities in Suburban Areas			
Dongxihu Sewer System	11.70	7.92	19.62
Caidian WWTP	6.06	5.64	11.70
III. Storm Water System in Wuhan			
Drainage Works in Luoja Road Area of Wuchang	18.17	27.02	45.18
Yangsigang Pump Stations & Pipes Works in Hanyang	4.71	5.58	10.29
3-gate Connection Works in Dongxihu	19.87	18.63	38.50
Changqing Pump Station Expansion	11.97	7.41	19.38
IV. Project Management	1.00	-	1.00
Subtotal	108.81	96.52	205.33
B. Contingencies			
Physical b	9.65	10.88	20.53
Price c	6.78	6.45	13.23
Subtotal	16.43	17.33	33.77
C. Financial Charges during Implementation d	14.41	12.91	27.32
Total	139.65	126.76	266.42

^a In mid-2005 prices.

^b Computed at 10% for all civil works, land acquisition and resettlement, equipment, training, and consulting.

^c Computed, based on foreign exchange inflation rate of 2.8% in 2006, and 1.9% in 2007 and onwards; and local currency inflation rate at 3.3% in 2006, 3.2% in 2007, and 3.0% in 2008 and onwards; and includes provision for potential exchange rate fluctuation under assumption of a purchasing power parity exchange rate.

^d Includes interest and commitment charges. Interest during construction has been computed at the five-year forward LIBOR rate plus a spread of 0.6%.

Table ES8-2 Financing Plan (\$ million)

Sources	Foreign Exchange	Local Currency	Total Costs	Percentage
A. ADB Loan	100	-	100	37.6
B. Wuhan Municipal Government	39.0	33.3	72.3	27.1
C. Local Bank Loans	-	94.1	94.1	35.3
Total	139.0	127.4	266.4	100.0

Tariff and Cost Recovery

ES8.4 In 1987 WMG introduced a wastewater tariff of 0.08 CNY/m³ for the Main Urban Area, and this has been progressively increased to 0.80 CNY/m³ which has been the tariff since 2003. In Dongxihu suburban area the current wastewater tariff is only 0.05 CNY/m³, and is mainly applied in the Wujiashan area, while in Caidian suburban area there is currently no wastewater tariff. A progressive increase in wastewater tariff approach is recommended as shown in Table ES8-3, in real terms.

Table ES8-3 Proposed Wastewater Tariffs (CNY/m³)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Main Urban Areas	0.80	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Dongxihu Suburban Area	0.05	0.05	0.45	0.45	0.45	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Caidian Suburban Area	0.00	0.00	0.20	0.20	0.20	0.80	0.80	0.95	0.95	0.95	0.95	0.95

Note: Tariffs expressed in Real Terms.

Discounted Cash Flow Analysis and Financial Projections

ES8.5 The Financial Internal Rate of Return (FIRR) for the Project, computed on an after-tax basis, is 12.36% for the Central Urban Area, 7.58% for the Dongxihu Suburban Area and 10.91% for the Caidian Suburban Area. This compares favorably with the WACC, also computed on an after tax basis, of 4.00%. The Project is considered both financially viable and sustainable. Sensitivity analysis indicates that the FIRR would be acceptable under adverse conditions.

ES8.6 Both the Discounted Cash Flow (DCF) analysis and the financial statement projections have shown satisfactory results based upon a progressive increase in tariffs in the Main Urban Area. Given that the current wastewater tariff is 0.80 CNY/m³, an initial wastewater tariff increase to 0.95 CNY/m³ in real terms in 2006 (the first year of the subproject implementation) would allow WMG to accumulate part of the construction fund during the construction period. The wastewater tariff could be increased further to 1.00 CNY/m³ in real terms in 2009. A progressive increase of about 0.20 CNY/m³ in a four year period is considered acceptable, and is important to achieve full cost recovery and to maintain satisfactory financial performance and long-term sustainability.

Financial Management Assessment

ES8.7 Effective financial management is a critical factor to ensure the benefits of a well designed and implemented project are sustainable. The EA and the IAs financial management arrangements should be capable of and adequate for recording all transactions and balances, supporting the preparation of regular and reliable financial statements, safeguarding the entity's assets, and be subject to audit (acceptable to ADB). A Financial Management Assessment (FMA) was

conducted to assess the institutional capacity of each IA, funds flow arrangements, staffing, accounting policies and procedures, internal and external auditing arrangements, reporting and monitoring aspects, and information systems.

ES8.8 From the FMA, it is concluded that the overall financial management arrangements of the WDC are satisfactory and could be relied upon, further ADB's financial due diligence requirements, especially the audit and reporting requirements, were addressed again during ADB's Loan Fact-Finding Mission and to be emphasized during ADB's Appraisal Mission. Commitments and assurances, as the normal practices for other ADB financed projects, are to be sought as well to ensure a solid financing plan is in place and adequate counterpart funds are available to implement the Project.

ES.9 Economic Analysis

ES9.1 In line with PRC policy and ADB support for sustainable economic growth and poverty alleviation, the Project provides an investment package to promote the further development of infrastructure needs (wastewater and storm water) in Wuhan. The economic assessment covers six main topics:

- economic background;
- sector review;
- water and wastewater demand projections for the subproject areas;
- review of water and wastewater tariffs;
- least-cost analysis; and
- economic evaluation of the nine subprojects.

Economic Background

ES9.2 In 2004, Wuhan had a registered population of 7.8 million plus a floating population of approximately 1.2 million. The main urban area (city) has a registered population of about 4.8 million. The economy of the Municipality has been growing at about 10% to 15% per year with GDP reaching CNY 196 billion (\$ 24 billion) in 2004. Industry and the service sectors (secondary and tertiary sectors) have been the main engines of growth. Indeed, the growth in population, GDP per capita, disposable income and local industries has lead to increasing pressure on urban services and the risk that water pollution and damage caused by annual storm events will adversely affect economic growth and lower living standards, especially of the urban poor. WMG has comprehensive plans to address the broad economic issues over the next 15 years up to 2020. The plans include substantial and sustained investments in wastewater and storm water management in order to achieve the sector targets set by the central government, promote increasing prosperity for the people of Wuhan and project the municipality as a modern international city.

Sector Review

ES9.3 With regard to the wider pollution control and water management plans associated with the Yangtze River Basin (YRB) and Wuhan Municipality, the proposed project package will have an important regional and local impact in reducing water pollution, improving municipal drainage systems, enhancing the environment and raising general living standards. The project should also make a modest contribution to pollution reduction in the downstream areas of the YRB, including the important cities of Huanggang, Ezhou, Huangshi, Jiujiang, Anqing, Tongling, Wuhu, Ma'anshan, Nanjing, Zhenjiang, Nantong, Shanghai and many other smaller towns, plus the rural population in the YRB areas of eastern Hubei Province, Anhui Province and Jiangsu Province. It is also important to emphasize that the central and provincial governments, and the ADB, have given high priority to appropriate pollution control and water management investments and measures in the YRB. This gives the Project a much wider social and economic significance than just the direct benefits in the immediate area of each subproject.

ES9.4 Wuhan has a comprehensive set of plans for wastewater and storm water management that are set within the framework of national guidelines and targets, the city's Urban Master Plan (1996-2020), and the investments proposed in the 11th Five Year Plan. These and other documents generally provide an effective program and package of projects to achieve the stated targets. Current data indicate that Wuhan plans to invest CNY 22.4 billion (\$ 2.8 billion) in the water environment over the next 15 years, of which 37% has been allocated to investment in wastewater management facilities and CNY 6.4 billion (\$ 850 million) in storm water management during the 11th FYP. With the increasing pressure on investment resources, WMG is also actively exploring other funding sources in the public and private sectors.

ES9.5 Direct public participation or consultation is not normally part of the recognized procedure in formulating and executing sector plans; on the other hand, some agencies do carry out limited surveys and public awareness campaigns to alert residents and secure public support. Least-cost analysis is not used in the evaluation of policy or projects, but does offer an analytical tool that could be usefully employed as pressure on available capital resources continues to increase.

Water and Wastewater Demand Projections

ES9.6 Water and wastewater projections were prepared for the five wastewater management subprojects, based on the projections in the FSRs and the review by the PPTA team. The forecasts are presented in Table 9-8 in the main text. The review of water and wastewater tariffs is presented in Section 9.5.

Least-cost Analysis

ES9.7 Least-cost analysis of two to four alternatives for the wastewater and storm water subprojects generally confirmed that the preferred options will offer the most cost-effective solutions for achieving the project goals. The net present values over 30 years of operation after the completion of construction, indicate that the cost differences between the alternatives are relatively small, with variations ranging from 2% to 9%.

Economic Analysis

ES9.8 Estimates indicate that the total population served by the two project components will be as follows:

- wastewater management sub-projects: 1.79 million by 2010 and 2.27 million by 2020; and
- storm water management sub-projects: 1.68 million by 2010 and 1.86 million by 2020.

ES9.9 The cost-benefit analysis was conducted in accordance with ADB guidelines and standards, comparing the "with project" and "without project" cases. Benefits were assessed under the following categories:

- wastewater management projects: (i) willingness to pay by non-industrial beneficiaries; and (ii) industrial wastewater treatment cost savings; and
- storm water benefits in the form of: (i) damage savings for private households both for direct and indirect beneficiaries; and (ii) costs of disruption to normal commercial and industrial activity in the respective drainage services areas.

ES9.10 The results of the cost-benefit analysis, as shown in Table ES9-1, indicate economic internal rates of return (EIRR) that justify the proposed investments. The wastewater management subprojects have a combined EIRR of 22.6%, ranging from 12.1% (Nantaizi Lake) to 35.1% (Erlangmiao). The storm water management subprojects have a combined EIRR of 19.6%, ranging from 12.4% (Luoja Road) to 27.1% (Dongxihu Three Gates Connection). The combined EIRR for both components is 21.5%. The sensitivity tests indicate that the results are generally robust and remain above the 12% target.

Table ES9-1 Economic Internal Rates of Return by Subproject

Subproject	EIRR (%)
Wastewater Management	
Erlangmiao	35.1%
Nantaizi Lake	12.1%
Huangpu Road	17.9%

Caidian	15.5%
Dongxihu	25.6%
All wastewater subprojects	22.6%
Storm Water Management	
Luoja Road	12.4%
Yangsigang	12.8%
Dongxihu Three Gates	27.1%
Changqing	22.4%
All storm water subprojects	19.6%
All subprojects	21.5%

ES.10 Management Arrangements, Capacity Building and Training

ES.10.1 The institutional and managerial framework for implementation of the Project has been defined and confirmed during ADB's inception and interim missions in July and September 2005. It is considered these arrangements will prove adequate and ensure an effective implementation of the proposed Project. In particular it has been confirmed that:

- WMG is the EA, and WPMO will coordinate work on behalf of WMG;
- for the wastewater component, WDC will be the IA responsible for both construction and operation; and
- for the storm water component, WUCF will be the IA, while the Jianxing Company will be responsible for construction and the local district level Water Bureau will be responsible for operation.

ES.10.2 The WDC has IA experience under the ongoing ADB funded WWMP, and the WB funded HUEP. WUCF and the Jianxing Company have implementation experience under the WB funded Wuhan Urban Transport Project.

ES.10.3 During the Loan-Fact Finding Mission, WPMO agreed the institutional arrangements for wastewater management for full integration of WDC and for a WDC branch company each to be established in Caidian and Dongxihu.

Integrated Wastewater Management

ES.10.4 International experience suggests that wastewater systems are best managed as an integrated process "from drain to river." That is, activities from the point of discharge to the sewerage system to the ultimate disposal of treated wastewater and residual sludge, should be managed as a single process albeit comprising many linked activities. This suggests that one agency, WDC the logical agency in Wuhan, is given overall management responsibility for this process and institutional reforms promulgated under the ongoing WWMP were designed to achieve this. However, these reforms have yet to be fully implemented.

ES.10.5 However not all wastewater activities should be performed directly by WDC, and it may be appropriate for WDC to contract out all or some of the activities for which it is responsible. WMG should therefore be encouraged to continue to develop WDC as an integrated wastewater management company within the Wuhan Water Services Group.

ES.10.6 The progression to more comprehensive wastewater treatment requires that greater attention be paid to industrial pollution control, and the owner / operator of WWTPs becomes an important stakeholder. The monitoring of industrial discharges, and responsibilities for enforcement, need to be reviewed. The role of the WMEPB should focus more on effluent discharges from WWTPs rather than on wastewater discharges to sewers. WDC as owner of the sewerage network should determine and control what is discharged, and be accountable for the satisfactory performance of WWTPs.

Future Wastewater Institutional Developments

ES.10.7 Future institutional developments, as WDC develops into an integrated wastewater management company as envisaged under WWMP, should facilitate government objectives for the sector of: ensuring the effectiveness and efficiency of services; making available investment funds for any capital improvements needed; and decreasing reliance on government funding. To meet these objectives there needs to be:

- an adequate and sustainable source of funding;
- effective competition where market forces can be utilized; and
- effective regulation to correct inadequacies in the market (for example the effects of monopoly service providers).

ES.10.8 The introduction of wastewater charges and the progressive move to full cost recovery will achieve a basis for meeting the first objective. In addition the corporatization of services providers (such as WDC) will in the medium term facilitate access to a wider selection of sources of investment capital. WMG has made good progress in this respect, a unified billing of water/wastewater is in place and the wastewater charges are remitted in full to WDC, although a concern is the enforceability of wastewater charges levied on self-supplied industries, and that wastewater charges have not yet been implemented in Caidian District (and only to a nominal degree in Dongxihu District).

ES.10.9 There is a fairly comprehensive set of regulatory arrangements in place, covering standards for water quality in rivers and lakes, discharges from WWTPs, the obligations of WDC, land developers, property owners and others in relation to connections and discharges to the sewerage system and its maintenance, and wastewater tariffs. Responsibilities for this regulation are fragmented across different agencies which may reduce effectiveness and may potentially create conflicts. However, this is not an issue that WMG can address alone as governmental responsibilities are defined national level documents.

ES.10.10 Less progress has been made by WMG in efforts to promote competition in the delivery of wastewater services or to actively introduce PSP. This is understandable as policies to actively encourage PSP are only recently established at the national level. The WWSMP, like the WWMP before it, has been proposed, designed and prepared as a public sector funded project. It would not appear sensible to change the basis of project financing for the WWSMP at this stage, however it would be appropriate for WMG to develop a strategy for increasing PSP in the future, and by doing so reduce the reliance of the water / wastewater sector on public funding. Development of such a strategy is further discussed in Section 11.8 and Appendix K4 of this report.

Storm Water Management

ES.10.11 Financing and institutional arrangements for storm water management, although less well developed than for wastewater management, should safeguard service sustainability and facilitate service improvements. International experience suggests this is best achieved through a dedicated funding source, a form of corporatization and potentially PSP, although full implementation of such a strategy would require changes in national policies and laws.

ES.10.12 It is therefore not appropriate for ADB financing of the storm water component to be conditional on financial or institutional reforms as these actions are outside the jurisdiction of WMG as the project EA. However, this does not mean that such reforms should not be further investigated - indeed they should be. This can be taken forward initially as a policy dialogue issue, and potentially as an ADB supported policy technical assistance.

Capacity Building Needs

ES.10.13 Capacity building needs have been identified and endorsed in principle by WPMO. In designing this capacity building program the existence of ongoing capacity building under WWMP has been recognized and taken into account. WWSMP capacity building seeks to build on the WWMP program and not duplicate it.

ES.10.14 The overlap of WWMP and WWSMP and their respective capacity building components is unusual for ADB projects in the PRC. It is more normal for follow-on projects to be designed after the initial project has been substantially completed and thus the outcome can be more clearly assessed. It is possible that either the WWMP or the local GIS capacity building initiative which are currently underway will require follow up initiatives and it may be appropriate to make some contingency provision for these. The need for such initiatives could be reviewed at the mid term point of WWSMP, by which time the outcome of the WWMP and GIS capacity building initiatives should be known.

Specific Assurances Required

ES.10.15 The WWMP legal documents (the loan and project agreements) provide a logical starting point for defining the conditions for the WWSMP. For the wastewater component only minor updating and refinement of the WWMP documents appear necessary, together with specific assurances that:

- WMG will prepare and implement a sludge management strategy;
- wastewater tariffs are to be introduced in Caidian District;
- wastewater operations in Dongxihu are to be integrated with WDC; and
- a WDC branch company is to be established in each of Caidian and Dongxihu Districts.

These assurances are not considered matters that should be conditions of loan effectiveness, but instead are matters to be addressed during project implementation.

ES.10.16 For the storm water component the key assurance required is that storm water operations and maintenance will be adequately funded. Draft assurances have been prepared on this basis and are included in the draft "Report and Recommendation of the President" (RRP) which forms Volume IV of this Final Report.

ES.11 Policy Dialogue

ES11.1 Notes for policy dialogue have been prepared which highlight issues and constraints, and provide possible approaches and required actions / measures to address these issues on the following aspects:

- upstream/basin-wide pollution prevention and control;
- integrated industrial and domestic wastewater management;
- storm water management and urban drainage;
- enterprise reform and corporate governance for the implementing agencies;
- cost recovery and tariff reform based on full cost recovery;
- private sector participation;
- urban poverty reduction;
- regulatory enforcement, monitoring, and environmental management strengthening;
- recycling of treated wastewater effluent; and
- sludge disposal arrangements.

These notes are summarized in Table ES11-1.

ES.12 Project Design Monitoring Framework and Benefit Evaluation

ES12.1 In accordance with ADB guidance, a project design and monitoring framework (PDMF) and a project monitoring and evaluation (PME) plan have been prepared. These tools provide a mechanism for the post-completion evaluation of the Project but will require implementation of procedures for data acquisition and analysis.

Table ES11-1 Summary of Notes for Policy Dialogue

Aspect	Relevance	Notes for Policy Dialogue
1. Upstream/ basin-wide pollution prevention and control	<p>Pollution generated by one city can have a significant and detrimental downstream effect.</p> <p>An integrated and coordinated basin-wide approach to planning of environmental investments gives optimum results.</p> <p>The Project's wastewater component will improve local pollution control, but the Project should also be assessed in the broader context of pollution control within the catchment.</p>	<p>The policies and planning approach adopted by SEPA identify the problems of cross-boundary pollution and also the need for adopting an integrated basin-wide approach in water pollution management. The need for an integrated approach is further reinforced in the PRC Water Law which emphasizes the need to adopt a basin-wide approach including the duty to prepare comprehensive basin plans.</p> <p>The concept of "polluter pays" places emphasis on the responsibilities of local governments to deal with pollution originating from within their area of jurisdiction. The concept of "beneficiary contributes" to pollution alleviation has been discussed and acknowledged within PRC, but has yet to be translated into policy.</p> <p>These concepts could be reconciled by placing primary responsibility on the polluter to meet accepted norms, and where a downstream beneficiary requires enhanced environmental standards, a contribution equivalent to the incremental costs of the enhanced standards is justified.</p>
2. Integrated industrial and domestic wastewater management	<p>Allowing industries to discharge pre-treated waste to urban sewer systems can greatly improve the cost effectiveness of their of wastewater treatment.</p> <p>Large centralized WWTPs will bring economies of scale.</p>	<p>Industrial wastewater in the suburban districts of Caidian and Dongxihu accounts for more than half of the total flow. Wastewater plans developed by WMG make provision for both domestic and industrial wastewater flows.</p> <p>Currently EPBs are the main regulatory agencies for controlling industrial wastewater discharges. Once the WWTPs become operational, the focus of the EPB should change and WDC should take the lead role in controlling discharges to sewer using a permit system which could be developed to include differential charging.</p>
3. Storm water management and urban drainage	<p>A core objective of the Project is to improve storm water management and urban drainage in areas of Wuhan that are at risk of flooding.</p> <p>Where combined drainage systems convey storm water and wastewater any flooding will have greater health risks.</p>	<p>WMG's sewerage master plan provides for the progressive separation of wastewater sewerage and storm water drainage, which will help alleviate health risks of urban flooding and reduce WWTPs from hydraulic overloading.</p> <p>WMG has an urban greening policy that encourages areas of parkland – increased cultivation can reduce storm water runoff.</p> <p>Storm water management is currently viewed as a public service that should be financed from government revenues. Alternative means of financing the storm water management could be explored.</p>
4. Enterprise reform and corporate governance for the implementing agencies	<p>Financial and managerial autonomy of WDC creates sustainable institutional framework. This can improve services and give wider access to financial markets.</p>	<p>Corporate governance includes the establishment of a Board of Directors, internal control systems, open procurement methods, audits, public disclosure, and modern financial management.</p> <p>WDC is already a managerially autonomous enterprise with its own Board of Directors and internal control. The FMA found no significant concerns. Financial management is being further strengthened under the ADB's WWMP capacity building program.</p>

Aspect	Relevance	Notes for Policy Dialogue
	This autonomy must be matched by high standards of financial stewardship to maintain confidence of stakeholders.	WMG will increase the use of open, competitive procurement to improve the efficiency and transparency of public services.
5. Cost recovery and tariff reform based on full cost recovery	<p>Adequate collection of tariffs based on full cost recovery will give the IAs financial autonomy to allow loan repayment, O&M and replacement of assets.</p> <p>The need for Government subsidies will largely be eliminated.</p>	<p>PRC reforms require wastewater projects to be financially sustainable. The wastewater charge (CNY 0.8 /m³) in the urban area is relatively high, but is minimal in suburban areas. Future charging could be more sophisticated. Public awareness of the benefits of effective wastewater management enhances willingness to pay. PPTA surveys indicated a relatively high level of willingness to pay.</p> <p>In Wuhan the "one bill – two items" collection approach is used, which has been most effective elsewhere. Difficulties occur where water is from self-supply wells and needs cooperation between agencies. Income collection rates should be monitored by the PPMS.</p> <p>Storm water management is currently viewed as a non revenue generating activity in the PRC, although this may change in future.</p>
6. Private sector participation (PSP)	<p>PSP can provide financing reducing reliance on government and multi- or bi-lateral sources. But for the proposed Project, the main finance sources have been identified.</p> <p>The private-sector can increase O&M efficiency.</p>	<p>Although the Project is to be financed traditionally, WMG encourages PSP and has sanctioned some BOT schemes. Reliable income is essential for attracting PSP, so tariff policies and PSP are closely related.</p> <p>Within the Project, WWTP O&M could be contracted out.</p> <p>PSP requires regulation so that procurement is open and transparent, and that stakeholders interests are safeguarded. Local "model" initiatives could form part of individual projects with capacity building.</p>
7. Urban poverty reduction	<p>Poverty alleviation is an overriding objective of the ADB and all ADB projects are expected to have a positive impact on poverty either directly or indirectly.</p> <p>The transition from a planned to a market economy means that employment is no longer certain as non-viable enterprises close.</p>	<p>Municipal wastewater projects impact poverty directly through employment (both construction and operations), and also benefit industry. Centralized wastewater treatment reduces costs for existing industry and is increasingly a prerequisite for approval of new industrial developments.</p> <p>Cleanup of urban waterways creates employment directly for the construction and maintenance of parks, and indirectly through the commercial development that often results.</p> <p>Increased wastewater charges may cause financial hardship, which can be offset by subsidies to poor households. These programs should be reviewed at the time of future tariff adjustments.</p>
8. Regulatory enforcement, monitoring, and environmental management strengthening	Environmental management is critical to both the protection of Project facilities and also the receiving watercourses. This includes the control of discharges to the municipal sewerage systems.	<p>Environmental laws, rules and regulations are well-established. As WWTPs are commissioned, monitoring and control arrangements will need to be strengthened, especially in Caidian and Dongxihu where industrial wastewater is significant. Traditionally monitoring and enforcement has been by EPBs, but in future the WWTP operator will need to establish capability to do this. The legal ability of the WDC to monitor and enforce discharges to its sewers must be clearly established.</p> <p>The IAs have acknowledged that the commitments in the EIA will be adhered, with a specific member of staff who will undertake a monitoring and coordination role.</p>

Aspect	Relevance	Notes for Policy Dialogue
9. Recycling of treated wastewater effluent	PRC policy encourages the beneficial reuse of wastewater, but in Wuhan there is abundant water and there appears to be no economic justification for significant recycling of WWTP effluent.	PRC policy encourages the reuse of treated wastewater and cities have been set targets to reuse 50% of treated effluent. In Wuhan this policy may encourage investment that could not be justified on economically. This appears to be recognized by WMG as other than Nantaizi Lake WWTP where treated effluent will be discharged to a proposed constructed wetland, significant wastewater reuse is not included in the proposed Project. Policies that set targets with little regard to local circumstances should be reviewed, so that wastewater is reused only where there is economic justification.
10. Sludge disposal arrangements	<p>The Project will significantly increase sludge produced by the WWTPs in the urban area.</p> <p>A robust strategy is required to ensure that the sludge is properly disposed of and that no secondary pollution arises. This needs to be integrated with the city's strategy for solid waste management.</p>	<p>WMG recognizes the sludge disposal issue needs to be dealt with and have stated this will be dealt with during Project implementation. However, it is not only the proposed Project facilities that will generate sludge. Existing WWTPs and those under construction within other projects financed by WB, the ADB's WWMP, and other WWTP investments will all generate significant volumes of sludge.</p> <p>The current strategy appears to be one of co-disposal with municipal refuse at sanitary landfills and incineration, but this strategy appears not to have resulted from any considered study of alternatives. Development of a city-wide sludge management strategy appears to be urgently required and should be an assurance in the project documents. PPTA discussions identified support for the development of a sludge management strategy to be financed under the WWSMP, and this is reflected in the TOR of the proposed implementation consulting services.</p>

1. Introduction

1.1. General Introduction

1.1.1 This report is the Final Report for ADB TA – 4436, the Project Preparatory Technical Assistance (PPTA) for the proposed Wuhan Wastewater and Storm Water Management Project (WWSMP). The report is presented in accordance with the requirements of the contract, dated May 10, 2005 between the Asian Development Bank (ADB) and Black & Veatch Asia Ltd (B&V), the appointed PPTA consultant (the Consultant). Funding of the PPTA is under a grant from the ADB.

1.1.2 The ADB notice to proceed was issued on May 20, 2005 and B&V undertook initial mobilization in Wuhan on June 1, 2005. An Inception Report was submitted on June 23, 2005 and an Inception Workshop was subsequently held on July 5, 2005. Further input was then made and an Interim Report was submitted on August 22, 2005 and an Interim Workshop was held on September 2, 2005. The Draft Final Report (DFR) was then submitted on November 7, 2005 and the Loan-Fact Finding Mission was held from November 24 to December 9, 2005.

1.1.3 This Final Report describes that project progress which has been made in undertaking the PPTA, highlights findings and conclusions identified, and presents the PPTA recommendations. The following are provided in this introductory section of the report :

- Confirmation of PPTA objectives;
- International donors involvements on the implementation of Wuhan Wastewater Master Plan;
- An overview of implementation arrangements;
- Description of the layout of this Final Report;
- Consultant's coverage on the Terms of Reference, and
- Actions that have been taken by the Consultant to address comments from the Ministry of Finance on the Interim Report during the briefing meeting held on September 8, 2005.

1.1.4 This Final Report is prepared in accordance with the Outline Terms of Reference for Consultants attached in Appendix A1, and the Consultant's coverage of TOR is detailed in Appendix A2.

1.1.5 This Project comprises five wastewater subprojects and four storm water subprojects. The inclusion of these 9 subprojects in the Project has been approved by the Hubei Development and Reform Commission on April 18, 2005.

1.2. Objectives of the PPTA

1.2.1 The overall objective of the PPTA is to prepare a project suitable for ADB financing, by assessment of the five wastewater collection and treatment subprojects and four storm water subprojects that have been identified to serve eight districts within the Wuhan Municipality. This includes an evaluation of subproject feasibility with respect to technical, environmental, financial, economic, social, resettlement, and institutional considerations.

1.2.2 An important objective of the PPTA is also to develop a sound rationale for the whole project. This will be done by examining the Project and individual subproject proposals within the context of broader development and environmental plans relevant to the project area. The PPTA team seeks to provide assurance that the subprojects will contribute to achieving the overall objectives of the Yangtze River Water Resources Protection Plan and they are the optimum choices for pollution control investment in the project areas.

1.2.3 Sustainability of the proposed wastewater and storm water systems is another key objective, which will require identification of the necessary counterpart financial plans and institutional capacity building measures.

1.3 Wastewater Master Plan and Bilateral Donor Coordination

1.3.1 Wuhan Municipal Government (WMG) has developed a Wastewater Master Plan which includes 13 wastewater treatment plants (WWTPs) and their associated wastewater collection systems in the main urban areas. The World Bank, ADB and other foreign governments have since been involved in the implementation of the Master Plan including the five wastewater subprojects under the Project. Further planning of another seven WWTPs and their associated sewerage systems were recommended for six suburban districts, including Caidian WWTP which is part of this Project.

1.3.2 In 1995, the World Bank funded Hubei Urban Environmental Project (HUEP) consists of four WWTPs identified in the Wastewater Master Plan, including the 180,000 m³/d primary treatment and associated sewers for Erlangmiao WWTP, the 400,000 m³/d secondary treatment and associated sewers for Hanxi WWTP, and the sewer system for Nantaizi Lake WWTP in the Dongxihu suburban district. Erlangmiao WWTP was completed in early 2002, and at the time of this report Hanxi WWTP is under construction and targeted to complete in 2006.

1.3.3 The Finnish Government financed the construction of Huangpu Road WWTP with a river outfall discharge system in 1998. This pretreatment facility completed in 1999, has a capacity of 100,000 m³/d.

1.3.4 The Polish Government funded another wastewater collection and treatment project in the Hangyang area in late 2002. This Nantaizi WWTP is a 100,000 m³/d secondary treatment facility which was completed in July 2005. Most of the sewer systems in the eastern portion of this WWTP service area were built under World Bank Loan arrangements.

1.3.5 In 2003, ADB financed the Wuhan Wastewater Management Project (WWMP), covering three WWTPs and their associated sewage collection systems. Implementation of this project has experienced delays in one of the 3 WWTPs. A number of related activities are also behind schedule. These activities include the implementation of project performance management system (PPMS), resettlement monitoring, and human resource development, formulation of the water quality model and construction of the training center. Wuhan Urban Construction Utilization of Foreign Investment Project Management Office (WPMO) and the Implementing Agency (IA) have given assurance to complete all project activities before project completion in June 2008.

1.3.6 Major loan covenants are being complied with and important policy reforms are being achieved. These include, strengthening wastewater management, cost recovery and tariff reform based on full cost recovery, and improving environmental management.

1.3.7 Funded by the World Bank, storm water trunks, box culverts, and Xindu Gate have been laid within the service areas of the Dongxihu Three-Gate Connection subproject of the storm water component.

1.3.8 This WWSMP (the Project) will complement the WWTPs being financed by the World Bank, Finnish, and Polish Government on the implementation of the Wastewater and Storm Water Master Plans, and extend wastewater management services to one selected suburban district, Caidian. This suburban district presently has no WWTP and raw wastewater generated is being directly discharged into the Han River, one of the major water supply sources for Wuhan. Consequently, the Caidian wastewater collection and treatment system will not only enhance Han River Basin overall pollution control but also improve water quality of Han River.

1.4 Implementation Arrangements

1.4.1 The Executing Agency (EA) for the WWSMP is the WMG who has established a Project Leading Group (PLG) to oversee project preparation and implementation.

1.4.2 WMG has assigned day to day responsibility for project preparations to the WPMO, which is an office under the prime jurisdiction of the Wuhan Urban Construction Foundation (WUCF) of the WMG.

1.4.3 The PLG is headed by a Vice Mayor and comprises provincial and municipal level staff from the Urban Construction Foundation, Construction Commission, Planning Commission, Finance Bureau, Water Bureau, and Environmental Protection Bureau, as well as other representation as required, including from the participating district governments in Caidan and Dongxihu.

1.4.4 The proposed IAs for the Project are the Wuhan Drainage Company (WDC, a corporate entity) for the wastewater subprojects and WUCF (a government agency) for the non-revenue storm water subprojects.

1.4.5 The commencement date for the PPTA was June 1, 2005 when the PPTA team began work at the offices provided by WPMO in Wuhan. The PPTA work is to be completed in a six-and-half month period, ending in mid December 2005. The project work and staffing schedules for the PPTA is shown in Figures 1-1 and 1-2, respectively. They have been revised to reflect delays in establishing flow projections and in facility planning of some subprojects which were finalized in the draft final Feasibility Study Report (FSR) available only in late September 2005.

The Inception Report was submitted on June 23, 2005, and the Interim Report was submitted on August 22, 2005. A DFR was submitted on November 7, 2005. This DFR then form the basis of discussion at a final workshop and the tripartite meeting which were held between November 24 and December 9, 2005, after which the DFR was refined and updated to this Final Report.

1.4.6 Activities undertaken by the PPTA team to date:

- Completion of the Inception Phase activities, including establishment of and relocation of the PPTA office, Inception Workshop with stakeholders, and submission of the Inception Report;
- Completion of the Interim Phase activities, including an Interim Workshop with stakeholders, and submission of the Interim Report;
- Completion and submittal of the DFR, and the final workshop;
- Review and analysis of draft and draft final FSRs, Environmental Impact Assessments (EIAs) and Resettlement Plans (RPs) and recommended modifications;
- Site visits to all subproject locations;
- Technical meetings with design institutes responsible for the draft and draft final FSRs preparation;
- Verification of project construction costs and operations and maintenance (O&M) costs; development of proposals for contract packaging;
- EIA briefing meetings with the consulting firm responsible for EIA preparation, and participation in public consultations;
- Meetings with Wuhan University who is responsible for the draft final RP preparation and supervisions on resettlement household surveys;

- Completion of household and business socio-economic surveys, interviews with key informants, and undertaking poverty profiling and analysis;
- Review and analysis of historical water and wastewater tariffs, financing assessment on WDC, and assessment of financial plan;
- Collection of data to assist in the identification and evaluation of project benefits;
- Completion of review of available sectoral plans and analysis of current wastewater and storm water management practices;
- Review and assessment of existing institutional capacity and proposed institutional arrangements, and preparation of proposals for strengthening institutional capacity;
- Preparation of this Final Report;
- Preparation of the draft Summary EIA (SEIA); and
- Preparation of the draft Summary RP (SRP) and review of two RPs.

1.4.7 In addition to the above activities there have been regular meetings held with WPMO to discuss working arrangements and to identify and resolve potential issues that have been identified. Close communications with WPMO have been well maintained. Strong support from WPMO has enabled the PPTA team to accomplish the ADB assignment effectively and in a timely manner.

1.4.8 The primary reference material for this Final Report consists of the draft and the draft final FSRs for the 9 subprojects, together with the draft and the draft final EIA reports, one combined draft and two draft final RPs. Other reference material which has been provided for the PPTA is listed in Appendix A3.

1.4.9 A list of the provincial, municipal, district and implementation agency staff, along with design institute, Wuhan University, consulting firm staff, and the international and domestic consultants participating in this PPTA are listed in Appendix A4.

1.5 Layout of Final Report

1.5.1 Based on the Terms of Reference (TOR) and review comments on the Interim Report from ADB and the Ministry of Finance (MOF), this Final Report includes five volumes as follows:

- Volume I, Project Analysis;
- Volume II, Summary Environmental Impact Assessment;
- Volume III, Summary Resettlement Plan (and two project component RPs);
- Volume IV, Draft Report and Recommendation of the President; and
- Volume V, Draft Project Administration Memorandum.

1.5.2 Responses to the comments received on the DFR have been incorporated into this Final Report, and are included in Appendix A5.

1.5.3 All key findings of the Project have been presented in the final workshop as required in the TOR, which was held on November 25, 2005.

1.6 Actions in Response to Ministry of Finance Comments on Interim Report

1.6.1 Based on the review comments on the Interim Report from the MOF during the briefing meeting held on September 8, 2005, the PPTA team took immediate actions to fully address the comments raised.

1.6.2 In the area of tariff reforms and cost recovery, different wastewater tariff based on customer categories is recommended along with the suggestions on tariff systems in both Caidian and Dongxihu suburban districts. Wastewater tariffs will be introduced a realistic step-by-step process to specific project related areas in the two suburban districts.

1.6.3 Corporatizing of WDC and institutional strengthening. An integrated wastewater management company by one company is recommended to serve both the main urban area, with a branch company to be established in each of Caidian and Dongxihu Suburban Districts. Continuing and adequate government funding is necessary for the storm water operations and maintenance.

1.6.4 Private sector participation (PSP) in the Wuhan wastewater sector with a potential listing of WDC on one of the local stock exchanges for private investment once the Project is in the operating stage is suggested and discussed with the WPMO. In addition, private sector involvements on the operations and maintenance of WWTPs and storm water management facilities are recommended.

1.6.5 Innovative technical recommendations discussed and accepted by WPMO including a comprehensive sludge management evaluation, household connection programs, inflow/infiltration (I/I) investigations in the Erlangmiao service area and better practices and QC/QA procedures on sewer connection of Dongxihu and Caidian subprojects to minimize I/I problem.

1.6.6 Other value added proposals to the Project include recommendations to improve the existing pretreatment and primary treatment systems and suggestions to integrate existing systems with the secondary treatment system to optimize the facility capability and to minimize equipment duplication.

1.6.7 Privatization of the storm water facility O&M as initiated by the WPMO and assessed by this PPTA.

1.6.8 Possibility of hydraulic modeling on the storm water drainage system improvements has been proposed.

1.6.9 From the experience gained from the previous ADB Wastewater Management Project, the PPTA Team has addressed ways to expedite procurement with design-built contract on Huangpu Road WWTP and to minimize loan savings with the increase of civil work and M&E portions to 57 and 75 percent, respectively. It is also proposed to continue with the institutional reform and strengthening efforts and follow up on the water quality modeling action plan under the previous ADB wastewater project.

1.6.10 The Project Design and Monitoring Framework has been coordinated with the design of the Project Management System of the Ministry of Finance to minimize duplication of effort and maximize monitoring efficiency. Selective indicators are included such that as much as possible readily available data will be gathered.

1.6.11 ADB might be interested in sponsoring an advisory TA on storm water management on a national initiative under the Ministry of Construction. Wuhan could be a specific case study given the significance of urban flood alleviation to the well being of city residents.

1.6.12 A Loan-Fact Finding briefing meeting to MOF was subsequently held in Beijing on December 8, 2005. The MOF agreed to keep ADB loan amount to \$100 million, set the civil works and M&E percentage financing to 70 and 100 %, respectively to maximize ADB cost sharing, and to increase manmonths on financial management service in the implementation phase consulting TOR as suggested by Hubei Provincial Finance Bureau and WPMO. The MOF also moves this Project from stand-by to firm position.

2. Project Description

2.1. Project Rationale

2.1.1. Rapid economic growth and continuing urbanization over the last twenty five years in the PRC has resulted in increasingly severe problems related to urban drainage and water pollution, and cause a rapid increase in demands for better urban infrastructure services and for relieving the environmental threats from pollution. This fast transformation has led to a deterioration of the quality of life for urban residents, degradation of the urban environment, creating water supply problems and inefficient economic development. Extensive urban reconstruction is necessary to alleviate these infrastructure deficiencies such as wastewater treatment and storm water management facilities in most of the major cities. Government policies require that urban environmental pollution and ecological damage be controlled and State guidelines require that major cities, such as Wuhan, have a wastewater treatment rate of not less than 70% by 2010.

2.1.2. Water quality in the Wuhan section of the Yangtze River has decreased over the last 15 years, partially due to the wastewater discharge from the city. In 2004, about 1.98 million m³/day of wastewater was generated but only 26.8% was treated by four WWTPs (most of them are primary treatment facilities). To achieve sustainable wastewater management and water resource protection, ADB approved the Wuhan Wastewater Management Project (WWMP) in 2003, to increase about 25% of wastewater treatment rate. Consequently an overall treatment rate of 74% with secondary treatment process and meeting discharge criteria will be reached by 2008 with the completion of ADB Phase 1 Project (WWMP), World Bank funded and other BOT projects. WMG is currently undertaking a comprehensive wastewater management initiative through to 2010, and additional WWTPs in the planning stages would raise the treatment percentage to the national mandated 80% target.

2.1.3. The built up areas in Wuhan Municipality (20-23 m above sea level) are mostly below the average flood level (23.47 m above sea level) of the Yangtze and Han rivers. Wuhan is served by a mixture of wastewater, storm water and combined sewer networks and its aging and inadequately maintained drainage network and under capacity pumping stations result in frequent severe flooding events. WMG is currently in the process of completing its drainage network, and separating the storm water from wastewater. WMG is also undertaking a comprehensive urban drainage and flood control program to increase drainage network coverage to 11.5-12.5 km/km² by 2010 and to 14.5-15.5 km/km² by 2020.

2.1.4. The Project will assist WMG in formulating a practical approach to provide improved urban environmental services and to introduce the principles of integrated water resource management through improved pollution control and more effective storm water management. The Project will supplement and extend the existing wastewater and storm water management program been funded under ADB, World Bank (Erlangmiao WWTP, Dongxihu Three Gates

Connections Xindu gate and major drainage networks), Finnish Government (Huangpu Road WWTP), Polish Government (Nantaizi Lake WWTP) and WMG. The treatment rate achieved by the Project is about 10% and this contribution will reach the overall treatment (with secondary process and meeting discharge criteria) percentage to the 80% target by 2010 set by the Wuhan Municipality.

2.1.5. The Project will help improve the urban environment and public health through improved wastewater and storm water management, and to improve the quality of surface and groundwater in and downstream of the project locations. It will also help improve the quality of life for the urban poor by reducing waterborne diseases, and relieving urban flooding threats. In accordance with the flooding records of the Drainage Manual of Wuhan Municipal Water Bureau, the four storm water subprojects under the Project cover more than 50% of the most flood-prone areas within the City.

2.2. Brief Description of Subprojects

2.2.1 The Project comprises five wastewater management subprojects and four storm water management subprojects for improving the Yangtze, Han and Fu River systems, and alleviating flooding. The location of each subproject is shown in Figure 2-1. A brief description of the scope and benefits of each of the proposed subprojects is given below. Further subproject details are provided in Appendix B. Technical analysis of the wastewater subprojects is included in Chapter 3 of this report and technical analysis of the storm water subprojects is given in Chapter 4.



Figure 2-1 Location of the Subprojects

2.2.2 The wastewater management subprojects are proposed in:

- Wuchang: The existing Erlangmiao WWTP of 180,000 m³/d primary treatment capacity is to be expanded and upgraded to 240,000 m³/d with secondary treatment process;
- Hanyang: The expansion of the existing 100,000 m³/d (secondary) Nantaizi Lake WWTP by 100,000 m³/d and its wastewater collection system within which another 3 pump stations and 7.435 km of sewer pipelines will be constructed;
- Hankou: The existing 100,000 m³/d Huangpu Road WWTP is to be upgraded from a pretreatment facility to a secondary treatment plant;
- Caidian: A new 50,000 m³/d secondary WWTP in the Chengguan Township and its wastewater collection system comprising 4.59 km of pipelines and one pump station will be constructed.
- Dongxihu: A wastewater collection system comprising 15.55 km of sewer pipelines, 9.80 km of box culverts and 5 pump stations will be constructed.

The total service area of wastewater management subprojects is 162 km² and the locations of these subprojects are shown in Figure 2-2.

2.2.3 The Erlangmiao and Huangpu Road subprojects involve WWTP upgrade / expansion works only, The Nantaizi Lake subproject includes WWTP secondary and extension works, together with new sewer construction. The proposed WWTP in the Caidian District includes a new 50,000 m³/d WWTP and associated sewer network, whereas the proposed Dongxihu subproject involves sewer network and pump station to deliver wastewater to Hanxi WWTP.

2.2.4 The wastewater subprojects are consistent with the overall pollution load reduction targets of the Yangtze River Resources Protection Plan; the WMG's planning of 13 WWTPs in the main urban area by 2020, another seven WWTPs and their associated sewerage systems for six suburban districts, including Caidian WWTP which is part of this Project, and with the wastewater treatment objectives set in *Wuhan Municipal Water Environment Renovation and Protection Plan*. Overall status on the planning, engineering, construction, and operation on these 13 WWTPs in the main urban area are summarized in Table 2-1.

Table 2-1 Wastewater Treatment Plants in Wuhan Main Urban Area

No.	Location	WWTP	Capacity (10,000 m ³ /d)	Process			Activity Status				Completion Year	Funding	Receiving Water
				P	1 st	2 nd	P	C	S	O			
1		Sanjintan	30								2008	ADB	Fu River
2	Hankou	Hanxi	40								2006	WB	Fu River
3		Huangpu Road	P1 10 P2 10								1999 2010	Finland ADB	Yangtze R.
4	Hanyang	Nantaizi Lake	P1 10 P2 20								2005 2010	Poland ADB	Yangtze R.
5		Zhuankou	6								2008	BOT	Yangtze R.
6		Huangjiahu	10								2008	ADB	Yangtze R.
7		Erlang-Miao	P1 18 P2 24								2002 2010	WB ADB	Yangtze R.
8		Luobuzui	12								2008	ADB	Yangtze R.
9	Wuchang	Shahu	P1 5 P2 10 P3 15								1990 1998 2002	Finland WB WB	Yangtze R.
10		Longwang-zui	P1 15 P2 15								2003 2005	WB WB	South Lake
11		Tangxunhu	5								2004	BOT	Tangxun L.
12		Beihu	2								Pending	Pending	Yangtze R.
13		Huangjiadawan	1.5								Pending	Pending	East Lake

Source: Draft final FSR

P1 – Phase 1; P2 – Phase 2

Treatment: P – Pretreatment, 1st – Primary, 2nd – Secondary

Activity Status: P – Planned, C – Under Construction, S – Start-Up, O – In Operation

WMG - Wuhan Municipal Government; WB - World Bank; ADB - Asian Development Bank

2.2.5 Benefits of all wastewater subprojects will include local environmental and health improvements from reduced pollution of watercourses, and reduced downstream pollution of the Yangtze River. Most of the wastewater subprojects are recommended for beneficial reuse of a proportion of treated effluent within the WWTPs. Furthermore, the effluent from Nantaizi Lake WWTP is suggested to be utilized as the replenished water for a nearby wetland. The Dongxihu wastewater collection system is expected to collect and intercept wastewater from the service area to the proposed Hanxi WWTP, a World Bank funded project which is scheduled to be in operation in 2006.

Furthermore, this wastewater subproject coincides with one of the storm water subprojects, Dongxihu Three Drainage Gates Connections, to segregate wastewater from storm water, and to improve the water quality in the open channel drainage system. The suburban Caidan WWTP will eliminate direct discharge of raw sewage into the Han River, the main water supply source (62%) for Wuhan.

2.2.6 Storm water subprojects are proposed in:

- Wuchang: The existing drainage work of the LuoJia Road area is to be improved with channel renovation for LuoJiagang and Shahugang, and an increase of the LuoJia Road drainage pumping station capacity by 55 m³/s;
- Hangyang: A new Yangsigang pumping station with a capacity of 20 m³/s is to be constructed, together with 1.34 km of storm water pipelines and 1.90 km of box culverts;
- Dongxihu: The three drainage controlling gates are to be connected. 3.91 km of box culvert and 4.34 km of open channel are to be constructed and 4.48 km of open channel is to be rehabilitated;
- Dongxihu Changqing pumping station: The existing station is to be expanded with 135 m³/s.

The total service area of storm water management subprojects is 658 km² and the locations of these subprojects are shown in Figure 2-3.

2.2.7 The storm water subprojects will improve the drainage system and reduce the combined sewer overflow situations. The drainage pumping capacity increase in some portions of the urban areas and the Dongxihu suburban area in WMG, will alleviate and minimize flooding incidents within the project areas.

2.3. Estimated Costs and Financial Plan

2.3.1 The Project cost as given in the draft final FSR is CNY 2.055 billion (\$ 253.38 equivalent) which includes capital costs, fees for land acquisition and resettlement, project supervision and management, work drawing and as-built drawing preparation, interests, initial working capital, etc. During the Loan-Fact Finding Mission, these cost estimates were subsequently adjusted to \$ 266.43 million with ADB loan amount of \$100 million. This Project cost includes a foreign exchange cost of \$ 139.65 million (52.4 %) and a local currency cost of \$ 126.78 million equivalent (47.6 %). The detailed capital cost estimates presented in the draft final FSR are CNY 1.250 billion and the breakdowns are shown in Table 2-2 below:

Table 2-2 Summary of Capital Cost Estimates

Subproject	Civil Works		M&E Works		Total	
	CNY x 10 ⁶	\$ equiv x 10 ⁶	CNY x 10 ⁶	\$ equiv x 10 ⁶	CNY x 10 ⁶	\$ equiv x 10 ⁶
Wastewater						
Erlangmiao WWTP	84.53	10.42	80.90	9.98	165.43	20.40
Nantaizi Lake WWTP	86.90	10.72	47.80	5.89	134.70	16.61
Huangpu Road WWTP	35.00	4.32	73.57	9.07	108.57	13.39
Caidian WWTP	44.63	5.50	25.70	3.17	70.33	8.67
Donxihu WW Collection System	121.94	15.04	15.26	1.88	137.20	16.92
Storm Water						
Luojia Road Pump Station & Luojiagang Open Channel	157.65	19.44	52.09	6.42	209.74	25.86
Yangsigang Pump Station & Storm Water Network	33.43	4.12	21.35	2.63	54.78	6.75
Dongxihu Three Gates Connections	230.22	28.39	0	0	230.22	28.39
Changqing Pump Station	59.09	7.29	79.97	9.86	139.06	17.15
Total	853.39	105.23	396.64	48.91	1,250.03	154.13

Notes: \$:CNY exchange rate is defined as 8.11.

2.3.2 This Project will be financed by an ADB loan of \$ 100 million, with matching counterpart funds of \$ 166.43 million being provided from WMG and domestic borrowing from local bank as summarized in Table 2-3. Details are presented in the Financial Analysis Chapter.

Table 2-3 Financing Plan (\$ Million)

Funding Source	Foreign Exchange	Local Currency	Total Cost	Percentage
ADB Loan	100	-	100	37.5%
Wuhan Municipal Government	39.65	32.69	72.34	27.2%
Local Bank Loans	-	94.09	94.09	35.3%
Total	139.65	126.78	266.43	100.0%

2.4. Synchronized ADB and Domestic Processes

2.4.1 In accordance with the synchronized ADB loan processing and domestic project approval status and timetable disclosed in the Aide Memoire of the ADB TA Inception Mission, dated July 8, 2005, the Project will be processed in a synchronized schedule as shown in Figure 2-4.

2.4.2 Domestic processing schedule is as follows:

- The formal project proposal was already approved by HDRC in April 2005;
- The draft final FSR was completed in September 2005 and has been submitted for review in October 2005. The FSR was approved by HDRC on January 23, 2006;
- Six individual subproject EIAs and one combined EIAs for three subprojects were completed in September 2005 and have been submitted for review. Hubei Environmental Protection Bureau (HEPB) approved these EIAs on January 10, 2006;
- WMG approved the disclosure of the SEIA in December 2005;
- It is anticipated that the two Resettlement Plans (RPs) will be endorsed by WMG in early February 2006; and
- The Capital Utilization Application is to be submitted in February 2006, and to be approved in March 2006.

2.4.3 The ADB processing schedule is as follows:

- The PPTA team submitted the draft SEIA to ADB by September 30, 2005;
- Completion of the Final SEIA (both English and Chinese versions) by November 30, 2005;
- The PPTA Team to submit DFR (in English) by November 7, 2005;
- The PPTA Team to submit DFR (in Chinese translation) by November 14, 2005;
- The Loan Fact Finding Mission was held from November 24 to December 9, 2005;
- The SEIA was posted on ADB's website in January 2006;
- The Management Review Meeting to be held on February 22, 2006;
- The Loan Appraisal Mission is scheduled between February 26 and March 6, 2006 (as needed);
- The Staff Review Committee Meeting to be held on March 22, 2006;
- Loan negotiations to be conducted from April 17 to 21 in 2006;
- Board approval is expected at the end of May in 2006;
- Loan signing to be held in June 2006; and
- Loan to be effective in July 2006.

2.5. Implementation Schedule

This PPTA is being implemented in accordance with the following schedule:

- | | |
|--------------------------------|---------------------------|
| • Overall duration | June 2005 - December 2005 |
| • Inception Report Submittal | June 22, 2005 |
| • Inception Workshop | July 5, 2005 |
| • Interim Report Submittal | August 23, 2005 |
| • Interim Workshop | September 2, 2005 |
| • Draft Final Report Submittal | November 7, 2005 |
| • Final Workshop | November 25, 2005 |
| • Final Report Submittal | February 2006 |

3. Technical Analysis of Wastewater Subprojects

3.1. General

3.1.1. This Chapter provides an analysis of the technical aspects of each of the five wastewater subprojects. The draft final Feasibility Study Report (FSR) prepared by the design institutes (DIs) has been the main basis for this review, and this has been supplemented by field visits to each subproject site, discussions with local consultants and meetings with the institutes. A summary of the components for each subproject are given in Table 3-1 and also shown in Figure 3-1. The DIs responsible for preparation of the draft final FSR are the Wuhan Municipal Engineering Design & Research Institute and Wuhan Municipal Planning Design & Research Institute.

Table 3-1 Components for each of the wastewater subproject

Urban area	Erlangmiao WWTP Expansion and Upgrade	WWTP expansion and upgrade from primary treatment to secondary treatment (Phase II)
	Nantaizi Lake WWTP Expansion and Sewage Collection System	1. Construction of 3 new pumping stations; 2. Construction of sewers; 3. WWTP expansion (Phase II)
	Huangpu Road WWTP Upgrade	WWTP upgrade from pretreatment to secondary treatment (Phase II)
Suburban area	Caidian WWTP and Collection System	1. Construction of a new secondary WWTP; 2. Construction of sewers; 3. Construction of one new pumping station
	Dongxihu WW Collection System	1. Construction of trunk sewers and box culverts; 2. Construction of 5 new pumping stations 3. Construction of 2 control gates

3.1.2. The draft final FSR provides a general description of the rationale, technical basis, and rough estimated costs for the subprojects, which forms the basis for the implementation of the Project. This draft final FSR was submitted to the Hubei Provincial Development and Reform Commission (HPDRC) for their review in October 2005 and was approved in January 2006.

3.1.3. The topics of primary concern in the technical analysis for wastewater subprojects are described in this section, including:

- consistency of planning horizons with municipal master plan;
- forecasts of wastewater flows and loads;
- proposed capacities of wastewater collection systems and treatment plants, and the functional design of the treatment facilities in terms of the anticipated influent characteristics and required effluent quality;
- the existing and proposed wastewater collection systems;
- consideration of possible alternatives to the proposed subprojects, which are to be discussed further with the WPMO and the planning and design institutes; and
- Collection and analysis of additional data to support and optimize the wastewater collection and treatment systems.

3.1.4. This Chapter concludes with a summary of the recommended wastewater subprojects that identifies modifications which it is considered should be made to the subprojects as proposed in the final FSR.

3.2. Municipal Wuhan Wastewater Master Plan and Population Predictions

3.2.1 Wuhan Municipal Master Plan (WMMP) was prepared for the Year 1996 to Year 2020 and this master plan has formed the basis for the provision of services and utilities. The draft final FSR for all of the wastewater subprojects has used the WMMP available at the time. In accordance with the States Council, the percentage of wastewater treated should be over 80% for cities having populations over 500,000 in Year 2010. Consequently, the updated Wuhan Wastewater Master Plan (Wuhan Urban and Suburban Wastewater Treatment and Water Reuse facilities Planning Study, May 2005) recommended a target rate of 80% for the main urban area in Year 2010 and 95% in Year 2020, respectively for the main urban areas. For the suburban areas, a target of 80% in Year 2020 was suggested.

3.2.2 Based on the WMMP, each subproject adopts its own planning horizon according to the actual situation, seeing in Table 3-2:

Table 3-2 Planning horizon of each wastewater subproject

Subproject	Planning Horizon			
	WWTP		Collection System	
	M & E	Civil Works	M & E	Civil Works
Erlangmiao Subproject	2020	2020	Not applicable	Not applicable
Nantaizi Lake Subproject	2015	2015	2015	2020
Huangpu Road Subproject	2010	2010	Not applicable	Not applicable
Caidian Subproject	2015	2015	2015	2020
Dongxihu Subproject	Not applicable	Not applicable	2015	2020

3.2.3 For the collection systems, provisions are installed to meet the need in 2015 and the civil works is constructed for Year 2010 demand.

3.2.4 The difference in the planning horizon of each WWTP results from the wastewater volume capacity projection. For the Erlangmiao subproject, the projected wastewater volume in 2015 is close to that in 2020 and is designed for 2020 flow. For the Nantaizi Lake subproject and Caidian subproject, separate WWTPs are planned to be constructed to meet the need in 2015. For the Huangpu Road subproject, the existing flow already exceeds its design capacity but wastewater volume is predicted to peak in 2010, which is its planning horizon.

3.2.5 Population projections for the planning horizons of the proposed subprojects in the Project are generally established in the WMMP, and the draft final FSR provides population predictions proposed for each of the subprojects.

These projections were adjusted by the PPTA Consultants based on the discussions with DIs and WPMO. Table 3-3 presents projected populations served by individual wastewater subprojects in the draft final FSR.

Table 3-3 Projected service population for each subproject

Subproject	Base Population	Projected Population	
	2003	2015	2020
Erlangmiao WWTP Expansion and Upgrade	533,100	677,000	723,800
Nantaizi Lake WWTP Expansion and Collection System	376,300	610,900	747,500
Huangpu Road WWTP Upgrade	349,100	285,300	258,700
Caidian WWTP and Collection System	≈100,000	165,000	226,000
Dongxihu WW Collection System	120,000 (2005)	210,000	Not available

3.3. Wastewater Flow Projections

3.3.1 The draft final FSR provides an understanding of the existing water sources (mostly from public water supply companies), and the historical and planned growth of the water supply systems. The forecasts selected are usually based on a comparison of several different methods taking into account the projected population growth; per capita water consumption figures; industrial water consumption considering increases in production and also improved efficiency in water use; and increased coverage of the potential service area.

3.3.2 Under the current PPTA, the flow forecasts have been reviewed and additional details have been requested, in order to provide sufficient information for the technical, financial and social analysis. Topics investigated include:

- design horizons, as noted above;
- population growth estimates;
- per capita water consumption;
- industrial water supply and wastewater generation;
- wastewater return flow ratios
- peaking factors; and
- infiltration.

Population Growth Projections

3.3.3 Population growth estimates have generally been made in accordance with the most recent Wuhan Municipal Master Plan approved by the Sate Council in 1999. Historic population growth rate for Wuhan Municipality as a whole ranged from 1% to 2% per year since 1978.

3.3.4 Various population growth rates in the draft final FSR are defined for each subproject according to individual area development planning and the survey results on the population growth in the last few years, as summarized in Table 3-4:

Table 3-4 Population growth rates of each subproject

Population Growth Rates	Before 2005	2005-2010	2010-2020
Erlangmiao WWTP	1.57%	1.57%	1.57%
Nantaizi Lake WWTP	4.10%	4.10%	4.10%
Huangpu Road WWTP	-0.76%	-0.76%	-0.76%
Caidian WWTP	7.00%	5.50%	4.00%
Dongxihu Collection System	Not available	5.88%	5.88%

3.3.5 The 43 km² service area of the Nantaizi Lake subproject includes the Sixin Development Area and the Hanjiang Urban Area. The Sixin Development Area has a low population density but it is expected that the population will have a sharp increase in the near future because this area has been planned to be the manufacturing service center on a municipal level. The Hanjiang Urban Area will have a steady population growth rate in the future since it is a built-up area. The PPTA consultants suggested that different population projection approach be adopted separately for these two areas to provide more realistic projections, and accepts a revised estimate made by the DIs in the draft final FSR.

3.3.6 The population growth rate for the Huangpu Road subproject appears to be different from that of the other subprojects, in that it is expected that the beneficiaries will decrease in the next 15 years. This is deduced from the historical population data from 1998 to 2003, and aerial planning on commercial use and tourist services for the Huangpu Road subproject service area (7.48 km²) as formulated in WMMP.

Per Capita Domestic Water Consumption

3.3.7 The per capita domestic water consumption figures represent the total non-industrial water use which includes domestic, institutional and commercial water use. The historical data indicate that there was a steady and slight increase of per capita water supply in the major urban areas from 1979 to 1993, as summarized in Table 3-5. However this figure has stagnated after 1993. This may be due to two main reasons: (i) The installation of water saving appliances, which has compensated the increased demand for water supply with the improvement of living standard and the steady development of the service sectors; (ii) The increase of water tariff.

Table 3-5 Per capita water consumption from 1979 to 2002

Year	1979	1980	1981	1982	1983	1984	1985	1986
Water Consumption (Lpcd)	217	247	241	162	209	221	217	259
Year	1987	1988	1989	1990	1991	1992	1993	1994
Water Consumption (Lpcd)	255	281	292	296	255	331	278	289
Year	1995	1996	1997	1998	1999	2000	2001	2002
Water Consumption (Lpcd)	289	305	280	310	300	288	281	290

3.3.8 The domestic water consumption varies from the highest 331 Lpcd to the lowest 162 Lpcd in the last 20 years. Under the ADB Wastewater Management Project, per capita water consumption ranging from 255 Lpcd to 270 Lpcd was recommended. High water consumption figures might be due to the fact that Wuhan is a water abundant area and its hot and humid weather in the long summer.

3.3.9 The per capita water consumption summarized in Table 3-6 indicates that different indicators have been selected for each subproject. The per capita water consumption figures for this Project range from 225 Lpcd for the suburban Caidan subproject to 340 Lpcd for the urban Erlangmiao subproject against their different planning horizons. The PPTA consultants recognize that the service areas of the Nantaizi Lake subproject include new development areas and the per capita water consumption will increase rapidly in the near future. The figure used for the Nantaizi Lake subproject in the draft final FSR is somewhat lower (see Table 3-6).

Table 3-6 Per capita water consumption of the subprojects (Lpcd)

Subprojects	2003	2005	2010	2015	2020
Erlangmiao	316	340	340	340	340
Nantaizi	203	Not available	260	280	290
Huangpu Road	331	Not available	310	300	300
Caidian	185	Not available	200	225	250
Dongxihu	Not available	306	304	302	300

Industrial Water Supply and Wastewater Generation

3.3.10 Estimates of industrial wastewater flows and loads are particularly important and these have generally been estimated based on notional water demand in m³ per hectare of industrial land. A more considered approach related to specific local plans is required, except where the proposed WWTP capacity is being constrained by financial capacity and service demand is not a critical issue.

3.3.11 Lacking of appropriate data and inconsistency of projections on the industrial water supply and wastewater generation, industrial wastewater flows will require further evaluation on Erlangmiao, Nantaizi Lake, and Caidian WWTPs. It is noted that in the planning horizon year of each wastewater subproject, the percentage of industrial wastewater is estimated to be about 5.1% for Erlangmiao WWTP, 14.8% for Nantaizi Lake WWTP, 2.5% for Huangpu Road WWTP and 38% for Caidan WWTP.

3.3.12 One of the key assumptions is that industries will comply with the requirements of the *Chinese National Integrated Wastewater Discharge Standard* (GB8978-1996) and the *Standard of Effluent Quality Discharging to Urban Sewers* (CJ3082-1999).

3.3.13 The PPTA team understands that an industrial wastewater pretreatment program has been in place, however strong and continuous enforcement should be performed to ensure that toxic chemicals and harmful matters would not damage the collection system or the biological treatment processes of the WWTPs. Consequently, these toxic and hazardous chemicals would not accumulate in the wastewater sludge to prevent potential beneficial uses.

Water Return Ratios

3.3.14 The water return ratio represents the proportion of water consumed which is likely to be returned as wastewater that will be collected and delivered to the WWTPs. The draft final FSR did account a high percentage, 90% for wastewater returns on their estimates on domestic wastewater flow, and 78% to 80% on industrial wastewater returns.

3.3.15 The Nantaizi Lake subproject, Caidian subproject and Dongxihu subproject have some existing sewers and under this Project new sewer, either combined or separate, will be constructed. In the future, it is likely that secondary and tertiary link sewers will be provided. Based on the experience elsewhere in China, high interception and household connection ratios are essential factors to collect enough wastewater for sustainable operations of a WWTP.

Peaking Factors

3.3.16 The draft final FSR indicates that the sewerage systems will be designed to allow for peak flows by use of a peaking factor to take account of flow variations during the day. Although the FSR does not explicitly state the factor that will be used it is assumed that the values given in the Outdoor Drainage Design Criteria, GBJ13-87, will be adopted. In general, peaking factors of 1.3 to 2.3 have been used for domestic sewers based on flow rates and average of 1.3 is used for industrial wastewater.

Interception Factors

3.3.17 It is noted that a higher combined flow interception rate of 2 was adopted for Erlangmiao WWTP on the draft final FSR. The other WWTPs were reported with an interception factor of 1.

Inflow/Infiltration Rates

3.3.18 The draft final FSR considered infiltration in the estimated wastewater flows. In the draft final FSR an infiltration rate of 15% has been adopted because of the reported high underground water level and poorly jointed pipes in the existing sewerage system.

3.3.19 Standard practice to estimate the infiltration is based on pipe length and diameter or based on service area coverage. For service area coverage method, infiltration rate ranging from 10.0 m³/ha·d for a good system to 20.0 m³/ha·d for a poor system is considered.

3.3.20 The PPTA team has found that, for industrial wastewater projection, there is no sufficient field data in the draft final FSR which can adequately justify the water consumption of the industries within the service areas. It is understandable that it is difficult to collect such data from all the existing industries and then make projection for the industrial water consumption on planning horizon. However, the PPTA consultants have addressed that the data used for industrial wastewater projection should be more typical and persuasive even if they are not sufficient enough.

3.3.21 Recommended modifications to the design wastewater treatment capacity for each of the subprojects, together with the wastewater volume project in the draft final FSR, are summarized in Appendix C1. There is no significant adjustment to the industrial wastewater projection due to the lack of data. For domestic wastewater projection, minor adjustment has been carried out so as to make the projection more consistent with the Wuhan Municipal Master Plan, the wastewater management target and the common practice, although it turns out to be slight difference between the PPTA projections and domestic projections from the draft final FSR.

3.3.22 Erlangmiao WWTP Expansion Capacity. From the population and wastewater flow projections, the existing 180,000 m³/d capacity of Erlangmiao WWTP would be sufficient to cater for the catchment area of 32.2 km² until 2010. Only by 2020 that the WWTP would require to be extended to its proposed capacity of 240,000 m³/d. However the draft final FSR recommends a 60,000 m³/d extension under the Project, providing the full 240,000 m³/d treatment capacity by 2010.

3.3.23 A review of the operational data of Erlangmiao WWTP shows that the WWTP influent flows constantly exceed 200,000 m³/d, and that the average BOD concentration in the influent was 38.7 mg/L in 2004. With a low lying topography and high water table in the Erlangmiao catchment, it is logical to deduce that there is more substantial amount of inflow and infiltration than the 15% assumed in the draft final FSR. Inflow and infiltration typically result in a higher volume of diluted wastewater entering the WWTP. The PPTA team has proposed an inflow and infiltration study be conducted in the Erlangmiao catchment, so as the better under the extent and problem. The study would identify and prioritize the problematic areas, so as to provide a structural approach to a sewer rehabilitation or reconstruction program. However, experience shows that in order to conduct a meaningful inflow and infiltration study detailed works need to be done to establish realistic sewerage information, to set up a computer model, to undertake detailed rain and sewer flow gauging, and to carry out extensive sewer inspections. These activities take much effort, investment and time.

3.3.24 In view of the Project implementation program, the PPTA team concurs with the DI that it is a more practical approach to extend Erlangmiao WWTP from 180,000 m³/d to 240,000 m³/d in one stage at this juncture. This would provide the much needed relief to the already beaten WWTP, while the inflow and infiltration study and any subsequent sewer rehabilitation or reconstruction program are being undertaken. In addition, a 60,000 m³/d module increase to

a plant of a size such as Erlangmiao WWTP is also more logical than staging the expansion into, e.g. 2 x 30,000 m³/d.

3.3.25 One strong argument that the DI provided to support their recommendation of the 60,000 m³/d extension, is that Erlangmiao WWTP is now surrounded by much residential and other developments. To minimize future disruption and inconvenience to the residents during construction in the WWTP vicinity, it is logical that the extension works is to be carried out in one go. In considering the social impacts, the PPTA team also concurs with the DI's view in this aspect.

3.4. Wastewater Characteristics

3.4.1 Wastewater characteristics have generally been established for each subproject based on a review of wastewater characteristics elsewhere. The amount of wastewater sampling and analysis that has been carried out by the DIs for most subprojects is minimal. It is noted that data made available to the PPTA team indicate that the concentrations of BOD, SS, and COD in the wastewater are generally low, potentially resulting from high per capita water consumption, coupled with high inflow and infiltration dilution.

3.4.2 Influent design strengths were based on recommended standards and available data, it is expected that septic tanks would be gradually abandoned and the separate sewer system would reduce the amount of inflow and infiltration. The anticipated influent wastewater characteristics for each subproject are summarized in Table 3-7. A key assumption in the determination of these influent wastewater characteristics is that industries in areas served by the WWTPs will comply with the relevant requirements of *the National Integrated Wastewater Discharge Standard* (GB 8987 - 1996).

Table 3-7 Anticipated influent characteristics

Subproject	BOD ₅ (mg/L)	COD (mg/L)	SS (mg/L)	NH ₃ -N (mg/L)	TP (mg/L)
Erlangmiao WWTP Expansion and Upgrade	120	240	150	24	3
Nantaizi Lake WWTP Expansion and Collection System	160	300	180	30	3
Huangpu Road WWTP Upgrade	140	270	160	22.5	3
Caidian WWTP and Collection System	120	260	160	22.5	3

3.4.3 It is noted that low strength wastewater could make the operation of a biological treatment facility difficult, and different operational measures should be taken to assure adequate wastewater treatment.

3.4.4 Influent to the pumping station of the sewer system and the WWTP should be adequately monitored in order to provide better hydraulic control and to protect treatment processes from toxic wastes.

3.4.5 In addition to the wastewater quality monitoring program recommended in the environmental management plan (EMP), field observations on the wastewater color, odor and floating oil should be made as these are indicative toxic waste characteristics. These observations would allow an early warning of the presence of undesirable toxic substances in the wastewater, and to promptly trace illegal dumping.

3.4.6 Appropriate pumping station and WWTP operating procedures should be established to minimize the effects of any toxic materials that are introduced to the WWTP in the sewer system and in the influent.

3.4.7 It is further recommended that strict enforcement of the requirement to install industrial wastewater pretreatment facilities, and continuous monitoring and enforcement of the O&M standard of the pretreatment facilities be performed, and a comprehensive toxic waste management program to prevent illegal dumping of toxic wastes be introduced.

3.5. Wastewater Collection Systems

3.5.1 Sewer systems will be built in the Nantaizi Lake, Caidan and Dongxihu subprojects. It is the PPTA team's understanding that sewer extension will be provided to connect to individual properties within the areas served. It can be expected that the connection ratio would increase from 64% to 72 % in the Caidan subproject catchment and from 83% to 92% in the Huangpu Road subproject catchment over time as the collection system is expanded and the household connection is completed from 2005 to 2015.

3.5.2 From the proposed sewerage networks that are shown in the draft final FSR it appears that new sewerage will be provided along most major streets within the existing urban area, suggesting that either:

- numerous interception points within the urban area will be required; or
- considerable additional secondary sewerage will be required to collect wastewater from each individual property within the urbanized area.

3.5.3 The final FSR needs to be further emphasized on the timely completion of wastewater collection systems to effectively utilize WWTP treatment capacity in the Caidan wastewater subproject, the Nantaizi Lake and Dongxihu wastewater collection systems.

3.5.4 In most of the existing combined drainage and sewerage systems, the combined system within properties collects wastewater from toilets, kitchens and washing areas as well as surface runoff. As wastewater from toilets is typically discharging to septic tanks, this will significantly reduce the pollution load on this wastewater if the septic tanks are designed and constructed effectively, and desludged when required.

3.5.5 The extent of the wastewater collection systems proposed in the draft final FSR is summarized in Table 3-8.

Table 3-8 Wastewater Collection Systems Proposed in draft final FSR

Subproject	Wastewater Collection System		
Erlangmiao Subproject	Not Applicable		
Nantaizi Lake Subproject	Pumping Station (PS)	Qingduankou PS	0.31 m ³ /s
		Longyanghu Eastern Road PS	0.53 m ³ /s
		Nantaizi Lake PS	2.1 m ³ /s
	Sewer	D800	1,180 m
		D1,000	3,430 m
		D1,200	960 m
		D1,500	520 m
		D1,800	1,345 m
Huangpu Road Subproject	Not Applicable		
Caidian Subproject	Pumping Station (PS)	Daqiao PS	1.00 m ³ /s
	Sewers	D1,200	2,090 m
		D1,350	1,170 m
		D1,500	1,150 m
		D1,800	180 m
Dongxihu Subproject	Sewer	D600	750 m
		D800	1,000 m
		D1,000	1,630 m
		D1,200	1,010 m
		D1,350	3,200 m
		D1,800	2,210 m
		D2,000	2,290 m
	Pressure Pipe	DN1,200	3,460 m
	Box Culvert	BH=2.0 m*1.8 m	3,580 m
		BH=2.0 m*2.0 m	1,620 m
		BH=3.2 m*1.8 m	1,100 m
		BH=4.0 m*2.0 m	3,500 m
	Pumping Station (PS)	PS No.1	1.5 m ³ /s
		PS No.2	1.8 m ³ /s
		PS No.3	2.0 m ³ /s
		PS No.4	0.5 m ³ /s
		PS No.5	1.0 m ³ /s

3.5.6 Geotechnical investigations on the proposed sewer alignments should be considered as early as possible to provide the subsoil information to further the engineering design. Properly designed and constructed sewers will minimize uneven settlement that could cause pipeline breakage or leakage at joints, which would in turn introduce unwanted inflow and infiltration.

3.5.7 For the existing sewers, it is the PPTA team's understanding that Wuhan Municipality has begun the implementation of a comprehensive sewer investigation and rehabilitation program to better understanding and improve the sewer condition and capacity. The investigations of the existing sewer system on problems on leakage, breakage, infiltration / exfiltration should be able to better determine the extent of inflow and infiltration to the system. Further, the conversion of a combined sewer to a separate sewerage system will increase the wastewater flow rate and enhance the strength. Consequently, the service life of the collection and treatment system could be extended and WWTP performance is expected to be improved.

3.6. Wastewater Treatment

Wastewater Treatment Plant Location

3.6.1 Generally the wastewater treatment plant location has been selected from considerations of land use and availability, ease of access to the proposed wastewater collection system, proximity to a water course, and prevailing wind direction with respect to the main urban area. The PPTA consultants understand that all the existing WWTPs in this Project have been planned and recently built in accordance with the WMP. The Project involves expansion and / or upgrade of the relatively new existing WWTPs such as Nantaizi Lake, Erlangmiao and Huangpu Road. Improvements to foundations and structures to minimize potential ground subsidence of the expansion of Nantaizi Lake WWTP have to be taken into account. It is the PPTA team's understanding that ground subsidence was experienced during the construction of the primary treatment tanks in the Phase 1 Nantaizi Lake WWTP funded by the Polish Government.

Wastewater Treatment Process

3.6.2 Several classes of treated effluent standard are set out in the *National Discharge Standard of Pollutants from Municipal Wastewater Treatment Plants* (GB 18918 - 2002), and the required standard is established during the EIA based on the quality and required class of the receiving water, as summarized in Table 3-9.

Table 3-9 Required Treated Effluent Quality

National Discharge Standard ¹	Receiving Water Quality	BOD ₅ (mg/L)	COD (mg/L)	SS (mg/L)	NH ₃ -N (mg/L)	T-N (mg/L)	T-P (mg/L)
1B	III	≤ 20	≤ 60	≤ 20	8	≤ 20	≤ 1

3.6.3 In the draft final FSR a comparison is made of the wastewater treatment processes for each of the four subprojects that include WWTPs. These processes include oxidation ditch, A2O, biologically aerated filter (BAF) and sequential batch reactor (SBR).

3.6.4 For the Huangpu Road WWTP Upgrade Subproject, the BAF process is proposed to fit in the limited space available for the secondary treatment process upgrade. This BAF process should be able to achieve the required Class 1B treated effluent standard, and could provide an acceptable quality of effluent for, if required, subsequent treatment for reuse by industry. However, chemically enhanced primary treatment might be considered as an alternative to this secondary upgrading. It is however understood that the DI has already made a similar comparison on the Hanxi WWTP, and found that the secondary process is preferred over the chemically enhanced primary process on that WWTP.

3.6.5 For the Caidian WWTP and Collection Subproject an oxidation ditch process is proposed. While occupying more land, this process has the advantages of resistance to shock loading, process flexibility, and low capital, operations and maintenance costs, which is suitable for this suburban district when taking the technical and economic considerations into account.

3.6.6 The proposed wastewater treatment processes are summarized in Table 3-10.

Table 3-10 Wastewater Treatment Processes Proposed in FSR

Subproject	National Discharge Standard ¹	Wastewater Treatment Process Proposed in FSR
Erlangmiao WWTP	1B	A2O Process
Nantaizi Lake WWTP	1B	Anaerobic Tank plus Carrousel Oxidation Ditch
Huangpu Road WWTP	1B	High-density Settler plus BAF
Caidian WWTP	1B	Anaerobic Tank plus Carrousel 2000 Oxidation Ditch

¹Pollutant Discharge Standard GB 18918-2002

3.6.7 Advance aeration systems and other energy saving pumping equipment should be considered in the detailed design of the pumping stations and WWTPs. Further performance specifications on these advance systems should be prepared for the equipment procurement.

3.6.8 Odor control at the WWTP headwork and sludge dewatering areas has been considered for occupational health and safety, and to minimize complaints of odor. Complaints of odor are an issue faced by the existing operations of both Erlangmiao and Huangpu Road WWTPs.

3.7. Effluent Reuse

3.7.1 The draft final FSR did not propose effluent reuse for any of the subprojects, however, recommendations on effluent reuse on each WWTP subproject based on the requirements of *Wuhan Urban Area Wastewater Treatment and Water Reuse Facility Construction Plan* are summarized in Table 3-11.

Table 3-11 Effluent reuse recommendations

Subprojects	Water Reuse Ratio
Erlangmiao Subproject	2% of treated wastewater to be reused for trunk road (such as Zhongbei Road) flushing
Nantaizi Lake Subproject	80% of treated wastewater to be reused for recharging a nearby proposed wetland in dry seasons
Huangpu Road Subproject	Facilities be reserved for future use
Caidian Subproject	Facilities be reserved for future use

3.7.2 As understood in a seminar together with the DI and the PMO on July 14, 2005, ultraviolet (UV) disinfection was an optional process for reuse water treatment. However, as the effluent is only required to meet discharge standard 1B in compliance with GB18918-2002 (see Section 3.6), only a small portion of

the treated effluent is supposed to be further processed for reuse. The effectiveness and efficiency of UV disinfection will be affected by the characteristics of wastewater to be disinfected and the aging of quartz sleeve. The cost of UV disinfection systems will depend on the manufacturer, the site and the capacity of the plant. In general, the total cost of UV disinfection is much higher compared with chlorine disinfection unless dechlorination is used and fire codes are required to be met strictly.

3.7.3 The first UV disinfection system in China was installed in Shanghai Minhang WWTP in 2000 and since then there have been only a few WWTPs with UV disinfection systems under construction, in Wuxi, Suzhou, Shanghai and other developed cities. However due to site constraints in the Huangpu Road WWTP, the PPTA consultants agree with DI's consideration of UV system. However further evaluations of their actual and success applications during the equipment procurements are necessary.

3.8. Sludge Treatment and Disposal

3.8.1 Based on the FSR, the quantity of the dewatered sludge produced from proposed WWTPs is shown in Table 3-12

Table 3-12 Sludge quantity of the proposed WWTPs

Subproject	Sludge quantity (t/d)	Notes
Erlangmiao WWTP	27.76	Phase I and Phase II
Nantaizi Lake WWTP	14.15	Phase II
Huangpu Road WWTP	18.0	Phase II
Caidian WWTP	14.15	-
Total	74.06	-

3.8.2 Sewage sludge should be disposed of in an environmentally safe manner. There are three typical sludge disposal practices in China as mentioned in the FSR: composting, incineration and landfill. Most of composting facilities have been closed due to unfavorable market situations for the compost produced. Incineration is the most effective and efficient way to realize solid waste reduction, but it is costly with complicated operation and management.

3.8.3 The most widely used and cost effective way for solid waste disposal is land filling in China. Currently there are five operational sanitary landfills serving Wuhan Municipality and are shown in Table 3-13:

Table 3-13 Existing Wuhan sanitary landfill sites

Name	Service Area	Capacity (t/d)	In Service Since	Expiration
Jinkou Landfill	Jiangnan and Qiaokou Districts; Portions of Jiang'an and Dongxihu Districts	2,000	1989	2005
Daishan Landfill	Portions of Jiang'an District	900	1989	2005
Zixiaguan Landfill	Hanyang District	800	1992	Closed
Beiyangqiao Landfill	Qingshan District	1,200	1988	2006

Erfeishan Landfill	Wuchang and Hongshan Districts	800	2003	2010
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3.8.4 For the proposed WWTPs, the draft final FSR proposes sludge disposal by means of landfill (see Table 3-14). However as all of the above mentioned existing landfills are anticipated to be closed by year 2010, they will not be able to receive sludge from the proposed WWTP subprojects.

Table 3-14 Sludge treatment and disposal proposed in the draft final FSR

Subproject	Sludge Treatment	Sludge Disposal
Erlangmiao WWTP	Centrifugal decanter	Landfill
Nantaizi Lake WWTP	Centrifugal decanter	Landfill
Huangpu Road WWTP	Centrifugal decanter	Landfill
Caidian WWTP	Centrifugal decanter	Landfill

3.8.5 According to the *Eleventh Five Year Plan for Wuhan Urban Construction (Solid Waste Treatment)*, another five landfill/ incineration plants are planned to be built from 2006 to 2010, of which two will be situated in Wuchang, two in Hankou and one in Hanyang (see Table 3-15).

Table 3-15 Solid waste management facilities to be constructed from 2006 to 2010

Name	Location	Year of Completion	Capacity (t/d)	Service Life (year)	Service Area	Distance from the Main Urban Area (km)
Chenjiachong Solid Waste Sanitary Landfill	Hankou	2008	2,000	25	Hankou	50
Guodingshan Solid Waste Incineration Plant	Hanyang	2010	1,500	25	Portions of Hanyang and Hankou	11
Solid Waste Incineration Plant	Hankou	2009	2,000	25	Hankou	20
Qingshan Solid Waste Incineration Plant	Wuchang	2010	1,000	25	Portions of Qingshan, Wuchang and Hongshan	Not available
Guanshan Solid Waste Incineration Plant	Wuchang	2010	1,000	25	Wuchang	15

3.8.6 Accordingly, Chenjiachong landfill site, is scheduled to be constructed in the next five years, which complies with the solid waste disposal objective formulated in the *11th Five Year Plan for Wuhan Urban Construction (Solid Waste Treatment)*, i.e., solid waste incineration is expected to be the dominant approach with landfill and composting being the accessorial ways for solid waste disposal.

3.8.7 The PPTA consultants have been informed by the WPMO that the Chenjiachong Sanitary Landfill is expected to be used for sludge disposal for the WWTPs under the Project. However this landfill is somewhat far away from most of the WWTPs and it would not be cost effective to transport sludge over a long distance. Consequently, sludge generated from WWTPs of this Project might be disposed of at the designated active landfills in their general vicinity areas.

3.8.8 The 11th Five Year Plan for solid waste treatment in Wuhan also indicates that a composting plant, three landfill sites and three comprehensive solid waste treatment centers are under consideration for mid and long term planning purposes. If the quality of the sludge is acceptable it would be possible for sludge to be used beneficially in agriculture or forestry. Hence there are a few options for sludge disposal in mid and long term and this matter will need to be further evaluated during the implementation phase of the Project.

3.9. Alternatives Considered

3.9.1 Alternative Considered by DI. Table 3-16 summarizes the alternatives that have been considered in the draft final FSR for the wastewater subprojects. The level of detail to which these alternatives have been reviewed is varied, and none of them has been provided with cost estimates. Consequently, the PPTA team developed detailed cost estimates on capital, operations and maintenance on these alternatives and are summarized in the Least Cost Analysis Section of the Economic Analysis Chapter.

Table 3-16 Alternatives considered in FSR

Subproject	Alternatives
Erlangmiao WWTP Expansion and Upgrade	Treatment process: A2O ; Modified Carrousel Oxidation Ditch
Nantaizi Lake WWTP Expansion and Collection System	Treatment process: Anaerobic Tank + Carrousel Oxidation Ditch; A2O WWTP site: Two WWTP site options with different sewer network schemes
Huangpu Road WWTP Upgrade	Treatment process: High-density Sedimentation Tank + BAF; SBR
Caidan WWTP and Collection System	Treatment process: Anaerobic Tank + Carrousel-2000 Oxidation Ditch; A2O WWTP site: Two WWTP site options with different sewer network schemes
Dongxihu WW Collection System	Not Available

3.9.2 Alternative Huangpu Road WWTP Location. Huangpu Road WWTP is located near Yangtze River Bridge No 2 outside the flood protection bund along Yanjiang Avenue. The 1.2 ha site has been earmarked to be a WWTP in Wuhan Wastewater Master Plan. During its planning and construction stage a few years ago, the WWTP site was at a sandy river bank with no significant development in its surrounding area. Rapid economic growth in Wuhan has resulted in residential and commercial developments springing up to the proximity of the WWTP site.

3.9.3 The Phase 1 development of Huangpu Road WWTP was completed in 1999 under Finnish funding. It is a 100,000 m³/d pretreatment plant with a planned upgrade to secondary treatment under the Project, with no increase in its treatment capacity. As Huangpu Road WWTP serves a mature catchment covering the old concession area, it is not expected that wastewater flow would

increase, and 100,000 m³/d is its ultimate capacity. The Phase 1 pre treatment plant has thus been designed and constructed with this in mind, and no further land acquisition is required for the 1.2 ha site to accommodate the planned secondary treatment upgrade.

3.9.4 Understood from the PMO and the DI, there had been previous discussions to explore transferring the Huangpu Road flows to the neighboring Sanjintang catchment (financed under ADB first phase project), thus doing away with the Huangpu Road WWTP. However, this option had not been adopted and Huangpu Road and Sanjintang have since been developed into their independent sewerage catchment with their own respective WWTPs.

3.9.5 The PPTA team has also explored the feasibility of relocating Huangpu Road WWTP to a more suburban site further downstream of the Yangtze River, with the main aim of removing this sewage treatment facility further away from existing and encroaching developments. However, the further economic and technical reasons described in the Least Cost Analysis Section of the Financial Chapter support keeping Huangpu Road WWTP at its present site

3.10. Cost Estimates, Contract Packaging and Implementation Schedule

3.10.1 Based on the review of the draft FSR, the PPTA team provided comments on the construction and other related costs (including quantities of major civil works, and schedule of major WWTP items, equipment and instrumentation and control systems), proposed contract packages and implementation schedule. In addition, preliminary cost estimates on the BAF system for Huangpu Road WWTP were performed with overseas technical support (see Appendix C2), in addition to supplement cost information gathered from local equipment suppliers and the DI.

3.10.2 The cost estimates presented in the draft final FSR have been found to be reasonable and further adjustments were made during the Loan-Fact Finding Mission were made. The COSTAB costing model program has then been used to generate project cost estimates. Details of project costs, by subproject, year, financier, and expenditure are presented further in the Financial Analysis Chapter.

3.10.3 The procurement contract packaging proposal has been developed in the draft final FSR, however there are some inconsistency in the cost figures and the PPTA team has further reviewed with the DI and the PMO and made appropriate adjustments in accordance with ADB's guidelines for the size and type of contract packages. Table 3-17 presents our suggested contract packaging for the DI and PMO's consideration in the final FSR preparation. The contract numbers are in general agreement with the DI's procurement contract packaging proposal.

Table 3-17 Recommended wastewater component contract packages

Subproject: Erlangmiao WWTP Expansion and Upgrade

Contract No.	Item	Contract Amount (CNY million)	Procurement Method
<i>Civil Works</i>			
ELMWW/1.1	WWTP	72.03	LCB
ELMWW/1.2	Site preparation & foundation strengthening	12.50	LCB
<i>M & E</i>			
ELMWW/11.1	WWTP	80.90	ICB
Total		165.43	

Subproject: Nantaizi Lake WWTP Expansion and Collection System

Contract No.	Item	Contract Amount (CNY million)	Procurement Method
<i>Civil Works</i>			
NTZWW/1.1	WWTP	50.53	LCB
NTZWW/1.2	Site preparation & foundation strengthening	14.56	LCB
NTZWW/2.1	Pumping stations and sewers (I)	12.15	LCB
NTZWW/2.2	Pumping stations and sewers (II)	9.66	LCB
<i>M & E</i>			
NTZWW/11.1	WWTP	37.86	ICB
NTZWW/21.1	Pumping stations	9.95	ICB
Total		134.70	

Subproject: Huangpu Road WWTP Upgrading

Contract Method	Contract Amount (CNY million)	Procurement Method
Design and build contract	108.57	ICB

Subproject: Caidian WWTP and Collection System

Contract No.	Item	Contract Amount (CNY million)	Procurement Method
<i>Civil Works</i>			
CDWW/1.1	WWTP	32.31	LCB
CDWW/2.1	Upstream sewer	6.15	LCB
CDWW/2.2	Pumping station and downstream sewer	6.17	LCB
<i>M & E</i>			
CDWW/11.1	WWTP	23.46	ICB
CDWW/21.1	Pumping station	2.24	IS
Total		70.33	

Subproject: Dongxihu Collection System

Contract No.	Item	Contract Amount (CNY million)	Procurement Method
<i>Civil Works</i>			
DXHWW/2.1	No.1, 2 & 3 pumping stations and sewers	56.83	LCB
DXHWW/2.2	No.4 & 5 pumping stations and sewers	20.84	LCB
DXHWW/2.3	Sewerage main box culvert (I)	12.29	LCB
DXHWW/2.4	Sewerage main box culvert (II)	6.12	LCB
DXHWW/2.5	Sewerage main box culvert (III)	5.64	LCB
DXHWW/2.6	Sewerage main box culvert (IV)	20.23	LCB

<i>M & E</i>			
DXHWW/21.1	No.1 & 2 pumping stations	7.38	IS
DXHWW/21.2	No.3, 4 & 5 pumping stations	7.88	IS
Total		137.20	

3.10.4 The implementation schedule presented in the draft final FSR is considered reasonable and appropriate. The wastewater component of the Project will be implemented over a period of 5 years from 2006 to 2010. Preliminary discussions on a design and build package for the priority Huangpu Road WWTP upgrade subproject have been included in the proposed implementation schedule, this will allow an early construction in the third or fourth quarter of 2006 and be completed in 2008. The other three WWTPs are scheduled to be completed in 2009, and the sewer systems of the Nantaizi Lake WWTP and the Dongxihu sewer system are scheduled for mid 2010 completion. Figure 3-2 presents the project implementation schedule proposed in the draft final FSR.

Figure 3-2 Implementation Schedule of Wastewater Subprojects

Item		2006				2007				2008				2009				2010			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
ADB Loan Period			○																		
Wuchang Erlangmiao WWTP Expansion & Upgrade (Phase II)	1) Disclosure and consultation of land acquisition and resettlement information																				
	2) Resettlement																				
	3) Preliminary design and preparation of construction drawings																				
	4) Bidding																				
	5) WWTP construction																				
	6) Commissioning																				
Hankou Huangpu Road WWTP Upgrade (Phase II)	1) Disclosure and consultation of land acquisition and resettlement information																				
	2) Resettlement																				
	3) Preliminary design and preparation of construction drawing																				
	4) WWTP construction																				
	5) Commissioning																				
Hanyang Nantaizi Lake WWTP Expansion & Collection System (Phase II)	1) Disclosure and consultation of land acquisition and resettlement information																				
	2) Resettlement																				
	3) Preliminary design and preparation of construction drawing																				
	4) Bidding																				
	5) WWTP construction																				
	6) Commissioning																				
	7) Construction of pumping stations and pipeline																				
Caidian WWTP & Collection System	1) Disclosure and consultation of land acquisition and resettlement information																				
	2) Resettlement																				
	3) Preliminary design and preparation of construction drawing																				
	4) Bidding																				
	5) WWTP construction																				
	6) Commissioning																				
	7) Construction of pumping station and pipeline																				
Dongxihu Waste Water Collection System Subproject	1) Disclosure and consultation of land acquisition and resettlement information																				
	2) Resettlement																				
	3) Preliminary design and preparation of construction drawing																				
	4) Bidding																				
	5) Construction of pumping stations and pipeline																				

3.11 Summary of Proposed Wastewater Subprojects

The wastewater projects as proposed in the draft final FSR are summarized in Appendix B. A summary of the recommended modifications to these subprojects is given below in Table 3-17. These recommendations have been made to the DIs who has prepared the draft final FSR and it is anticipated that the final FSR will take account of these recommendations.

Table 3-17 Recommended modifications to the proposed wastewater subprojects

Subproject	Parameter	Recommended Modifications
Erlangmiao WWTP Expansion and Upgrade	Planning horizon	The planning horizon should be extended from Year 2010 to Year 2015 as staged construction was not preferred. The draft final FSR further extended the planning horizon accordingly.
	Collection system	Further storm water separation from the sewer system and interceptor improvements are required to ensure effective collection of wastewater flows.
	Capacity	Proposed capacity appears generous – timely completion of sewer collection system and interceptor improvements are required to ensure wastewater flows are received and treated.
	Treatment process	The proposed treatment process appears reasonable, but considerations should be made for a low strength BOD and SS influent. Proprietary technology and equipment should be avoided to be in compliance with ADB's procurement requirements. Choice of cost-effective effluent disinfection should be considered. Integration of and improvements to the primary and secondary processes should be considered to ensure existing systems are fully utilized.
	Sludge disposal	Beneficial use of sludge should be considered if quality is acceptable.
	Effluent reuse	Reuse of treated effluent could be extended.
Nantaizi Lake WWTP Expansion and Collection System	Other	Effective odor control must be considered.
	Planning horizon	The planning horizon should be extended from Year 2010 to Year 2015 and it was extended in the draft final FSR accordingly.
	Collection system	Further completion of the New District and western Hankou collection systems and storm water separation is required to ensure effective interception of wastewater flows.
	Capacity	Proposed capacity appears excessive – higher coverage of sewer collection system and timely storm water separation from wastewater collection system are required to ensure wastewater flows are received and treated by the WWTP with increased flows after 2010.

Subproject	Parameter	Recommended Modifications
	Treatment process	The proposed treatment process appears reasonable and compliments with the Phase 1 work. Proprietary technology and equipment should be in compliance with ADB's procurement requirements. Choice of cost-effective effluent disinfection should be considered. Integration of and improvements to the primary and secondary processes should be considered to ensure existing systems are fully utilized.
	Sludge disposal	Beneficial use of sludge should be considered if quality is acceptable.
	Effluent reuse	Effluent reuse should be considered for the nearby ecological park/wetland applications.
Huangpu Road WWTP Upgrade	Planning horizon	The planning horizon on Year 2010 is reasonable.
	Collection system	Further consideration of the collection system and the interceptor improvements are required to ensure effective interception of wastewater flows.
	Capacity	Existing capacity of 100,000 m ³ /d appears adequate, for a mature catchment no anticipated to have significant future flow increase.
	Treatment process	The proposed treatment process appears reasonable, equipment procurements must be in compliance with ADB's requirements. Choice of cost-effective effluent disinfection should be considered.
	Sludge disposal	A sanitary landfill will be required to safely dispose of the sludge generated. Alternatively beneficial use of adequate sludge should be considered.
	Effluent reuse	Effluent reuse should be considered.
	Other	Effective odor control should be considered. Design-built contract should be considered for this complicated facility upgrading subproject.
Caidian WWTP and Collection System	Planning horizon	The planning horizon should be extended from 2010 to 2015 as staged construction was not preferred, and it was extended accordingly.
	Collection system	Further completion of the collection system and interceptor improvements are required to ensure effective interception of wastewater flows.
	Capacity	The proposed capacity of 50,000 m ³ /d appears excessive, timely completion of sewer network and household connection should be in placed
	Treatment process	The proposed treatment process appears reasonable. Reliable conventional process that can be easily operated should be considered.
	Sludge disposal	Agricultural application of suitable sludge should be considered in this suburban district.
	Effluent reuse	Effluent reuse should be considered.
Dongxihu WW Collection System	Planning horizon	The planning horizon should be in consistent with the Hanxi WWTP which receives wastewater from this collection system.
	Collection system	Further consideration of the collection system is required to ensure effective segregation of wastewater from storm water.
	Other	Alternative pumping / lifting system might be considered.

4. Technical Analysis of Storm Water Subprojects

4.1. General

4.1.1 This Chapter provides an analysis of the technical aspects of the four storm water subprojects. The draft and final draft Feasibility Study Reports (FSRs) prepared by the design institutes (DIs) has been the main basis for this review, and this has been supplemented by field visits to each subproject site, discussions with local project teams and meetings with the relevant IA, Wuhan Urban Construction Foundation. The main components of each subproject are shown in Table 4-1, and are also illustrated in Figure 4-1.

Table 4-1 Major Subprojects of the Storm Water Component

Storm Water Subproject	Components of Each Subproject
Luoja Road Subproject	1. Pumping station expansion by 55 m ³ /s; and 2. Rehabilitation of existing open channel and box culvert
Yangsigang Subproject	1. One new pumping station with a capacity of 20 m ³ /s; and 2. Drainage pipeline and box culvert
Dongxihu Three Gates Connections Subproject	1. Box culvert; 2. New open channel; and 3. Rehabilitation of existing open channel
Changqing Pumping Station Subproject	Expansion of the existing pumping station by 135 m ³ /s

4.1.2 The draft FSR provides a general description of the rationale, technical basis, and estimated cost for the four subprojects. The final draft FSR then formed the basis for all subprojects, which was submitted to the HDRC in October 2005 for approval. This draft final FSR was further revised and then approved by HDRC in January 2006.

4.1.3 The topics of primary concern in the technical analysis of the storm water subprojects that are covered in this Chapter include:

- Determination of rational and consistent service life;
- Prediction of rainfall intensity, storm water flows and volumes;
- Evaluation of the proposed drainage systems and assessment of the required storm water drainage capacities; and
- Review of alternatives, and recommendations on alternatives to ensure least-cost solutions are adopted.

4.1.4 The Chapter concludes with a summary of the recommended storm water subprojects that identifies modifications which the PPTA team considered should be made to the subprojects as proposed in the draft FSR. The DIs have been requested to revise their draft FSR to incorporate the modifications proposed by the PPTA team for the preparation of the draft final and final FSRs.

4.2. Rationale for Storm Water Subprojects

4.2.1 The built up areas in Wuhan are mostly below the average flood level of the Yangtze, Han and Fu Rivers, which are protected by flood control bunds. During wet seasons storm water is discharged from the drainage system to the rivers by pumping. Being located in the subtropical monsoon climate zone, distinct seasonal variation and heavy summer rains place particular stress on Wuhan's urban drainage system. Approximately 55% of the most severely flood-prone areas in the urban and suburban districts of Wuhan are within the service areas of the four storm water management subprojects, based on the historical flooding records of the Wuhan Water Bureau. The depth of reported flooding varies from 0.5 m to 0.8 m.

4.2.2 The following factors will have contributed to the severity of these flooding events:

- (i) continued urbanization with a consequential increase in impermeable areas, a reduction in vegetation cover and infilling of natural detention areas for flow-balancing;
- (ii) inadequate and aging drainage networks with pipelines, culverts, and pumping stations of insufficient capacity;
- (ii) blockage of drainage networks by debris from infrastructure construction and street improvements; and
- (iii) inadequate maintenance to repair defects and to remove siltation.

4.2.3 Except in more recently developed areas or areas where new wastewater collection systems have already been installed, the drainage systems in many other parts of the city convey both surface water and wastewater. So storm water management and wastewater pollution control are closely linked through the extensive use of combined sewer systems. Surface water run-off is contaminated by wastewater, while wastewater flows and strengths are affected by surface water inflow and groundwater infiltration. Wuhan has been experiencing high ground water infiltration and storm water inflow resulting in low BOD and SS concentrations in the wastewater.

4.2.4 By developing viable storm water management and segregating storm water from the wastewater collection systems, contamination of surface water will be reduced, and wastewater with higher strength will be collected for treatment. This allows for more efficient wastewater management as wastewater treatment plants can be appropriately sized with potential for extension of the service life of plants and other investments.

4.3. Wuhan Municipal Master Plan

4.3.1 The Wuhan Municipal Master Plan (WMMP) was prepared for 1996 to 2020 and this master plan has formed the basis for the provision of services and utilities. This WMMP specifies that storm water will be drained in disced sub-catchments and discharged into nearby rivers or lakes. The WMMP

establishes a target for the drainage network of 11.5 – 12.5 km per km² within the urban area by 2010 and 14.5 – 15.5 km per km² by 2020.

4.3.2 The WMMP has led to the identification of the storm water management subprojects in the Project and the proposed expansion of 3 pumping stations, with a total increase of pumping capacity of 210 m³/s. The WMMP also establishes a target to achieve segregating storm water from the wastewater within 85% of the urban area by 2020.

4.4. Storm Water Flow Predictions

4.4.1 The draft final FSR provides a rational understanding of the data about the historical rainfall and the historical situation and the development plan of the drainage system, which are obtained from the *Storm Water Drainage Handbook*¹. The parameters included in the projection are selected based on the comparison of different methods, and the following key factors are highlighted:

- rainfall intensity;
- the change of runoff coefficient; and
- the catchments which are likely to expand.

4.4.2 The amount of rainfall has been evaluated, which also provides sufficient information for technical, financial and social analysis. The evaluation covers:

- service life;
- definition of the catchment and the catchment area;
- rainfall intensity formula;
- rainfall recurrence interval;
- runoff coefficient; and
- rainfall duration.

4.4.3 Generally storm water components have been planned with a 50 year service horizon and have been sized as follows:

- Urban areas: a return period of 30 years, rainfall intensity of 274 mm/day, and a requirement that any flood water is completely drained in one day; and
- Suburban areas, a return period of 20 years, rainfall intensity of 248 mm/day, and a requirement that any flood water is completely drained in 3 days.

¹ Wuhan Storm Water Drainage Handbook 2004, Wuhan Water Bureau

Rainfall Intensity

4.4.4 The rainfall intensity has been determined in accordance with established practice using a formula that accounts for the rainfall recurrence interval, the inlet time and the topography of the catchment. According to the historical rainfall records of Wuhan Municipality in the last 100 years, the following rainfall intensity formula has been developed by Wuhan Municipal Planning Design & Research Institute:

$$q = \frac{885[1 + 1.58 \lg(P + 0.66)]}{(t + 6.37)^{0.604}}$$

Where q = Rainfall intensity (L/s·ha)
 P = Rainfall recurrence interval (a)
 t = Rainfall duration (minutes)

4.4.5 The recurrence interval is defined according to the nature of the catchment. In the *Storm Water Drainage Handbook* by Wuhan Water Bureau, the recurrence interval of all the storm water subprojects is defined to be one year.

Rainfall Duration

4.4.6 Rainfall duration is determined based on the inlet time, the reducing coefficient and the time of flow, as follows:

$$t = t_1 + mt_2$$

Where t = Rainfall duration (minutes)
 t_1 = Inlet time (minutes)
 t_2 = Time of flow (minutes)
 m = Reducing coefficient

4.4.7 In the draft final FSR, the inlet time t_1 is defined to be 15 minutes, while the reducing coefficient is defined to be 1.2 for open channels, 1.2 to 2.0 for pipes.

Runoff Coefficient

4.4.8 The runoff coefficient is determined according to the ground conditions within the catchment. Based on the local experience on storm water projects, the runoff coefficient of all the storm water subprojects has been taken as 0.7.

Required Capacity of Pumping Stations and Gates

4.4.9 According to the topographic nature and the storm water master plan of Wuhan Municipality, the service area and the calculated required pumping capacity for each of the proposed storm water subprojects are shown in Table 4-2.

Table 4-2 Service Area and Drainage Flow of Each Subproject

Subproject	Service Area (km²)	Pumping Capacity (m³/s)
Luoja Road Subproject	22.57	55
Yangsigang Subproject	3.67	20
Dongxihu Three Gates Connections Subproject	54.5	Not Applicable
Dongxihu Changqing Pumping Station Subproject	54.5	135

4.4.10 The gates have been sized according to the rainfall in the dry season (November to April) which varies between approximately 78 mm/d and 50 mm/d, with calibration against the rainfall intensity formula.

4.4.11 At the detailed design stage it is recommended that computer-based hydraulic modeling be undertaken to further optimize the capacity and configuration of the drainage channels, gates and pumping stations, and to establish operating rules for the system.

4.5. Proposed Layout of Storm Water Networks

Luoja Road Subproject

4.5.1 The Luoja Road subproject mainly includes rehabilitation of the Shahugang Open Channel and Luojiagang Open Channel and expansion of Luoja Road Pumping Station. The length of the open channels totals 8.81 km. The drainage system, mostly a combined system, is relatively sound. However several reaches of the open channel suffer from accumulation and sedimentation of waste due to erosion of the unlined channel and the poor flow regime caused by fishing nets installed along open channels.

4.5.2 The drainage capacity of Luojiagang Open Channel is 30 m³/s at present. Rehabilitation and expansion works are planned for Xingou Channel, Shanhu Channel and Luoja Channel to enlarge their discharge capacity, and there are also plans to construct a separate wastewater collection system within this area. The proposed increase in the capacity of Yangsigang Pumping Station from 30 m³/s by another 55 m³/s will improve the performance of the drainage systems within this catchment.

Yangsigang Subproject

4.5.3 The Yangsigang subproject is part of the Jiahe Drainage System (7.18 km²), which has a combined drainage system. Currently there is no integrated drainage system, although some trunk sewers have been laid already. Following rainfall, the surface water flows into local drainage ditches, most of which then flow into Moushui Lake via Wanjiagang Gate or Nashuigang Channel.

4.5.4 Most of the drainage ditches are deposited with sediment and Moushui Lake water level is artificially raised for aqua farming. These factors have

contributed to severe flooding during rainy seasons. As such, improvements on the existing drainage systems and the construction of a new Yangsigang Pumping Station are necessary to alleviate these flooding problems.

Dongxihu Three Gates Connections and Changqing Pumping Station Subprojects

4.5.5 The main storm water drains and principal branches have been laid within the service areas of the Dongxihu Three Gates Connections Subproject with funding by the World Bank. The discharge capacity of Xindun Gate has been enlarged to 85 m³/s, but the drainage flows into Jinyin Lake cause heavy water pollution to the lake from both point and non-point sources.

4.5.6 A box culvert from west to east is proposed under this subproject to intercept the storm water from Xindun Gate, Jinkou Gate and Huangjiadawan Gate. The discharge capacity of the Jinchang Open Channel outside Zhanggong Bank will be enlarged, and eventually, the collected storm water will flow into the Fu River either by gravity or via Changqing Pumping Station depending on the relative level in the channel and the river. Changqing Pumping Station pumps storm water not only from the service area of 54.5 km² of Three Gates Connections Subproject, but also from another service area of 445.7 km² of Jinyin Lake Ecological Park outside Zhanggong Di and Dongxihu suburban and agriculture lands.

4.5.7 The Dongxihu wastewater collection system of the Project (see Chapter 3) will segregate wastewater from the storm water entering the drainage system in the Wijiashan and the Southern Jinyinhu areas (55.2 km²), and will convey the wastewater for treatment at the Hanxi WWTP.

4.6. Land Requirements of Pumping Stations and Gates

4.6.1 The land requirements for the pumping stations have been calculated by the following methods:

- *Estimated in reference to Municipal Drainage Engineering Master Plan Criteria (GB50318—2000);*
- *Calibrated with Municipal Infrastructure Facility Engineering Investment Estimation Indices;*
- The actual land requirements of other municipal drainage facilities in Wuhan Municipality; and
- Preliminary designs prepared for each of the proposed pumping stations.

Luoja Road Subproject

4.6.2 The capacity of Luoja Road Pumping Station is sized to meet the demand of timely drainage of storm water from within the Luoja Road Catchment of 22.57 km², and the Donghu Catchment of 132 km² (in less than

72 hours) with a total covering area of 154.57 km². The pumping capacity is 85 m³/s and the land requirement is 34,000 m², based on a land requirement index of 0.4 m²/L/s. However by preparing preliminary designs for the site the DI has established that only an additional area of 14,151 m² will need to be acquired for the expansion.

4.6.3 The discharge capacity of Luoia Road Gate is 21.7 m³/s, and the estimated flood flow is 20 m³/s. The capacity of the gate can meet the design discharging requirement.

4.6.4 Xingou Gate is operated to lower the water level of Donghu Lake before a flood event, thus increasing the buffering capacity of Donghu Lake. The discharge capacity of the gate is 85 m³/s, which is sufficient to meet the drainage requirement within the Donghu Lake Catchment.

Yangsigang Subproject

4.6.5 The design capacity of Yangsigang Pumping Station is 20 m³/s. The land requirement is 10,000 m², based on a land requirement index of 0.5 m²/L/s. However by preparing preliminary designs for the site the DI has established that only an additional area of 5,558 m² will need to be acquired for the new drainage pumping station.

4.6.6 The flood flow within the Yangsigang Catchment is expected to be 12 m³/s. Hence an auto-drainage gate with a capacity of 13.2 m³/s will be provided.

4.6.7 The Changqing Pumping Station is to cater for the urban areas of Hankou District, Dongxihu Urban Development Area and Dongxihu Agriculture Development Area. The design pumping capacity is estimated to be 187 m³/s. The land requirement is 74,800 m², based on a land requirement index of 0.4 m²/L/s. However by preparing preliminary designs for the site the DI has established that only an additional area of 12,600 m² will need to be acquired for the expansion works.

4.7. Alternatives Considered

4.7.1 Table 4-3 lists the alternatives considered in each subproject by the DI. Only qualitative analyses were compared, none of these alternatives was evaluated with full cost estimates. Consequently, the PPTA team developed detailed cost estimates on capital, operations and maintenance on these alternatives and are summarized in the Least Cost Analysis Section of the Economic Analysis Chapter

Table 4-3 Alternatives Considered in Each Subproject

Subproject	Alternative Considered
Wuchang Luoia Road Drainage Improvements	None - rehabilitation of existing open channel and expansion of an existing pumping station.

Hanyang Yangsigang Drainage Improvements	Two alternative pumping station locations were evaluated.
Dongxihu Three Drainage Gates Connections	Two drainage network options were evaluated.
Dongxihu Changqing Pump Station Expansion	None - expansion of an existing pump station.

4.8. Cost Estimates, Contract Packaging and Implementation Schedule

4.8.1 Based on the review of the draft FSR, the PPTA team provided comments on the construction and other related costs (including quantities of major civil works, and schedule of major storm water management facility items, equipment and instrumentation and control systems), proposed contract packages and implementation schedule. In addition, local equipment suppliers were contacted by the PPTA team member to supplement cost information gathered by the DI. It is noted that the cost estimates presented in the draft final FSR are reasonable, however cost estimates on storm water subprojects were further adjusted during the Loan-Fact Finding Mission. The COSTAB costing model program has then been used to generate project cost estimates. Details of project costs, by subproject, year, financing source, and expenditure are presented further in the Financial Analysis Chapter.

4.8.2 The procurement contract packaging proposal has been developed in the draft final FSR, however there are some inconsistency in the cost figures. The PPTA team has further reviewed with the DI and PMO and made appropriate adjustments in accordance with ADB's guidelines for the size and type of contract packages. Table 4-4 presents our suggested contract packages for the DI and PMO's consideration on their final FSR preparation. The contract numbers are in general agreement with the DI's procurement contract packaging proposal.

Table 4-4 Recommended Storm Water Component Contract Packages

Luoji Road Subproject

Contract No.	Item	Contract Amount (CNY million)	Procurement Method
<i>Civil Works</i>			
LJLSW/2.1	Pumping station	33.85	LCB
LJLSW/2.2	Shahugang Channel (I)	36.71	LCB
LJLSW/2.3	Shahugang Channel (II)	41.59	LCB
LJLSW/2.4	Luojiagang Channel (I)	21.15	LCB
LJLSW/2.5	Luojiagang Channel (II)	19.11	LCB
LJLSW/2.6	Box culvert underneath the railway	5.25	LCB
<i>M & E</i>			
LJLSW/21.1	Pumping station	52.09	ICB
Total		209.74	

Yangsigang Subproject

Contract No.	Item	Contract Amount (CNY million)	Procurement Method
<i>Civil Works</i>			
YSGSW/2.1	Pumping station	16.23	LCB
YSGSW/2.2	Box culvert and pipe	17.21	LCB
<i>M & E</i>			
YSGSW/21.1	Pumping station	21.35	ICB
Total		54.78	

Dongxihu Three Gates Connections Subproject

Contract No.	Item	Contract Amount (CNY million)	Procurement Method
<i>Civil Works</i>			
DXHSW/2.1	Storm water box culvert (I)	77.82	LCB
DXHSW/2.2	Storm water box culvert (II)	70.39	LCB
DXHSW/2.3	New open channel	62.97	LCB
DXHSW/2.4	Rehabilitation of existing open channel	19.04	LCB
Total		230.22	

Changqing Pumping Station Subproject

Contract No.	Item	Contract Amount (CNY million)	Procurement Method
<i>Civil Works</i>			
CQSW/2.1	Pumping station	59.09	LCB
<i>M & E</i>			
CQSW/21.1	Pumping station	79.97	ICB
Total		139.06	

4.8.3 The implementation schedule presented in the draft final FSR is considered appropriate and is reproduced as Figure 4-2. The storm water component of the Project will be implemented over a 4 year period from 2006 to 2009. In accordance with this schedule, the Three Gates Connection in Dongxihu will be constructed as early as the third quarter of 2006, and the other storm water subprojects are to follow commencing 2007 after land acquisitions and resettlements are successfully implemented.

Figure 4-2 Implementation Schedule of Storm Water Subprojects

Item		2006				2007				2008				2009				2010			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
ADB Loan Period		●																			
Luojiagang Open Channel Rehabilitation & Luoia Road Pumping Station Expansion	1) Disclosure of consultation, land acquisition and resettlement information																				
	2) Resettlement																				
	3) Preliminary design and preparation of construction drawing																				
	4) Bidding																				
	5) Construction of pump station and pipeline																				
Hanyang Yangsigang Pumping Station & Storm Water Pipework	1) Disclosure of consultation, land acquisition and resettlement information																				
	2) Resettlement																				
	3) Preliminary design and preparation of construction drawing																				
	4) Bidding																				
	5) Construction of pump station and pipeline																				
Donxihu Three- Gate Connection	1) Disclosure of consultation, land acquisition and resettlement information																				
	2) Resettlement																				
	3) Preliminary design and preparation of construction drawing																				
	4) Bidding																				
	5) Construction of pump station and pipeline																				
Changqing Pumping Station Expansion (Phase II)	1) Disclosure of consultation, land acquisition and resettlement information																				
	2) Resettlement																				
	3) Preliminary design and preparation of construction drawing																				
	4) Bidding																				
	5) Pumping station construction																				

4.9 Summary of Proposed Storm Water Subprojects

4.9.1 A summary of the modifications recommended by the PPTA team to the subprojects proposed in the draft FSR are shown in Table 4-5 below. These recommended modifications have been given to the IA to facilitate the preparation of the final FSR by the DIs.

Table 4-5 Recommended Modifications to Proposed Subprojects

Subproject	Parameter	Recommended Modifications
Wuchang Luojia Road Drainage Improvements	Planning Horizon	Service life of 50 years
	Drainage Flow	75 m ³ /s based on the Dadonghu improvement planning.
	Drainage Network	Not applicable
	Pumping Station	55 m ³ /s capacity is reasonable
	Others	Ecological design of open channel should be considered under the Dadonghu improvement planning. Sediment dredged during rehabilitation work should be appropriately disposed of to minimize environmental impacts.
Hanyang Yangsigang Drainage Improvements	Planning Horizon	Service life of 50 years
	Drainage Flow	20 m ³ /s flow is reasonable
	Drainage Network	Reasonable in accordance with the spatial drainage plan
	Pumping Station	20 m ³ /s capacity is reasonable
	Others	Dredged sediment during rehabilitation work should be appropriate disposed of to minimize environmental impacts. Alternative evaluations should be carried out taking capital and O&M cost estimates into consideration.
Dongxihu Three Drainage Gates Connections	Planning Horizon	Service life of 50 years
	Drainage Flow	Drainage flow of 135 m ³ /s is reasonable
	Drainage Network	None
	Pumping Station	Under a separate government funding arrangement, two interception pumping stations will be built to divert wastewater into the Hanxi WWTP collection system.
	Others	Considerations on Dongxihu wastewater collection

Subproject	Parameter	Recommended Modifications
		should be made. Alternative evaluations should be carried out taking capital and O&M cost estimates into consideration
Dongxihu Changqing Pumping Station Expansion	Planning Horizon	Service life of 50 years
	Drainage Flow	Drainage flow of 187 m ³ /s is reasonable
	Drainage Network	Three drainage gates connections network.
	Pumping Station	135 m ³ /s pumping capacity is reasonable

5. Environmental Impact Assessment

5.1. Introduction

5.1.1 This Chapter of the Final Report deals with the environmental assessment of the Project as a whole and also of the individual subprojects that make up the whole Project. As referred to in Chapter 2, the Project comprises five wastewater collection and treatment subprojects and four storm water management subprojects within the main urban area and two suburban areas of Wuhan Municipality. A map of the project area is shown as Figure 2-1 of this report within Chapter 2. The project area drains in part to the Han River, in part to the Fu River (both tributaries of the Yangtze River) and in part direct to the Yangtze River itself.

5.1.2 Nine separate draft final environmental impact assessments (EIAs) have been prepared in accordance with the well-established Chinese EIA procedures¹. These EIAs will be subject to review and approval by the Hubei Provincial Environmental Protection Bureau (HEPB) acting under delegation from the State Environmental Protection Agency (SEPA). The PPTA team has also reviewed these subproject EIAs and has prepared a summary environmental impact assessment (SEIA) for the whole Project in a form that meets ADB requirements.

5.1.3 In preparation of this Final Report of the PPTA the following has been accomplished:

- the completed draft domestic EIAs have been reviewed;
- discussions have been held with the firm preparing the domestic EIAs regarding ADB requirements, and suggestions have been made to improve the domestic EIAs;
- visits have been made to all of the project sites;
- an assessment has been made of the main environmental impacts, and measures identified to mitigate the main impacts;
- public consultation has taken place through public meetings at Erlangmiao WWTP and in Caidian, and through questionnaires (the public consultation is summarized in Appendix E1); and
- a SEIA and EMP have been prepared (included as Volume II of this Final Report).

Description of the Project

5.1.4 The Project comprises five wastewater management subprojects and four storm water management subprojects, mostly located in the main urban area of

¹ EIA Reports have been prepared for the four subprojects that propose wastewater treatment facilities and EIA Forms have been prepared for the other subprojects.

Wuhan with two of the wastewater management subprojects and two of the storm water management subprojects located in the suburban areas of Caidian and Dongxihu Districts.

5.1.5 The wastewater management subprojects comprise:

- Wuchang: The existing Erlangmiao WWTP of 180,000 m³/d capacity will be upgraded from primary to secondary treatment and will be expanded to 240,000 m³/d;
- Hanyang: The existing Nantaizi Lake WWTP of 100,000 m³/d capacity (secondary treatment) will be expanded by another 100,000 m³/d capacity, and the associated wastewater collection system will be extended by construction of 3 pumping stations and 7.435 km of sewers;
- Hankou: The existing Huangpu Road WWTP of 100,000 m³/d capacity (pretreatment) will be upgraded to provide secondary treatment;
- Dongxihu: The wastewater collection system will be extended by construction of 5 pumping stations and 25.35 km of sewers, which will convey wastewater to Hanxi WWTP which is currently under construction, funded by the World Bank; and
- Caidian: A new WWTP of 50,000 m³/d capacity (secondary treatment) and the associated wastewater collection system of one pumping station and 4.59 km of sewers will be constructed.

5.1.6 The storm water management subprojects comprise:

- Wuchang: 8.81 km of open channel in Luojiagang and Shahugang will be renovated and the capacity of the Luoja Road pumping station will be increased from 30 m³/s by 55 m³/s;
- Hangyang: A new pumping station of 20 m³/s capacity at Yangsigang, and 1.34 km of storm water pipelines and 1.9 km box culverts will be constructed;
- Dongxihu: Three drainage control gates will be connected with the construction of 3.91 km of box culvert, 4.34 km of new open channel and 4.48 km of renovation of existing channel;
- Dongxihu: The capacity of Changqing pumping station will be increased from 52 m³/s by 135 m³/s.

Description of the Environment

5.1.7 The project area is located in Wuhan City, in the eastern part of Hubei Province. The area lies in the Jiangnan Plain where the Han River joins the Yangtze River. Regarding the topography of the project area, the central part is low and relatively flat, while the southern part is surrounded by hills and there are several low mountains in the north part.

5.1.8 The project area is in the subtropical monsoon climate zone. The climate is characterized by distinct seasonal variation and abundant rainfall. Average annual precipitation is 1280.9 mm, with the majority occurring from May to October. The annual average temperature is 15.8°C to 17.5°C, with recorded temperatures ranging from 41.3°C (August) to -18.1°C (January). The annual average relative moisture is 80% and average annual non-frozen time is 211 to 272 days. The wind directions are primarily from southeast in the summer and from the north and northeast during the winter, with an annual average wind speed of 2.7 m/s.

5.1.9 Although the project location is now mostly heavily urbanized, the urban areas of Wuhan contain numerous lakes, ponds and water bodies (which cover 25% of the city area) that are deteriorating in quality as a result of the ongoing discharge of untreated wastewater. This wastewater eventually drains to the Han River, in the Fu River (both are the tributaries of the Yangtze River) and to the Yangtze River. The current and target water quality of these water courses are given in Table 5-1 below.

Table 5-1 Current and Target Water Quality of Major Rivers in the Project

Water Course	Monitoring Section	Target Water Quality	Existing Water Quality	Major Pollutants Exceeding the Standard
Yangtze River	Shamao (entering section)	Class III	Class III	
	Yangsigang (control section)	Class III	Class III	
	Baihushan (leaving section)	Class III	Class IV	Faecal coliform bacteria
Han River	Guojiatai (entering section)	Class III	Class III	
	Xingang (control section)	Class III	Class III	
	Zongguan	Class III	Class III	
	Longwangmiao	Class III	Class IV	Faecal coliform bacteria
Fu River	Taipingsha	Class IV	Class IV	
	Lijia Gate	Class V	Class V	
	Daishan Bridge	Class V	> Class V	
	Zhuji River mouth	Class V	> Class V	Ammonia nitrogen, faecal coliform bacteria, total phosphorus

Monitoring Year: 2004

Sources: 2004 Wuhan Environmental Monitoring Briefing, Wuhan Water Environmental Management and Protection Plan issued in March 2005, draft EIAs of the Project

5.1.10 Biological resources are relatively abundant and diverse in Wuhan. Wuhan is located in the transition region from the middle subtropical zone to the north subtropical zone, with vegetation characteristics of mixed forest consisting of evergreen broadleaf and deciduous broadleaf trees. Major agricultural resources in the project area include rice, corn, tea and rapeseed. Animals include birds, livestock and poultry. Fishery resources are abundant, and there are more than twenty kinds of major fish species including the famous Wuchang fish. The reaches of the Yangtze River within Wuhan are migration channels for the endangered white-flag dolphin and Chinese paddlefish, which are Class I protected species in the PRC.

5.1.11 As the capital of Hubei Province, Wuhan is the province's main political, economic, trading, information and cultural center, and it also a famous historical and cultural city with a long history. The city comprises seven central urban areas and six suburban areas with a total area of 8,494 km² and permanent population of 7,859,000 in 2004. The major industrial sectors in Wuhan include machinery, metallurgy, electronics, pharmaceuticals and high-tech industry. In 2004 the gross production value reached RMB195.6 billion.

5.2. Regulatory Context

EIA Laws and Regulations in PRC

5.2.1 The procedures for environmental impact assessment of construction projects in the People's Republic of China (PRC) using credits and loans from International Financing Organizations (IFOs) are described in the Circular on Strengthening Environmental Impact Assessment Management for Construction Projects Financed by IFOs issued in June 1993 (the Circular), as well as the Environmental Impact Assessment Law of PRC dated September 2003. Subject to Chinese EIA regulations, IFO's technical requirements for EIAs should be incorporated. The EIA requirements and procedures based on the existing laws and regulations in China, particularly the Circular are basically consistent with the Asian Development Bank (ADB) requirements and review procedures.

5.2.2 Table 5-2 shows the Chinese-related EIA laws and regulations, and Table 5-3 shows the Chinese standards and guidelines related to EIAs. Obviously not all these laws and regulations are relevant to all subprojects. In addition to the national level laws and regulations there are also supporting regulations and circulars issued by Hubei Provincial Government and Wuhan Municipal Government, shown in Table 5-4. All these regulations must be compatible with national level documents. They can impose stricter requirements but cannot contradict or allow a relaxation of national standards unless the national regulations make specific provision for this.

Table 5-2 EIA-related Laws and Regulations in PRC

Law or Regulation	Date of Implementation
Environmental Protection Law of PRC	26 December 1989
Environmental Impact Assessment Law of PRC	1 September 2003
Water Law of PRC	1 October 2002
Air Pollution Prevention Law of PRC	1 September 2000
Water Pollution Prevention Law of PRC	15 May 1996
Solid Waste Pollution Prevention Law of PRC	1 April 2005
Environmental Noise Pollution Control Law of PRC	1 March 1997
Land Management Law of PRC	1 January 1999
Flood Control Law of PRC	1 January 1998
Water and Soil Conservation Law of PRC	29 June 1991
River Course Management Ordinance of PRC	10 June 1988
Environmental Protection Management Ordinances for Construction Projects	29 November 1998
Environmental Protection Management Directories for Construction Projects	1 January 2003
Notice to Strengthen the Environmental Impact Assessment and Management of Construction Projects Financed by Loan from International Financial Organizations	June 21, 1993
Municipal Wastewater Treatment and Pollution Control Technical Policy	May 29, 2000

Table 5-3 EIA-Related Standards and Guidelines in PRC

Standard or Guideline	Standard No.
Environmental Impact Assessment Technical Guidelines (General, Air, Surface Water, Noise, Ecology)	HJ/T 2.1~2.3-93, HJ/T 2.4-1995, HJ/T 19-1997
Environmental Quality Standards for Surface Water	GB 3838-2002
Integrated Wastewater Discharge Standard	GB 8978-1996
Discharge Standard for Municipal Wastewater	CJ 3082-1999
Ambient Air Quality Standards	GB 3095-1996
Integrated Emission Standard of Air Pollutants	GB 16297-1996
Standard of Environmental Noise of Urban Area	GB 3096-93
Standard of Environmental Vibration of Urban Area	GB 10070-88
Standard of Noise at Boundary of Industrial Enterprises	GB 12348-90
Noise Limits for Construction Site	GB 12523-90
Odor Emission Standard	GB 14554-93
Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant	GB 18918-2002
Discharge Standard of Wastewater and Sludge for Municipal Wastewater Treatment Plant	GJ 3025-93
Control Standards for Pollutants in Sludge from Agricultural Use	GB 4284-84
Industrial Design Sanitation Standard	TJ 36-79

Table 5-4 Local EIA-related Regulations and Circulars

Regulation or Circular	Date of Promulgation
Hubei Wuhan Lakes Protection Regulation	January 18, 2002
Hubei Han River Basin Water Pollution Prevention Regulation	May 1, 2000
Wuhan Environmental Protection Regulation	December 1997
Wuhan Surface Water Functional Zones	January 1, 2000
Wuhan Drinking Water Sources Protection Gradation Regulations	November 18, 1999
2004 Wuhan Environmental Monitoring Briefing	2005
2004 Wuhan Environmental Quality Communique	May 17, 2005

5.2.3 Review and approval of EIA reports for IFO-funded construction projects should follow Chinese EIA review and approval procedures. The EIA reports are pre-reviewed by the corresponding local government authority and submitted to the State Environmental Protection Agency (SEPA) for comments and approval, except where SEPA has given delegation for Provincial Level environmental protection bureaus (EPBs) to issue the required approval.

ADB's Requirements

5.2.4 In pursuit of its commitment to promote environmentally sustainable economic development in its developing member countries, the ADB has instituted environmental assessment (EA) requirements and established environmental review procedures to ensure that environmental considerations are properly integrated and monitored in each stage of the project cycle.

5.2.5 ADB requires some form of EA for all projects, especially for environmental-sensitive projects or those projects expected to have significant environmental impacts. The degree of severity of potential project impacts is indicated by the environment category assigned to the project. This in turn determines the need for and the required type of environmental assessment report that is either an initial environmental examination (IEE) or a full EIA.

5.2.6 ADB's categorization of each proposed project is made according to its potential impact and availability of cost-effective mitigation measures. Based on the results of screening conducted during early ADB fact-finding missions, projects are assigned to one of the following three categories:

- **Category A:** Projects with significant adverse environmental impact as predicted by the IEE; an EIA is required.
- **Category B:** Projects with adverse environmental impacts which are of lesser degree and/or significance than those of Category A; although an EIA may not be required, an IEE is required for these projects.
- **Category C:** Projects unlikely to have adverse environmental impact; no EIA or IEE is normally required

5.2.7 For projects under Category A and selected projects under Category B which the Office of the Environment and Social Development (OENV) believes would benefit from external review, a SEIA should be prepared to comply with ADB requirements.

5.2.8 The WWSMP has been classified as a Category A project by ADB and therefore full EIAs and a SEIA are required. All the subprojects are considered construction projects based on PRC criteria, and as such they require full-scale EIAs under PRC law.

5.2.9 ADB requirements are stipulated in the following documents:

- Environmental Policy of the Asian Development Bank, ADB, 2002; and
- Environmental Assessment Guidelines, ADB, 2003.

5.3. Current Status

Preparation and Approval of Domestic EIAs

5.3.1 Hubei Junbang Environmental Technology Company was appointed in February 2005 to be responsible for preparing EIAs for the nine subprojects. The preparation of four EIA reports for four wastewater treatment plants subprojects and three EIA forms for the other five subprojects has been completed. The EIAs were approved by Hubei Provincial Environmental Protection Bureau in early January of 2006.

Purpose and Scope of PPTA work

5.3.2 The main purpose of this element of the PPTA is to prepare a SEIA in accordance with ADB requirements. This SEIA is to summarize the individual subproject EIAs prepared under PRC regulations; and to update and strengthen these domestic EIAs as necessary.

5.3.3 The methodology for review of environmental impacts and SEIA preparation has included:

- review of existing feasibility studies on each subproject;
- review of existing EIAs for each subproject;
- identification of important environmental impacts in the construction and operation phases;
- recommendation of appropriate mitigation measures;
- preparation of the SEIA in accordance with ADB's guidelines;
- preparation of the Environmental Management Plan (EMP); and

- strengthening and/or updating of the SEIA and EMP based on stakeholder feedback.

Review of Domestic EIAs

5.3.4 The review of the draft domestic EIA reports and forms has indicated that the major environmental requirements of the PRC and the ADB have been complied with. However the draft domestic EIA reports and forms needed to be improved to:

- provide more comprehensive conclusions, particularly regarding the project benefits of water quality and public health improvements;
- identify more clearly appropriate mitigation measures with associated estimated costs;
- undertake public consultation and incorporate the results of the consultation; and
- be updated to be consistent with the final FSRs.

These improvements have now been completed and incorporated into revised versions of the EIA reports and forms.

Public Consultation

5.3.5 ADB's Environmental Policy mandates that effective public consultation be undertaken. Public consultation may be categorized into three types:

- Disseminating information;
- Soliciting input; and
- Getting consensus on issues.

5.3.6 Consultation undertaken to date for this Project has included stakeholder participation in the Inception Workshop on 5 July 2005 and the Interim Workshop on 2 September 2005, public consultation meetings at Erlangmiao WWTP on 21 July 2005 and Caidian on 19 September 2005. Further consultation was subsequently undertaken through a questionnaire survey. Additional feedback from the public was obtained through the household and business surveys undertaken for the social impact assessment. This consultation provided useful forums for disseminating information about the proposed project and obtaining inputs from interested parties. Details of the consultation undertaken are provided in Appendix E1.

5.3.7 The following points were highlighted at the public meetings:

- Most participants support the Project and believe adverse impacts can be alleviated by using advanced technologies and appropriate mitigation measures.

- The proximity of Huangpu Road WWTP to the River Front Landscaping Project, is a potential concern because of possible odor nuisance.
- Major concerns include odor, noise during construction, mosquitoes and sludge disposal.
- For the proposed Caidian wastewater subproject, the affected people wanted the resettlement and land acquisition compensation to be fair, in compliance with relevant state and provincial policies, and to be paid on time and in full to the affected households.

5.3.8 The following issues were identified to be important from the questionnaire surveys:

- More than 80% of the people surveyed knew about the proposed project through the media, conferences, public meetings etc;
- 95% supported the project and have expected social and economic developments and quality of life improvement from project implementation, and more than 77% believed that water quality of local rivers and lakes would be improved significantly;
- As for the locations of the proposed WWTPs, more than 95% of the people surveyed thought they were reasonable. 25% expressed their concerns on noise, airborne dust and waste during construction and nuisance odor, sludge and effluent discharge during operation of WWTPs;
- The affected public demanded sound environmental management during construction and operation to minimize impacts to the surrounding communities; and
- The public surveyed also expected that the project facilities would be well constructed to high quality.

5.3.9 Public consultation should continue during project implementation to ensure that the public are aware of the progress of the project and the planned construction activities, and that any legitimate concerns of the public are acknowledged and appropriate actions are taken.

Information Disclosure

5.3.10 So far, disclosure of information on the Project and potential environmental and socio-economic impacts from the construction and operation of the Project works has been undertaken through a brief description given during the public consultation (public meetings and questionnaire survey). This disclosure, however, is not considered sufficient, and needs to be developed further possibly through distribution of the EIA reports in county public libraries for public review, advertisement in public media on the Project, the EIA process and further public consultation, and distribution of the EIA reports on the internet, where conditions permit. The completed SEIA report was posted on ADB's website in January 2006.

Analysis of Alternatives

5.3.11 As a key process of incorporating environmental considerations into project design and decision-making, analysis of alternatives is a critical part of the EIA. The wastewater management subprojects involve the progressive implementation of components of the city's wastewater master plan, and so the alternatives which have been considered in the domestic FSRs (and corresponding EIAs) generally relate to alternative configurations of collection system and alternative treatment processes, rather than broader alternatives such as whether to have pre-treatment for industrial effluents.

5.3.12 Except for the Nantaizi and Caidian wastewater management subprojects the scope for considering alternative sites for wastewater treatment is constrained by the existing or ongoing construction of earlier wastewater treatment plants that are to be upgraded and expanded. However for the Huangpu Road wastewater management subproject additional analysis has been carried out under the PPTA to assess alternative sites, but this analysis has confirmed that use of the existing site is the least cost solution.

Processing Schedules

5.3.13 To meet the target date of ADB Loan Approval in the second week of May 2006, the SEIA would need to be posted on the ADB website in January 2006 and also circulated to the ADB Board at least 120 days before May 2006. Accordingly, the SEIA has been completed in the early December 2005 and the Project management office (PMO) has confirmed to ADB their acceptance of the SEIA by the mid December 2005.

5.4. Specific Issues Identified

Project-wide Benefits

5.4.1 The Project can be anticipated to bring significant benefits through some water quality improvements associated with the collection and treatment of wastewater in accordance with the progressive implementation of the City's overall wastewater master plan. Improvements in water quality will reduce risks of algal blooms in the receiving water courses and reduce risks of disturbance to water treatment plants and other users located downstream

5.4.2 Significant health benefits can be anticipated, particularly through the increased collection of wastewater leading to improvements in water quality, and the improved management of storm water leading to reductions in the frequency and severity of flooding.

5.4.3 The Project will bring other significant benefits through improvements in the urban environment, reduced disruption to commercial and social activities

following reductions in flood frequency and severity, and improved economic activity.

Project-wide Impacts and Mitigations

5.4.4 The following mitigation measures will be undertaken during the design phase: (i) all subproject sites will be carefully selected to avoid or minimize potential impacts to the environment and surrounding communities; (ii) the WWTP layouts will be designed so sources of noise and odors will be as far away from nearby residential areas as possible; (iii) the WWTP designs will limit odor emissions and noise to acceptable levels; and (iv) mitigation measures requiring design such as landfill site drainage control, leachate collection and treatment plants, will be incorporated into the design of sanitary landfills.

5.4.5 A potential concern has been identified with the location of the Huangpu Road WWTP which is to be upgraded to provide secondary treatment rather than the existing facilities which only provide screening of wastewater. The existing facilities are located within the flood management reserve on the west bank of the Yangtze River. Normally development within the flood management reserve is prohibited, but it is understood that an exemption certificate has been issued for the wastewater treatment facility. The detailed design of the facility will need to take into account the possible risk of flooding during exceptionally high river levels.

5.4.6 Construction phase impacts and mitigations can be summarized in Table 5-6 below:

Table 5-6 Construction Phase Impacts and Mitigations

Construction Phase Impact	Mitigation
Wastewater	Enclose construction sites by a temporary perimeter wall, build screening, grit removal, primary sedimentation tanks, and drainage ditches for treatment of wastewater for reuse or to discharge into local sewers, section by section construction is adopted
Air pollution	Enclose construction sites, cover or spray water at exposed storage sites, minimize on-site storage of materials, spray water at construction sites and on dusty roads, transport materials in covered vehicles or in closed containers, control vehicle speeds, and select transport routes, maintenance of vehicles and construction machinery
Noise	Reasonable construction arrangements, installation of on-site sound barriers, proper equipment and correct operation and maintenance
Disturbance to traffic and access	Construct temporary roads, select transport routes, divert traffic at peak hours, and make interim traffic arrangements
Disposal of surplus excavated material	Characterize material and dispose of appropriately
Pollution from temporary workers quarters	Install temporary screening to treat washing and cooking wastewater and then discharge into local sewers, utilize existing or install

Construction Phase Impact	Mitigation
Muddy runoff and soil erosion	temporary septic tanks for collection of lavatory wastewater and then discharge into local sewers, provide solid waste collection facilities Retaining wall or drainage ditch, enclosed construction site
Temporary land occupation	Restore following completion of construction
Permanent land occupation	Minimize land required, provide compensation
Archaeological or cultural materials	Suspend construction for investigation
Public safety	Isolate construction sites by barriers and hoardings, control access to sites

5.4.7 Operation phase impacts and mitigations are summarized in Industrial Pollution Control.

5.4.8 The project WWTPs, particularly for the Caidian and the Dongxihu wastewater subprojects will receive relative significant volumes of industrial wastewater, and it will therefore be necessary to implement plans to control industrial pollution sources. In theory, local EPBs can close the factories that cannot meet discharge standards but in reality this rarely happens. Local governments and EPBs need to develop stronger and more effective management regulations to regulate wastewater discharges from industries.

Industrial Pollution Control

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Table 5-7 Operation Phase Impacts and Mitigations

Operation Phase Impact	Mitigation
Pollution of receiving water courses following failure to operate WWTPs correctly	Adequate process control of WWTPs, enhancement of operational and environmental monitoring
Odor nuisance	Cover process units, with associated ducting and treatment of odorous gases using biological soil filter or biofilter, and implement proper maintenance, operation and monitoring, establish buffer zone around WWTPs and build greenbelt around WWTPs and pump stations, and implement proper maintenance and supervision

Operation Phase Impact	Mitigation
Sludge transportation and disposal	Characterize sludge, treat sludge, dispose of sludge appropriately, provide sanitary landfill sites
Noise generated by pumps and machinery	Select low noise machines, locate high noise equipment indoors, install noise enclosures or buffers, semi-underground setting of pump stations, and build greenbelt around WWTPs and pump stations

Odor Nuisance

5.4.10 The project WWTPs are mostly sited in highly urbanized locations, with residential areas and amenity areas in close proximity to the WWTP sites. Where possible buffer zones should be established around the WWTPs in which inappropriate development is prohibited. It will also be necessary to make significant provision for odor control facilities in the design of the WWTPs to cover or enclose odorous processes and to treat the gaseous emissions. Once the WWTPs are in operation it will be necessary that these odor control facilities are correctly operated, and that adequate financing is made available.

5.4.11 Odor nuisance during construction of some of the storm water management subprojects is also possible as existing drainage channels that are to be improved are emptied and sludge removed.

Sludge Disposal

5.4.12 Once operational the four WWTPs are expected to produce 235 t/d of sludge cake containing around 75 % moisture. Handling and disposing of this in a safe, proper and environmentally responsible manner will be a substantial task. It can be anticipated that the quality of this sludge will be affected by contaminants in industrial wastewater and that the sludge will not be suitable for beneficial use as a fertilizer. The Project proposes disposal of sludge to either existing or planned landfill sites, and it has been confirmed that incineration will not be used. However a sludge management study is required to consider the disposal of sludge from the entire city's WWTPs including those which are to be constructed under the Project, and this study will consider sludge management further as a component of the city's overall solid waste management strategy.

5.4.13 In addition to sludge from the WWTPs which will require disposal once the WWTPs become operational, there will be a need to dispose of sludge from existing drainage channels that are to be improved as part of the storm water management subprojects. As these channels have conveyed wastewater as well as surface water for many years, it is possible that the sludge from these channels may be contaminated. These sludge need to be characterized and quantified before deciding how they are to be disposed.

Comprehensive Reuse

5.4.14 The project area is rich in natural water resources and therefore effluent reuse is unlikely to prove economic. Effluent reuse is not proposed under the Project for any of the wastewater subprojects except for use within the WWTPs. Use of effluent from Nantaizi Lake WWTP in a proposed constructed wetland area is being considered, but this does not form part of the Project. Beneficial use of sewage sludge is also referred to and should be encouraged subject to financial and economic viability being established.

Flood Alleviation

5.4.15 The most important benefits of the storm water management subprojects will be reductions in the frequency and severity of flooding, and an attempt should be made to quantify these benefits such as the reduced frequency of occurrence, the reduced depth of flooding and the reduced numbers of persons affected.

Resettlement

5.4.16 People affected physically and economically by the Project include: (i) people affected by the acquisition of land; (ii) people affected by the temporary use of land for the wastewater collection systems, wastewater treatment plants, storm water drainage and pumping stations; and (iii) people whose livelihoods are impacted during construction activities. The resettlement of 1,747 people will be required. It is understood that no indigenous people or ethnic minorities will be adversely affected by the nine subprojects.

5.4.17 The nine subprojects will require the permanent acquisition of 62.5 hectares (ha) of land, the temporary acquisition of 26.0 ha of land, and the demolition of 39,288 m² of residential buildings, and 18,881 m² of non-residential buildings.

5.5. Environmental Management

Environmental Responsibilities

5.5.1 There are a number of organizations which will be involved with various roles and responsibilities in regulatory enforcement, environmental supervision, environmental monitoring, mitigation measures execution and other environmental management aspects in the project implementation. These organizations include:

- HEPB for reviewing and approving the EIAs and for the as-built environmental audit;
- Wuhan Municipal Environmental Protection Bureau (WEPB) for reviewing

and approving the SEIA including EMP, supervising implementation of mitigation measures and monitoring during the construction and operation phases, and regulation enforcement;

- PMO and Implementation Agencies (IAs) for engaging services for EIA preparation, environmental monitoring and management of contractors, with the ultimate responsibilities for environmental performance of the project;
- EIA preparation company and design institutes for EIA preparation and incorporating mitigation measures into project design as may be needed;
- Environmental monitoring centers/stations for environmental monitoring and reporting of environmental performance during the construction and operation phases; and
- Contractors and construction supervision companies for execution of mitigation measures, and self monitoring and reporting.

Institutional Strengthening and Training

5.5.2 The Wuhan Drainage Company (WDC) and the Wuhan Urban Construction Foundation (WUCF) are the IAs of the wastewater and storm water components respectively, which have sufficient technical and institutional capacities, which are adequate for Project implementation. Still, they will receive the EMP training on the relevant ADB procedures during implementation of the Project.

5.5.3 With the help of the EMC and support from the loan consultancy services, the PMO and the IAs will develop expertise in efficient operations of the wastewater and storm water facilities. WDC is already a recipient of consulting services support under the WWMP, so capacity building will be weighted towards the storm water component.

5.5.4 Training programs will be required to provide training for the construction supervision companies and contractors to ensure they have the necessary knowledge and skills for mitigation measures implementation and to perform these required regular monitoring and reporting.

5.5.5 The training program will also be extended to environmental specialists of WEPB, PMO and IAs. Because of the nature of these organizations and their responsibilities in the environmental management for the project, the training content will include environmental management, monitoring and supervision, mitigation planning, emergency response, environmental policymaking, and other environmental management techniques. Funding of this training will be included in the project budget and in the Operation and Maintenance (O&M) budgets during the operational phase.

Environmental Monitoring

5.5.6 Currently, monitoring programs are mandatory based on national regulations. After the subprojects are completed, such monitoring programs should be used for monitoring the impacts on the environment. In order to enhance environmental monitoring, identification of necessary modification of effluent outlets, selection, and installation of monitoring equipment are necessary. It is also very important that the monitoring data are reliable and complete for the purposes required.

5.5.7 Accurate monitoring data are to be acquired for evaluating the effects of the subprojects on downstream water sources. However, currently, there is little possibility to acquire quantitative results on water quality improvement, given the lack of functioning water quality models for the watercourses concerned. What limited data there is on expected water quality improvement are all based on theoretical evaluations of reduced COD discharge.

5.5.8 The project environmental monitoring program will be two-tier: periodical and compliance monitoring and daily or regular monitoring. The objective of the compliance monitoring is to take samples and measurements to determine compliance status with the application regulations and standards. Such monitoring will be conducted periodically to demonstrate the compliance of the project activities during both construction and operation phases. Daily monitoring will be mostly by visual observations of the environmental staff of contractors and construction supervision companies. The objective of the regular monitoring is to ensure proper execution of mitigation measures, timely identification of environmental issues and prompt corrective actions. The PMO will report regularly the environmental performance to WEPB and ADB.

5.6 Conclusions

5.6.1 The Project can be anticipated to bring significant benefits to the urban and suburban areas of Wuhan and the water systems downstream through water quality improvements associated with the collection and treatment of wastewater in accordance with the progressive implementation of the City's overall wastewater master plan. These project benefits will be cumulative with those achieved through other earlier and ongoing interventions in the sector.

5.6.2 The nine subprojects are expected to contribute to the achievement of the following targets: (i) water bodies in the project area will meet target water quality levels by 2010; (ii) a total COD reduction of 35,800 t/yr will be achieved by 2010; (iii) wastewater treatment capacity will be available to treat more than 80 % of the wastewater generated within the urban area by 2010; (iv) all project-related WWTPs will meet discharge standards from 2010; and (v) all sludge will be disposed of in compliance with PRC regulations by 2010.

5.6.3 Significant health benefits can be anticipated, particularly through the increased collection of wastewater leading to improvements in water quality and the improved management of storm water. Reductions in the frequency and severity of flooding will bring other substantial benefits too through improvements to the urban environment, reduced disruption to commercial and social activities and improved economic activity.

5.6.4 The adverse impacts generated by the Project will be avoided or reduced to acceptable levels by taking appropriate mitigation and compensation measures. The main measures include: (i) careful selection of WWTP sites to avoid sensitive locations; (ii) control of noise, dust, and release of wastewater during construction; (iii) soil erosion control during earthworks; (iv) odor and noise control during operation; (v) landscaping after project completion; and .

5.6.5 Some limited adverse impacts, while mitigated to acceptable levels, include the relocation of 1,747 persons and a permanent loss of about 62.5 ha of land which will be appropriately compensated.

6. Poverty and Social Analysis

6.1. General

6.1.1 The social impact analysis (SIA) was undertaken to evaluate project impacts on beneficiaries including persons living within the service area of the 9 subproject as well as the general population. Methods used in the analysis include a review of published statistics, household (HHs) and business surveys, focus groups with residents, web-based review of literature and key informant interviews. Survey and focus group methodologies are described in Appendices F1, F2 and F3.

6.2. Socio-economic and Poverty Profile

General Profile

6.2.1. General characteristics of the urban and suburban population in Wuhan were evaluated using published statistics and information obtained from the household survey. A summary is provided here. Further details are provided in Appendix F2.¹ The following sections summarize HH composition, housing characteristics and HH economy.

Household Composition

6.2.2. The average HH size for survey respondents was 2.95 persons.² This ranged from one to six persons with three persons being the norm (62%), and 23% of HHs having two persons. Single person HHs were uncommon (2.0%). Childless HHs were also the norm (68% of HHs).³ Where children were present, there was almost always only one (98%).

6.2.3. The number of employed or self employed persons averaged 1.4 per HH, with 26% of HHs having no employed persons, 31% with one, and 38% with two and 6% with three or more. Educational attainment among employed persons was relatively high with 60% having college or university training and only 2% having lower than high school education.

6.2.4. There were on average 1.4 dependent persons and 1 adult dependent person per HH. Dependent persons comprised 47% of HH members.⁴ Dependent persons include retired and disabled persons who may contribute government support payments or pension income. One quarter of the respondents reported retired persons as HH members but only 1% reported a disabled person. The average age of adult HH members, at 41 years, reflects the paucity of children and the relatively large number of adult dependants in households.

¹ See Appendix F2 for documentation of the SIA HH survey questionnaire, sample, field work and data processing.

² Not significantly different ($p=0.01$) from a HH size of 3.03 published in the Wuhan Statistical yearbook, 2003.

³ Children are here defined to be persons under the age of 16.

⁴ Dependants are here defined to include children and adults who are not working outside of the home or doing paid child care in the home (home care, students, retired, disabled). Unemployed persons are not included.

6.2.5. 4.8% of respondents (22 HHs) were elderly persons living alone and 5.7% were in female headed HHs.

Housing

6.2.6. Two thirds (66%) of survey respondents lived in apartment blocks without elevators, 2% in apartments with elevators, 27% in traditional single storey houses and only 2% in rented rooms. Three rooms was the norm for respondents (44% of respondents) with almost 30% having only one or two rooms and one out of ten having 5 or more rooms. The average living space was 92 m². The living space was less than 50 m² for 22% of respondents and exceeded 150 m² for 13%.

6.2.7. Home ownership was high (95% of respondents) but this bore little relationship to HH income, perhaps because many lower income respondents were previously employees of state owned enterprises (SOEs) and acquired their accommodation from their former employers at low prices. This possibility is corroborated by the fact that 45% of low to medium income respondents had lived at their current address for 10 years or more while 65% of high income respondents had lived at their current address for 5 years or less.⁵

Household Income and Expenditures

6.2.8. The distribution of total monthly HH income for survey respondents is provided in Table 6-1. Based on this distribution, the average monthly HH income was estimated to be CNY 2,300 and average monthly per capita income CNY 830.⁶

Table 6-1 Distribution of Monthly Household Income

Income Range (CNY)	Percentage of Sample in Range
Under 300	0
300 to 600	4
600 to 1,200	18
1,200 to 1,600	24
1,600 to 2,000	18
2,000 to 2400	15
2400 to 2,800	7
2,800 to 3,700	6
over 3,700	8
Total	100

Source: Household survey

6.2.9. Household expenditures from the HH survey and the statistical yearbook are provided in Table 6-2. While expenditure values from these two sources show considerable variation, there is good agreement on the total expenditures and key items such as food and utilities. Food accounts for just over one third of

⁵ The dividing line between medium and high income respondents is an annual HH income of CNY 33,600.

⁶ The distribution indicated in Table 6-1 is not representative of the population, being weighted in favor of poor HHs. The first three classes, at 22% of the sample, actually correspond to 10% of the population. Mean values are therefore weighted averages.

living expenditures, while total basic expenditures (food, clothing, shelter and utilities) account for 55% of living expenditures.

Table 6-2 Average Monthly Income and Expenditures, 2003 (in CNY)

Item	Wuhan Statistical Yearbook, 2003		HH Survey
	Per capita	Per Household	Per Household
Total income	750	2,274	2,299
Disposable income	710	2,152	2,264
Total expenditures	720	2,181	NA
Living expenditures	604	1,831	1,781
1. Food	246	646	654
2. Tobacco and alcohol	32	98	129
3. Clothing	63	191	113
4. Household facilities, articles, services	32	97	39
5. Medical and health expenditures	46	139	71
6. Transportation (bus, taxi, car)	22	66	92
7. Communication (telephone, other)	39	117	132
8. Recreation, cultural activities	28	86	59
9. Education	45	138	197
10. Housing rent and fees	19	58	46
11. Utilities (water, electricity, fuels)	50	151	164
12. Other living expenditures	14	43	18
13. Taxes	40	121	35
14. Other expenditures and savings	106	321	NA

Profile of Poverty

6.2.10. Low income HHs in the project area resemble low income HHs described in the ADB poverty profile of PRC.⁷ The characteristics of low income HHs in the project area are:

- Head of HH is retired or laid off, often with children of school age;
- Female headed HHs; and
- Floating population, usually from rural areas living in poor housing conditions.

6.2.11. The majority of women and men attending the focus groups for low income people were unemployed or retired. Women's League representatives also identified dismissal of employees from SOEs as a significant cause of poverty in addition to poor education and illness. The HH survey data supports these observations. For instance 18% of the lowest income HHs are elder-only HHs compared to 3% in the highest income category. HHs with no income earners represent 59% of the lowest income HHs and 8% of the highest.

6.2.12. Published data on total HH size and the number of income earners in the HH give some insight into the economic circumstances contributing to poverty

⁷ Poverty Profile of the People's Republic of China – Asian Development Bank May 2004

(Table 6.3). The poorest HHs have the greatest number of persons per HH but the lowest number of persons with income and the highest number of income earners relying on the informal economy for their income (i.e., 'Other persons with income'). The dependency ratio for the lowest income group is more than 40% higher than for the highest.

Table 6-3 Dependency Ratios*

Item	Avg	Low-est	Low	Med-Low	Med-ium	Med-High	High	High-est
HH size (persons)	3.03	3.18	3.18	3.14	3.10	2.99	2.83	2.68
Number of employees	1.53	1.37	1.30	1.46	1.55	1.66	1.63	1.62
Retirees	0.69	0.38	0.72	0.74	0.71	0.72	0.77	0.68
Other persons with income	0.08	0.16	0.11	0.08	0.08	0.09	0.03	0.04
Total persons with income	2.30	1.91	2.13	2.29	2.33	2.47	2.43	2.34
Persons supported by employees	1.99	2.32	2.45	2.15	2.00	1.80	1.74	1.65
Persons supported by persons with income	1.32	1.66	1.49	1.37	1.33	1.21	1.16	1.15

Source: Wuhan Statistical Yearbook, 2004.

* Lowest = 1st decile; Low = 2nd decile; Medium Low = 2nd quintile; Medium = 3rd quintile; Medium High = 4th quintile; High = 9th decile; Highest = 10th decile

6.2.13. For the 4 lower income classes, total expenditures exceed disposable income, suggesting either an understatement of income or an overstatement of expenditures (Table 6.4). Both income and expenditure are often understated in HH surveys because respondents are reluctant to disclose their full income and consumption because respondents forget about purchases, or fail to declare full expenditures on items like alcohol.⁸

Table 6-4 Monthly Household Income and Expenditures by Income Class (in CNY)

Item	Avg	Low-est	Low	Med-Low	Med-ium	Med-High	High	High-est
Total income	2,274	968	1,428	1,773	2,166	2,565	3,074	4,279
Disposable income	2,152	852	1,321	1,670	2,057	2,447	2,918	4,105
Total expenditures	2,181	1,288	1,527	1,863	2,142	2,364	2,748	3,529
Living expenditures	1,831	979	1,296	1,652	1,780	2,002	2,270	2,913
Food	744	455	605	679	759	842	856	972
Clothing	191	69	119	143	192	232	259	336
HH facilities, articles, services	97	34	63	95	97	110	114	157
Medical, health	139	67	85	105	131	141	181	307
Transportation, communication	183	66	109	135	180	202	223	401
Education, recreation, cultural	223	104	132	239	205	242	293	336
Housing, utilities	209	173	162	226	171	193	276	301
Other	43	11	20	30	45	40	68	104
Food, clothing, housing	1,144	697	886	1,048	1,121	1,267	1,390	1,609
Taxes*	121	116	107	103	109	118	156	174
HH size (persons)	3.03	3.18	3.18	3.14	3.10	2.99	2.83	2.68

Source: Wuhan Statistical Yearbook, 2004.

⁸ <http://www.worldbank.org/wbi/povertyanalysis/manual/ch3.pdf>

* Total income less disposable income.

6.2.14. Table 6-5 reports expenditure as a percentage of total expenditure and Table 6-6 shows how expenditure changes relative to expenditures of HH in the lowest income class. These data show similar overall expenditure patterns. Low income HHs spend proportionately more on food and utilities than other income classes and less on more discretionary expenditure categories like recreation. Basic expenditures on food, clothing and housing represent 71% of the total expenditures of the poorest HHs. Taxes paid by the poorest HHs are comparable in magnitude to the taxes paid by HHs in all other classes except the 2 highest income classes.

Table 6-5 Allocation of Household Expenditures by Income Class (% of Respondents)

Item	Avg	Low-est	Low	Med-Low	Med-ium	Med-High	High	High-est
Total expenditures	119	131	118	113	120	118	121	121
Living expenditures	100	100	100	100	100	100	100	100
Food	41	46	47	41	43	42	38	33
Clothing	10	7	9	9	11	12	11	12
HH facilities, articles, services	5	3	5	6	5	6	5	5
Medical, health	8	7	7	6	7	7	8	11
Transportation, communication	10	7	8	8	10	10	10	14
Education, recreation, cultural	12	11	10	14	12	12	13	12
Housing, utilities	11	18	12	14	10	10	12	10
Other	2	1	2	2	3	2	3	4
Food, clothing, housing	63	71	68	63	63	63	61	55

Source: Based on data in the Wuhan Statistical Yearbook, 2004.

Table 6-6 Change in Expenditures Relative to Lowest Income Class (% of Respondents)

Item	Avg	Low-est	Low	Med-Low	Med-ium	Med-High	High	High-est
Disposable income	153	0	55	96	141	187	242	382
Total expenditures	69	0	19	45	66	84	113	174
Living expenditures	87	0	32	69	82	104	132	197
Food	63	0	33	49	67	85	88	113
Clothing	178	0	73	108	179	237	276	389
HH facilities, articles, services	184	0	85	178	185	222	234	359
Medical and health	109	0	28	58	97	111	171	360
Transportation, communication	178	0	66	105	173	207	239	509
Education, recreation, cultural	114	0	26	129	96	132	181	222
Housing, utilities	21	0	-6	31	-1	12	59	74
Other	282	0	80	165	298	252	497	817
Food, clothing, housing	64	0	27	50	61	82	99	131

Source: Based on data in the Wuhan Statistical Yearbook, 2004.

6.2.15. Ownership of HH assets varied across income groups. Assets to meet basic needs in an urban setting such as flush toilets, showers, refrigerators and telephones were not universally owned by the lowest income HHs, whereas color television sets had high levels of ownership across all groups. Ownership of

luxury items such as automatic washing machines was very income sensitive. Only the highest income classes own cars, while motor cycles are uncommon. This suggests that both average and poor households rely on their feet, bicycles, public transit or taxis for transportation.

Table 6.7 Ownership of Household Assets

Household Asset in Working Condition	Asset Class*	Wuhan Urban Asset Ownership* (#/100 HH)	Household Survey Ownership by Income Class (#/100 HH)***			
			All	Lowest	Low	Highest
1 Flush toilet in house	BN		90	63	66	141
2 Bathtub	BN		19	6	8	57
3 Shower	BN		95	50	78	140
4 Piano or other instrument	LUX		7	0	1	22
5 Electric cooking appliances		110	102	69	95	114
6 Gas stove with oven		60	23	0	5	48
7 Refrigerator	BN	103	93	69	83	105
8 Washing machine		98	45	50	61	10
9 Automatic washing machine	LUX		51	13	27	98
11 Color television set	UO	136	121	100	104	186
12 Video disc player		73	91	25	73	149
13 Telephone / mobile phone	BN	83	178	40	130	317
14 Air conditioner		115	107	31	40	237
15 Computer	LUX	38	37	0	10	100
16 Motor cycle, scooter		11	12	19	19	11
17 Automobile	LUX	1	4	0	0	19

* BN - basic needs, UO- universally owned, LUX- luxury item

** Wuhan Provincial Statistical Yearbook 2004

*** Lowest = CNY 0-600 /month, Low = CNY 601-1,200 /month, Highest > CNY 3,700 /month

Profile of Vulnerability

6.2.16. Vulnerable HHs lack the ability to generate income and have few social support systems. This reduces their ability to cope with adverse impacts of rapid social and economic change such as has been seen in China and increases their risk of being poor. Details on the poverty assessment are presented in Appendix F5, these vulnerable HHs include:

- Female headed HHs (21 HH survey respondents - 4.6%);
- Elderly living alone (22 HH survey respondents - 4.8%);
- HHs containing one or more disabled or chronically sick persons (5 HH survey respondents - 1.1%);
- Floating population, usually from rural areas living in poor housing conditions; and
- Ethnic minority HHs (2 HH survey respondents - 0.4%).

6.2.17. The condition of female headed HHs and elder-only HHs is evident in their economic conditions (Table 6.8). Elder-only HHs are three times more likely to be in the lowest income category. Both groups have less access to certain basic amenities (flush toilet, bathing facilities) and luxury items (e.g. video disc

players). Both groups are also more likely to live in smaller apartments with no elevators.

6.2.18. Only a few HH survey respondents reported disability in a family member (5 respondents, 1.1%). They all lived in apartments without elevators, most of the apartments were smaller in size. Three of the 5 HHs were in the lower income categories (under CNY 1,200 /month) but none claimed to receive a government subsidy.

6.2.19. In only two cases was the respondent or the respondent's spouse from an ethnic group other than Han. In both of these cases, the HH was in the highest income category (over CNY 2,800 /month) and could not reasonably be characterized as vulnerable.

Table 6.8 Status of Vulnerable Households (% of Respondents)

	Female Headed HH		Elder-only HH	
	Yes	Other	Yes	Other
Households in low income class				
Lowest (<CNY 600 /month)	4.8	3.7	13.6	3.2
Low (CNY 600 – 1,200 /month)	23.8	17.9	18.2	18.2
Household assets (% with asset)				
Flush toilet in house	67	80	68	80
Bathtub	10	18	9	18
Shower	86	88	73	89
Electric cooking appliances	90	96	91	96
Gas stove with oven	29	23	14	24
Refrigerator	86	92	100	91
Washing machine	48	45	59	44
Automatic washing machine	52	50	36	50
Color television set	100	100	100	100
Video disc player	52	80	41	81
Telephone / mobile phone	81	95	81	95
Air conditioner	76	77	91	77

Source: Household survey data

6.2.20. The non-resident or floating population in project service areas comprises 13% of the total population (199,084 out of 1,486,306 persons), making this the largest vulnerable group in Wuhan. While these persons were not captured in the HH survey because they are not registered and have informal living arrangements, their situation in urban areas is well documented. They are primarily rural residents who have migrated to seek employment, but the lack of registration means that they can only work in lowly paid manual jobs. Characteristics of HHs in this group include:⁹

⁹ [1] Analyses and thought on countermeasures for the family formation trend among floating population in Wuhan city. Chin J Popular Sci. 1997; 9(1):67-74. [2] Voices against Discrimination: Chinese Citizens Challenge Discriminatory Regulations and Practices China Law and Governance Review June 2004 Issue No. 2, <http://www.chinareview.info/pages/main1.htm>. [3] Survey findings on in-migrant women of childbearing age. China Popular Today. 1998 Dec; 15(5-6):15. [4] Yang X. Are temporary migrants escapees of the one-child-per-family population policy: a revisit to the detachment hypothesis? Soc Biol. 2001 Spring-Summer; 48(1-2):151-70.

- A majority of the floating population live in family groups;
- Most have a low level of education;
- The dependency burden for the employed floating population is greater than for the urban employed population;
- Access to health care facilities and education for children is poor; and
- They exhibit a significantly higher probability of having a second or higher order birth than permanent residents.

Public Health¹⁰

6.2.21. Housing conditions of Wuhan urban residents are relatively advanced from the perspective of public health. No residents rely on untreated well or river water for their water supply. Permanent residents are reported to practice good personal hygiene and published statistics indicate that fewer than 5% of urban HHs have no sanitary facilities and use a public washroom.¹¹ All of these factors suggest significant progress in establishing the requirements for prevention of infectious disease. This is confirmed by the fact that infectious disease, with a combined death rate of 6.96 per 100,000 persons, ranked last in a list of the ten categories of disease causing deaths in the City in 2003.

6.2.22. Available statistics on water related diseases for Wuhan City in 2000 and for 2000 to 2004 are provided in Tables 6-9 and 6-10, respectively. The data for Wuhan Municipality in total in Table 6-10 imply an annual health care cost of CNY 0.8 million and a 40,000 days of lost work time each year in association with the 5 types of water related diseases. Further health impact analysis based on the survey results are also presented in Appendix F4.

Table 6-9 Water Related Infectious Disease in Wuhan City, 2000

Disease	Incidence Rate*	Death Rate*	Direct Health Care Costs per Case	Lost Work Time per Case
	(no. per 100,000)		(CNY)	(days)
Hepatitis A	23.26	2.58	480	30
Dysentery	1.29	0.36	257	7
Cholera	0.023	0.00	642	28
Typhoid	0.32	0.065	623	22
Giardia	0.41	0.052	467	18
Bilharzias	0.22	0.039	516	25
Others	0.74	0.079	60	4
Total	26.27	3.19	459**	28**

Source: Wuhan City Health Bureau

* Original data was number of cases. Rates calculated assuming a population of 7.582 million for 2000 (Wuhan Statistical Yearbook, 2004)

** Estimated as a weighted average.

Table 6-10 Water related infectious disease in Wuhan Municipality

Disease	2000	2001	2002	2003	2004
Reported Cases (nos.)					
Dysentery	98	89	96	82	94
Hepatitis	1,764	1,639	1,694	1,827	1,782

¹⁰ See Appendix F4 for a more detailed discussion.

¹¹ Table 9-12, Wuhan Statistical Yearbook, 2004.

Typhoid	24	21	17	26	22
Cholera	2	1	0	0	2
Malaria	28	22	25	30	21
Total	1,916	1,772	1,832	1,965	1,921
Estimated Incidence					
Population (000)	7,492	7,582	7,681	7,812	7,859
Cases per 100,000					
Dysentery	1.3	1.2	1.2	1	1.2
Hepatitis	23.5	21.6	22.1	23.4	22.7
Typhoid	0.3	0.3	0.2	0.3	0.3
Cholera	0.03	0.01	0.00	0.00	0.03
Malaria	0.4	0.3	0.3	0.4	0.3
Weighted Average	25.6	23.4	23.9	25.2	24.4
Average Days in Hospital (days/case)					
Dysentery	7	5	6	5	5
Hepatitis	30	26	21	24	22
Typhoid	22	18	15	27	20
Cholera	28	23	0	0	26
Malaria	10	9	9	7	8
Weighted Average	28.4	24.6	20.0	23.0	21.0
Average Direct Medical Costs (CNY/case)					
Dysentery	257	182	216	305	232
Hepatitis	480	446	432	430	415
Typhoid	623	557	475	734	583
Cholera	642	578	0	0	623
Malaria	321	332	362	348	337
Weighted Average	468	433	420	428	407
Reported Deaths (nos.)					
Dysentery	28	21	26	17	23
Hepatitis	196	177	137	122	114
Typhoid	5	3	0	2	1
Cholera	0	0	0	0	0
Malaria	2	0	1	0	0
Total	231	201	164	141	138

Source: Wuhan Public Health Bureau, Wuhan Centre for Disease Control and Prevention.

6.2.23. The rate of ownership of a flush toilet indicated by the HH survey, at 79%, suggests a much higher degree of reliance on public washrooms or other alternatives than is indicated in published statistics.

Business Enterprise¹²

6.2.24 Virtually all the business survey respondents (98%) report discharging domestic wastewater, one fifth discharge process wastewater (20%) and a small number cooling water (7%). Most rely on city sewers for disposal. Only 6 out of 98 use septic tanks for domestic wastewater. Direct discharge to drains or open water is done by 2 for domestic wastewater and by three for process wastewater. Not all of the directly discharged process wastewater is treated first but the largest enterprise doing this has had its own pretreatment plant since 1998. There are five other enterprises operating pretreatment plants that discharge into the city sewers.

¹² See Appendix F3 for details of the business survey.

6.2.25 The main method of payment for wastewater services is the water bill (72%) or a separate wastewater bill (10%), but 18% report not paying anything. The average monthly wastewater bill was just under CNY 2,000. In contrast to this, the average monthly water bill is CNY 7,100, over three times as much.

6.3. Perception of Wastewater and Storm Water Services

Satisfaction with Current Services

6.3.1. HH survey respondents and focus group participants expressed high levels of support for storm water and wastewater service improvements. Three of four focus groups supported the Project and ranked it at or near the top, while one group, average income women, ranked improvements in electricity and water supply services highest. Other services ranked high were education, health and public transport.

6.3.2. Less than 2% of HH survey respondents were 'very satisfied' with either wastewater or storm water services in their neighborhoods or elsewhere in the city, just over half were 'satisfied' with current service levels, and about one third were 'dissatisfied' or 'very dissatisfied' with them.

6.3.3. When asked to comment on the need for storm water and wastewater service improvements, 61% of respondents identified them as 'high need'.¹³ Storm water and wastewater service improvements were assigned the highest priority by 17% of respondents and a high priority by 44%. In responses to a question concerning the need for improvements in alternative public services ranging from storm water and wastewater through to health and education, storm water and wastewater services were ranked first in terms of the frequency of respondents identifying them as 'high need' (60%) followed closely behind by health care (58%) and solid waste management (57%).¹⁴

6.3.4. The proportion of business survey respondents expressing dissatisfaction with wastewater and storm water services was generally lower than the rate for householders, ranging from 10% to 30% of respondents. When asked about local environmental problems, they expressed the greatest degree of concern for water pollution (91% indicating great or medium concern), followed closely by air pollution (88%) and flooding (85%). Just over half of business respondents (51%) indicated a 'high' need for storm water and wastewater service improvements. Electric power followed with 46% support and medical services with 42%. These results show a strong degree of business support for the proposed project.

¹³ Comprising 60% of men and 63% of women in a sample of 456. This close agreement between men and women was consistent among 21 questionnaire items dealing with storm water and wastewater problems and the priority of related investments. In only one case, was there a significant difference ($p=0.05$).

¹⁴ This analysis interpreted the 'high need' rating as a supporting vote in an approval voting scheme (see Steven J. Brams, 2002. "Approval Voting: A Better Way to Select a Winner", What Matters MIT Alumni Opinion Column, <http://alum.mit.edu/ne/whatmatters/200211/index.html>). Sensitivity analysis considered an adjustment of the statement of need based on the respondent's assessment of environmental problems. This did not alter the ranking.

Impact of Service Deficiencies on Residents

6.3.5. Storm water and wastewater service deficiencies are associated with foul odors, unsightly conditions in local drains, increased risk of infection, disruption of daily routines and soiling and other damage to property. All these impacts can result in costs associated with coping strategies, cleaning and repairs, and lost work time due to flood or sickness.

6.3.6. On a daily basis, poor wastewater services are most closely associated with a degradation of the quality of life due to an aesthetic impairment of the living environment. Poor storm water services, on the other hand, cause periodic flooding, which in turn has a host of adverse impacts on householders. The severity of these impacts is all the greater because flood waters are contaminated with wastewater as a result of inadequate wastewater systems.

6.3.7. From 45% to 58% of respondents felt wastewater was a 'major problem' due to odor, vermin, its presence in the drains and on roads during flooding and the pollution that it causes. Similar numbers of respondents (42% to 60%) felt storm water was a 'major problem' due to odor, vermin, flooding of streets and pollution.

6.3.8. One third of survey respondents reported experiencing flooding (150 out of 456). The experience of flooding is prevalent in the following project districts: Dongxihu (54% of respondents in the service area), Nantaizi Lake (66%), and Luoja Road (37%).

6.3.9. The frequency of problems caused by flooding is reported in Table 6-11. Interference with travel is the most commonly experienced impact followed by cleaning and disruption of work. For those HHs that experience flooding, average annual damages caused by the flooding are CNY 52 per HH (150 HHs).¹⁵ In the Dongxihu area where flooding is most prevalent, average annual damages are CNY 148 per HH (36 HHs).

Table 6-11 Impacts on Residents who Experience Flooding (% of Respondents)

Impact	One or More Times a Year	Once Every 2 to 5 Years	Once Every 5 Years or Less	Never
1. Clean up the outside area around home	27	3	9	61
2. Clean clothes, other goods	28	1	1	70
3. Heavy cleaning of the house (mud, debris).	25	1	1	73
4. Spoiled food supplies	3	3	5	89
5. Spoiled clothing, other goods	3	3	7	87
6. Minor repairs of home and equipment	2	6	11	81
7. Major repairs of home and equipment	1	0	3	96
8. Must leave the house during flooding	0	0	1	99
9. Interferes with travel around the city	48	7	8	37
10. Flood disrupts work or business	13	3	9	75

Source: Household survey data. 33% of survey respondents reported experiencing flooding.

¹⁵ See Appendix F6. This estimate accounts for both direct costs and lost work time associated with each of the different impacts and is based on both the severity of the damages and the frequency of occurrence.

6.3.10. Women were primarily responsible for HH cleaning chores. Respondents indicated, however, that the responsibility was more evenly shared following flooding (Table 6-12). Male respondents claimed to assume greater responsibility for cleaning and repairs after a flood than their spouses attributed to them.¹⁶ Much of the repair work is done by others.

Table 6-12 Responsibility for Cleaning and Repairs (% of Respondents)

	Regular Cleaning Chores	Cleanup after a Flood	Repairs after a Flood
Male head of household	21	17	23
Female head of household	41	13	9
Both	32	46	15
Someone else	6	24	53

Source: Household survey data.

Impact of Service Deficiencies on Enterprises

6.3.11. Business survey respondents expressed views that resemble those of householders. From 34% to 50% of respondents felt wastewater was a 'major problem' due to odor, vermin, its presence in the drains and on roads during flooding and the pollution that it causes. Similar numbers of respondents (40% to 76%) felt storm water was a 'major problem' due to odor, vermin, flooding of streets and pollution.

6.3.12. These problems have a financial impact on the enterprises. Just over half of the respondents reported incurring costs as a result of problems with wastewater such as wastewater overflows or treatment system failures, with the average annual cost being CNY 10,200 per enterprise. Flooding was reported by 29 out of 100 enterprises and damages by 7 of these enterprises. Average annual flood damages for all enterprises experiencing flooding were estimated to be CNY 200 per employee or CNY 4,600 per CNY 1 million operating income (0.46%).

Impact on Poor and Vulnerable

6.3.13. The impact of service deficiencies on low income and vulnerable HHs is disproportionately high. Lower income HHs are less likely to live in areas provided with covered storm or sanitary sewers and far more likely to live in an area where wastewater is discharged directly into an open drain (Table 6-13). This means that they are more likely to experience odors and other ongoing effects of poor services.

6.3.14. The frequency of flooding and average annual flood damages were not significantly different across income groups however, lower income HHs will be less resilient in the face of flooding, not having the resources to recover as easily from losses.

6.3.15. The HH survey also provided evidence that lower income HHs experienced a greater adverse impact from illness. Although the burden of

¹⁶ Significant relationship at $P = 0.05$

diseases considered in the survey was not greater in lower income HHs, their children experienced higher rates of absenteeism from school due to illness.¹⁷

Table 6-13 Disposals of Storm Water and Wastewater (% of Respondents)

	1	2	3	4	5
Income Class (CNY / month)	<600	600 to 1,200	1,200 to 1,600	1,600 to 2,800	>2,800
Wastewater Disposal					
Sewers	59	43	66	74	84
Private septic tank	6	0	1	0	2
Public septic tank	0	8	15	11	13
Directly into open drain or ditch	35	40	12	8	2
Directly into a river or lake	0	7	5	6	0
Directly into own yard	0	1	0	1	0
Storm water disposal					
Sewers	30	23	45	54	49
Covered concrete channels	13	3	3	3	3
Ditches, uncovered channels	22	21	20	22	30
Overland, natural drains	35	53	30	21	18
Other	0	0	2	0	0

Source: Household survey data.

Coping Mechanisms

6.3.16. Coping with service deficiencies requires expenditure to recover from flood damage and to pay for medical treatment when infection with waterborne disease occurs. In the limit, those who can afford to may avoid service deficiencies by moving into areas of the city where services have been upgraded. The survey data does not reveal a consistent relationship between income level and disease incidence or the respondent's strategy for dealing with illness when it occurs. This is not the case however for annual expenditures in response to illness, which rose from CNY 42 for the poorest households to CNY 175 for the highest income group.

6.3.17. There is no direct evidence to suggest that individuals use coping mechanisms to avoid flood damages such as temporary berms around their properties. It would seem that many survey respondents do however have effective coping mechanisms to deal with the frequent flooding of streets since 63% who indicate frequent flooding report no damages. Their coping mechanisms under such circumstances will be simple measures such as keeping children indoors, moving smaller articles out of harms way and delaying excursions for work or shopping. Many business enterprises also report experience of flooding without reporting any damage (22 out of 29). This suggests that business is also employing various measures to cope with frequent flooding.

¹⁷ Significant relationship at P = 0.05

6.3.18. There is evidence that some HHs cope with poor wastewater and storm water services by moving to a better serviced neighborhood. For instance, lower income HHs report that flooding to the first floor of buildings is a major problem much more than the highest income HHs (28% of low income respondents versus 11% of high income respondents).

Impacts on Women

6.3.19. The adverse impacts of service deficiencies will affect men and women differently. Data from the SIA survey show that women are more likely to be responsible for general cleaning and the care of sick family members. This may explain why women were somewhat more likely than men to identify wastewater overflows onto roads as a major problem. Time spent on these activities means less time is available for other priorities.

6.4. Assessment of Project Impacts

General Description of Impacts

6.4.1. The Project will have a direct beneficial impact on the lives of approximately 3.17 million people including 0.26 million with incomes below the official poverty line. Another 4 million persons within the Project cities will benefit indirectly as a result of the Project.¹⁸

6.4.2. The project benefits are:

- Improved living environment by improvement of storm water management—1.61 million direct beneficiaries;
- Improved environment by improvement of wastewater treatment—1.56 million direct beneficiaries;
- Reductions in water related disease by an average of 8,000 cases per year. This impact is associated with an annual reduction of 5,800 days of lost work and a net present value of savings in medical costs and avoidance of lost earnings of CNY 7.7 million;
- Reductions in morbidity due to decreased exposure to waterborne and water washed disease—37,000 cases of illness avoided each year;
- Direct creation of 5,000 full-time-equivalent jobs over the 5 year period of construction and 220 permanent jobs in the new project facilities;
- Indirect creation throughout the regional economy of 9,000 person years of work over the 5 year period of construction and 130 permanent jobs once operations begin;
- Reduction in women's burden of work by reducing time spent cleaning after flooding;
- Increase in disposable income by reduction of lost work days, the direct costs of flooding, and medical treatment costs; and

¹⁸ Indirect beneficiaries live outside of the Project service areas, but are nevertheless likely to experience some improvement in their living condition as a result of the project. For a more detailed discussion see Appendix F5.

- Poverty cycle interventions such as reduction in school days lost due to waterborne and water washed disease.

6.4.3. The Project's negative impacts are;

- Relocation of 1,747 persons to make way for construction of wastewater treatment and other works. These impacts are mitigated through the Resettlement Plan; and
- Increased wastewater tariffs.

6.4.4. Direct project benefits are largely expected to be uniformly distributed across affected populations including poor HHs. The urban poor are expected however to derive greater benefit from Project since they have fewer resources with which to cope with the impaired infrastructure services that are being redressed by the Project.¹⁹

6.4.5. The distribution of Project costs falls relatively more heavily on enterprises and relatively well off HHs. Government equity is the funding source for 27.1% of total costs with the balance funded from loans. Loans for the wastewater component, amounting to 32.2% of total costs, are serviced out of user charges, and other loans are financed out of general government funds. The user charge funded costs are recovered from wastewater customers through the wastewater tariff. This is charged against water consumption. Since poor HHs receive a lump sum subsidy to offset the cost of wastewater services, cost recovery from users is not proportional to water use.

6.4.6. Government revenues are used to finance 15.0% of Project costs for flood control and drainage works. These funds will be generated from a variety of sources, including value added tax revenues and urban infrastructure fees. These cost recovery mechanisms spread costs in a uniform manner across the urban population. Poor HHs will pay proportionately less since the cost recovery mechanisms are tied to consumption.

Access to Project Benefits

6.4.7. Obstacles to access are:

- Affordability of increased tariffs for low income HHs; and
- Weak accountability of the drainage company to customers.

6.4.8. Economic access to project benefits (i.e. being able to afford wastewater services) is a key issue for low income HHs. They have little flexibility to absorb tariff increases since expenditures on discretionary items are low and there is little opportunity for savings elsewhere. These HHs may require additional income support (see Section 6.5.3 below).

6.4.9. If wastewater services are not affordable, poor HHs may adopt measures to reduce their water and wastewater bill such as less frequent bathing

¹⁹ See Appendix F5 for a more detailed discussion of the distribution of benefits and costs.

or HH cleaning, reuse of wash water and not flushing toilets regularly. These practices increase the risk of infectious disease.

6.4.10. Some concerns were raised during focus group sessions about the need for proper management of project facilities by the government. As shown in Table 6-14, respondents in the HH survey expressed concerns about high taxes (55 %) and the trust worthiness of government officials (30%). Business survey respondents also consider taxes to be too high (51%). Participatory methods such as consumers committees could be used by the IAs to address such concerns, alter erroneous perceptions, improve customer relations and get feedback on the quality of service.

Table 6-14 Public Attitudes (% of Respondents)

Statement to be Evaluated by Respondent	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
Government taxes and charges are too high	10.6	44.5	37.1	7.8	0.0	100.0
These services should be free to the public	12.4	45.1	29.4	11.9	1.1	100.0
Government wastes money on construction projects	0.7	3.3	31.7	48.3	16.0	100.0
Government officials are trustworthy	2.5	18.7	48.4	25.6	4.8	100.0
The proposed project will benefit my household	24.6	64.8	9.7	0.9	0.0	100.0
Business pays it's fair share for government services	36.1	46.3	13.5	3.3	0.7	100.0

Source: Household survey data.

6.5. Willingness to Pay for Improvements

Household Willingness to Pay

6.5.1. A majority of HH survey respondents (59%) expressed a willingness to pay a wastewater tariff of CNY 1.5 per m³ and another 12% would pay between CNY 1.0 and 1.5 per m³. The average willingness to pay amount from the HH survey was CNY 1.36 per m³. Details on willingness to pay are presented in Appendix F6.

6.5.2. In the focus groups the majority of participants expressed support for a wastewater tariff increase so long as it was modest, reflecting income and ability to pay. Three groups said the water bill is small and a tariff increase would not affect them, but lower income women expressed concern about a tariff increase and said they would probably respond by reducing consumption.

6.5.3. Inability to afford a higher tariff was the most frequently cited reason for not supporting a tariff increase followed closely by having other expenditure priorities. Three quarters (76%) of low income respondents cited affordability as an issue and almost half (46%) did not believe that the funds would be properly spent. Middle income respondents were more likely to cite other priorities as their reason for not supporting a tariff increase (42%). Among those not willing to pay

a tariff increase, there was little support for the proposition that the project was not needed. This was true of all income groups.

6.5.4. Income appears to be the main factor motivating customer willingness to pay for improvements. Variations in the perception of problems associated with wastewater services (odor, pollution) did not appear to be determining factors. Nor did housing conditions or sex of the respondents.

6.5.5. A majority of respondents (61%) also expressed a willingness to pay CNY 5.0 per month for storm water management improvements and another 38% said they would willingly pay a lesser amount (CNY 0.5 to 3.0 per month). The average payment amount that respondents found acceptable increased with HH income, low income respondents having an average payment amount of CNY 2.4 and the top income group having an average of CNY 4.5 per month. As was the case for wastewater, income is a major determinant of willingness to pay. Within the lowest income group 24% were willing to pay CNY 5.0 per month while 84% of the top income group was willing to pay this amount.

Business Enterprise Willingness to Pay

6.5.6. Business survey respondents were more receptive than householders to a wastewater tariff of CNY 1.5 per m³; 85% approved of the tariff and another 5% approved of the tariff if it is introduced gradually. The average willingness to pay amount from the business survey was CNY 1.44 per m³. The willingness to pay for storm water improvements was not queried in the business survey, but the strong support for the project suggests that business enterprises will also support justifiable increases in taxes or government fees and charges to pay for these components.

Affordability and Poverty Alleviation

6.5.7. Cost recovery for the Project will require that wastewater tariffs increase. Estimates of the with-project tariff and the impact on the water and wastewater bill are provided in Table 6-15.

Table 6-15 Project Impact on Domestic Tariffs (CNY/m³)*

Project Component	Existing Tariff		Tariff Increase**	Project Tariff	% Increase	
	Water Supply	Wastewater			Waste water	Total
Urban	0.71	0.80	0.20	1.71	25%	13%
Sub-urban	0.71	0.00	0.95	1.66	NA	57%

* Tariffs shown here are total domestic tariffs and include wastewater and water supply charges.

** Tariff increases will likely be phased in gradually. The Project tariff used here is the final full-cost tariff expressed in constant 2005 prices.

6.5.8. Results of the analysis are reported in Table 6.16.²⁰ Current water bills represent less than 1% of HH income for HHs below the official poverty line ('lowest' class). After project implementation and the corresponding tariff increases the share of HH income for this class is 1.59% for urban HHs and

²⁰ The analysis considers the impact of the tariff and the wastewater bill discount for poor HHs. See Appendix F5 for a more detailed discussion.

1.08% for suburban HHs. The water and wastewater bill exceeds 2% of income only for urban HHs in the low income class.

6.5.9. The Project will improve standards of wastewater service for poor HHs and increase the wastewater tariff that they pay. The proportion of poor HH expenditures going to tap water and wastewater is currently less than 1%. With the Project, this proportion might rise to 1.6%. Poor HHs have little scope for absorbing even a small increase in costs. The HHs most likely to be adversely affected by the tariff increase are those within the classes of low income HHs experiencing the most extreme poverty. Factors contributing to extreme poverty include elevated health care costs due to poor health of a HH member and single person HHs where there is no opportunity to share common costs within a family group. Such HHs may require additional support in the face of an increase in their wastewater bill.

Table 6-16 Affordability of Project Tariffs to Lowest Income Households

	Household Income Class (CNY per month)				
	Lowest (< 600)	Low (600 to 1,200)	Low-middle (1,200 to 1,600)	Middle (1,600 to 2,800)	High (>2,800)
Urban					
Household size*	2.90	2.90	2.90	2.90	2.90
Income (CNY per month)					
Per capita	188.2	323.5	491.2	725.3	1,403.8
Household*	545.9	938.1	1,424.5	2,103.3	4,071.1
Water use (m ³ /month)					
Existing*	9.3	12.6	14.2	15.0	22.9
Project**	9.2	11.5	12.9	13.6	20.8
Tariff (water + wastewater)***					
Existing	1.5	1.5	1.5	1.5	1.5
Project	1.7	1.7	1.7	1.7	1.7
Water bill discount	10.8	0.0	0.0	0.0	0.0
Water bill (CNY per month)					
Existing	3.3	19.0	21.5	22.6	34.6
Project	8.7	24.2	27.3	28.8	44.0
Increase in the water bill	5.4	5.2	5.8	6.2	9.4
Income share					
Existing	0.61%	2.03%	1.51%	1.07%	0.85%
Project	1.59%	2.58%	1.92%	1.37%	1.08%
Suburban					
Household size*	2.90	2.90	2.90	2.90	2.90
Income (CNY per month)					
Per capita	181.9	304.6	482.8	717.8	n.a
Household*	527.5	883.3	1,400.0	2,081.5	n.a
Water use (m ³ /month)					
Existing*	11.1	11.1	11.4	12.6	n.a
Project**	10.3	8.1	8.3	9.1	n.a
Tariff (water + wastewater)***					
Existing	0.7	0.7	0.7	0.7	0.7
Project	1.6	1.6	1.6	1.6	1.6
Water bill discount	10.8	0.0	0.0	0.0	0.0
Water bill (CNY per month)					
Existing	0.0	7.9	8.1	9.0	n.a

	Household Income Class (CNY per month)				
	Lowest (< 600)	Low (600 to 1,200)	Low-middle (1,200 to 1,600)	Middle (1,600 to 2,800)	High (>2,800)
Project	5.7	13.0	13.3	14.7	n.a
Increase in the water bill	5.7	5.1	5.2	5.8	n.a
Income share					
Existing	0.00%	0.90%	0.58%	0.43%	n.a
Project	1.08%	1.47%	0.95%	0.71%	n.a

* Based on household survey data.

** Assumes a price elasticity of -0.4 and accounts for the lump sum discount.

*** Tariffs shown here are total domestic tariffs and include wastewater and water supply charges. The project tariff is the tariff required to achieve full cost recovery following a period of gradual phase in.

6.5.10. The main policies used to support poor HHs are lifeline tariffs, and proportional or lump sum water bill discounts. The lifeline tariff is a poorly targeted policy since it benefits all HHs, not just those needing support. The water bill discount is a much better poverty alleviation measure primarily because it can be properly targeted to poor HHs. It is now being used in Wuhan. The proportional water bill discount (i.e. a percentage decrease) creates an opportunity for a recipient of the discount to sell water to neighbors at a profit. The existing lump sum subsidy is therefore the preferred poverty alleviation measure.

6.5.11. If tariff increases prove to be greater than forecast for the Project, the official poverty line should be reviewed and adjusted by a small amount representing a portion of the expected increase in the typical water and wastewater bill of a poor HH. This adjustment should take into account the size of the water and wastewater bill.

6.6. Project Risks and Mitigations

6.6.1. Risks that jeopardize the achievement of the ADB objectives of poverty alleviation, gender equity and good governance are identified in Table 6-17.

Table 6-17 Monitoring Project Risks and Mitigations

Risk	Mitigation	Monitoring Indicator
Poor families cannot afford the wastewater tariff	Adjust the existing tariff subsidy or official urban and suburban poverty lines to account for the cost of improved wastewater services.	i. Water consumption levels of poor HHs. ii. Water service connection rates for poor HHs.
Poor HHs may not realize health status benefits	Target low income HHs, including the floating population, with an awareness campaign on personal hygiene stressing benefits of hand washing, regular flushing of toilets, etc.	i. Morbidity rates for key water related diseases. ii. School days lost due to illness.
Poor cost recovery causes service	Set up wastewater consumer committees to work in partnership	i. Consumer committees are established

levels to decline	with the Wuhan Drainage Company.	ii. Cost recovery rates
Poor people will not have equal access to employment opportunities created by the Project.	The Wuhan Drainage Company should establish a strict policy of allocating a proportion of unskilled jobs to employable persons in registered poor families and to the floating population.	iii. Record of consumer complaints
The status of women will not improve	Ensure 50% representation of women on consumer committees with adequate representation of poor HHs.	i. Existence of pro-poor employment policies.
	Enter into an agreement with the Women's League to support their employment program for disadvantaged women.	ii. Number of registered poor and floating population employed by the Project
		i. Women present on consumer committees.
		ii. Active cooperation between the Wuhan Drainage Company and the Women's League.
		iii. Record of consumer complaints

6.7. Conclusions and Recommendations

6.7.1. Improvements to storm water and wastewater services will improve the quality of life of poor and vulnerable people provided that they can afford to pay for these services. Existing measures to ensure affordability are well designed but their implementation should be periodically evaluated.

6.7.2. Public support for improvements provided by this Project is high however low income families express concern with affordability and have many priorities for their income especially education if they have children.

6.7.3. Project improvements will:

- reduce the risk of exposure to water related disease. The number of school days and work days lost due to sickness will be reduced thereby making key interventions in the poverty cycle;
- reduce expenditures associated with flooding thus benefiting HHs and businesses;
- generate employment opportunities many of which will be available to poor people; and
- reduce the risk of infection from flooding sewers in areas prone to flooding. The time and effort, of mainly women, to clean up after floods will significantly be reduced.

6.7.4. Measures can be taken to help assure that project benefits are realized and that resistance to tariff increases does not jeopardize project viability:

- Establish effective consumer committees to work with the Drainage Company on matters relating to consumer confidence, public complaints, levels of service and tariff adjustments;

- Link neighborhood committees into the structure of the consumer committee to promote communication with local communities and develop a mechanism for recruiting volunteers for the consumers committees;
- Solicit the views and opinions of consumer committees when planning project facilities and resettlement plans;
- Assure a minimum 50% female representation on consumer committees and adequate representation of poor HHs. If necessary, compensate poor people to encourage participation;
- Review and adjust tariff subsidies for low income HHs to guarantee affordability; and
- Implement a health awareness program (or reinforce an existing program) targeted to poor HHs including the floating population. Use this program to promote good hygiene.

7 Resettlement Plan

7.1 General

7.1.1 The objective of the resettlement plans (RPs) is to ensure that the land acquisition and resettlement aspects of the Project are fulfilled successfully and that the standards of living of all categories of affected persons will be improved or at least restored to their pre-project levels after land acquisition and resettlement. For the Project, the two implementing agencies (IAs) prepared their respective RPs, for the wastewater and storm water components respectively. The WPMO on behalf of the Executing Agency (EA) and IAs engaged the services of Wuhan University to assist in the preparation of RPs. The PPTA Consultants have given guidance in the RP preparation and prepared a Summary RP (SRP) for the overall project to submit to ADB.

7.1.2 The Project includes 9 subprojects, which are classified into a wastewater component and a storm water component. The IAs are Wuhan Drainage Company (WDC) for the wastewater component and Wuhan Urban Construction Foundation (WUCF) for the storm water component. Among these 9 subprojects, the land required for Erlangmiao WWTP Expansion and Upgrade and Huangpu Road WWTP Upgrade have been reserved already in their Phase I stage. The other subprojects require land acquisition and resettlement (See Table 7-1).

7.1.3 According to ADB requirements, if there has been land acquisition in the past 3 years, either for associated components or for advance works of the same project, due diligence issues have to be reviewed. In the wastewater component, the Erlangmiao and Huangpu Road subprojects have acquired and set aside land in 1998 and 1999 respectively, during their Phase I construction, and the sites provided include for subsequent expansion / upgrade of these facilities. No additional land therefore needs to be acquired for these two subprojects. The affected people have been compensated and relocated with a satisfactory outcome.

Table 7-1 The subprojects and related resettlement identification of the Project

Item	Subproject Name		Site	Land Acquisition	Implementing Agency (IA)
Wastewater	Urban Area	Wuchang Erlangmiao WWTP Expansion and Upgrade	Hongshan District	Already been reserved in 1999	Wuhan Drainage Company (WDC)
		Hanyang Nantaizi Lake WWTP Expansion and Sewage Collection System	Hanyang District	139.4 mu collective land for WWTP and 6.6 mu collective land for three pumping stations, will be acquired permanently	
		Hankou Huangpu Road WWTP Upgrade	Jiang'an District	Already been reserved in 1998	
	Suburban Area	Dongxihu Sewage Collection System	Dongxihu District	24.3 mu state-owned land will be occupied permanently	
		Caidian WWTP and Sewage Collection System	Caidian District	81.05 mu collective land for WWTP and 2.55 mu collective land for pumping station will be acquired permanently	
Storm Water	Urban Area	Luojiagang Open Channel Rehabilitation and Luoja Road Pumping Station Expansion	Qingshan District	208.1 mu land will be acquired permanently	Wuhan Urban Construction Foundation (WUCF)
		Hanyang Yangsigang Pumping Station and Storm Water Pipe Work	Hanyang District	34.8 mu land will be acquired permanently, including 2.2mu state-owned land and 32.6mu collective land	
	Suburban Area	Dongxihu Three Gates Connection	Dongxihu District	422.6 mu land will be acquired permanently	
		Changqing Pumping Station Expansion	Dongxihu District	18.9 mu land will be acquired permanently	

7.2 Review of RP Preparation Process

7.2.1 The preparation of the RPs is on the basis of the relevant project design documents, land acquisition and resettlement legal documents, ADB's *Handbook on Resettlement*, as well as project impacts survey and the results of public participations and consultations. The resettlement plans include description of the project, potential project impacts assessment, objectives of the RAP, socioeconomic studies, legal framework for resettlement, institutional arrangement, definition of affected persons (APs) and their eligibility, valuation of and compensation for losses, restoration strategies and measures, feasibility of resettlement measures, public participation and grievance, monitoring arrangement, implementation schedule and resettlement budget.

7.2.2 Project impacts survey, public participation and community consultation activities were jointly conducted by Wuhan University and the PPTA consultant for the RP preparation as follows:.

- A resettlement impacts survey was carried out for each subproject. 20 % (60 in number) of the total affected households (HHs) and 50% of the seriously affected enterprises and shops were surveyed;
- The compensation policies and village restoration plans were discussed with related village/street and/or township/district government leaders and APs;
- Consultation meetings on the project compensation policies, especially for the vulnerable group restoration plan and funds were held with relevant officers of EA, Wuhan Project Management Office (WPMO) and IAs; and
- Draft final RPs are to be distributed to local officials and seriously affected villages and resettlement information booklets (RIBs) are to be distributed to local officials, all affected villages/neighbourhoods and affected HHs.

7.2.3 On the basis of the above work, the RPs in Chinese were completed at the end of September 2005. And the English versions were finalized at the end of October 2005. The draft final RPs will be endorsed by IAs and Wuhan Municipal Government (WMG) prior to ADB appraisal.

7.3 Resettlement Impacts

7.3.1 In order to avoid or minimize land acquisition and resettlement, there was close consultation with the local officials and village committees/street

committees during the preliminary and final Feasibility Study stages, and the best site is recommended by comparison with alternative sites.

7.3.2 The Project will affect 8 townships/streets, 15 villages in Hanyang District, Dongxihu District, Hongshan District and Caidian District of Wuhan city. In total, 351 HHs with 1,747 persons (including 161 persons classified as floating population) will be affected directly by land acquisition and/or house demolition. 938.3 mu of land will be permanently occupied, of which 59.4 % is classified as cultivated land. In addition, 390.7 mu of land will be occupied temporarily during the construction phase. 39,288 m² of residential housing (including 4,157 m² of unlicensed housing) will be demolished, among which 34,638 m² (88.2 %) are rural residents' housing, and 4,650 m² (11.8 %) are urban residents' housing. 43 enterprises and institutions with 18,881 m² of structures will have to be demolished, and 19 shops with 10,912 m² (of which 4,070 m² is unlicensed) of structures will have to be demolished. The details are shown in Table 7-2.

Table 7-2 Summary of Land Acquisition and Resettlement Impacts

Item			Unit	Wastewater Component	Storm Water Component	Total	
Permanent Land Occupation	Collective Land	Cultivated	mu	225.5	167.4	392.9	
		Non-cultivated	mu	4.1	49.2	53.3	
	State-owned Land	Cultivated	mu	9	155.9	164.9	
		Non-cultivated	mu	15.3	311.9	327.2	
	Total Land Occupation	Cultivated	mu	234.5	323.3	557.8	
		Non-cultivated	mu	19.4	361.1	380.5	
Total			mu	253.9	938.3		
Temporary Land Occupation	Collective Land	Cultivated	mu	20.5	28	48.5	
		Non-cultivated	mu	59	2.3	61.3	
	State-owned Land	Cultivated	mu	0	5	5	
		Non-cultivated	mu	258.3	17.6	275.9	
	Total Land Occupation	Cultivated	mu	20.5	33	53.5	
		Non-cultivated	mu	317.3	19.9	337.2	
	Total			mu	337.8	390.7	
House Demolition	Residential	Rural	m ²	2,015	32,623	34,638	
		Urban	m ²	0	4,650	4,650	
		Subtotal	m ²	2,015	37,273	39,288	
		Including: Unlicensed	m ²	260	3,897	4,157	
	Shops	Common	m ²	0	6,842	6,842	
		Unlicensed	m ²	0	4,070	4,070	
		Subtotal	m ²	0	10,912	10,912	
	Enterprises and Institutional Buildings	Business	m ²	0	18,311	18,311	
		Non-business	m ²	320	250	570	
		Subtotal	m ²	320	18,561	18,881	
	Total			m ²	2,335	66,746	69,081

Item	Unit	Wastewater Component	Storm Water Component	Total
Directly Affected Family Households	HH	83	268	351
Directly Affected Persons	Number	364	1,383	1,747
including: Floating Population	Number	0	161	161
Number of Enterprises and Institutions	Number	1	42	43
Number of Shops	Number	0	19	19

7.4 Policy and Legal Framework

7.4.1 For people unavoidably affected by the Project, the resettlement objective is to achieve equal, or better, income and living standards in line with not only the PRC laws and regulations, but also ADB's *"Policy on Involuntary Resettlement"*. The compensation for permanent land loss and house demolition is based on the Land Administration Law of PRC (2004) and the State Council Decision to Deepen Reform and Strictly Enforce Land Administration (Document 28 dated November 2004) and Implementing regulation of Land Administrative Law of Hubei province (2nd revision) (effective September 27, 1999), Method of Collective Land Acquisition and Compensation for Housing Demolition on Collective Land of Wuhan Municipality, (Wuhan Government No.148, effective February 1, 2004) and Management and Implementation Method of Urban Housing Demolition of Wuhan Municipality, (Wuhan Government No.130, effective March 1, 2002).

7.4.2 Based on consultations with local governments and those affected, and general practice in the project districts, a set of compensation standards, based on the replacement cost, was adopted by the respective project IAs. The resettlement principles established for the Project are:

- land acquisition and involuntary resettlement should be avoided or minimized where feasible by developing and comparing a series of design alternatives;
- compensation and entitlements provided are based on market value or replacement value and must be adequate to allow those affected to at least maintain their pre-project standard of living, with the prospect of improvement;
- land temporarily occupied and the period of disruption are to be kept to a minimum;
- all the people affected, legal and illegal, are to be taken into consideration and accounted for;
- the per capita landholding after land acquisition will be sufficient to maintain the previous livelihood standard;

- where land allocation per capita is not sufficient to maintain the previous livelihood standards, other income generating activities will be provided for;
- a preferential policy will be provided to vulnerable groups and floating population in such things as compensation, housing assignment, transfer, and employment;
- all those affected will be adequately informed about eligibility, compensation rates and standards, livelihood and income restoration plans, and project timing; and
- close monitoring and timely actions will be carried out to identify and resolve any problems.

7.4.3 The APs who are entitled to receive compensation refer to the persons affected by the involuntary taking of land resulting in:

- relocation or loss of houses;
- lost of assets or access to assets; or
- loss of income sources or means of livelihood, whether or not the APs must move to another location.

7.4.4 All buildings, landowners and users in the Project land acquisition and relocation areas will be eligible for fair compensation or assistance (See Table 7-3).

7.4.5 The cut-off date for the compensation will be determined by WMG. The APs are those who lose their land, house and their livelihood due to the project construction. They shall be compensated and rehabilitated according to the type and quantities of loss as well as the cut-off date of the government within the completion date of the construction plan and investigation; or due to the temporary impact during the construction phase. The cut-off date for each project component will be announced publicly. Any newly cultivated land and newly built houses shall not be compensated after the cut-off date.

7.4.6 Compensation for land acquisition, and residential house and non-residential house (enterprise and shop demolition) will be paid to all users with or without legal papers, including APs settled on the land and they are included in the final AP list or are able to prove their occupation of affected plots before the cut-off date determined by the WMG. The payment will be made in cash according to the class and type of land and dwellings. The relocated HHs will also receive a transfer and transportation allowance. Compensation for standing crops, auxiliaries and other assets will also be paid directly to the APs. Any income lost from production / sales and wages

will be paid in cash to the APs. The loss of enterprises and shops will also be compensated in cash.

Table 7-3 Entitlement Matrix

Type of Loss	Impacts of the Project	Entitled Persons	Entitlement	Compensation Policies
Permanent Land Acquisition	A total of 938.3 mu land (including 557.8 mu cultivated land) will be acquired under the Project with 203 HHs or 824 APs	Affected villages/groups or APs who used land before specified deadline	<ol style="list-style-type: none"> (1) All affected villages/production groups shall obtain compensation. (2) The APs shall obtain compensation for the young crops directly. (3) If the land is not readjusted in the affected villages, APs shall gain the resettlement subsidies and part of the land compensation to restore their living standard and income. (4) Job opportunities shall be provided to preferential APs by local government and village-owned enterprises (5) Technical training shall be provided to preferential APs by project owners 	<p>Land compensation fee</p> <p>Dry land: CNY 64,160 / mu Fish pond: CNY 64,160 / mu Pond: CNY 38,496 / mu Nursery land: CNY 64,160 / mu Orchard: CNY 64,160 / mu Forestry land: CNY 38,496 / mu House site: CNY 38,496 / mu Wasteland: CNY 38,496 / mu</p> <p>Resettlement subsidies</p> <p>Dry land: CNY 96,240 / mu Fish pond: CNY 57,744 / mu Pond: CNY 51,328 / mu Nursery land: CNY 96,240 / mu Orchard: CNY 96,240 / mu Forestry land: CNY 57,744 / mu House site: CNY 0 / mu Wasteland: CNY 0 / mu</p> <p>Young crops and attachment compensation fee</p> <p>Vegetable field: CNY 1,000 / mu Cotton, grains & oil plant field: CNY 780 / mu Nursery gardens: CNY 5,000 / mu Fruit trees : CNY 20 to 70 / plant, Trees: CNY 20 to 85 / plant</p>
Residential Housing Demolition	A total of 39,288 m ² residential housing including 4,157 m ² unlicensed will be demolished with 235 HHs or 943 APs (including 782 house owners and 161 tenants/floating population)	Property/house owner	<ol style="list-style-type: none"> (1) APs shall have cash compensation, economically affordable house or restored residential buildings. (2) House owners without certificate of title shall have compensation according to the house replacement price (excluding land price) without any depreciation (3) If APs are not satisfied with the compensation, they may 	<p>Compensation for rural residential buildings shall be the replacement cost for structures plus the house site price.</p> <p>Replacement cost for structures:</p> <p>Steel and concrete structure: CNY 830 / m² Brick and concrete structure: CNY 570 / m² Brick and timber structure: CNY 420 / m² Simple structure: CNY 340 / m² House site price:</p>

			<p>entrust the specialized institution to conduct an assessment of the real estate, the result of which shall be considered as the house relocation compensation rates.</p> <p>(4) APs will gain the moving subsidies and transitional subsidies</p> <p>(5) APs without certificate of title shall pay charges for the certificate of title of the new house</p>	<p>Class I: CNY 2,280 / m² Class II: CNY 1,920 / m² Class III: CNY 1,500 / m²</p> <p>Compensation for urban residential buildings</p> <p>In Class I area</p> <p>Steel &concrete structure: CNY 2,580 / m² Brick and concrete structure:CNY 2,320 / m² Brick and timber structure:CNY 2,170 / m² Simple structure:CNY 2,090 / m²</p> <p>In Class II area</p> <p>Steel and concrete structure:CNY 2,230 / m² Brick and concrete structure:CNY 1,970 / m² Brick and timber structure:CNY 1,820 / m² Simple structure: CNY 1,740 / m²</p> <p>In Class III and suburban area</p> <p>Steel & concrete structure: CNY 2,030 / m² Brick and concrete structure:CNY 1,770 / m² Brick and timber structure: CNY 1,620 / m² Simple structure:CNY 1,540 / m²</p> <p>Compensation for unlicensed structure</p> <p>Steel and concrete structure:CNY 830 / m² Brick and concrete structure:CNY 570/ m² Brick and timber structure: CNY 420 / m² Simple structure:CNY 340 / m²</p>
	Tenants/ floating population	<p>(1) All tenants enjoy rights to ask or obtain relevant compensation.</p> <p>(2) Terms and conditions in the</p>	<p>The affected tenants will obtain movement subsidies</p> <p>Movement subsidies: CNY 6 / m² / month</p>	

			<p>amended compensation agreement are the same with the agreement before replacement.</p> <p>(3) All APs, whoever the leasehold belongs to, including the floating population, shall obtain equivalent compensation.</p>	Provide assistance to the affected tenants to find new living places
Ground attachments	12 ground attachments will be affected	Property owner	All will be compensated at replacement cost in cash	
Public facilities	Power supply and potable water pipeline	Property owner	<p>(1) All affected property owners will be provided with satisfactory relocated land based on the foot print of structure demolished;</p> <p>(2) The demolished structure will be compensated at replacement cost in cash (including compensation for loss of facilities and labor on the basis of replacement cost)</p>	<p>Compensation rate for shops:</p> <p>In Class I area</p> <p>Steel & concrete structure: CNY 4,330 / m²</p> <p>Brick and concrete structure: CNY 4,070 / m²</p> <p>Brick and timber structure: CNY 3,920 / m²</p> <p>Simple structure: CNY 3,140 / m²</p> <p>In Class II area</p> <p>Steel & concrete structure: CNY 3,630 / m²</p> <p>Brick and concrete structure: CNY 3,370 / m²</p> <p>Brick and timber structure: CNY 3,220 / m²</p> <p>Simple structure: CNY 3,140 / m²</p> <p>In Class III and suburban area</p> <p>Steel and concrete structure: CNY 3,030 / m²</p> <p>Brick and concrete structure: CNY 2,770 / m²</p> <p>Brick and timber structure: CNY 2,620 / m²</p> <p>Simple structure: CNY 2,540 / m²</p> <p>Compensation rate for enterprises and institutions:</p> <p>Productive building:</p> <p>In Class I area</p>
Affected enterprises, institutions and shops	A total of 29,793.85 m ² , including 18,561.85 m ² of enterprises and institutions and 10,912 m ² of shops will be demolished with 19 shops and 43 enterprises and institutions or 322 employees/hired hands affected	The owners and employees or hired hands affected	<p>(1) The affected enterprises / shops can choose cash compensation or property exchange compensation. All owners affected who runs the business before announcement of the project construction shall be compensated at replacement cost regardless of unlicensed building, or overdue temporary building.</p> <p>(2) If only part of the business</p>	

			<p>land is affected rather than whole building structure, the building shall not be demolished in order to avoid its favorable geographic location and commercial loss resulting from interruption of business.</p> <p>(3) Loss in net income during interruption of business of enterprises shall be compensated for in cash. The affected enterprises/shops shall obtain movement subsidies.</p> <p>(4) All affected employees, whether permanent, or contracted, shall obtain cash compensation for the income / wage loss resulting from interruption of work.</p> <p>(5) The affected employees or hired hands shall be employed again after the affected enterprises / shops restore business operations;</p> <p>(6) If the affected employees or helperhands are not employed, the project owners shall provide training for them at no cost.</p>	<p>Steel & concrete structure: CNY 2,880 / m²</p> <p>Brick and concrete structure: CNY 2,620 / m²</p> <p>Brick and timber structure: CNY 2,470 / m²</p> <p>Simple structure: CNY 2,390 / m²</p> <p>In Class II area</p> <p>Steel and concrete structure: CNY 2,530 / m²</p> <p>Brick & concrete structure: CNY 2,270 / m²</p> <p>Brick and timber structure: CNY 2,120 / m²</p> <p>Simple structure: CNY 2,040 / m²</p> <p>In Class III and suburban area</p> <p>Steel & concrete structure: CNY 2,330 / m²</p> <p>Brick & concrete structure: CNY 2,070 / m²</p> <p>Brick and timber structure: CNY 1,920 / m²</p> <p>Simple structure: CNY 1,840 / m²</p> <p>Non-Productive building:</p> <p>In Class I area</p> <p>Steel & concrete structure: CNY 2,530 / m²</p> <p>Brick and concrete structure: CNY 2,270 / m²</p> <p>Brick and timber structure: CNY 2,120 / m²</p> <p>Simple structure: CNY 2,040 / m²</p> <p>In Class II area</p> <p>Steel & concrete structure: CNY 2,180 / m²</p> <p>Brick and concrete structure: CNY 1,920 / m²</p> <p>Brick and timber structure: CNY 1,770 / m²</p> <p>Simple structure: CNY 1,690 / m²</p> <p>In Class III and suburban area</p>
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				Steel & concrete structure: CNY 1,980 / m ² Brick and concrete structure: CNY 1,720 / m ² Brick and timber structure: CNY 1,570 / m ² Simple structure: CNY 1,490 / m ² Compensation for unlicensed structure (excluding land price) Steel and concrete structure: CNY 830 / m ² Brick and concrete structure: CNY 570 / m ² Brick and timber structure: CNY 420 / m ² Simple structure: CNY 340 / m ²
Income Rehabilitation Measures	The Project estimates 938.3 <i>mu</i> land acquisition, including 492.1 <i>mu</i> state-owned land, 446.2 <i>mu</i> collective-owned land	All APs	(1) Compensation rates for young crops on the acquired land (2) If collective-owned land will not be redistributed, APs will obtain resettlement subsidy and part compensation for land (not less than 80% of total) to restore their income and living standard (3) The local government will provide employment assistance for APs in the local enterprises. (4) The project owner will provide preferential employment opportunities for APs and provide technical training prior to the employment.	
	Other subsidies	Person affected	Transportation subsidies, such as	Movement subsidies CNY 300 to 600 / household;

		by physical relocation	household articles, salvage or transporting building materials to the new relocation site will be provided	Transitional subsidies: Residential house: CNY 6 / m ² / month; Shop : CNY 20 / m ² / month; Enterprise & institution: CNY15 / m ² / month.
	Special supporting measures for affected vulnerable groups	Affected vulnerable groups, including people in poor, ethnic minority, aged and disabled and families accepting social welfare.	<p>(1) The demolished housing less than 20 m² (including 20 m²) will be compensated on the basis of 25 m²; above 20 m² but less than 30 m² will be compensated on the basis of 30 m².</p> <p>(2) Cheap rented housing for families in hardship will be provided.</p> <p>(3) CNY 1,500,000 special supporting fund for the vulnerable groups of storm water component, and CNY 400,000 for wastewater component will be set up.</p> <p>(4) Preferentially employment opportunities for seriously affected vulnerable groups, especially women will be provided.</p> <p>(5) Labor support for the vulnerable groups in the house reconstruction will be provided.</p>	
Complaints and Grievance	Compensation rate, payment of compensation and relocation measures	The APs who have complaints about land acquisition and relocation problems	Various expenses related to relocation complaints putting forward by the APs and management expenses should be exempted.	

7.5 Resettlement and Rehabilitation

7.5.1 In order to minimize the resettlement impacts to APs and restore their living standards, the detailed programs of restoration and relocation have been arranged in the RPs. APs can choose from the available programs according to their requirements.

7.5.2 According to the economic characteristics of affected villages, different schemes for income restoration will be carried out. As to the land acquisition, the most affected villages located in the suburban / urban areas of Wuhan can be defined as "villages in a city". HHs are not partially engaged in agricultural activities, and family members supplement HH incomes through employment away from their villages or other activities which likely contribute the greater portion of their income. The main income restoration strategies and measures are cash compensation, provision of employment opportunities during the project construction and operational phases, provision of training and employment information etc. Through these measures it is envisaged APs will achieve stable incomes that fully restore their living standards.

7.5.3 Demolition of housing and other structures will be compensated at replacement cost. Displaced persons will have the options to purchase commercial houses, to exchange properties, or to rebuild their houses with free house sites provided to them.

7.5.4 In addition, more attention will be paid to vulnerable groups for their compensation and rehabilitation. The vulnerable groups will receive additional assistance from the project as follows:

- if the demolished house is less than 20 m² (including 20 m²), it will be compensated / relocated on the basis of 25 m²; and if the demolished house is from 20 m² to 30 m², it will be compensated/relocated on the basis of 30 m²;
- providing low rate rental housing for vulnerable families;
- setting up CNY 1.9 million special supporting funds;
- providing potential employment opportunities to seriously affected vulnerable groups, especially women; and
- providing labor support to the vulnerable groups for house reconstruction.

7.6 Resettlement Cost and Fund Management

The cost estimate for land acquisition and resettlement is CNY 355 million (16.6% of the total project cost) including contingencies, taxes and duties. This land acquisition and resettlement cost will be included as part of total project cost. The RPs for each component contains a detailed budget, together with a compensation matrix. According to the compensation policies and standards defined in the RP, the payment and usage of compensation funds will be carried out under the supervision of the internal monitoring agencies; with regular review by the external monitoring agency. Detailed Measurement Surveys (DMS) will be conducted in each village, enterprise, shop, and the compensation contracts will be negotiated and signed with village committees, HHs, enterprises and shops owners.

Table 7-4 Cost Estimates for Land Acquisition and Resettlement

No.	Item	Wastewater Component (CNY x 1,000)	Storm Water Component (CNY x 1,000)	Total (CNY x 1,000)
1	Permanent land acquisition (including state-owned land)	38,658	84,786	123,444
2	Temporary land occupation	25,413	2343	27,756
3	House demolition	3,226	122,034	125,260
3.1	Registered rural residential house	2,619	40,517	43,136
3.2	Registered urban residential house	0	7,679	7,679
3.3	Non-registered residential house	105	1,380	1,485
3.4	Registered shops affected	0	23,233	23,233
3.5	Non-registered shops affected	0	9,277	9,277
3.6	House of enterprise and institution for operation	502	39,843	40,345
3.7	House of enterprise and institution for office or storage	0	105	105
4	Young crops and attachments	492	1,609	2,101
5	Subsidy for transition	35	8,888	8,923
Basic Costs of Resettlement		71,050	290,710	
6	Land acquisition management fee (2%)	1,421	4,393	5,814
7	Special assistance fund for vulnerable groups	4.0	1,500	1,900
8	Training fee	500	500	1,000
9	House demolition appraisal fee	0	560	560
10	Management fee for resettlement and house demolition (3%)	2,132	6,590	8,721
11	RPs compilation and monitoring fee (1%)	711	2,197	2,907
12	Contingencies (15%)	10,658	32,949	43,607
Total Costs		86,871	355,219	

7.7 Resettlement Organizational Arrangement

The WPMO will assume the overall responsibility for implementing resettlement. The IAs' roles include resettlement compensation payment and supervision. A Resettlement Office (RO) within WPMO will coordinate the planning, implementation, financing and reporting of land acquisition and resettlement. Also, the RO will entrust a qualified house demolition agency to carry out the house demolition affected by the Project. The RO is in charge of land acquisition of the Project with the assistance of Wuhan Land Administrative Bureau.

7.8 Participation, Consultation and Information Disclosure

7.8.1 The consultation with APs has been carried out in the early process of project planning and PPTA periods. Wuhan University has carried out the DMS of resettlement impacts and socioeconomic survey with the APs. A detailed questionnaire also has been drafted to gather the opinions of the APs. Further, the survey team with the PPTA consultants had informal meetings with the village leaders and APs during the survey. During the survey and consultation process, the opinions from vulnerable groups, women, poor, have also been addressed.

7.8.2 A Resettlement Information Booklet (RIB) including project background, land acquisition and resettlement impacts, compensation policies, resettlement implementation organization, schedule arrangements and grievance procedures has been prepared by Wuhan University and the PPTA Consultants.

7.8.3 The people affected will be notified about the key elements of the RP prior to ADB loan appraisal. The RPs will be disclosed to the affected townships and seriously affected villages, and resettlement information booklets will be disseminated to affect HHs including vulnerable group and women. In accordance with ADB's Public Communications Policy, the draft RPs will be posted on ADB's website prior to loan appraisal and the approved RPs will be posted by the time of board approval. The respective project IAs will establish project resettlement units for supervising implementation, continuing public consultation, monitoring progress and responding to grievances.

7.9 Resettlement Monitoring and Evaluation

Internal and external monitoring of RP implementation will be conducted. Monitoring methodologies are specified in the RPs. A TOR for monitoring and

evaluation has been drafted and are attached to the RPs. Internal supervision and monitoring will be done by each IA to ensure compliance with the provisions of the RP. The WPMO and IAs have agreed to a set of supervision milestones with ADB, to ensure timely and effective implementation of the resettlement activities. WPMO and IAs will engage an independent agency for semi-annual monitoring and annual evaluation of land acquisition and resettlement until 2 years after the completion of land acquisition and resettlement. External monitoring reports will be forwarded directly to both the WPMO and ADB.

7.10 Conclusion and Recommendations

7.10.1 The prepared RPs are in line with not only the PRC laws and regulations, but also ADB's Policy on Involuntary Resettlement. All people affected, legal and illegal, are to be taken into consideration and accounted for. On the basis of participation and consultation, reasonable and practicable income rehabilitation plans and house restoration plans, resettlement cost estimates, resettlement implementation arrangements, and APs grievance procedures have been established.

7.10.2 The budget in RPs is an estimate of the resettlement cost. The WPMO will guarantee payment for any increase due to physical changes in project scope, actual impacts based on DMS, revision in compensation and price inflation. The budget already has some provision for physical and price contingencies, which and then will be utilized or revised as required.

7.10.3 In order to ensure the resettlement implementation compliance with the provisions of the RPs, close monitoring and timely actions will be carried out to identify and resolve any problems during the implementation of the resettlement plans, and regular internal and external monitoring and evaluation reports will be submitted to ADB .

8. Financial Analysis

8.1 Cost Estimates

Introduction

8.1.1. Two Design Institutes (DIs) Wuhan Urban Engineering Design & Research Institute Co., Ltd. and Wuhan Urban Planning & Design Institute prepared the draft Feasibility Study Report (FSR) issued in May 2005 for the Project. In late September 2005, a revised FSR was issued, providing more information for the PPTA consultants to process the project cost estimates and to review the draft financing plan.

8.1.2. It is understood that the cost estimates presented in the FSRs were prepared partly based on :

- guidance and quotas issued by the relevant People's Republic of China (PRC) authorities;
- construction costs of the DIs' recent projects; and
- market price of major construction materials, pipes and equipment.

8.1.3. After reviewing cost estimates information given in the FSRs, the PPTA consultants requested more detailed cost data as required to properly determine the direct and indirect foreign exchange contents involved in the Project and to effectively utilize the ADB loan proceeds.

8.1.4. The cost estimates have been prepared in domestic currency units with foreign exchange costs converted into CNY at the projected purchasing power parity exchange rate for the year of expenditure, and in nominal terms taking into consideration the potential impacts of international and domestic inflation and potential exchange rate fluctuation. Foreign exchange costs include both direct and indirect foreign costs. Taxes and duties have been disclosed as a separate line item as part of the base costs. The project cost summary is presented in US dollars in the report.

8.1.5. It should be noted that whilst this procedure accords with relevant ADB guidelines for project financial analysis the reality is the exchange rate is widely expected to move in the opposite direction to relative inflation rates. This situation arises because the current exchange rate does not fully reflect market conditions

Project Costs Summary

8.1.6. The total cost of the nine subprojects in the Project is further estimated at \$ 266.43 million, including a foreign exchange cost of \$ 139.65 million (52.4 %)

and a local currency cost of \$ 126.78 million equivalent (47.6 %). Summarized project cost estimates are given in Table 8.1. Detailed project cost summary tables are presented in Appendix H-1. Further review and discussions with WPMO, DIs and IAs was conducted during the ADB Loan Fact Finding Mission to update and refine these project cost estimates from those figures of FSRs.

Table 8.1 Project Cost Estimates (\$ million)

Component	Foreign Exchange	Local Currency	Total Cost
A. Base Costs ^a			
I. Wastewater Treatment Facilities in Main Urban Area			
Erlangmiao WWTP	14.56	7.88	22.44
Nantaizi Lake WWTP	11.39	11.10	22.49
Huangpu Road WWTP	9.38	5.36	14.74
II. Wastewater Treatment Facilities in Suburban Areas			
Dongxihu Sewer System	11.70	7.92	19.62
Caidian WWTP	6.06	5.64	11.70
III. Storm Water System in Wuhan			
Drainage Works in Luoia Road Area of Wuchang	18.17	27.02	45.18
Yangsigang Pump Stations & Pipes Works in Hanyang	4.71	5.58	10.29
3-gate Connection Works in Dongxihu	19.87	18.63	38.50
Changqing Pump Station Expansion	11.97	7.41	19.38
IV. Project Management	1.00	-	1.00
Subtotal	108.81	96.52	205.33
B. Contingencies			
Physical ^b	9.65	10.88	20.53
Price ^c	6.78	6.45	13.23
Subtotal	16.43	17.33	33.77
C. Financial Charges during Implementation ^d	14.41	12.91	27.32
Total	139.65	126.76	266.42

^a In mid-2005 prices.

^b Computed at 10% for all civil works, land acquisition and resettlement, equipment, training, and consulting.

^c Computed, based on foreign exchange inflation rate of 2.8% in 2006, and 1.9% in 2007 and onwards; and local currency inflation rate at 3.3% in 2006, 3.2% in 2007, and 3.0% in 2008 and onwards; and includes provision for potential exchange rate fluctuation under assumption of a purchasing power parity exchange rate,

^d Includes interest and commitment charges. Interest during construction has been computed at the five-year forward LIBOR rate plus a spread of 0.6%.

8.2 Proposed Financing Plans

8.2.1 In the FSRs initial financing plans were prepared for review. The PPTA consultants discussed with and requested the EA and IAs to develop specific and solid financing plans for each subproject. The financing plans proposed in the latest revised FSR issued in late September 2005 are relatively preliminary.

Although there is an overall financing plan indicating major sources of funds for the Project, firm commitments from the government and domestic commercial banks are not yet in place. The PPTA consultants have emphasized that solid financing plans are essential for the performance of robust financial and economic analysis, and also to avoid potential implementation delays. The EA and IAs were informed that the government commitment letter on solid financing plans for all subprojects is required to facilitate ADB project loan processing. This is a condition required for higher level government to approve the FSR. It has been agreed that the EA and IAs would review and confirm the likely availability of counterpart funds. The financing plan was then further discussed during the ADB Loan Fact Finding Mission. The Wuhan Municipal Finance Bureau issued a commitment letter on 5 December 2005 to commit timely provision of local counterpart funds for smoothly implementing the Project.

8.2.2 The WPMO pointed out during the ADB Interim Review Mission that the cost estimates in the FSRs have almost always proved excessive and this has resulted in loan savings. The Mission endorsed this view and requested that the WPMO and the PPTA consultant work together to ensure that the cost estimates and their presentation in the PPTA outputs are realistic and clear. WPMO indicated that it would request the DIs to prepare more realistic base cost estimates for the PPTA Consultant to review. Any discrepancies between these more realistic base cost estimates and the base costs in the draft final FSR would be treated as additional contingencies to be funded by the Government. The Mission indicated that as was the case with some other ADB funded PRC projects, the EA could opt to finance the project physical and price contingencies with domestic funds. If this option was selected, then an assurance would be included in the Loan Agreement ensuring that adequate funds would be provided by the EA to finance the project contingencies. The EA has indicated such an assurance could be provided and hence all contingencies are shown in the financing plan as government funded.

8.2.3 The Government has requested a loan of \$ 100 million, about 37.6 % of the total project cost. Since this is well below 60 % of the total project cost, the ADB cost sharing limit for the PRC, it was agreed that the civil works percentage financing under the Project would be set at 70 %. The proceeds of the ADB loan will be used to finance the foreign exchange cost of the Project, including interest during construction on the loan. Counterpart funding will provide about 62.4% of the total project costs and be used to finance 100% of the local currency costs, and \$39.01 million of the foreign exchange base costs and contingencies costs. Local costs will be financed by wastewater tariff, WMG budget sources, and domestic loans from the PRC banks including the State Development Bank loans and domestic commercial bank loans. The financing plan for the Project is summarized in Table 8.2 and detailed in Appendix H- 2.

Table 8.2 Financing Plan (\$ million)

Sources	Foreign Exchange	Local Currency	Total Costs	Percentage
A. ADB Loan	100	-	100	37.6
B. Wuhan Municipal Government	39.0	33.3	72.3	27.1
C. Local Bank Loans	-	94.1	94.1	35.3
Total	139.0	127.4	266.4	100.0

8.2.4 The ADB loan is proposed to come from ADB's ordinary capital resources. The loan will carry an interest rate to be determined in accordance with ADB's London Inter Bank Offered Rate (LIBOR) based lending rate system for US dollar loans, a commitment charge of 0.75% per annum, and such other terms and conditions set forth in the draft Loan Agreement. The loan will have a term of 25 years, including a grace period of 5 years.

8.2.5 The Borrower will be the Government of the PRC, who will re-lend to the Government of the Hubei Provincial Government (HPG). HPG will re-lend to WMG, who will on-lend to the designated IAs for the wastewater and storm water management components of the Project. It is understood that all re-lending and on-lending will be on the same terms and conditions as the ADB loan. The IAs will assume the foreign exchange and interest rate variation risks for its portion of the ADB's loan.

8.3 Financial Analysis for Wastewater Management Subprojects in Main Urban Area

Introduction

8.3.1. A formal Project Proposal was approved by the Hubei Development & Reform Commission in April 2005. In the Project Proposal only a constant incremental increase of wastewater tariff has been assumed. It is based on incremental amount of wastewater treated in one proposed subproject and on the subproject's capital and operations and maintenance (O&M) costs, in order to arrive at a financial internal rate of return (FIRR) higher than 4 %. In order to implement the respective subprojects, the Project Proposal proposes a wastewater tariff increase of:

- CNY 0.59 / m³ for the three wastewater subprojects in the main urban area (7 districts);
- CNY 0.90 / m³ for the Dongxihu suburban wastewater subproject; and
- CNY 1.54 / m³ for the Caidian suburban wastewater subproject district.

8.3.2. In the revised FSR provided in late September 2005, the DI combined all the five subprojects as a whole wastewater management project to conduct the financial analysis, and proposed an incremental wastewater tariff increase of

CNY 0.98 / m³ based on the incremental increase of wastewater treated by the five proposed subprojects and their total capital and O&M costs. This arrives at a FIRR higher than 4 %. While the proposed wastewater tariff increases in the Project Proposal and the FSRs are close to the average incremental financial costs (AIFCs), it does not reflect a practical approach in charging tariffs in a city. In reality a wastewater tariff increase would apply to all the 7 districts in the main urban area and be levied on top the potable water sold, while a newly introduced or increased wastewater tariff would apply to the two suburban districts, Caidian and Dongxihu.

8.3.3. Further, given that 100 % secondary wastewater treatment rate would not be reached even after commissioning of the Project, it is felt that a lower incremental tariff increase would be sufficient to achieve full cost recovery. Based on this assumption, detailed financial analysis has been conducted as described in the following sections of this report.

8.3.4. A financial discounted cash flow (DCF) analysis has been conducted in real terms to determine the weighted average cost of capital (WACC), FIRR, financial net present value (FNPV) and AIFC where applicable, to assess the financial viability of each subproject and the incremental tariff required. The PPTA consultant developed the financial statement (FS) projections in nominal price terms for WDC. The IA who is responsible for implementing the wastewater subprojects. The FS projects financial performance of WDC to assess profitability and debt service ability, and to test incremental tariff required for the IA to raise sufficient funds for construction and to achieve full cost recovery during operation.

8.3.5. Major capital expenditures of WDC are important inputs for the projections. WDC would be responsible for the operation and management of :

- the existing wastewater facilities in the main urban areas;
- facilities just / being commissioned;
- facilities managed by independent legal entities (wastewater tariff revenue arrangement needs to be reviewed);
- facilities financed by World Bank and Polish Government to be completed in 2005 / 2006,
- the ADB financed Phase I facilities to be completed in 2008; and
- facilities to in this Project.

8.3.6. Institutional arrangements would need to be planned as soon as possible in order to introduce wastewater tariff to the Caidian and Dongxihu suburban districts. The WPMO indicates that the IA would also be responsible for the wastewater facilities in the two suburban districts. As such, their proforma FSs after separately analyzed and projected, have also been consolidated into WDC's FSs.

Project Revenues

8.3.7. Project revenues are based on the wastewater tariff charged on the customer water demand. The financial analysis is based on total water sales in the main urban area rather than sales in the Project service areas since cost recovery is based on billing of the total population. Water demand and wastewater projections for the main urban area, provided in the FSRs are reviewed and discussed in Section 9.4 and Appendix I5.

8.3.8. Sufficient cost recovery is key to successful implementation of the Project. An effective tariff mechanism is needed to ensure sufficient contributions from beneficiaries to ensure adequate and timely provision of counterpart funds during project implementation, and support O&M and finance overhead costs including debt servicing.

8.3.9. Since wastewater tariff is levied on top of water sold, the PPTA consultant has adopted an approach that wastewater tariff revenues are to be based upon projections of water sold / billed, and not water consumed which is used in the economic analysis. In addition, a provision for bad debt is assumed for the wastewater revenue, to arrive at a realistic tariff increase plan for policy dialogue and the Government's consideration.

Historic Retail Water Tariff and Wastewater Charges in Wuhan

8.3.10. In accordance with PRC government policy all local governments are expected to charge reasonable fees for wastewater collection and treatment. Wastewater tariffs should be established based on the cost of operating the facilities and the affordability of the consumers. In cities where profitability is not possible, local governments are encouraged to set a minimum price that can cover O&M costs.

8.3.11 The historic retail water and wastewater tariff information is presented in Table 8.3 for comment and reference. It should be noted that the water and wastewater tariff in this table have been applying only to the seven main urban districts of Wuhan. It is understood that wastewater tariff has yet been introduced in suburban Caidian District, while CNY 0.05 /m³ wastewater tariff is levied on top of potable water sold in suburban Dongxihu District.

Table 8.3 Wastewater and Water Tariff in Wuhan (CNY /m³)

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Wastewater tariff ^a									
Domestic	0.160	0.176	0.192	0.208	0.40	0.40	0.80	0.80	0.80
Public institutions	0.160	0.176	0.192	0.208	0.40	0.40	0.80	0.80	0.80
Industries	0.160	0.176	0.192	0.208	0.40	0.40	0.80	0.80	0.80
Operation and services businesses	0.160	0.176	0.192	0.208	0.40	0.40	0.80	0.80	0.80
Special Industry	0.160	0.176	0.192	0.208	0.40	0.40	0.80	0.80	0.80

	1997	1998	1999	2000	2001	2002	2003	2004	2005
Water resources fee									
Domestic	-	-	-	-	0.01	0.01	0.01	0.01	0.01
Public institutions	-	-	-	-	0.01	0.01	0.01	0.01	0.01
Industries	-	-	-	-	0.02	0.02	0.02	0.02	0.02
Operation and services businesses	-	-	-	-	0.02	0.02	0.02	0.02	0.02
Special Industry	-	-	-	-	0.02	0.02	0.02	0.02	0.02
Potable water tariff									
Domestic	0.450	0.450	0.620	0.620	0.70	0.70	0.70	0.70	0.70
Public institutions			0.690	0.690	0.80	0.80	0.80	0.80	0.80
Industries	0.600	0.600	0.880	0.880	1.00	1.00	1.00	1.00	1.00
Operation and services businesses	1.000	1.000	1.460	1.460	1.70	1.70	1.70	1.70	1.70
Special Industry			1.660	1.660	1.90	1.90	1.90	1.90	1.90
End user potable water tariff inclusive (including wastewater tariff, water resource fee)									
Domestic	0.610	0.626	0.812	0.828	1.11	1.11	1.51	1.51	1.51
Public institutions			0.882	0.898	1.21	1.21	1.61	1.61	1.61
Industries	0.760	0.776	1.072	1.088	1.42	1.42	1.82	1.82	1.82
Operation and services businesses	1.160	1.176	1.652	1.668	2.12	2.12	2.52	2.52	2.52
Special Industry	0.160	0.176	1.852	1.868	2.32	2.32	2.72	2.72	2.72

a Wastewater charges are based on actual water consumed.

8.3.12 WMG introduced an uniform wastewater tariff of CNY 0.08 / m³ for all water consumer categories based upon wastewater discharged (assumed to be 80 % of water consumed) in 1988. The wastewater tariff was progressively increased. Since July 2003 a wastewater tariff of CNY 0.80 / m³ has been charged based upon actual water consumed. Figures in Table 8.3 above have been adjusted to correct the differences in earlier chargeable wastewater volume.

8.3.13 There has been no cross subsidy between consumer categories, i.e. a uniform wastewater tariff is applied across all water consumer categories. The practice in other PRC cities in charging different water user categories different wastewater tariffs is also being considered by WMG.

8.3.14 The WMG has been giving attention and consideration on poverty alleviation for urban poor households when increasing water and wastewater tariff in 2001 and 2003. Since 2003 in addition to the original CNY 5 wastewater subsidy to each urban poor household, an additional wastewater subsidy of CNY 2 is granted for each person in an urban poor household. In 2004 CNY 5.7 million was transferred to subsidize the urban poor households' wastewater charges.

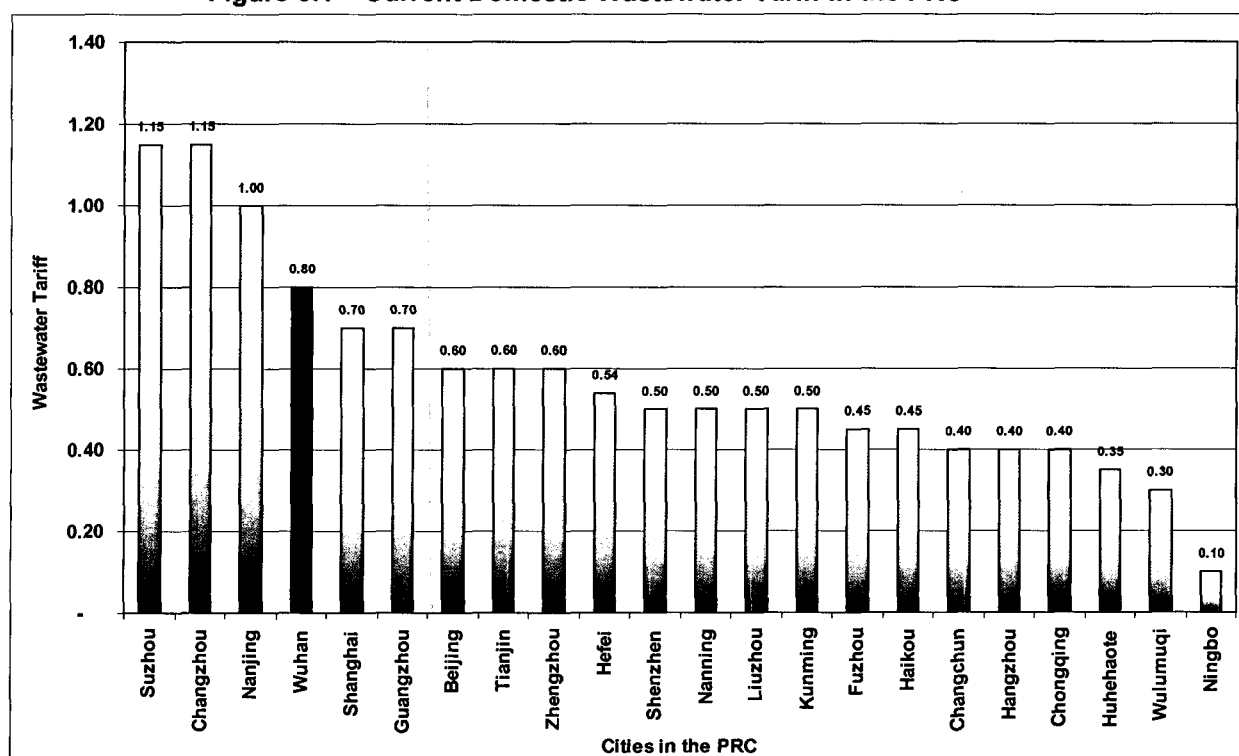
8.3.15 It is understood that the current wastewater tariff revenue is collected on top of potable water sold by Wuhan Water Company (WWC), after 3.5 % commission charged by the WWC to cover its expenses in billing and collection. The commission is transferred to a special bank account established by WDC, and subsequently booked as its operating revenue. Wuhan Steel Complex Real Estate Development Co., Ltd. is responsible to collect wastewater tariff revenues from water users in its complex with self supplied ground water, and transferred

the revenues to WDC after 4 % commission charges. WDC also has a special unit to collect wastewater tariff revenues from users who have self supplied ground water. The wastewater tariff revenue in the Wuhan main urban area was CNY 370.18 million in 2004.

8.3.16 The current domestic wastewater tariff of CNY 0.80 / m³ in Wuhan is higher than the median level among cities in PRC, as shown in Figure 8.1. It is understood that higher wastewater tariff is required to generate more fund to finance:

- the O&M cost increase due to the cost increases of manpower and operating materials;
- additional O&M costs of wastewater collection networks and WWTPs that are now under construction and will be commissioned in the near future; and
- part of the capital investment costs of the planned wastewater collection and treatment facilities

Figure 8.1 Current Domestic Wastewater Tariff in the PRC



Assumptions Used in Financial Analysis

8.3.17 DCF analysis covering the period from 2006 to 2033 for the subprojects has been prepared. Income statement, balance sheet and cash flow statement projections for WDC for the scenarios of "without" and "with the subproject" have

been projected covering period from 2006 to 2018, while historical financial statement from 2002 to 2004 are presented together with the projection, with the 2005 financial statements as the starting base for the forecast. It is assumed that all components of the subprojects in the main urban area are to be commissioned in 2009 and become fully operational in 2012. Construction in progress is transferred to the balance sheet as fixed assets at the end of the implementation period in end 2009.

8.3.18 Normally, a value added tax (VAT) rate of 17 % for a business enterprise is applied to sales revenues, then sales taxes and surcharges of total 10 % on top of the VAT are also levied. In the FSR no VAT and sales taxes and surcharges were assumed, while 33 % corporate income tax rate was assumed to apply to WDC. Historical financial statements of WDC indicate that no VAT, consequently no sales taxes and surcharges, have been levied on the wastewater tariff revenues; and income taxes have also been waived in all WDC's historical financial statements up to 2004. The PPTA consultants discussed with WPMO and WDC on the appropriate income tax rate to be used for the financial analysis, and agreed the following tax related assumptions are to be used for the DCF analysis and financial statement projections:

- a base case of "zero" income tax rate to be applied from 2005 to 2010;
- 15 % income tax rate being applied from 2011 to 2015; and
- the normal 33 % income tax rate being applied from 2016 and onwards.

8.3.19 A 33 % income tax rate applied throughout the whole life of the project is considered as one scenario for sensitivity analysis.

8.3.20 In the DCF analysis, an incremental wastewater tariff applied to water sold is assumed to arrive at incremental wastewater tariff revenues for the three main urban area subprojects.

8.3.21 The operating cost estimates given in the FSRs have been reviewed, and are found to be generally acceptable to be used in the FS projections and DCF analysis, with some modification in parameters and unit costs for some consumables, coal and electricity to reflect current market prices and to maintain overall consistency for the various subprojects.

8.3.21 Annual average depreciation costs have been computed at 4.17 % of the book value of fixed assets at end 2009 until the net book value of fixed assets become zero after 24 years operation. 8 % is applied to the original book value at end 2009 of the total intangible assets and deferred assts to arrive at the average annual amortization costs, until the total book value of the intangible and deferred assets is amortized to zero. Depreciation and amortization costs are non-cash cost items for the purpose of saving cash for full replacement of the operating assets at the end of the project operational life. The depreciation and amortization costs are calculated based on the items' book value in nominal

terms at end 2009 and treated in accordance with the generally accepted accounting standards in the PRC; and their value in real terms at end 2009 is treated according to ADB guidelines in the DCF analysis.

8.3.22 Annual repair cost is calculated at 1.5 % of initial book value of the fixed assets at end 2009, while maintenance costs are computed at 1 % of the initial book value of the fixed assets. Annual administrative and other expenses are computed at 10 % of the total annual production costs, which is equal to the sum of O&M costs plus depreciation and amortization costs.

8.3.23 Annual costs for consumables purchased outside are based on specific quantities of the consumable items identified in the FSR and the market prices provided by the DI and WDC. Annual costs of electricity are based on the capacity required and annual actual amount of electricity consumed.

8.3.24 Costs of consumables, electricity, sludge transportation costs, and wages and other salary expenses, are variable and adjusted annually according the proposed capacity utilization rate. Except the treatment of depreciation and amortization costs indicated above, all the costs are utilized in nominal terms inflated at the following local currency inflation rate projected by the ADB in the FS projections, and in real terms in the DCF analysis. ADB projected inflation rates for US dollars and local currency are given in Table 8.4.

Table 8.4 ADB Projected Inflation Rates

ADB Projected Inflation Rate	2006	2007	2008	2009
US Dollar (\$)	2.80%	1.90%	1.90%	1.90%
Renminbi (CNY)	3.30%	3.20%	3.00%	3.00%

8.3.25 In the FS projections, the project loans to be obtained from ADB are to be included in the analysis. The amount assumed for the ADB loan has been calculated from estimated foreign exchange investment expenditure, including indirect. The balance of the total investment is to be financed by WDC from wastewater tariff revenues as equity injection, and by local commercial bank loans.

8.3.26 The ADB loan period is taken as 25 years including 5 years grace period (during the construction period plus the first two years of operations). Equal annual payments of principal plus interest in US dollar have been assumed. As of 12 October 2005, the 6 month LIBOR rate was 4.303 %, and 5 year fixed swap rate was 4.71 %. An increment of 0.6 % would be added to the 5 year fixed swap rate giving a long run of 5.31 % to be used as the ADB loan interest for the loan period. The commitment fee has been taken as 0.75 %, while the 1 % front end fee has not been assumed. In accordance with current ADB policy the front end fee will be waived.

8.3.27 The cost of local bank loans is assumed to be 6.2% and the opportunity cost of equity in the water and wastewater sector is assumed to be from 6 to 8% based on the national Guidelines for Water Tariffs.

8.3.28 A retention account of 6 months loan repayment together with 3 months O&M expenditures is to be maintained.

8.3.29 Further assumptions have been made in the preparation of the FS projections include:

- legal reserve fund - 10 % annual net income
- public welfare fund - 5 % net income,
- general reserve fund - 5 % net income
- retaining earning including reserve funds - opening balance plus 20 % net income;
- undistributed profit - opening balance plus 80 % net income;
- accounts receivables - 1 month of annul sales revenues,
- other receivables - 1.5 months of the annual sales;
- inventory - value of 3 months of annual consumables;
- accounts payables - 1.5 months of expected purchase;
- accrued payroll and welfare - one month salary and welfare; and
- tax payable - one month tax to be paid.

Discounted Cash Flow Analysis

8.3.30 The ADB's January 2002 Guidelines for Financial Governance and Management of Investment Projects specify that the appropriate rate for DCF analyzes is WACC, which represents the cost incurred by the entity in raising the capital necessary to implement a project. In the guidelines, a minimum real rate for each source of 4 % is specified. The WACC of 4 % was computed on an after tax basis in real terms, and the nominal financial cash flow is converted to real terms by removing the impacts of inflation and potential currency fluctuation.

8.3.31 DCF analysis was undertaken in real terms using constant 2005 year end prices, and has been used to compute the FIRR, FNPV and AIFC. The DCF analysis follows standard ADB methodology. The NPV and AIFC were computed based on WACC, and FIRR was compared to the WACC. The FIRR is computed on an after tax basis in real terms over 28-year period including 4 years for the project construction, including all capital and operating cash flow, and physical but not price contingencies. Interest and other financing charges during construction are not included in the costs. Residual value of fixed assets is not assumed, as the book value of fixed assets will be depreciated to zero under the current annual average 4.17 % depreciation rate (24 years of depreciation period).

8.3.32 The FSR assumes the long term average wastewater tariff to be CNY 0.98 / m³ throughout in the DCF analysis to arrive at a FIRR higher than 4 %,

based upon incremental volume of wastewater treated by the proposed five wastewater management subprojects (in the main urban area, and Dongxihu and Caidian districts) and on the capital and O&M costs. Since no inflation is assumed in the FSRs, that amount is the same according to the FSRs in both constant and nominal prices. For the main urban area subprojects, a progressively step by step incremental wastewater tariff increase approach is recommended to be applied in the as the base case for the DCF analysis, based upon the wastewater tariff revenues calculated on the projected water demand/sold in the main urban area in Para 8.3.12 above. The detailed proposed progressively step by step incremental wastewater tariff increasing plan is presented in Table 8.5.

Table 8.5 Proposed Incremental Wastewater Tariff (CNY / m³)

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Tariff in Real Terms	0.15	0.15	0.15	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Tariff in Nominal Terms	0.16	0.16	0.17	0.23	0.24	0.24	0.25	0.26	0.27	0.27	0.28

8.3.33 With the proposed incremental wastewater tariff above, summarized detailed DCF analysis is presented in Table 8.6 including the DCF results of FIRR, FNPV and AIFC each in 2 scenarios, including depreciation costs and excluding depreciation costs.

8.3.34 FIRR for the main urban combined wastewater subprojects, computed on an after tax basis, is 12.36 %. This compares favorably with the 4 % WACC, also computed on an after tax basis. The AIFC based on the volume of wastewater treated without depreciation and amortization costs is CNY 0.64 / m³. If the depreciation and amortization costs are included, the AIFC is CNY 0.78 / m³. The Project is considered both financially viable and sustainable. Details of FIRR calculations on the main urban area, Caidian and Dongxihu suburban districts are presented in Appendix H-3.

Table 8.6 Discounted Cash Flow Analysis and Results

		Wastewater Tariff CNY / m ³ A	Wastewater Treated 000 m ³ /a B	Financial revenues 000 CNY C	Capital costs 000 CNY D	O&M costs 000 CNY E	Depreciation Amortization 000 CNY F	Total costs 000 CNY G=D+E+F	Total excluding depreciation 000 CNY H=G-F	Net Cash Flow 000 CNY I=C-H
1	2006	0.15	0	0	60,476	0	0	60,476	60,476	-60,476
2	2007	0.15	0	0	210,352	0	0	210,352	210,352	-210,352
3	2008	0.15	0	0	165,652	0	0	165,652	165,652	-165,652
4	2009	0.20	32,120	108,217	63,105	14,071	0	77,176	77,176	31,041
5	2010	0.20	120,450	118,116	26,294	40,594	25,165	92,053	66,888	51,228
6	2011	0.20	160,600	119,219		55,637	25,165	80,802	55,637	63,582
7	2012	0.20	160,600	120,335		55,805	25,165	80,969	55,805	64,531
8	2013	0.20	160,600	130,809		57,376	25,165	82,541	57,376	73,433
9	2014	0.20	160,600	132,042		57,561	25,165	82,725	57,561	74,481
10	2015	0.20	160,600	133,290		57,748	25,165	82,913	57,748	75,542
11	2016	0.20	160,600	134,598		68,848	25,165	94,012	68,848	65,750
12	2017	0.20	160,600	135,924		69,285	25,165	94,450	69,285	66,639
13	2018	0.20	160,600	137,269		69,729	25,165	94,894	69,729	67,540
14	2019	0.20	160,600	138,632		70,179	25,165	95,344	70,179	68,453
15	2020	0.20	160,600	140,014		70,635	25,165	95,800	70,635	69,379
16	2021	0.20	160,600	140,215		70,701	25,165	95,866	70,701	69,514
17	2022	0.20	160,600	140,417		71,657	21,786	93,442	71,657	68,760
18	2023	0.20	160,600	140,619		72,612	18,406	91,018	72,612	68,007
19	2024	0.20	160,600	140,822		72,679	18,406	91,085	72,679	68,143
20	2025	0.20	160,600	141,025		72,746	18,406	91,153	72,746	68,279
21	2026	0.20	160,600	141,229		72,813	18,406	91,220	72,813	68,416
22	2027	0.20	160,600	141,434		72,881	18,406	91,287	72,881	68,553
23	2028	0.20	160,600	141,639		72,949	18,406	91,355	72,949	68,690
24	2029	0.20	160,600	141,845		73,017	18,406	91,423	73,017	68,828
25	2030	0.20	160,600	142,051		73,085	18,406	91,491	73,085	68,966
26	2031	0.20	160,600	142,258		73,153	18,406	91,559	73,153	69,105
27	2032	0.20	160,600	142,465		73,221	18,406	91,628	73,221	69,244
28	2033	0.20	160,600	142,674		73,383	18,053	91,436	73,383	69,291
NPV@ 4.00%			2,087,583	1,849,828	475,450	865,302	295,728	1,636,480	1,340,752	509,076
Per m³ WW treated				0.89	0.23	0.41	0.14	0.78 AIFC	0.64 AIFC	0.24
IRR										12.36%

8.3.35 Sensitivity tests have been carried out for the subproject. Under the proposed progressively wastewater tariff increasing plan, the subproject is relatively sensitive to the simultaneous changes (decreases) in wastewater tariff, volume of water sold and wastewater revenue collection rate, as after 10.17 % simultaneous decrease of the three factors the FIRR would be lower than WACC of 4 %. In the case of all five factors (wastewater tariff, water sold amount, wastewater revenue collection rate, capital investment costs and O&M costs) changing by the same proportion at the same time, the FIRR and NPV would be sensitive up to about 7.87 % change, and the FIRR would be lower than WACC of 4 %. In the case that 33 % income tax rate is applied throughout the whole life of the project, the FIRR would be 10.70 %, higher than WACC of 4 %. This sensitivity analysis indicates that the FIRR would be acceptable under adverse conditions. The detailed analysis is summarized in Table 8.7 on changes of wastewater tariff and collection, and water sales, and Table 8.8 on changes of investment, O&M cost, and combined factors.

Table 8.7 Sensitivity Analysis on Changes of Wastewater Tariff and Collection, and Water Sales on FIRR and NPV Estimates

Part a					
WW Tariff	FIRR	NPV (CNY)	Water Sales	FIRR	NPV (CNY)
-17.5%	7.48%	185,356	-17.5%	7.48%	185,356
-15.0%	8.25%	231,602	-15.0%	8.25%	231,602
-12.5%	8.99%	277,847	-12.5%	8.99%	277,847
-10.0%	9.70%	324,093	-10.0%	9.70%	324,093
-7.5%	10.39%	370,339	-7.5%	10.39%	370,339
-5.0%	11.07%	416,585	-5.0%	11.07%	416,585
-2.5%	11.72%	462,830	-2.5%	11.72%	462,830
0.0%	12.36%	509,076	0.0%	12.36%	509,076
2.5%	12.99%	555,322	2.5%	12.99%	555,322
5.0%	13.60%	601,567	5.0%	13.60%	601,567
7.5%	14.20%	647,813	7.5%	14.20%	647,813
10.0%	14.79%	694,059	10.0%	14.79%	694,059
12.5%	15.37%	740,305	12.5%	15.37%	740,305
15.0%	15.95%	786,550	15.0%	15.95%	786,550
17.5%	16.51%	832,796	17.5%	16.51%	832,796
20.0%	17.06%	879,042	20.0%	17.06%	879,042

Part b					
WW Tariff Collection	FIRR	NPV (CNY)	WW Tariff & Collection, and Water Sales	FIRR	NPV (CNY)
-17.5%	7.48%	185,356	-17.5%		-302,045
-15.0%	8.25%	231,602	-15.0%	-1.36%	-204,726
-12.5%	8.99%	277,847	-12.5%	1.66%	-101,512
-10.0%	9.70%	324,093	-10.0%	4.16%	7,773
-7.5%	10.39%	370,339	-7.5%	6.39%	123,300

WW Tariff Collection	FIRR	NPV (CNY)	WW Tariff & Collection, and Water Sales	FIRR	NPV (CNY)
-5.0%	11.07%	416,585	-5.0%	8.47%	245,244
-2.5%	11.72%	462,830	-2.5%	10.44%	373,778
0.0%	12.36%	509,076	0.0%	12.36%	509,076
2.5%	12.99%	555,322	2.5%	14.25%	651,310
5.0%	13.60%	601,567	5.0%	16.12%	800,655
7.5%	14.20%	647,813	7.5%	17.98%	957,284
10.0%	14.79%	694,059	10.0%	19.86%	1,121,369
12.5%	15.37%	740,305	12.5%	21.74%	1,293,085
15.0%	15.95%	786,550	15.0%	23.64%	1,472,605
17.5%	16.51%	832,796	17.5%	25.55%	1,660,103
20.0%	17.06%	879,042	20.0%	27.49%	1,855,751

Table 8.8 Sensitivity Analyses on Changes of Investment, O&M Cost and Combined Factors on FIRR and NPV Estimates

Investment	FIRR	NPV (CNY)	O&M cost Changes	FIRR	NPV (CNY)	Combined Factors	FIRR	NPV (CNY)
-17.5%	15.31%	592,280	-17.5%	14.20%	660,504	-17.5%	31.67%	1,894,734
-15.0%	14.83%	580,394	-15.0%	13.95%	638,871	-15.0%	28.59%	1,673,718
-12.5%	14.36%	568,507	-12.5%	13.69%	617,239	-12.5%	25.65%	1,460,679
-10.0%	13.93%	556,621	-10.0%	13.43%	595,606	-10.0%	22.82%	1,255,444
-7.5%	13.51%	544,735	-7.5%	13.17%	573,974	-7.5%	20.10%	1,057,840
-5.0%	13.11%	532,849	-5.0%	12.91%	552,341	-5.0%	17.47%	867,693
-2.5%	12.73%	520,962	-2.5%	12.64%	530,709	-2.5%	14.90%	684,829
0.0%	12.36%	509,076	0.0%	12.36%	509,076	0.0%	12.36%	509,076
2.5%	12.01%	497,190	2.5%	12.09%	487,443	2.5%	9.82%	340,260
5.0%	11.68%	485,303	5.0%	11.80%	465,811	5.0%	7.21%	178,207
7.5%	11.35%	473,417	7.5%	11.52%	444,178	7.5%	4.44%	22,744
10.0%	11.04%	461,531	10.0%	11.23%	422,546	10.0%	1.32%	-126,303
12.5%	10.74%	449,645	12.5%	10.93%	400,913	12.5%		-269,106
15.0%	10.46%	437,758	15.0%	10.63%	379,281	15.0%		-405,839
17.5%	10.18%	425,872	17.5%	10.32%	357,648	17.5%		-536,676
20.0%	9.91%	413,986	20.0%	10.01%	336,016	20.0%		-661,791

Financial Statement Projections

8.3.36 In the FS projections, the incremental wastewater tariff assumed above in the DCF analysis is added on top of the current prevailing wastewater tariff of CNY 0.80 / m³ in Wuhan. The incremental wastewater tariff will be applied to the total water sold in the main urban areas to arrive at total wastewater tariff revenues for the IA. The wastewater tariffs in real terms used in the DCF analysis were converted into nominal terms in the FS projections. Income statement, balance sheet and cash flow statement projections for the existing WDC for the scenario of "without the three subprojects in the main urban areas" were conducted taking account of:

- major capital expenditures described in Para 8.3.5;
- related O&M costs; and
- other related costs and arrangements.

8.3.37 FS projections for the three subprojects were prepared and then consolidated into WDC's financial statements to form the "with project" scenario. The FS projections for WDC were prepared in nominal price terms including inflation adjusted costs and revenues in each year from 2006 to 2018.

8.3.38 Both DCF analysis and FS projections have shown satisfactory results based upon the progressively step by step tariff increasing approach. Given that the current wastewater tariff is CNY 0.80 / m³, an initial wastewater tariff increase to CNY 0.95 / m³ in real terms in 2006 (the first year of project implementation) would allow WMG to accumulate part of construction fund during construction period. This is critical for WMG to ensure adequate and timely provision of counterpart funds during project implementation. The wastewater tariff is suggested to increase further to CNY 1.00 / m³ in real terms in 2009. A progressively tariff increase of CNY 0.20 / m³ every year over the four years period would be considered acceptable. This would allow WDC to realize full cost recovery and to maintain satisfactory financial performance and achieve long term sustainability.

8.4 Financial Analysis for Wastewater Management Subproject in Dongxihu District

Introduction

8.4.1. WDC would be responsible for implementing and operating the proposed extension of wastewater collection network to serve Wujiashan and southern Jinyinhu in Dongxihu District. Currently, the Dongxihu Water Supply Company (DWSC) supplies potable water mainly to Wujiashan. The water tariffs have been levied in the area, while a wastewater tariff of CNY 0.05 / m³ is levied on top of water sold since 2003. The EA indicates that DWSC will continue its responsibility to collect water tariff and wastewater tariff revenues.

8.4.2. Water supply to some areas in Wujiashan and Jinyinhu adjacent to the main urban area is provided by the Wuhan Water Supply Group Co., Ltd. (WWSCL). No wastewater charges for the water consumers in these areas presently. The EA indicates that WWSCL will be assigned to collect wastewater tariff, the level of which would be Dongxihu, and need not be that levied in the main urban area. WDC would also collect wastewater tariff revenues from self supplied ground water users in Dongxihu.

Project Revenues

8.4.3 Project revenues are based on the wastewater tariff charged on the customer water demand. Water demand and wastewater projections for Dongxihu, provided in the FSRs are reviewed and discussed in Section 9.4 and Appendix I5.

8.4.4 The PPTA consultants propose that a wastewater tariff increase be applied to Wujiashan and southern Jinyinhu in Dongxihu; and the tariff be levied on top of the potable water sold. The wastewater tariffs revenues have been calculated based on water demand/sold in the above water demand projection. In addition to 15 % non revenue water and an initial 20 % un-collectable rate for the wastewater tariff revenues have been assumed. The un-collectable rate has been assumed to decrease gradually to 5 % by 2015 and onwards.

Current Water and Wastewater Tariff in Dongxihu

8.4.5 The current categorized water and wastewater tariffs in Dongxihu are shown in Table 8.9. The current wastewater tariff is only 0.05 yuan/m³, mainly applied in the Wujiashan area. Water tariff are relatively higher than those in the main urban areas. The end user water and wastewater tariffs in the Wujiashan area are of CNY 1.16 /m³ for resident water user, CNY 1.35 /m³ for industries, CNY 1.42 /m³ for commercial water users, CNY 2.12 /m³ for public institutions, and CNY 2.32 /m³ for special industries.

Table 8.9 Dongxihu Current Water and Wastewater Tariffs (CNY/m³)

Consumer Categories	Water Tariffs	Water Resource Fee	Wastewater Tariffs	End User Tariff
Domestic	1.10	0.01	0.05	1.16
Industrial	1.29	0.01	0.05	1.35
Commercial	1.35	0.02	0.05	1.42
Institutional	2.05	0.02	0.05	2.12
Special	2.25	0.02	0.05	2.32

Assumptions in Financial Analysis

8.4.6 Major assumptions for the DCF analysis and FS projections are the same as those described in Section 8.3 for the main urban area. Major points used for this subproject that are different from those used for the main urban areas are:

- The DCF analysis is conducted covering the period from 2006 to 2033. Pro forma income statement, balance sheet and cash flow statement projections for the have been carried out covering the period from 2006 to 2018;
- The subproject in Dongxihu will be partially commissioned in 2009, and fully operational by 2020. Construction in progress is transferred to the balance sheet as fixed assets at end of the implementation period at end 2010; and

- In the DCF analysis, an incremental wastewater tariff increasing plan is assumed to achieve full cost recovery for the subproject itself, as detailed in Para 8.4.11 below.

Discounted Cash Flow Analysis

8.4.7 A similar approach to DCF analysis as that described in Section 8.3 has been conducted for Dongxihu. The resultant progressive incremental wastewater tariff increasing plan, not taking account of wastewater treatment cost, is presented in Table 8.10

Table 8.10 Proposed Incremental Wastewater Tariff (CNY / m³)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tariff in Real Terms	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Tariff in Nominal Terms	0.43	0.45	0.46	0.47	0.49	0.50	0.52	0.53	0.55

8.4.8 With the proposed incremental wastewater tariff above, summarized detailed DCF analysis is presented in Table 8.11 including DCF results of FIRR, FNPV and AIFC each in 2 scenarios, including deprecation costs and excluding depreciation costs.

8.4.9 FIRR for the Dongxihu wastewater subproject, computed on an after tax basis, is 7.58 %. This compares favorably with the 4 % WACC, also computed on an after tax basis. The AIFC based on the volume of wastewater collected without depreciation and amortization costs is CNY 0.30 / m³. If the depreciation and amortization costs are included, the AIFC is CNY 0.38 / m³. The Project is considered both financially viable and sustainable.

Table 8.11 Discounted Cash Flow Analysis and Results

		Wastewater Tariff CNY / m ³ A	Wastewater Treated 000 m ³ /a B	Financial revenue 000 CNY C	Capital costs 000 CNY D	O&M costs 000 CNY E	Depreciation Amortization 000 CNY F	Total costs 000 CNY G=D+E+F	Total excluding depreciation 000 CNY H=G-F	Net Cash Flow 000 CNY I=C-H
1	2006	0.30	0	0	4,321	0	0	4,321	4,321	-4,321
2	2007	0.30	0	0	1,729	0	0	1,729	1,729	-1,729
3	2008	0.30	0	0	65,686	0	0	65,686	65,686	-65,686
4	2009	0.40	21,900	14,154	65,686	1,302	0	66,988	66,988	-52,834
5	2010	0.40	32,850	15,178	35,436	2,447	0	37,883	37,883	-22,705
6	2011	0.40	43,800	17,292		4,417	8,153	12,571	4,417	12,875
7	2012	0.40	54,750	18,542		5,835	8,153	13,988	5,835	12,707
8	2013	0.40	65,700	21,051		6,780	8,153	14,934	6,780	14,271
9	2014	0.40	71,175	22,572		7,429	8,153	15,583	7,429	15,143
10	2015	0.40	76,650	25,548		8,395	8,153	16,548	8,395	17,153
11	2016	0.40	87,600	27,381		13,363	8,153	21,516	13,363	14,018
12	2017	0.40	93,075	29,345		14,532	8,153	22,685	14,532	14,813
13	2018	0.40	98,550	31,450		15,799	8,153	23,952	15,799	15,652
14	2019	0.40	104,025	33,707		17,172	8,153	25,326	17,172	16,534
15	2020	0.40	109,500	36,125		20,578	8,153	28,732	20,578	15,546
16	2021	0.40	109,500	36,667		20,844	8,153	28,997	20,844	15,823
17	2022	0.40	109,500	37,217		21,113	8,153	29,266	21,113	16,104
18	2023	0.40	109,500	37,775		21,646	7,166	28,812	21,646	16,129
19	2024	0.40	109,500	38,342		22,183	6,179	28,362	22,183	16,159
20	2025	0.40	109,500	38,917		23,584	6,179	29,763	23,584	15,332
21	2026	0.40	109,500	39,500		23,887	6,179	30,066	23,887	15,614
22	2027	0.40	109,500	40,093		24,194	6,179	30,373	24,194	15,899
23	2028	0.40	109,500	40,694		24,506	6,179	30,685	24,506	16,189
24	2029	0.40	109,500	41,305		24,822	6,179	31,001	24,822	16,483
25	2030	0.40	109,500	41,924		25,143	6,179	31,322	25,143	16,781
26	2031	0.40	109,500	42,553		25,469	6,179	31,648	25,469	17,084
27	2032	0.40	109,500	43,191		25,800	6,179	31,979	25,800	17,392
28	2033	0.40	109,500	43,839		26,135	6,179	32,314	26,135	17,704

NPV	4.00								
@	%	1,173,976	416,197	149,423	206,026	91,171	446,620	355,449	60,748
Per m³ WW			0.35	0.13	0.18	0.08	0.38	0.30	0.05
							AIFC	AIFC	
IRR									7.58%

8.4.10 Sensitivity tests have been carried out for the subproject. Under the proposed progressively wastewater tariff increasing plan, the subproject is relatively sensitive to the simultaneous changes (decreases) in wastewater tariff, volume of water sold and wastewater revenue collection rate, as after 5.14 % simultaneous decrease of the three factors the FIRR would be lower than WACC of 4 %. In the case of all five factors (wastewater tariff, water sold amount, wastewater revenue collection rate, capital investment costs and O&M costs) changing by the same proportion at the same time, the FIRR and NPV would be sensitive up to about 3.9 % change, and the FIRR would be lower than WACC of 4 %. In the case that 33 % income tax rate is applied throughout the whole life of the project, the FIRR would be 6.57 %, higher than WACC of 4 %. This sensitivity analysis indicates that the FIRR would be acceptable under adverse conditions. The detailed analysis is summarized in Table 8.12 on changes of wastewater tariff and collection, and water sales, and Table 8.13 on changes of investment, O&M cost, and combined factors..

Table 8.12 Sensitivity Analysis on Changes of Wastewater Tariff and Collection, and Water Sales on FIRR and NPV Estimates

Part a					
WW Tariff	FIRR	NPV (CNY)	Water Sales	FIRR	NPV (CNY)
-17.5%	3.14%	-12,087	-17.5%	3.14%	-12,087
-15.0%	3.88%	-1,682	-15.0%	3.88%	-1,682
-12.5%	4.58%	8,723	-12.5%	4.58%	8,723
-10.0%	5.24%	19,128	-10.0%	5.24%	19,128
-7.5%	5.86%	29,533	-7.5%	5.86%	29,533
-5.0%	6.46%	39,938	-5.0%	6.46%	39,938
-2.5%	7.03%	50,343	-2.5%	7.03%	50,343
0.0%	7.58%	60,748	0.0%	7.58%	60,748
2.5%	8.11%	71,153	2.5%	8.11%	71,153
5.0%	8.63%	81,557	5.0%	8.63%	81,557
7.5%	9.13%	91,962	7.5%	9.13%	91,962
10.0%	9.62%	102,367	10.0%	9.62%	102,367
12.5%	10.09%	112,772	12.5%	10.09%	112,772
15.0%	10.56%	123,177	15.0%	10.56%	123,177
17.5%	11.01%	133,582	17.5%	11.01%	133,582
20.0%	11.45%	143,987	20.0%	11.45%	143,987

Part b					
Tariff Collection	FIRR	NPV (CNY)	WW Tariff and Collection, and Water Sales	FIRR	NPV (CNY)
-17.5%	3.14%	-12,087	-17.5%		-121,748
-15.0%	3.88%	-1,682	-15.0%		-99,852
-12.5%	4.58%	8,723	-12.5%		-76,630
-10.0%	5.24%	19,128	-10.0%		-52,042
-7.5%	5.86%	29,533	-7.5%	2.06%	-26,049
-5.0%	6.46%	39,938	-5.0%	4.09%	1,388
-2.5%	7.03%	50,343	-2.5%	5.91%	30,307
0.0%	7.58%	60,748	0.0%	7.58%	60,748

2.5%	8.11%	71,153	2.5%	9.17%	92,749
5.0%	8.63%	81,557	5.0%	10.70%	126,351
7.5%	9.13%	91,962	7.5%	12.19%	161,591
10.0%	9.62%	102,367	10.0%	13.65%	198,509
12.5%	10.09%	112,772	12.5%	15.11%	237,143
15.0%	10.56%	123,177	15.0%	16.57%	277,534
17.5%	11.01%	133,582	17.5%	18.04%	319,719
20.0%	11.45%	143,987	20.0%	19.52%	363,739

Table 8.13 Sensitivity Analyses on Changes of Investment, O&M Cost and Combined Factors on FIRR and NPV Estimates

Investment	FIRR	NPV (CNY)	O&M Cost	FIRR	NPV (CNY)	Combined Factors	FIRR	NPV (CNY)
-17.5%	9.95%	86,897	-17.5%	9.21%	96,802	-17.5%	22.73%	381,923
-15.0%	9.56%	83,161	-15.0%	8.99%	91,652	-15.0%	20.36%	330,851
-12.5%	9.20%	79,426	-12.5%	8.77%	86,501	-12.5%	18.11%	281,575
-10.0%	8.84%	75,690	-10.0%	8.54%	81,350	-10.0%	15.95%	234,054
-7.5%	8.51%	71,954	-7.5%	8.31%	76,200	-7.5%	13.85%	188,249
-5.0%	8.19%	68,219	-5.0%	8.07%	71,049	-5.0%	11.78%	144,123
-2.5%	7.88%	64,483	-2.5%	7.83%	65,898	-2.5%	9.70%	101,635
0.0%	7.58%	60,748	0.0%	7.58%	60,748	0.0%	7.58%	60,748
2.5%	7.30%	57,012	2.5%	7.33%	55,597	2.5%	5.35%	21,421
5.0%	7.03%	53,276	5.0%	7.06%	50,446	5.0%	2.88%	-16,385
7.5%	6.76%	49,541	7.5%	6.79%	45,296	7.5%	0	-52,708
10.0%	6.51%	45,805	10.0%	6.52%	40,145	10.0%		-87,587
12.5%	6.27%	42,070	12.5%	6.23%	34,994	12.5%		-121,061
15.0%	6.03%	38,334	15.0%	5.94%	29,844	15.0%		-153,170
17.5%	5.80%	34,599	17.5%	5.63%	24,693	17.5%		-183,952
20.0%	5.58%	30,863	20.0%	5.32%	19,542	20.0%		-213,446

Pro Forma Financial Statement Projections

8.4.11 Most of the wastewater collected is conveyed to the Hanxi WWTP and a small portion of the wastewater is conveyed to Sanjintan WWTP for secondary treatment. As such, wastewater treatment costs incurred in the two WWTPs will be covered by the wastewater tariff revenues gathered from the subproject service area, Wujiashan and southern Jinyinhu. Unit secondary wastewater treatment cost of CNY 0.55 / m³ has assumed, which is added on top of the incremental wastewater tariff for the subproject itself (derived from DCF analysis) to derive the overall wastewater tariff. This tariff increasing plan has been used to calculate wastewater revenues to prepare the pro forma FS projections for the subproject. The overall wastewater tariff increasing plan is given in Table 8.14.

Table 8.14 Proposed Overall Incremental Wastewater Tariff (CNY / m³)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tariff in Real Terms	0.40	0.40	0.40	0.95	0.95	0.95	0.95	0.95	0.95
Tariff in Nominal Terms	0.43	0.45	0.46	1.12	1.16	1.19	1.23	1.26	1.30

8.4.12 Detailed FS projections in nominal price terms including inflation adjusted costs and revenues in each year from 2006 to 2018 have been prepared for the subproject. Both DCF analysis and FS projections have shown satisfactory results based upon the progressive wastewater tariff increase approach. An initial wastewater water tariff of CNY 0.40 / m³ in real terms to be introduced in 2006 or 2007 in the subproject related area would allow the Dongxihu district and WMG to accumulate significant amount of fund during construction period This is critical for the Government to ensure adequate and timely provision of counterpart funds during project implementation. It is suggested that the wastewater tariff in real terms be increased to CNY 0.95 / m³ in 2010 and beyond for full cost recovery of the subproject and for covering wastewater treatment costs incurred in the WWTPs. The progressive tariff increase is considered acceptable, and important to achieve full cost recovery and to maintain satisfactory financial performance and achieve long term sustainability of the subproject.

8.4.13 The Pro Forma FS projections for the subproject are to be consolidated into the WDC's financial statement projections.

8.5 Financial Analysis for Wastewater Management Subproject in Caidian District

Introduction

8.5.1. The subproject in Caidian includes a new WWTP and its wastewater collection system. The Caidian Water Supply Company (CWSC) supplies potable water mainly to the Caidian Avenue area. The water tariffs have been levied in the Caidian Avenue area, while wastewater tariff has yet been introduced in whole of the Caidian District. The EA indicates that CWSC will be responsible for collecting water tariff and wastewater tariff revenues, and WDC will be responsible for construction and O&M of the proposed subproject in Caidian.

Project Revenues

8.5.2. Project revenues are based on the wastewater tariff charged on the customer water demand. Water demand and wastewater projections for Caidian, provided in the FSRs are reviewed and discussed in Section 9.4 and Appendix 15.

8.5.3. The PPTA consultants propose that a newly introduced wastewater tariff on top of the potable water sold be applied in the Caidian Avenue area and the rest of the project related areas in Caidian District. In addition to 15 % non revenue water and an initial 20 % un-collectable rate for the wastewater tariff

revenues have been assumed. The un-collectable rate has been assumed to decrease gradually to 5 % by 2015 and onwards.

Current Water and Wastewater Tariff in Caidian

8.5.4. The current categorized water tariffs in Caidain are shown in Table 8.15. The water tariffs in the Caidian Avenue area are CNY 1.20 / m³ for the domestic water users, CNY 1.36 / m³ for industrial water users, CNY 1.52 / m³ for the commercial water users, CNY 1.83 / m³ for the public institutions, and CNY1.95 / m³ for special industries. They are relatively higher than those in the main urban area. Wastewater tariff has not yet been introduced in Caidian.

Table 8.15 Caidian Current Water Tariff^a (CNY/m³)

Consumer Categories	Water Tariffs	Water Resource Fee	End User Tariff
Domestic	1.19	0.01	1.20
Industrial	1.35	0.01	1.36
Commercial	1.50	0.02	1.52
Institutional	1.81	0.02	1.83
Special	1.93	0.02	1.95

a/ Effective from August 2002.

Assumptions in Financial Analysis

8.5.5. Major assumptions for the DCF analysis and FS projections are the same as those described in Section 8.3 for the main urban area. Major points used for this subproject that are different from those used for the main urban areas are:

- The DCF analysis is conducted covering the period from 2006 to 2033. Pro forma income statement, balance sheet and cash flow statement projections for the have been carried out covering the period from 2006 to 2018; and
- The subproject in Caidain will be partially commissioned in 2010, and fully operational by 2012. Construction in progress is transferred to the balance sheet as fixed assets at end of the implementation period at end 2009.

Discounted Cash Flow Analysis

8.5.6. The 4 % WACC of was computed on an after tax basis in real terms, and the nominal financial cash flow is converted to real terms by removing the impacts of inflation and potential currency fluctuation. A similar approach to DCF analysis as that described in Section 8.3 has been conducted for Caidain. The resultant progressive incremental wastewater tariff increasing plan, not taking account of wastewater treatment cost, is presented in Table 8.16.

Table 8.16 Proposed Wastewater Tariff (CNY / m³)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Tariff in Real Terms	0.20	0.20	0.20	0.80	0.80	0.95	0.95	0.95	0.95
Tariff in Nominal Terms				0.95	0.97	1.19	1.23	1.26	1.30

8.5.7. With the proposed incremental wastewater tariff above, summarized detailed DCF analysis is presented in Table 8.17 including the DCF results of FIRR, FNPV and AIFC each in 2 scenarios, including depreciation costs and excluding depreciation costs.

8.5.8. FIRR for the Caidian wastewater subproject, computed on an after tax basis, is 10.91 %. This compares favorably with the 4 % WACC, also computed on an after tax basis. The AIFC based on the volume of wastewater collected without depreciation and amortization costs is CNY 1.06 / m³. If the depreciation and amortization costs are included, the AIFC is CNY 1.32 / m³. The Project is considered both financially viable and sustainable.

Table 8.17 Discounted Cash Flow Analysis and Results

		Wastewater Tariff CNY / m ³ A	Wastewater Treated 000 m ³ /a B	Financial revenues 000 CNY C	Capital costs 000 CNY D	O&M costs 000 CNY E	Depreciation Amortization 000 CNY F	Total costs 000 CNY G=D+E+F	Total excluding depreciation 000 CNY H=G-F	Net Cash Flow 000 CNY I=C-H
1	2006	0.00	0	0	3,090	0	0	3,090	3,090	-3,090
2	2007	0.40	0	0	27,811	0	0	27,811	27,811	-27,811
3	2008	0.40	0	0	39,141	0	0	39,141	39,141	-39,141
4	2009	0.40	0	0	27,811	0	0	27,811	27,811	-27,811
5	2010	0.80	10,950	11,035	5,150	4,381	5,331	14,862	9,531	1,503
6	2011	0.80	14,600	12,571		5,901	5,331	11,231	5,901	6,671
7	2012	0.95	18,250	16,013		7,507	5,331	12,838	7,507	8,506
8	2013	0.95	18,250	18,194		7,834	5,331	13,165	7,834	10,360
9	2014	0.95	18,250	19,532		8,035	5,331	13,366	8,035	11,497
10	2015	0.95	18,250	22,142		8,427	5,331	13,757	8,427	13,716
11	2016	0.95	18,250	23,918		10,788	5,331	16,119	10,788	13,130
12	2017	0.95	18,250	25,848		11,425	5,331	16,756	11,425	14,423
13	2018	0.95	18,250	27,946		12,118	5,331	17,448	12,118	15,829
14	2019	0.95	18,250	30,229		12,871	5,331	18,202	12,871	17,358
15	2020	0.95	18,250	32,713		13,691	5,331	19,021	13,691	19,023
16	2021	0.95	18,250	33,179		13,844	5,331	19,175	13,844	19,334
17	2022	0.95	18,250	33,656		14,286	4,249	18,535	14,286	19,370
18	2023	0.95	18,250	34,144		14,732	3,168	17,900	14,732	19,413
19	2024	0.95	18,250	34,646		14,897	3,168	18,065	14,897	19,748
20	2025	0.95	18,250	35,159		15,067	3,168	18,234	15,067	20,092
21	2026	0.95	18,250	35,686		15,240	3,168	18,408	15,240	20,445
22	2027	0.95	18,250	36,225		15,418	3,168	18,586	15,418	20,807
23	2028	0.95	18,250	36,778		15,601	3,168	18,769	15,601	21,177
24	2029	0.95	18,250	37,345		15,788	3,168	18,956	15,788	21,557
25	2030	0.95	18,250	37,926		15,980	3,168	19,148	15,980	21,946
26	2031	0.95	18,250	38,522		16,176	3,168	19,344	16,176	22,346
27	2032	0.95	18,250	39,132		16,378	3,168	19,546	16,378	22,755
28	2033	0.95	18,250	39,758		16,600	3,107	19,707	16,600	23,158
NPV@ 4.00%			228,971	356,961	91,486	152,160	59,173	302,819	243,646	113,315
Per m³ WW				1.56	0.40	0.66	0.26	1.32	1.06	0.49
IRR								AIFC	AIFC	10.91%

Sensitivity tests have been carried out for the subproject. Under the proposed progressively wastewater tariff increasing plan, the subproject is relatively sensitive to the simultaneous changes (decreases) in wastewater tariff, volume of water sold and wastewater revenue collection rate, as after 11.95 % simultaneous decrease of the three factors the FIRR would be lower than WACC of 4 %. In the case of all five factors (wastewater tariff, water sold amount, wastewater revenue collection rate, capital investment costs and O&M costs) changing by the same proportion at the same time, the FIRR and NPV would be sensitive up to about 9.3 % change, and the FIRR would be lower than WACC of 4 %. In the case that 33 % income tax rate is applied throughout the whole life of the project, the FIRR would be 10.61 %, higher than WACC of 4 %. This sensitivity analysis indicates that the FIRR would be acceptable under adverse conditions. The detailed analysis is summarized in Table 8.18 on changes of wastewater tariff and collection, and water sales, and Table 8.19 on changes of investment, O&M cost, and combined factors..

Table 8.18 Sensitivity Analysis on Changes of Wastewater Tariff and Collection, and Water Sales on FIRR and NPV Estimates

Part a					
WW Tariff	FIRR	NPV (CNY)	Water Sales	FIRR	NPV (CNY)
-17.5%	7.55%	50,847	-17.5%	7.55%	50,847
-15.0%	8.08%	59,771	-15.0%	8.08%	59,771
-12.5%	8.59%	68,695	-12.5%	8.59%	68,695
-10.0%	9.09%	77,619	-10.0%	9.09%	77,619
-7.5%	9.56%	86,543	-7.5%	9.56%	86,543
-5.0%	10.03%	95,467	-5.0%	10.03%	95,467
-2.5%	10.47%	104,391	-2.5%	10.47%	104,391
0.0%	10.91%	113,315	0.0%	10.91%	113,315
2.5%	11.33%	122,239	2.5%	11.33%	122,239
5.0%	11.75%	131,163	5.0%	11.75%	131,163
7.5%	12.15%	140,087	7.5%	12.15%	140,087
10.0%	12.55%	149,011	10.0%	12.55%	149,011
12.5%	12.94%	157,935	12.5%	12.94%	157,935
15.0%	13.31%	166,859	15.0%	13.31%	166,859
17.5%	13.69%	175,783	17.5%	13.69%	175,783
20.0%	14.05%	184,707	20.0%	14.05%	184,707

Part b					
WW Tariff Collection	FIRR	NPV (CNY)	WW Tariff & Collection, Water Sales	FIRR	NPV (CNY)
-17.5%	7.55%	50,847	-17.5%		-43,207
-15.0%	8.08%	59,771	-15.0%	1.77%	-24,427
-12.5%	8.59%	68,695	-12.5%	3.62%	-4,510
-10.0%	9.09%	77,619	-10.0%	5.28%	16,579
-7.5%	9.56%	86,543	-7.5%	6.80%	38,872
-5.0%	10.03%	95,467	-5.0%	8.24%	62,404
-2.5%	10.47%	104,391	-2.5%	9.60%	87,207
0.0%	10.91%	113,315	0.0%	10.91%	113,315

2.5%	11.33%	122,239	2.5%	12.18%	140,762
5.0%	11.75%	131,163	5.0%	13.43%	169,581
7.5%	12.15%	140,087	7.5%	14.65%	199,806
10.0%	12.55%	149,011	10.0%	15.86%	231,469
12.5%	12.94%	157,935	12.5%	17.05%	264,605
15.0%	13.31%	166,859	15.0%	18.24%	299,247
17.5%	13.69%	175,783	17.5%	19.42%	335,429
20.0%	14.05%	184,707	20.0%	20.60%	373,183

Table 8.19 Sensitivity Analyses on Changes of Investment, O&M Cost and Combined Factors on FIRR and NPV Estimates

Investment	FIRR	NPV (CNY)	O&M Cost	FIRR	NPV (CNY)	Combined Factors	FIRR	NPV (CNY)
-17.5%	12.88%	129,325	-17.5%	12.15%	139,943	-17.5%	23.08%	378,067
-15.0%	12.56%	127,038	-15.0%	11.98%	136,139	-15.0%	21.26%	335,794
-12.5%	12.26%	124,751	-12.5%	11.81%	132,335	-12.5%	19.47%	295,061
-10.0%	11.97%	122,464	-10.0%	11.63%	128,531	-10.0%	17.73%	255,834
-7.5%	11.69%	120,177	-7.5%	11.45%	124,727	-7.5%	16.01%	218,079
-5.0%	11.42%	117,890	-5.0%	11.27%	120,923	-5.0%	14.32%	181,763
-2.5%	11.16%	115,602	-2.5%	11.09%	117,119	-2.5%	12.62%	146,853
0.0%	10.91%	113,315	0.0%	10.91%	113,315	0.0%	10.91%	113,315
2.5%	10.67%	111,028	2.5%	10.73%	109,511	2.5%	9.17%	81,116
5.0%	10.43%	108,741	5.0%	10.54%	105,707	5.0%	7.37%	50,221
7.5%	10.21%	106,454	7.5%	10.35%	101,903	7.5%	5.47%	20,599
10.0%	9.99%	104,167	10.0%	10.16%	98,099	10.0%	3.40%	-7,786
12.5%	9.78%	101,880	12.5%	9.96%	94,295	12.5%	1.07%	-34,965
15.0%	9.57%	99,592	15.0%	9.77%	90,491	15.0%		-60,974
17.5%	9.37%	97,305	17.5%	9.57%	86,687	17.5%		-85,844
20.0%	9.17%	95,018	20.0%	9.37%	82,883	20.0%		-109,611

Pro Forma Financial Statement Projections

8.5.9. Detailed FS projections in nominal price terms including inflation adjusted costs and revenues in each year from 2006 to 2018 have been prepared for the subproject. The projected income statement, balance sheet and cash flow statement are presented in Tables 8.21, 8.22 and 8.23, together with major financial ratios computed under each table.

8.5.10. The subproject would show profit in 2012 when 100 % of the 50,000 m³/d water treatment capacity is utilized. Full cost recovery can be achieved in 2013 while the return on equity (ROE) indicator is about 7.84 %, slightly lower than 8 %. A debt services coverage ratio of 0.96 would be reached in 2015, though lower than 1.30 required under the generally accepted definition of this ratio. However; this ratio can reach 3.04 in 2017. The cost recovery ratio in the ADB's AOTA definition for water tariff setting, will reach 1.08 in 2012, higher than the required 1.00. Overall it shows acceptable and reasonably viable results.

8.5.11. Both DCF analysis and FS projections have shown satisfactory results based upon the progressively step by step tariff increasing approach. An initial wastewater tariff of CNY 0.40 / m³ in real terms in 2006 or 2007 would allow the Caidian district and WMG to accumulate part of construction fund during the construction period. This is critical for the Government to ensure adequate and timely provision of counterpart funds during project implementation. The wastewater tariff is suggested to increase further to CNY 0.80 / m³ in real terms in 2010. A progressively tariff increase of every 2 years over would be considered acceptable. This would allow full cost recovery, satisfactory financial performance and long term sustainability to be achieved.

8.5.12. The Pro Forma FS projections for the subproject are to be consolidated into the WDC's financial statement projections.

8.6 Financial Analysis - Summary

Conclusions

8.6.1. Wastewater charges were implemented in the main urban area of Wuhan in 1988 at a rate of CNY 0.08 / m³. The rate has been increased progressively over the years to the current level of CNY 0.80 / m³. The increase is equivalent to 400 % from 1988 to 2005. Between 1999 and 2005, the wastewater tariff has increased by 317 %, while the water tariffs have increased by about 14 %. The combined water and wastewater tariff increase for different categories of consumers are :

- domestic 86 %;
- industrial 70 %;
- institution 83%;
- commercial 53%; and
- special industry 47%.

8.6.2 It is noted that wastewater tariffs had not yet been introduced in Caidian, while CNY 0.05 / m³ wastewater tariff is levied on top of potable water sold in Dongxihu.

8.6.3 The PPTA consultants conducted DCF analysis and FS projections to test wastewater tariff required to achieve full cost recovery for the Project. It was realized that it would not be possible to apply a uniform wastewater tariff in the whole suburban district given only one subproject to serve a small area, while residents in the other areas are not beneficiaries. In view of that, it is important to identify the subproject related area where a wastewater tariff introduction or increase is to apply. Equally important issues to achieve full cost recovery and to ensure long term sustainability of a subproject include:

- realist population projection in the subproject related area;
- realistic water demand assessments in the subproject related area, as a wastewater tariff is to be levied on top of the water sold;
- improved water supply system; and
- strengthened water and wastewater tariff revenues collecting system.

8.6.4 For the WWTPs subprojects in the main urban area, given that the current wastewater tariff is CNY 0.80 / m³, a progressive tariff increase plan with an initial increase to CNY 0.95 / m³ in real terms in 2006 the subproject implementation commences. The wastewater tariff is suggested to increase further to CNY 1.00 / m³ in real terms in 2009.

8.6.5 An initial wastewater water tariff of CNY 0.40 / m³ in real terms is proposed to be introduced in 2006 or 2007 in Dongxihu for WMG to accumulate significant amount of fund during construction period. It is further suggested that the wastewater tariff in real terms be increased to CNY 0.95 / m³ in 2010 and onwards for full cost recovery of the subproject and to cover wastewater treatment costs incurred.

8.6.6 For the subproject in Caidian, a progressive wastewater tariff increase plan has been suggested. An initial wastewater water tariff of CNY 0.20 / m³ in real terms being introduced in 2007 in the subproject related area would allow the Caidian district and WMG to accumulate fund during construction period. The wastewater tariff in real terms is proposed to increase to CNY 0.80 / m³ in 2010 when the subproject comes into initial operation, and then to CNY 0.95 / m³ in 2012 when the wastewater system is fully operational.

8.6.7 The wastewater charges on beneficiaries in the two suburban districts would initially be set at adequate and affordable levels to achieve full cost recovery for the subprojects. WMG has indicated its intention to consider the same wastewater tariffs to be applied to the whole Wuhan municipality in the long run.

8.6.8 Table 8.20 below shows the proposed tariffs in real terms in the main urban area and Caidian and Dongxihu districts.

Table 8.20 Proposed Wastewater Tariffs (CNY/m³)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Main Urban Areas	0.80	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Dongxihu Suburban Area	0.05	0.05	0.45	0.45	0.45	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Caidian Suburban Area	0.00	0.00	0.20	0.20	0.20	0.80	0.80	0.95	0.95	0.95	0.95	0.95

Note: Tariffs expressed in Real Terms.

8.6.9 The wastewater component of the Project is affordable to beneficiaries and financial viable with the following financial internal rates of return (FIRR), all are higher than the real weighted cost of capital (WACC) of 4%:

- Main urban area – 12.36%;
- Dongxihu suburban area – 7.58%; and
- Caidian suburban area – 10.91%.

Consolidated Financial Statement Projections for WDC

8.6.10 The Pro Forma FS projections for the Caidian and Dongxihu subprojects have been consolidated into the FS projections for WDC. The detailed consolidated FS projections are given in Tables 8.21, 8.22 and 8.23. Under the proposed wastewater tariff increasing plans in the two suburban project related areas, together with the proposed wastewater tariff increasing plan in the main urban area, the overall consolidated FS projections for WDC show satisfactory results. A debt service coverage ratio of 1.29 can be reached in 2013, and 1.34 in can be reached in 2014 which is higher than 1.3 required. In addition, a satisfactory cost recovery ratio higher than 1.0 throughout the projection period can be expected. The ROE would be relatively low, at 4.3 in 2011 and 5.1 in 2012. However, the results would generally be considered satisfactory. Both the DCF analysis and FS projections have shown satisfactory results based upon the proposed progressive tariff increasing approach.

Table 8.21 WDC Consolidated Income Statement Projection

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
SALES	7,429	6,673	162,819	370,182	385,092	464,334	512,952	519,421	572,870	669,339	688,113	708,861	780,318	801,191	827,628	852,068	878,165	906,073
Less: Cost of goods sold	6,128	5,677	14,582	66,197	46,453	53,615	61,808	138,626	159,373	223,127	243,988	249,656	253,899	257,897	262,027	267,727	271,915	276,234
Selling expenses	0	0	486	13,301	13,837	16,684	18,431	18,664	20,017	22,470	22,876	23,407	25,634	26,133	26,653	27,209	27,790	28,400
Sales taxes and surcharges	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
REVENUE	1,300	996	147,751	290,684	324,802	394,035	432,714	362,132	393,480	423,743	421,248	435,798	500,785	517,161	538,948	557,132	578,459	601,439
Add: Other profit	191	382	662	476	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Less: Administrative expenses	1,536	1,630	3,802	3,419	3,368	9,696	8,012	5,116	20,146	35,179	38,942	39,272	37,803	37,995	38,195	38,594	38,683	38,773
Financial expenses	11	-9	-23	16,855	49,856	44,779	39,473	85,883	78,268	105,180	110,707	96,136	88,410	80,164	71,363	65,926	60,698	56,855
OPERATING REVENUE	(58)	(242)	144,634	270,886	271,579	339,560	385,228	271,133	295,066	283,384	271,599	300,390	374,572	399,002	429,390	452,612	479,078	505,812
Add: Investment income	0	0	0	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
Subsidies	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Non-operating income	34	242	0	56	56	56	56	56	56	56	56	56	56	56	56	56	56	56
Less: Non-operating expenses	0	0	156	71,230	71,230	71,230	119,410	135,470	151,530	154,618	155,866	157,084	158,893	160,593	163,150	165,487	168,147	171,171
Add: Profit adjustment of previous year	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL PROFIT	(23)	0	144,478	199,770	200,462	268,443	265,932	135,777	143,649	128,880	115,846	143,419	215,792	238,522	266,354	287,239	311,044	334,755
Less: Income tax	-	-	-	-	-	-	-	-	-	-	18,906	21,942	32,319	36,606	45,175	97,565	105,574	113,457
NET PROFIT	(23)	0	144,478	199,770	200,462	268,443	265,932	135,777	143,649	128,880	96,940	121,478	183,473	201,916	221,179	189,673	205,471	221,298
Operating Ratio			11.6%	22.4%	16.5%	17.2%	17.2%	31.3%	34.8%	41.9%	44.4%	44.1%	40.7%	40.2%	39.5%	39.1%	38.5%	37.9%
Rate of Return on Net Fixed Assets																		
Historically Valued Assets (%) =			32.1%	24.3%	27.7%	34.9%	19.7%	10.1%	9.2%	8.8%	8.7%	9.6%	12.9%	14.4%	16.2%	18.1%	20.5%	23.3%
Return on Equity (ROE) = Net profit after tax/Equity			21.4%	26.2%	19.7%	21.4%	17.1%	7.5%	7.2%	6.0%	4.3%	5.1%	7.3%	7.4%	7.5%	6.0%	6.2%	6.2%
Average Cost of Debt (%) =			0.0%	2.4%	5.3%	3.9%	2.9%	6.0%	5.6%	7.9%	9.3%	9.1%	9.5%	9.9%	10.1%	10.1%	9.9%	9.9%
Interest Coverage			12.85	5.02	6.99	7.74	2.58	2.84	2.23	2.05	2.49	3.44	3.98	4.73	5.36	6.12	6.89	
Profit Margin			88.7%	54.0%	52.1%	57.8%	51.8%	26.1%	25.1%	19.3%	14.1%	17.1%	23.5%	25.2%	26.7%	22.3%	23.4%	24.4%

Table 8.22 WDC Consolidated Balance Sheet Projection

Year ended 31 December	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
CURRENT ASSETS:																		
Cash	83,064	175,017	127,240	85,846	197,650	170,183	234,513	344,013	453,727	568,475	581,046	759,997	982,399	1,154,688	1,457,911	1,760,812	2,101,403	2,465,053
Accounts receivable - net	-	-	-	-	32,091	38,695	42,746	43,285	47,739	55,778	57,343	59,072	65,027	66,766	68,969	71,006	73,180	75,506
Advances to suppliers	8,216	11,206	17,315	30,105	30,105	30,105	30,105	30,105	30,105	30,105	30,105	30,105	30,105	30,105	30,105	30,105	30,105	30,105
Other receivable	189,665	412,576	505,909	263,843	48,136	58,042	64,119	64,828	71,809	83,667	86,014	88,608	97,540	100,149	103,453	106,508	109,771	113,259
Inventories	211	211	-	-	-	-	-	202	982	1,915	2,262	2,353	2,423	2,496	2,571	2,648	2,727	2,809
Other current assets	-	-	-	297,589	297,589	297,589	297,589	297,589	297,589	297,589	297,589	297,589	297,589	297,589	297,589	297,589	297,589	297,589
Total Current Assets	281,156	599,010	650,464	677,382	605,571	594,613	669,072	780,122	901,751	1,037,530	1,054,360	1,237,723	1,475,083	1,651,793	1,960,598	2,268,668	2,614,776	2,984,322
LONG-TERM INVESTMENT:	-	12,000	12,100	32,150	32,150	32,150	32,150	32,150	32,150	32,150	32,150	32,150	32,150	32,150	32,150	32,150	32,150	32,150
FIXED ASSETS:																		
Fixed assets - cost	38,774	39,537	868,376	949,023	973,259	1,021,731	2,373,579	2,470,522	3,019,146	3,185,971	3,185,971	3,185,971	3,185,971	3,185,971	3,185,971	3,185,971	3,185,971	3,185,971
Less: Accumulated depreciation	4,188	6,314	1,294	36,285	77,635	121,044	167,542	271,499	375,456	502,290	636,082	769,873	903,664	1,037,455	1,171,246	1,305,037	1,438,829	1,572,620
Fixed assets - net	34,586	33,223	867,081	912,738	895,624	900,687	2,206,037	2,199,023	2,643,691	2,683,681	2,549,890	2,416,098	2,282,307	2,148,516	2,014,725	1,880,934	1,747,143	1,613,351
Construction in progress	650,325	829,868	253,545	637,894	1,159,317	1,559,122	569,648	617,433	149,179	-	-	-	-	-	-	-	-	-
Net loss of fixed assets waiting for disposal	11,143	11,143	3,023	2,543	38,728	108,140	455,586	571,862	644,025	610,493	546,951	483,409	419,868	356,326	292,785	229,243	185,803	102,485
Total Fixed Assets	684,911	882,930	1,125,001	1,562,128	2,054,941	2,459,808	2,775,684	2,816,456	2,792,869	2,683,681	2,549,890	2,416,098	2,282,307	2,148,516	2,014,725	1,880,934	1,747,143	1,613,351
INTANGIBLE AND DEFERRED ASSETS	11,143	11,143	3,023	2,543	11,495	11,495	11,495	11,495	11,495	11,495	11,495	11,495	11,495	11,495	11,495	11,495	11,495	11,495
OTHER ASSETS	977,211	1,485,084	1,790,588	2,274,204	2,742,887	3,206,207	3,943,987	4,212,085	4,382,291	4,375,349	4,194,845	4,180,876	4,220,803	4,200,281	4,311,753	4,422,490	4,571,367	4,743,784
TOTAL ASSETS	977,211	1,485,084	1,790,588	2,274,204	2,742,887	3,206,207	3,943,987	4,212,085	4,382,291	4,375,349	4,194,845	4,180,876	4,220,803	4,200,281	4,311,753	4,422,490	4,571,367	4,743,784
CURRENT LIABILITIES																		
Short-term loans	38,500	215,000	320,000	375,000	328,861	280,442	229,630	176,307	120,349	61,625	-	-	-	-	-	-	-	-
Accounts payable	-	-	-	4,072	3,851	4,643	5,130	5,194	6,481	9,392	10,638	11,001	11,778	12,060	12,350	12,673	12,985	13,307
Advance from customers	-	320	160	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Accrued payroll and welfare	67	(32)	217	922	578	697	769	779	863	1,050	1,115	1,166	1,262	1,286	1,311	1,337	1,364	1,392
Tax payable	-	-	3	16	39	46	51	52	56	61	62	63	69	125	271	739	972	1,218
Dividends payable	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other payable (unpaid)	37,691	83,509	153,050	67,328	67,304	67,304	67,304	67,304	67,304	67,304	67,304	67,304	67,304	67,304	67,304	67,304	67,304	67,304
Accrued expenses	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Current portion of long-term loans	-	45,000	55,000	-	83,109	86,022	173,107	178,883	212,819	269,058	226,450	230,212	234,124	167,549	149,086	121,448	109,064	109,314
Total Current Liabilities	76,258	343,797	528,430	447,338	483,741	439,154	475,992	426,520	407,872	408,491	305,570	309,746	314,558	248,324	230,322	203,502	191,689	192,535
LONG-TERM LIABILITIES																		
Long-term loans	333,015	398,348	610,206	822,340	1,054,158	1,233,893	1,450,410	1,428,762	1,386,233	1,266,029	1,113,143	996,579	872,953	741,847	673,464	628,400	592,785	553,262
Long-term payable	-	969	41,000	88,113	88,113	88,113	88,113	88,113	88,113	88,113	88,113	88,113	88,113	88,113	88,113	88,113	88,113	88,113
Other long-term liabilities	66	66	601	601	49,020	221,284	369,869	423,596	402,032	380,397	357,106	332,051	305,119	276,187	266,358	254,263	241,072	241,072
Total Long-Term Liabilities	333,081	399,383	651,206	911,054	1,142,872	1,371,026	1,759,808	1,886,545	1,897,942	1,756,175	1,581,653	1,441,798	1,293,118	1,135,080	1,037,764	982,872	935,161	882,447
TOTAL LIABILITIES	409,338	743,179	1,179,636	1,358,392	1,626,613	1,810,181	2,235,800	2,313,065	2,305,814	2,164,666	1,887,223	1,751,544	1,607,675	1,383,404	1,268,086	1,186,373	1,126,850	1,074,982
OWNER'S EQUITY																		
Paid-in capital	48,462	48,462	59,630	59,630	332,712	548,832	799,872	854,928	888,736	894,061	894,061	894,061	894,061	894,061	894,061	894,061	894,061	894,061
Capital surplus	519,411	693,442	536,867	836,520	742,977	742,977	742,977	742,977	742,977	742,977	742,977	742,977	742,977	742,977	742,977	742,977	742,977	742,977
Reserve funds	-	-	493	493	40,586	94,274	147,461	174,616	203,346	229,842	251,269	275,883	312,762	353,492	398,850	437,340	479,020	523,877
Undistributed profit	-	-	13,963	19,169	9,943	17,878	126,499	241,418	343,802	419,316	516,312	663,428	826,347	1,007,780	1,181,739	1,328,459	1,507,888	1,507,888
Total Owner's Equity	567,872	741,904	610,953	915,812	1,116,274	1,396,026	1,708,187	1,899,020	2,076,477	2,210,682	2,307,622	2,429,332	2,613,228	2,816,876	3,043,667	3,236,117	3,444,516	3,668,802
TOTAL LIABILITIES AND OWNER'S EQUITY	977,211	1,485,084	1,790,588	2,274,204	2,742,887	3,206,207	3,943,987	4,212,085	4,382,291	4,375,349	4,194,845	4,180,876	4,220,803	4,200,281	4,311,753	4,422,490	4,571,367	4,743,784
Current Ratio	3.69	1.74	1.23	1.51	1.25	1.35	1.41	1.83	2.21	2.54	3.45	4.00	4.69	6.65	8.51	11.15	13.64	15.50
Quick ratio	3.68	1.74	1.51	1.25	1.35	1.41	1.83	2.21	2.54	3.44	3.99	4.68	6.64	8.50	11.14	13.63	15.49	
Debt-to-Total-Assets Ratio	0.42	0.50	0.66	0.60	0.59	0.56	0.57	0.55	0.53	0.49	0.45	0.42	0.38	0.33	0.29	0.27	0.25	0.23
Debt-to-Equity Ratio	0.72	1.00	1.93	1.48	1.46	1.30	1.31	1.22	1.11	0.98	0.82	0.72	0.62	0.49	0.42	0.37	0.33	0.29
Long-term debt/Total capitalization	0.37	0.35	0.52	0.50	0.51	0.50	0.51	0.50	0.48	0.44	0.41	0.37	0.33	0.29	0.25	0.23	0.21	0.19

Table 8.23 WDC Consolidated Cash Flow Statement Projection

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
1 Reconciliation of Net Profit to Cash Flows from Operating Activities																	
Net Profit	0	144,478	199,770	200,462	268,443	265,932	135,777	143,649	128,880	96,940	121,710	183,896	203,649	226,790	192,450	208,400	224,286
Add: Depreciation of fixed assets	2,126	-	26,998	41,350	43,409	46,498	103,957	103,957	126,835	133,791	133,791	133,791	133,791	133,791	133,791	133,791	133,791
Amortization of intangible/deferred assets	-	-	1,489	3,368	9,696	16,025	41,938	51,431	61,319	63,542	63,542	63,542	63,542	63,542	63,542	63,440	63,338
Financial expenses	(9)	(23)	16,855	49,856	44,779	39,473	85,883	78,268	105,180	110,707	96,136	88,410	80,164	71,363	65,926	60,698	56,855
Losses arising from investments (or deduct: gains)	-	-	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)	(58)
Decrease in inventories (or deduct: increase)	-	-	-	-	-	-	(202)	(780)	(933)	(347)	(90)	(71)	(73)	(75)	(77)	(79)	(82)
Decrease in operating receivables (or deduct: increase)	(225,901)	(909)	-	183,615	(16,509)	(10,129)	(1,348)	(11,135)	(20,098)	(3,911)	(4,323)	(14,887)	(4,348)	(5,508)	(5,092)	(5,437)	(5,814)
Increase in operating payables (or deduct: decrease)	91,039	329	-	82,542	3,833	87,649	3,851	5,291	7,170	(41,748)	3,719	4,350	(66,700)	(18,473)	1,501	1,263	358
Other cash received relating to investing activities	132,434	(3,098)	49	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Net cash flows from operating activities	(311)	140,777	245,104	561,135	353,594	445,391	369,798	370,624	408,294	358,916	414,427	458,974	409,967	471,373	451,983	462,018	472,675
2. Cash Flows from Investing Activities																	
Cash received from return of investment	-	29,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cash received from distribution of dividends or profits	-	-	58	58	58	58	58	58	58	58	58	58	58	58	58	58	58
Other cash received relating to investing activities	-	-	231	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal of cash inflows	-	29,000	289	58	58	58	58	58	58	58	58	58	58	58	58	58	58
Cash paid to acquire FA, intangible assets and other long-term assets	356,312	271,777	467,078	575,188	497,997	672,721	278,479	167,153	36,335	-	-	-	-	-	-	-	-
Cash paid to acquire equity investments	12,000	100	20,000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other cash paid relating to investing activities	46,226	45,533	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal of cash outflows	414,538	317,409	487,078	575,188	497,997	672,721	278,479	167,153	36,335	-	-	-	-	-	-	-	-
Net cash flows from investing activities	(414,538)	(288,409)	(486,789)	(575,131)	(497,939)	(672,664)	(278,421)	(167,095)	(36,277)	58	58	58	58	58	58	58	58
3. Cash Flows from Financing Activities																	
Proceeds from issuing shares	296,930	29,000	32,000	-	11,309	46,229	55,056	33,807	5,325	-	-	-	-	-	-	-	-
Proceeds from borrowings	351,015	153,339	170,566	302,107	281,877	421,681	223,422	133,346	31,010	-	-	-	-	-	-	-	-
Other proceeds relating to financing activities	8,170	13,231	47,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal of cash inflows	656,115	195,570	249,666	302,107	293,186	467,910	278,479	167,153	36,335	-	-	-	-	-	-	-	-
Cash repayments of amounts borrowed	143,404	62,491	30,672	126,451	131,528	136,834	181,746	189,827	217,201	251,095	151,256	159,739	168,723	107,590	93,516	70,603	61,516
Cash payments of interest expenses	-	33,455	18,797	49,856	44,779	39,473	78,610	71,140	76,403	95,307	84,279	76,890	69,013	60,618	55,624	50,881	47,566
Other cash payments relating to financing activities	7,360	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Subtotal of cash outflows	150,764	95,947	49,469	176,307	176,307	176,307	260,356	260,967	293,604	346,402	235,534	236,629	237,735	168,208	149,140	121,484	109,082
Net cash flows from financing activities	505,351	99,623	200,197	125,800	116,879	291,603	18,123	(93,814)	(257,269)	(346,402)	(235,534)	(236,629)	(237,735)	(168,208)	(149,140)	(121,484)	(109,082)
4. Effect of Foreign Exchange Rate Changes on Cash	-	(84)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5. Net Increase in Cash and Cash Equivalents	90,502	(48,103)	(41,488)	111,804	(27,467)	64,330	109,500	109,714	114,748	12,571	178,950	222,402	172,289	303,223	302,901	340,591	363,650
Net Cash Increase	90,502	(48,009)	(41,488)	111,804	(27,467)	64,330	109,500	109,714	114,748	12,571	178,950	222,402	172,289	303,223	302,901	340,591	363,650
Cash at beginning of year	83,064	175,017	127,240	85,846	197,650	170,183	234,513	344,013	453,727	568,475	581,046	799,997	982,399	1,154,688	1,457,911	1,760,812	2,101,403
Cash at end of year	175,017	127,240	85,846	197,650	170,183	234,513	344,013	453,727	568,475	581,046	799,997	982,399	1,154,688	1,457,911	1,760,812	2,101,403	2,465,053
Net Cash Increase	91,953	(47,777)	(41,395)	111,804	(27,467)	64,330	109,500	109,714	114,748	12,571	178,950	222,402	172,289	303,223	302,901	340,591	363,650
Debt Service Coverage (1.3 covenant)	0.00	1.51	4.38	1.42	1.78	1.73	0.85	0.85	0.80	0.85	1.02	1.29	1.34	2.01	2.37	3.06	3.59
Cost Recovery Ratio (1.0 covenant)	0.04	1.42	3.56	1.97	2.29	2.54	1.88	1.88	1.73	1.51	2.02	2.19	2.21	2.53	2.55	2.60	2.64

8.7 Cost Recovery and Tariff Reform

8.7.1. The WPMO has confirmed that it is Government policy to progressively introduce wastewater tariffs in suburban districts, in conjunction with specific projects. The WPMO recognizes the need for tariff increases and supports tariffs that are affordable. PPTA consultants have worked with the EA and WPMO to develop realistic wastewater tariff proposals. Suitable assurances from the Government have been included in the loan document to ensure tariff reform and cost recovery in the suburban districts. Further discussion of tariff reform is provided in Section 11.7.

8.8 Financial Analysis for Wuhan Storm Water Management Subprojects

8.8.1. The four storm water subprojects will enhance the performance of the drainage system, reduce combined sewer overflows and improve flood control in several urban and suburban areas of Wuhan. The storm water subprojects are non revenue earning subprojects. As such, the concept of an FIRR is not relevant and only economic analysis and justification are required. The subproject capital and O&M cost estimates, contract packages and financing plan for the four storm water subprojects are included in Chapter 4 and detailed in the FSRs. The annual O&M costs excluding depreciation, amortization and the non-cash cost items, in real terms for each of the storm water subproject would be around :

- | | |
|--------------------------------------|-------------------|
| • Wuchang LuoJia Road Area Drainages | CNY 10.67 million |
| • Hanyang Yangsigang PS & Pipe Work | CNY 2.51 million |
| • Dongxihu 3 Gates Connections | CNY 5.44 million |
| • Changqing Pump Station Expansion | CNY 11.96 million |

8.8.2. It is important for the WNG to assure that adequate government budgetary funds are available to cover the O&M costs needed for normal operation.

8.9 Financial Management Assessment

Introduction and Approaches

8.9.1. Effective financial management is a critical factor to ensure the benefits of a well designed and implemented project are sustainable. The financial management arrangements of the Executing Agency (EA) or Implementing Agencies (IAs) should be capable of and adequate for recording all transactions and balances, supporting the preparation of regular and reliable financial statements, safeguarding the entity's assets, and be subject to audit (of substance and a form acceptable to ADB). This section describes the Financial Management Assessment (FMA) conducted under

the PPTA to assess the following aspects of Wuhan Drainage Company (WDC), the IA for the wastewater management component :

- Institutional capacity;
- Funds flow arrangements;
- Staffing;
- Accounting policies and procedures;
- Internal and external auditing arrangements;
- Reporting and monitoring aspects; and
- Information system.

8.9.2. As the storm water management component contains non revenue earning subprojects, FMA has not been undertaken for the respective IA. Only economic analyses and justification have therefore been conducted under the PPTA.

8.9.3. As a FMA needs to take local accounting and auditing standards into consideration. The Financial Management Assessment Questionnaire (FMAQ) initially proposed and prepared by the ADB has been slightly modified, where necessary, to adapt to the Project's conditions. The PPTA consultants appreciate the cooperation and strong support from the Wuhan Urban Construction Utilization of Foreign Investment Project Management Office (WPMO) for the conduct of the FMA. The FMAQ was completed by WDC in July 2005 and has been reviewed and assessed by the PPTA consultants. Related matters have been discussed with WDC for clarification, where necessary. The completed FMAQ, translated into English, is given in Appendix H-4. Issues or risks associated with the entity's financial management systems are identified, and appropriate risk mitigation measures are suggested to facilitate more effective project design and implementation.

8.9.4. The Wuhan Municipal Government (WMG), WPMO and the IAs are experienced in preparing and implementing major foreign funded projects. WPMO has indicated that training, organized by the Government and ADB, has been provided to staff from the IA for ADB financed projects on ADB loan processing policies, and on related procedures relating to procurement arrangement and disbursement, among others. Their extensive experience should facilitate smooth and successful implementation of the proposed Project.

PRC Accounting Standards

8.9.5. The Ministry of Finance (MOF) engaged consultants in 1993, financed by the World Bank, to develop some 30 accounting standards aimed at bringing accounting and financial reporting practices in the People's Republic of China (PRC) to be more in line with international best practices. Exposure drafts on the 30 standards have been published, of which 16 have been issued to date as final standards for application by various types of enterprises. The 16 PRC accounting standards are shown in Table 8.24. It is understood that the other 14 detailed accounting standards are currently being revised and are to be issued for application in the near future.

Table 8.24 Summary of PRC Accounting Standards as of January 2005

Accounting Standard	Issue Date	Effective Date	Applies To
Disclosure of Related Party Relationships and Transactions	May 25, 1997	Jan 1, 1997	Companies listed on the Shanghai / Shenzhen Stock Exchange
Cash Flow Statements	March 20, 1998 (Rev. Jan 2001)	Jan 1, 1998 (Rev. Jan 2001)	All
Events Occurring after the Balance Sheet Date	May 12, 1998 (Rev. 2003)	Jan 1, 1998 (Rev. 2003)	All who follow Accounting System for Business Enterprises (ASBE) (starting 2003)
Debt Restructuring	June 12, 1998 (Rev. Jan 2001)	Jan 1, 1999 (Rev. Jan 2001)	All
Revenue	June 20, 1998	Jan 1, 1999	Companies listed on the Shanghai / Shenzhen Stock Exchange
Investments	June 24, 1998 (Rev. Jan 2001)	Jan 1, 1999 (Rev. Jan 2001)	Joint Stock Limited Enterprises
Construction Contracts	June 25, 1998	Jan 1, 1999	Companies listed on the Shanghai / Shenzhen Stock Exchange
Changes in Accounting Policies and Estimates and Corrections of Accounting Errors	June 25, 1998 (Rev. Jan 2001)	Jan 1, 1999 (Rev. Jan 2001)	All (starting 2001)
Non-monetary Transactions	June 28, 1999 (Rev. Jan 2001)	Jan 1, 2000 (Rev. Jan 2001)	All
Contingencies	Apr 27, 2000	July 1, 2000	All
Intangible Assets	Jan 18, 2001	Jan 1, 2001	Joint Stock Limited Enterprises
Borrowing Costs	Jan 18, 2001	Jan 1, 2001	All
Leases	Jan 18, 2001	Jan 1, 2001	All
Interim Reporting	Nov 9, 2001	Jan 1, 2002	Companies listed on the Shanghai / Shenzhen Stock Exchange
Inventories	Nov 9, 2001	Jan 1, 2002	All who follow ASBE (starting 2003)
Fixed Assets	Nov 9, 2001	Jan 1, 2002	All who follow ASBE (starting 2003)

8.9.6. MOF issued a comprehensive Accounting System for Business Enterprises (the System) in January 2001. Chapters in the System address :

- General provisions;
- Assets (including a requirement to recognize impairment losses on receivables, inventories, investments, fixed assets, intangibles, and other assets);
- Liabilities;
- Owners' equity;
- Revenue;
- Costs and expenses;
- Profit and profit appropriation;
- Non-monetary transactions;

- Foreign currency transactions;
- Accounting adjustments;
- Contingencies;
- Related party disclosures; and
- Financial and accounting reports.

8.9.7. The detailed table of contents of the System is shown in Table 8.25. All joint stock limited enterprises (JSLEs) are required to follow the System since January 1, 2001. The applicability of the System was extended to all foreign investment enterprises on January 1, 2002. In the meantime, a separate accounting system has been adopted, effective in 2002 for banking, insurance, and other specialized financial industries. MOF intends that the System eventually applies to all large and medium sized enterprises in PRC, other than banks and insurance companies, eliminating the accounting distinctions based on industries or on the form of business enterprises that have existed in the past.

Table 8.25 Contents of Accounting System for Business Enterprises

Chapter 1: General Provisions
Chapter 2: Assets
Section 1 Current Assets
Section 2 Long Term Investments
Section 3 Fixed Assets
Section 4 Intangible Assets and Other Assets
Section 5 Impairment of Assets
Chapter 3: Liabilities
Section 1 Current Liabilities
Section 2 Long Term Liabilities
Chapter 4: Owners' Equity
Chapter 5: Revenue
Section 1 Revenue from Sales of Goods and Rendering of Services
Section 2 Construction Contracts Revenue
Chapter 6: Costs and Expenses
Chapter 7: Profit and Profit Appropriation
Chapter 8: Non-monetary Transactions
Chapter 9: Foreign Currency Transactions
Chapter 10: Accounting Adjustments
Section 1 Changes in Accounting Policies
Section 2 Changes in Accounting Estimates
Section 3 Corrections of Accounting Errors
Section 4 Events Occurring After the Balance Sheet Date
Chapter 11: Contingencies
Chapter 12: Related Party Relationships and Transactions
Chapter 13: Financial and Accounting Reports
Chapter 14: Supplementary Provisions

PRC Auditing Standards

8.9.8 Forty three (43) standards were issued by the Chinese Institute of Certified Public Accountants (CICPA) from 1994 to 2003 after approval by the MOF, including:

- China's Independent Auditing Standards;
- General Standard on Professional Ethics;
- General Standards on Quality Control; and
- General Standard on Continuing Professional Education.

8.9.10 These 43 standards progressively became effective from 1 January 1996. Table 8.26 presents a summary of 41 PRC auditing standards as of 2003. Continuous pronouncement of the Independent Auditing Standards is expected. In developing these standards, the CICPA has sought to harmonize them with international standards and practices while taking into account the special conditions in China. Issued pursuant to the PRC Certified Public Accountants Law, these standards form the framework for regulating auditing practices in the PRC.

Table 8.26 Summary of PRC Auditing Standards as of 2003

General Independent Auditing Standards
Specific Independent Auditing Standards
No.1 – Audit of Financial Statements
No.2 – Audit Engagement Letters
No.3 – Audit Planning
No.4 – Audit Sampling
No.5 – Audit Evidence
No.6 – Audit Working Papers
No.7 – Audit Report
No.8 – Error and Fraud
No.9 – Internal Control and Audit Risk
No.10 – Audit Materiality
No.11 – Analytical Procedures
No.12 – Using the Work of an Expert
No.13 – Using the Work of Other Certified Public Accountants
No.14 – Opening Balance
No.15 – Subsequent Events
No.16 – Related Parties and Transactions with Such Parties
No.17 – Going Concern
No.18 – Noncompliance with Laws and Regulations
No.19 – Other Information Disclosed with Audited Financial Statements
No.20 – Auditing in a Computer Information Systems Environment
No.21 – Knowledge of the Entity's Business
No.22 – Considering the Work of Internal Auditing
No.23 – Management Representations
No.24 – Communication With Management
No.25 – Accounting Estimates
No.26 – Supervision of Physical Inventory Count
No.27 – Confirmations
No.28 – Communication between Predecessor and Successor CPAs
Independent Auditing Practice
Pronouncement No.1 – Verification of Capital Contributions
Pronouncement No.2 – Management Letters
Pronouncement No.3 – Special Considerations for Audit of Small Businesses
Pronouncement No.4 – Examination of Profit Forecasts
Pronouncement No.5 – Special Considerations for Audit of Consolidated Financial Statements
Pronouncement No.6 – Audit Report on Special Purpose Engagement
Pronouncement No.7 – Audit of Financial Statement of Commercial Banks

Pronouncement No.8 – Inter-Bank Confirmation Procedures
Pronouncement No.9 – Engagements to Perform Agreed-upon Procedures Regarding Financial Information
Pronouncement No.10 – Engagements to Review Financial Statements
General Standards
General Standards on Professional Ethics
General Standards on Quality Control
General Standards on Continuing Professional Education

PRC Accounting Standards and Auditing Standards

8.9.11 In developing the PRC's new detailed accounting and auditing standards, the CICPA has sought to harmonize them with international standards and practices while taking into account the special conditions in PRC. The overall objective of a general purpose audit conducted by Certified Public Accountants (CPAs) in the PRC is for the auditor to express an opinion as to whether the financial statements are presented fairly in all materials respects, in conformity with PRC accounting standards and other regulations, and applied on a basis consistent with that of the preceding year. Independent Auditing Practice Pronouncements issued by the CICPA mainly deal with special purpose audit or services, such as review, examination, etc.

8.9.12 For ADB projects, consistent compliance with PRC national accounting standards is required to ensure accurate and timely interpretation of the financial position and performance of the IA. As common practices, the ADB loan fact finding mission and appraisal mission would re-address the ADB audit arrangement requirements and reporting requirements for project implementation, including submission in a timely manner of an audited financial statement, an audited project account and other audit requirements, to ensure that ADB loan proceeds be used for purposes specified in the loan agreement.

Wuhan Drainage Company

8.9.13 WDC is also known as Wuhan Urban Drainage Development Co., Ltd. It was established on September 6, 1995 with a registered capital of CNY 48.46 million. It is a solely state owned company with limited liabilities, initially under the supervision of the Wuhan Urban Administrative and Construction Bureau (WUACB). In September 2001 the Wuhan Water Affairs Bureau replaced the WUACB to manage WDC. On September 4, 2002 the Wuhan Water Affairs Group Co., Ltd (WWAGCL) was incorporated, and WDC was transferred as a subsidiary of the WWAGCL. A copy of the WDC business license (in Chinese) was provided to the PPTA consultants.

WDC Audit Arrangements

8.9.14 CPAs' audit reports and audited financial statements for WDC for 2002, 2003 and 2004, and also the Wuhan Municipal Audit Bureau audited financial statements for 2002 to 2004 were provided to the PPTA consultants for review. Qualified opinions were issued by the CPAs on the 2003 and 2004 financial statements, where

the CPAs indicated that some evidence for booking construction in progress was not fully in conformity with the required procedures. An unqualified opinion was issued by the CPAs for the 2004 financial statements. The government auditors suggested that some improvements be required for WDC's financial statements. The suggested improvements are indicated in the WDC completed FMAQ (Appendix H-4). WDC indicated that all suggestions and required adjustments had been accepted and implemented by the company. WDC indicated also that there are experienced internal auditors to audit subsidiaries and branches of the WDC, and the internal auditors report to the Board of Directors directly. The current WDC audit arrangements, including internal audit, external government audit and CPA audit satisfactorily meet the ADB audit requirements.

8.9.15 The Consultant noted that in the Feasibility Study Reports (FSRs), there are budgets for audit expenses for all the nine subprojects. This is unusual for design institutes to include such budgets in FSR cost estimates, but is encouraging.

WDC Financial Statements

8.9.16 Assessment based upon the completed FMAQ indicates that the accrual basis has been adopted by WDC for accounting, and that the PRC Accounting System for Business Enterprises and Accounting System for Construction Enterprises has been followed. This is deemed sufficient for purposes of project accounting. There were some slight discrepancies among year-end data in the 2003 and 2004 financial statements that led to a slight, but not material, imbalance of cash position, which would presumably be due to year-end adjustments made.

8.9.17 One major concern is the treatment of accounting transactions and booking of operating revenues. The financial statements audited by Wuhan Municipal Audit Bureau shows CNY 370 million operating revenues in the 2004 Income Statement. The PPTA consultants in conducting financial analysis on other information provided by WPMO such as records for the volume of water sold and water tariff revenues collected and historical annual wastewater revenues, believe that CNY 370 million operating revenues in 2004 are reasonable. The CPA audited financial statements however show much lower operating revenues. WPMO explained that a large part of the operating revenues were treated as "Proceeds from issuing shares" in the financing activities.

8.9.18 Overall, the audited financial statements for fiscal years 2002, 2003 and 2004 appeared to be generally of good quality, together with sufficient detailed notes to enable users of the financial statements to have a reasonable understanding of the WDC's financial performance. The PPTA consultants would emphasize, however, that consistently applying the PRC accounting system and standards is required. In particular the practices for sales revenues recognition, recording and presentation in the accounting system should be consistently followed.

Other Assessments and Comments

8.9.19 Other assessments and comments based on the completed FMAQ are given below:

- Internal control exists and appears to be effective, as indicated in the completed FMAQ;
- Adequate staffing with required training and qualifications is in place. WDC has given an assurance that qualified finance and accounts staff would be assigned for ADB financed projects;
- WDC's FMA is computerized and can produce the necessary project financial reports; and
- Samples of Financial Statement on WB/ADB Financed Projects, and detailed Chart of Accounts (in Chinese) were provided.

Conclusion

8.9.20 The PPTA consultants are of the view that the overall financial management arrangements of WDC are satisfactory and could be relied upon.

8.9.21 It is recommended that the ADB financial due diligence requirements especially the audit and reporting requirements, as normally mentioned in the ADB Memorandum of Understanding (MOU) and Report and Recommendation of the President (RRP), were emphasized to WDC during the ADB Loan Fact Finding Mission and will be reemphasized during the ADB Appraisal Mission. Commitments and assurances, as is the normal practice for other ADB financed projects, are to be sought to ensure that a solid financing management plan is in place and that adequate counterpart funds are available to implement the Project.

9. ECONOMIC ANALYSIS

9.1 Introduction

9.1.1. The main aim of the Project is to prepare an appropriate and justified investment package for the timely development of additional wastewater treatment, sewerage systems and storm water drainage facilities in the urban and suburban areas of Wuhan Municipality, within a framework that responds to the guidelines of the Wuhan Urban Master Plan, pollution control policies of the central and provincial governments, improves service delivery of important public utilities, emphasizes poverty reduction, addresses important environmental issues and provides the platform for the sustained urban development of Wuhan Municipality.

9.1.2. The economic analysis covers six main aspects, namely:

- Economic background;
- Sector review – Yangtze River and Wuhan sector plans;
- Water and wastewater demand projections for subprojects;
- Review of water and wastewater tariffs;
- Least cost analysis; and
- Economic evaluation.

9.1.3. The presentation that follows is based on a review of:

- the Feasibility Study Reports (FSRs) - Initial draft in English, May 2005; and draft final in Chinese, September 2005. It should be noted that the final FSRs are expected by end October 2005.
- additional data and information assembled during site investigations;
- discussions and consultations with the Wuhan Urban Construction Utilization of Foreign Investment Project Management Office (WPMO), local design institutes, and key departments and agencies of the Wuhan Municipal Government (WMG); and
- discussions within the PPTA team.

9.1.4. The economic analysis has been conducted to the standards required by the ADB as set out in specific Asian Development Bank (ADB) guidelines, namely:

- Guidelines for the Economic Analysis of Projects (February 1997);
- Handbook for Integrating Risk Analysis in the Economic Analysis of Projects (May 2002);
- Economic Analysis in 2002: A Retrospective;
- Economic Retrospective: 2003 Update (June 2004);

- Handbook for Integrating Poverty Impact Assessment in the Economic Analysis of Projects (July 2001).

9.1.5. In addition, a number of specific ADB references have been consulted and used, including:

- TNS 9 - Setting User Charges for Public Services: Policies and Practices at the ADB (December 2003);
- TNS10 - Beyond Cost Recovery: Setting User Charges for Financial, Economic and Social Goals (January 2004); and
- TNS 4 - Economic Issues in the Design and Analysis of a Wastewater Treatment Project (July 2002).

9.2 Economic Background

Introduction

9.2.1. This section reviews the economic background for Hubei Province, Wuhan Municipality and the eight districts that cover the main areas served by the nine (9) subprojects (5 wastewater and 4 storm water). The districts are: urban - Jiang'an, Hanyang, Qingshan, Qiaokou, Wuchang, Hongshan; and suburban - Dongxihu and Caidian. The location of each subproject is illustrated in Figure 1-1, with summary details in Table 9-1. Relevant socio-economic data for Hubei Province, Wuhan Municipality, plus the 6 urban districts and 2 suburban districts are presented in Appendix I.1 covering the period from 1990 to 2004.

9.2.2. Basic data have been assembled from 1990 to 2004. The following sources were made available to the PPTA team:

- Hubei Statistical Yearbooks 2001 to 2003 and 2005, Hubei Provincial Statistics Bureau, China Statistics Press;
- Hubei Yearbook 2004, Hubei Provincial Government, Hubei Yearbook Edit Commission;
- Wuhan Yearbook 2000 to 2005, Wuhan Almanac Press;
- Wuhan Statistical Yearbooks 2002 to 2004, China Statistical Press;
- Wuhan Municipality Urban Master Plan (1996 to 2020); and
- Wuhan Basic Facts 2005, Wuhan Statistic Bureau & Wuhan NRC, 2005.

Table 9-1 WWSMP – Subproject Location by District and Service Area

Subproject	District	Service Area
WASTEWATER		
Main Urban Area		
Erlangmiao WWTP Upgrade and Expansion	Wuchang	Hongshan
Nantaizi Lake WWTP Expansion and Collection System	Hanyang	Hanyang
Huangpu Road WWTP Upgrade	Hankou	Jiang'an
Suburban Area		

Caidian New WWTP and Collection System Dongxihu Collection System	Caidian Dongxihu	Caidian Dongxihu
STORM WATER		
Main Urban Area		
Luoja Road Drainage Improvement	Hanyang	Hanyang
Yangsigang Drainage Improvement	Qingshan	Qingshan
Suburban Area		
Dongxihu Three Gates Connections	Dongxihu	Dongxihu
Changqing Pumping Station Expansion	Dongxihu	Dongxihu

9.2.3. Socio-economic data for the individual districts were assembled from a number of sources, including:

- Wuhan Statistical Yearbooks for 2002 to 2004;
- Wuhan Yearbook 2000 to 2005;
- Caidian District National Economic Statistical Yearbook 2002 to 2004; and
- Data provided through the WPMO.

9.2.4. In addition, the PPTA consultants would like to highlight a statistical discrepancy between the figures for Gross Domestic Product (GDP) reported in the Wuhan Statistical Yearbooks and those in the District Yearbooks. The Statistics Bureau in the Districts does not receive economic data from municipal or state owned enterprises. Therefore, the district figures underestimate local GDP by as much as 50%.

Hubei Province

9.2.5. Hubei Province is located in central eastern China and is renowned as the "province of a thousand lakes". It has abundant water resources, large rivers such as the Yangtze, Han and Qing Rivers, and high mountains like the Shennongjia. It covers an area of 185,900 km² (1.9% of the national total).

9.2.6. In 2004, the total recorded population was about 60.2 million, of whom 44% are classified as urban and 56% as rural. The reported growth rate has declined slowly since 1990 from about 1.3% per year to 0.3% in 2004. Over the same period, there was a strong upward trend in urbanization with the proportion rising from 29% in 1990 to 40% in 2000 and 44% in 2004. The rural population has declined by -0.9% to -1.9% per year over the last four years. The continuing rural to urban migration also places increasing pressure on public services and infrastructure, and contributes to rising levels of environmental pollution.

9.2.7. Provincial GDP has increased more than seven-fold over the last 14 years in current prices:

- 1990 CNY 82.4 billion (\$ 17.2 billion, at \$ 1 = CNY 4.78 equivalent);
- 1995 CNY 239.1 billion (\$ 28.6 billion, \$ 1 = CNY 8.35);
- 2000 CNY 427.6 billion (\$ 51.7 billion, \$ 1 = CNY 8.28); and

- 2004 CNY 632 billion (\$ 76.3 billion, \$ 1 = CNY 8.28) – which accounted for 4.6% of national GDP.

9.2.8. Average growth in real terms has been impressive, with rates of 14% to 15% per year in the early 1990s, followed by 9% per year in the early 2000s. Recorded growth in 2003 was 9.3% and 6.5% in 2004, indicating a slow down in GDP growth. The main engines of growth have been the secondary sectors (industry and construction) and tertiary sectors (mainly service sectors) which accounted for 47% and 36% respectively of GDP in 2004.

9.2.9. Hubei's per capita GDP has increased nearly seven-fold over the last 14 years:

- 1990 CNY 1,556 (\$ 325);
- 1995 CNY 4,162 (\$ 498);
- 2000 CNY 7,188 (\$ 868); and
- 2004 CNY 10,506 (\$ 1,269) – the same as the national average.

9.2.10. Official survey results indicate that average disposable income per capita at current prices have nearly doubled between 1995 and 2004:

- Urban CNY 4,017 (\$ 481) in 1995 and CNY 8,023 (\$ 969) in 2004; and
- Rural CNY 1,511 (\$ 181) in 1995 to CNY 2,897 (\$ 350) in 2004.

9.2.11. Reported investment in environment related infrastructure (water supply, water conservancy management, environmental management and sanitation) has fluctuated between CNY 2.1 billion and 2.8 billion (\$ 256 million to 334 million) per year over the last five years. These figures account for approximately 1% of provincial GDP or CNY 36 to 46 (\$ 4 to 5.5) per capita per year.

9.2.12. The Provincial 11th Five Year Plan (FYP) for 2006 to 2010 is in draft form, but will not be released until March 2006 after official approval. However, national press reports indicate that one of the main themes of the 11th FYP will be "harmonious development" with emphasis on addressing issues of inequality and the growing disparities in income between provinces, urban and rural communities, and within urban conurbations.

Wuhan Municipality

9.2.13. Wuhan is the capital of Hubei Province and a major industrial, transportation, higher education and communications hub in central PRC. It accounts for approximately 30% of the provincial economy, investment and consumption, and nearly 50% of provincial government revenue. It is strategically located at the confluence of the Yangtze and Han Rivers. Rivers and lakes cover one-fourth of the urban built-up area. Wuhan Municipality consists of three cities and 13 districts.

9.2.14. In 2004, Wuhan Municipality had a reported population of 7.8 million in 2004, of whom 4.8 million (62%) were classified as non-agricultural and 3 million (38%) as agricultural. The main urban area (city) has a population of 4.8 million, with the remaining 3 million in the suburbs (e.g. Dongxihu and Caidian) and semi rural areas. In addition, the Municipality has an estimated floating population of about 1.2 million (15%) who are largely unregistered migrant workers in search of employment. The official figures indicate that the non-agricultural population has been increasing at 2% to 3.4% per year, whereas the agricultural population has been more or less static. Recorded employment was 4.2 million or 53% of the total population, with 20% employed in the primary sector, 34% in the secondary sector and 47% in the tertiary sector. Official estimates indicate that the urban unemployment rate is 4.2%, but this probably underestimates the impact of underemployment and over Manning. Recent reports in the PRC media indicate that data collection and statistical methods are being revised and that the official unemployment rate is likely to rise considerably, including more comprehensive coverage of the unemployment register so that more people will be able to benefit from the social welfare system.

The GDP of Wuhan Municipality has increased eleven-fold in current prices over the last 15 years:

- 1990 CNY 17.7 billion (\$ 3.7 billion);
- 1995 CNY 60.7 billion (\$ 7.3 billion);
- 2000 CNY 120.7 billion (\$ 14.6 billion); and
- 2004 CNY 195.6 billion (\$ 23.6 billion) - which accounts for 31% of provincial GDP.

9.2.15. Wuhan was ranked 8th out of the 15 largest municipalities in the People's Republic of China (PRC) in 2004. The secondary sector (manufacturing and construction) and tertiary sector (service sectors) have been the main engines of growth. In 2004, the tertiary sector accounted for 49% of GDP, followed by the secondary sector with 46% and the primary sector (agriculture, etc.) with a declining 5%. The industrial sector is dominated by the Wuhan Iron & Steel Company (Qingshanqu District), which is the third largest steel group in China. Industrial development is also being focused in specific outlying zones of the Municipality, namely:

- East Lake High-Tech Development Zone;
- Donghu New Technical Development Zone;
- Wuhan Economic and Technology Development Zone;
- Hanyang Economic Development Zone;
- Hanzhengjie Urban Industrial Zone;
- Jiangnan Economic Development Zone;
- Wujiashan Taiwan Business Investment Zone; and
- Wuhan Export Processing Zone.

9.2.16. The per capita GDP of Wuhan Municipality increased nearly six-fold in current prices

- 1990 CNY 2,673 (\$ 559)
- 1995 CNY 8,609 (\$ 1,031)
- 2000 CNY 16,206 (\$ 1,957); and
- 2004 CNY 24,963 (\$ 3,015) which is equivalent to 2.4 times the provincial average.

9.2.17. Official survey results indicate that average per capita disposable income in the urban area has risen nearly four-fold in current prices over the last 15 years:

- 1990 CNY 1,465 (\$ 306);
- 1995 CNY 4,170 (\$ 499);
- 2000 CNY 6,761 (\$ 817); and
- 2004 CNY 9,564 (\$ 1,155) - 19% higher than the provincial urban average.

9.2.18. Based on available statistics, average disposable household income was CNY 2,400 (\$ 290) per month in 2004 (assuming an average household size of 3 persons). Further details on disposable income and living expenditure in Wuhan are presented and discussed in Chapter 6.

9.2.19. Reported investment in fixed assets has increased significantly, reaching CNY 82.2 billion (\$ 9.9 billion) in 2004. Investment in public utility infrastructure (including environment related investments) accounted for 13.7%, in electricity, gas and water supply, water conservancy, environmental and public facility management and sanitation, social security and social welfare.

9.2.20. Key development targets for the Municipality are set out in the Wuhan Municipality Urban Master Plan (1996 to 2020). The targets include:

- Maintain high rates of economic growth, with continuing improvements in living standards and effective poverty reduction;
- Strengthen sustainable development through increased investment in environmental protection and pollution reduction, coupled with more effective resource conservation policies;
- Strengthen the urban hazard protection system and promote infrastructure development; and
- Develop a modern economic system with a well-developed tertiary sector supported by a dynamic manufacturing sector.

9.2.21. The details of the 11th FYP (2006 - 2010) are still confidential and will not be released until March 2006. The next 5 to 15 years (up to 2020) hold significant challenges for Wuhan. The main challenges include:

- Maintain high rates of economic growth, sustain improvements in living standards and continue the drive to reduce poverty;
- Continue the development of the open market system, attract more foreign investment, promote export oriented initiatives, and deepen the reform of state-owned enterprises;
- Sustain high levels of investment in infrastructure and modern support facilities in transport, telecommunications and industrial development;
- Address pressing issues of rising urbanization and the need to expand and improve public utility services, including wastewater treatment, storm water alleviation and water supply;
- Create new employment opportunities through the continuing diversification and modernization of the secondary and tertiary sectors; and
- Strengthen sustainable development through increased investment in environmental protection and pollution reduction, coupled with more effective resource conservation policies.

9.2.22. The main objectives and targets of the 10th FYP (2001-2005) for Wuhan Municipality were as follows:

- Population was expected to reach about 9.75 million by 2005, including an estimated floating population of 1.75 million;
- GDP was projected to grow at 12% per year between 2000 and 2005, reaching CNY 220 billion (\$ 27 billion) in 2005 in constant prices;
- Per capita GDP was forecast to rise from CNY 16,206 (\$ 1,957) in 2000 to about CNY 30,000 (\$ 3,700) in 2005 (both in constant prices), reflecting an average growth rate of 13% per year;
- Average urban disposable income per capita was projected to increase in real terms at 8% to 10% per year, to reach CNY 10,400 (\$ 1,280) by 2005; and
- Total investment in fixed assets was also forecast to rise by 8% to 10% per year in real terms, with an average investment of CNY 600 billion (\$ 37 billion) per year between 2001 and 2005.

Jiang'an District (Urban)

9.2.23. Jiang'an District is located on the north bank of the Yangtze River, and is the administrative, cultural and economic centre of Wuhan. In 2004, the district had a reported population of 635,000 (8% of the municipality and 1% of the provincial total).

9.2.24. The reported GDP of the district was CNY 9.9 billion (\$ 1.2 billion) in 2004. The service sectors dominate the local economy accounting for 66% of

GDP, followed by 32% for the secondary sector. Per capita GDP was CNY 15,593 (\$ 1,880) in 2004.

9.2.25. Average per capita disposable income in Jiang'an District was officially CNY 9,343 (\$ 1,128) in 2004, which was 98% of the municipality average and 116% of the provincial average. The figures indicate average disposable household income in the area of CNY 2,250 (\$ 270) per month (2.89 persons per household).

Hanyang District (Urban)

9.2.26. Hanyang District is in the southwest portion of the Municipality, west of the Yangtze River and south of the Han River. In 2004, the reported population was 483,000 (6% of the municipality and 0.8% of the provincial total).

9.2.27. GDP in the district has risen nearly four-fold over the last five years to CNY 6.6 billion (\$ 788 million) in 2004. The service sector accounted for 52% of GDP and the secondary sector (manufacturing and construction) for 44%. Per capita GDP was CNY 13,698 (\$ 1,655) in 2004.

9.2.28. Average urban per capita disposable income in Hanyang District was officially CNY 9,488 (\$ 1,146) in 2004, which was 99% of the municipality average and 118% of the provincial average. The figures indicate an average disposable household income in the area of CNY 2,303 (\$ 278) per month (2.91 persons per household).

Qingshan District (Urban)

9.2.29. Qingshan District is in the northeast sector of the Municipality, south of the Yangtze River. It is the main area for heavy industry and an important base for iron and steel production. It covers an area of 48.96 km². The reported population was 456,000 in 2004, accounting for 6% and 1% of the municipal and provincial totals respectively.

9.2.30. Reported GDP for the district has experienced a substantial nine-fold increase in current prices over the last five years, reaching CNY 9.1 billion (\$ 1.1 billion) in 2004. The industrial sector (secondary) accounts for 55% of GDP and the service sector for 45%. Per capita GDP was CNY 19,889 (\$ 2,402) in 2004.

9.2.31. The average salary / wage (staff and worker) in Qingshan District was CNY 1,120 (\$ 135) per month in 2004. The reported average disposable income per capita was CNY 9,656 (\$ 1,166) for 2004, which was the same as the municipality average and 20% higher than the provincial average. The figure indicates average disposable household income for the district of CNY 2,745 (\$ 330) per month (3.41 persons per household).

Qiaokou District (Urban)

9.2.32. Qiaokou District is in the west of Hankou, north of the Han River and west of the Yangtze River. It covers an area of 41.92 km². The reported population in 2004 was 537,000 (6.8% of the municipality total and 0.8% of the provincial total).

9.2.33. The reported GDP for the district was CNY 8 billion (\$ 0.97 billion) in 2004. The tertiary sector accounts for over 60% of district GDP followed by the secondary sector with nearly 40%. Per capita GDP in 2004 was CNY 14,905 (\$ 1,800).

9.2.34. Average urban disposable income per capita in Qiaokou District was officially estimated at CNY 9,210 (\$ 1,110) for 2004, which was 96% of the municipality average and 115% of the provincial average. The resulting average disposable household income for the area was CNY 2,250 (\$ 270) per month (2.93 persons per household).

Wuchang District (Urban)

9.2.35. Wuchang District is the political, cultural and information centre of Hubei Province, where the headquarters of the Hubei Provincial Committee of the Communist Party of China (CPC) and Hubei Provincial Government (HPG) are located. It is in the southeast sector of the main urban area on the south bank of the Yangtze River. It covers an area of 81.22 km² with a district population of 977,000 in 2004.

9.2.36. The district GDP is reported to have increased more than four-fold over the last five years in current prices, reaching CNY 10.67 billion (\$ 1.3 billion) in 2004. The tertiary sector has been the main source of growth, accounting for over 80% of district GDP. The secondary sector accounted for 20% of GDP. Per capita GDP was CNY 10,919 (\$ 1,320) in 2004.

9.2.37. Average urban disposable income per capita in Wuchang District was officially estimated at CNY 9,512 (\$ 1,150) for 2004, which was 99% of the municipality average and 119% of the provincial average. The figures indicate an average disposable household income of CNY 2,700 (\$ 326) per month (3.41 persons per household).

Hongshan District (Urban)

9.2.38. Hongshan District is located in the southeast sector of Wuhan and forms a semicircle adjacent to Wuchang and Qingshan Districts. The total area is 509 km² with a reported population of 791,000 in 2004.

9.2.39. The reported GDP in 2004 was CNY 8.75 billion (\$ 1.1 billion), with the primary, secondary and tertiary sectors accounting for 14%, 39% and 47% respectively. Per capita GDP was CNY 11,062 (\$ 1,336) in 2004.

9.2.40. Average urban disposable income per capita in Hongshan District was officially estimated at CNY 9,837 (\$ 1,188) in 2004, which was 103% of the municipality average and 123% of the provincial average. The figures indicate an average disposable household income for the area of CNY 4,000 (\$ 483) per month (4.88 persons per household).

Dongxihu District (Suburban)

9.2.41. Dongxihu District is located in the northwest sector of the municipality to the north of the Han River. It covers an area of nearly 496 km². The reported population in 2004 was 246,000, accounting for 3% of the municipality and 0.4% of the provincial total.

9.2.42. The district GDP is reported to have increased at 12% to 15% per year in current prices since 2000, rising from CNY 3.2 billion (\$ 387 million) in 2000 to CNY 5.1 billion (\$ 612 million) in 2004. The secondary sector (manufacturing and construction) has been the main source of growth, with the tertiary sector (services) also expanding quite rapidly. The secondary sector accounts for 55% of GDP, followed by the tertiary sector with 30% and the primary sector (agriculture, etc.) with a declining 15%. Per capita GDP was CNY 20,605 (\$ 2,488) in 2004.

9.2.43. Average rural net income per capita was officially estimated at CNY 4,167 (\$ 503) for 2004. The figures indicate an average disposable household income of CNY 983 (\$ 120) per month (2.83 persons per household).

Caidian District (Suburban)

9.2.44. Caidian District is a new suburb area, located to the southwest of the main urban area on the Han River. It covers an area of 1,101 km². The reported population was 463,000 in 2004, accounting for 6% and 0.8% of the municipality and provincial totals respectively.

9.2.45. In contrast to the other districts, the GDP estimates for Caidian District have shown a marked decline from CNY 6 billion (\$ 726 million) in 2000 to CNY 4.52 billion (\$ 546 million) in 2004 in current prices, accounting for 2% of municipal and 0.7% of provincial GDP. The tertiary sector (services) accounted for 41% of GDP, followed by the secondary sector with 36% and the primary sector (agriculture, etc.) with 23%. Per capita GDP was CNY 9,766 (\$1,180) in 2004.

9.2.46. Average rural net income per capita was officially CNY 3,946 (\$ 477) in 2004. The figures indicate an average disposable income for rural households of CNY 1,044 (\$ 126) per month (3.17 persons per household).

9.3 Sector Review – Yangtze River and Wuhan Sector Plans

Introduction

9.3.1. This section addresses the sector analysis with regard to the wider pollution control and water management plans associated with the Yangtze River Basin (YRB) and Wuhan Municipality. The proposed project package will have an important regional and local impact in reducing water pollution, improving municipal drainage systems, enhancing the environment and raising general living standards. The project should also make a modest contribution to pollution reduction in the downstream areas of the YRB, including the important cities of Huanggang, Ezhou, Huangshi, Jiujiang, Anqing, Tongling, Wuhu, Ma'anshan, Nanjing, Zhenjiang, Nantong, Shanghai and many other smaller towns, plus the rural population in the YRB areas of eastern Hubei Province, Anhui Province and Jiangsu Province. It is also important to emphasise that the central and provincial governments, and the ADB, have given high priority to appropriate pollution control and water management investments and measures in the YRB. This gives the Project a much wider social and economic significance than just the direct benefits in the immediate area of each subproject.

9.3.2. With regard to the sector analysis required by the PPTA terms of reference (TOR), meetings were held with relevant departments and agencies of WMG to discuss specific issues and request further information. The departments and agencies included: WPMO; Wuhan Water Bureau; Wuhan Environmental Protection Bureau; Wuhan Drainage Company; and Wuhan Municipality Design & Research Institute. The PPTA team was also given access to the following key documents (in Chinese):

- Wuhan Urban Master Plan 1996 – 2020;
- Wuhan Municipal Infrastructure Construction -11th Five Year Plan 2006 - 2010 (draft), Wuhan Construction Committee;
- Wuhan Wastewater and Storm Water Drainage: 11th Five Year Plan (draft);
- Wuhan Urban Area Wastewater Treatment and Water Reuse Facilities Construction Plan, Wuhan Municipality Flood Control Reconnaissance and Design Institute and Fanhua Construction Limited, April 2005;
- Wuhan Suburban Area Wastewater Treatment and Water Reuse Facilities Construction Plan, Wuhan Municipality Flood Control Reconnaissance and Design Institute and Fanhua Construction Limited, April 2005;
- Wuhan Municipality Water Environment Renovation and Protection Plan, Wuhan Water Bureau, March 2005;
- Wuhan Storm Water Drainage Handbook 2004, Wuhan Water Bureau; and

- Wuhan 10th Five-Year Plan for Urban Infrastructure Construction, Wuhan Municipal Engineering Design Institute, June 2001.

9.3.3. In addition, the PPTA team consulted the following documents:

- Wuhan Wastewater Management Project – Final Report, CDM International Limited, June 2002 (ADB TA No. 3638–PRC); and
- Wuhan Wastewater Management Report, Report and Recommendation of the President to the Board of Directors, ADB, March 2003 (RRP: PRC 34472).

9.3.4. The following documents were not available to the PPTA team (highlighted in the TOR, Section A.2):

- Yangtze River Water Resources Protection Plan, 2002;
- Wuhan Drainage Master Plan;
- Wuhan Industrial Wastewater Pollution Control Plan; and
- Wuhan Water Supply Master Plan.

General Background

9.3.5. The proposed project components are located within and drain into the YRB. Table 9-2 presents the summary information on:

- population, GDP and disposable income in the project districts within Wuhan Municipality for 2004; and
- similar information for the downstream impact areas. The combined presentation provides an estimate of the potential direct and indirect beneficiaries.

Table 9-2 Wuhan Municipality and Downstream Impact Areas – Summary Economic Indicators by District 2004

District (covered by the Proposed Project)	Resident Population (000)	GDP		Disposable Income	
		CNY billion	Per capita (CNY)	Per Capita (CNY)	Per HH (CNY/month)
Wuhan Municipality					
<u>Main Urban Area</u>					
Jiang'an	635	9.91	15,593	9,343	2,250
Hanyang	483	6.62	13,698	9,488	2,303
Qingshan	456	9.07	19,889	9,656	2,745
Qiaokou	537	8.01	14,905	9,210	2,250
Wuchang	977	10.67	10,919	9,512	2,700
Hongshan	791	8.75	11,062	9,837	4,000
Sub-total	3,879	53.03	13,671	9,523	2,674
<u>Suburban Areas</u>					
Dongxihu	246	5.06	20,605	4,167	983
Caidian	463	4.52	9,766	3,946	1,044
Sub-total	709	9.58	13,512	4,023	1,020
Total	4,588	62.61	13,650	8,673	2,395

Downstream Areas (1)					
Within Municipal Boundary	1,100				
Beyond Municipal Boundary	620				
Total	1,720				
Grand Total	6,308				
Totals					
Wuhan Municipality	7,859	195.60	24,963	9,564	
Hubei Province	60,161	632.05	10,506	8,023	

Notes: (1) Downstream areas – within 10km of Yangtze River: (a) within municipal boundary – from mouth of Zhujia River to the municipal boundary (50 km); and (b) beyond municipal boundary for 50 km.

Sources: Appendix I.1, Wuhan Statistical Yearbook 2005 and Study estimates.

9.3.6. Within Wuhan Municipality, the eight project districts had a combined resident population of nearly 4.6 million, accounting for 58% of the municipality and nearly 8% of the provincial total. If the floating population is included, then the total would rise to about 5.3 million. The combined reported GDP amounted to CNY 62.6 billion (\$ 7.6 billion), with average GDP per capita of CNY 13,650 (\$ 1,650). It should be noted that there is a discrepancy in the district GDP figures (please see: Para. 9.2.4). In the immediate downstream areas of the Yangtze River (100 km from the Zhujia River mouth), it is estimated that a further 1.7 million resident population will also benefit from the proposed investment package.

9.3.7. It is important to recognize that in the “without” project case (i.e. no action is taken) the levels of water pollution and environmental degradation in the subproject areas and the Municipality in general will continue to increase unless a sustained action program is implemented. This will require not only the proposed investment package, but also a comprehensive long term strategy to increase wastewater treatment and drainage capacity as the Municipality continues to grow.

9.3.8. The most significant trends for Wuhan are as follows:

- Permanent resident population of the Municipality is projected to increase at 0.5% per year (net), reaching a total of 9.7 million by 2020. This excludes the floating (temporary) population of migrant workers who make a considerable contribution to the Municipality's economic growth.
- Provincial government is pursuing a deliberate policy of increased urbanization.
- Demand for improved and expanded public utility services will increase significantly, especially as disposable household incomes continue to rise.
- Sustained GDP growth is expected at 7% to 9% per year for the foreseeable future; although the rate of growth may slow in the decade from 2010 to 2020.
- Provincial and municipal authorities will promote and encourage sustained industrial investment and the creation of new urban employment opportunities.

- Increasing public awareness of environmental pollution and rising disposable incomes will put pressure on public authorities to address the issue in a sustained manner in order to raise real living standards.

Yangtze River Basin – Water Resource Management and Pollution Control

9.3.9. The PPTA team requested a meeting with representatives of the Yangtze River Basin Commission, and a copy of the Yangtze River Water Resources Protection Plan (2002) and other relevant documents. Unfortunately, it was not possible to fulfill these requests. However, it is widely recognized that well planned and effective sustainable management of the YRB is essential. The Wuhan authorities are well aware of their responsibilities in this respect, and municipal plans and action programs fully reflect these requirements in terms of:

- effective control and reduction of water pollution and wastewater discharges from all sources; and
- improved flood and storm water alleviation measures.

9.3.10. In this context, it is worth highlighting that Wuhan was the location for the First Yangtze Forum in April 2005. The forum issued a formal **Yangtze Declaration on Protection and Development** that calls “...for active participation of all stakeholders in collaborative efforts to concurrently protect and develop the Yangtze River and ensure a healthy Yangtze for our future generations.” The statement also includes the following:

“It is the common demand of the people in the Yangtze River Basin to better develop the Yangtze River in a rational and sustainable way to foster the harmonious socio-economic development. Therefore, we must pay great attention to the negative impacts that river development activity may impose, and balance carefully and properly river development with river protection. We should neither halt our steps of development nor sacrifice the ecosystem with danger left behind.”

“We agree: the new approaches centered by “ensuring health of the Yangtze and promoting harmony between human and the nature” and the basic principle of “combined and concurrent protection and development” should be applied to the management of the Yangtze River.”

“...we perceive that the core task now to ensure the healthy Yangtze is to secure “three safeties”, namely: ...drinking water safety.....safety against floods....and ecological safety...”

"We urge: it is pressing need to update the existing Master Planning of Comprehensive Utilization of the Yangtze River Basin.....and accelerate the process of the proposed Yangtze River Law."

9.3.11. Finally, the Declaration highlights the importance of integrated river basin management.

Wuhan Urban Master Plan

9.3.12. The Wuhan Urban Master Plan 1996-2020 (WUMP) was approved by the State Council in February 1999 and is the mandatory comprehensive guide for all aspects of municipal development up to 2020. Local planning authorities and implementation agencies are all required to follow the framework, targets and projections set out in the WUMP. This includes the planning for water supply, wastewater and storm water drainage management. In the context of the current project, it is useful to highlight some of the important observations made by the State Council:

"As a riverside and lakeside city, Wuhan should pay more attention to the aquatic environmental protection and rehabilitation, so as to develop a comprehensive wastewater treatment system and speed up wastewater diversion to prevent direct discharge to Yangtze River and related Lakes Before 2010, urban environmental pollution and ecological damages should have adequate control and urban environmental quality should have comprehensive improvement to ensure an ecological cycle by 2020."

The WUMP also states that Wuhan should:

"....assure drinking water quality in both the Yangtze and the Han Rivers, implement comprehensive water quality rehabilitation and protection for Donghu, Shahu, Nanhui, and Mousui Lakes; assure water quality in the Yangtze and Han Rivers within the Main City section meets Class II national standards; and assure the water quality of the major lakes in the Main City meets Class III national standards."

9.3.13. WUMP highlights specific principles and targets that relate directly to the control of water pollution, increased wastewater treatment, improvements in flood protection and storm water systems, and general improvements in the living environment. Some of the more important statements are summarized as follows:

"Storm water should be collected into different drainage systems and drain into the closest rivers or lakes; wastewater should be separated from storm water and centrally treated; when draining

the storm water, both urban area and rural area should be considered; gradually complete the urban drainage systems.”

- Water quality in the vicinity of river intakes for potable water should meet Class I standards in both the Yangtze and Han Rivers.
- All point sources of pollution will be removed in the designated Water Source Protection Areas.
- No discharges of untreated wastewater will be permitted in the urban reaches of the Yangtze and Han Rivers, and water quality must satisfy Class II standards (GB 3838-96).
- Wastewater treatment facilities will be improved and expanded.
- Water quality of the middle and lower reaches of Fu River to satisfy the Class V standard.
- Comprehensive renovation and protection works for the main lakes in Wuhan.
- Groundwater quality will be monitored and fully protected.

Wuhan Municipality – Water, Wastewater and Drainage Management

9.3.14. This Subsection provides a brief overview of water, wastewater and drainage management in Wuhan Municipality.

9.3.15. The Yangtze River is approximately 6,380 km in length with a drainage basin of 1.2 million km². Wuhan Municipality is located on the river about 900 km from the estuary.

9.3.16. Currently, there are nine water treatment plants serving the municipality: four in Hankou District; one in Hanyang District; and four in Wuchang District. The total treatment capacity is 765,000 m³/day, with 54% of raw water abstracted from the Han River, 43% from the Yangtze River and 3% from Donghu.

9.3.17. In terms of drainage, Wuhan is located on the Hanjiang Plain with a surface elevation of 20 m to 24 m (above sea level), which is lower than the average flood water level of about 26 m. During the rainy season (June to September), sections of the Municipality are served by a storm drainage network consisting of:

- 1,482 km of drainage pipes and box culverts;
- 127 km of open channels;
- 69 pumping stations; and
- 47 sluice gates.

9.3.18. In the main urban area, the drainage network density is about 7.2 km per km². The actual drainage network is a mixed system:

- combined collection systems (storm water and wastewater) serving the Districts of Hankou, Hanyang and Wuchang old town; and

- separate collection systems serving Shuiguo Lake Region, Qingshan District, plus Zhuankou and Donghu Development Areas which were built in the late 1990s.

9.3.19. The main problems with Wuhan's storm water drainage system are:

- continuing urbanization and new developments in remaining limited open space within already congested areas;
- inadequate network coverage;
- old infrastructure with poor and inadequate design standards;
- limitations of the combined drainage systems leading to wastewater overflows during storm and flood events; and
- poor and inadequate maintenance of the drainage network.

9.3.20. Wuhan has been slow in developing adequate wastewater treatment facilities. The first WWTP was completed in 1993 at Shahu. The Municipality now has four operating WWTPs with a combined capacity of 530,000 m³/d to primary and secondary treatment standards. The municipal authorities estimate that present WWTP capacity is only sufficient to cover 26.8% of total wastewater discharges, compared with an average of 41% for the main municipalities in China.

9.3.21. Table 9-3 summarizes the available data on wastewater management facilities that exist, are under construction and planned in Wuhan:

- Existing – four WWTPs with a capacity of 530,000 m³/d serving approximately 0.9 million people and a sewer network of 160 km. The total capital cost was CNY 456 million (\$ 55 million) with supporting finance from the World Bank and Finland.
- Under construction – six WWTPs with a capacity of 1.16 million m³/d serving about 2.2 million people and a sewer network of 299 km. The estimated capital cost is CNY 1.83 billion (\$ 221 million) with supporting finance from ADB, World Bank, Poland and two BOT schemes
- Planned - four WWTPs with a capacity of 250,000 m³/d serving about 1 million people and a sewer network of 162 km. The estimated capital cost is CNY 610 million (\$ 74 million) with supporting finance from ADB and World Bank.

Table 9-3 Wuhan Municipality – Urban Wastewater Management Facilities

WWTP (District)	WWTP				Sewer Network		Source of Finance
	Capacity (000 m ³ /day)	Beneficiary Population (000)	Service Area (km ²)	Investment to 2010 (CNY mln)	Length to 2010 (meters)	Investment to 2010 (CNY mln)	
Existing							
Huangpu Road (Hankou)	100	130	7.2	80			Finland
Shahu (Wuchang)	100	140	14.1	26	54,000	20	IBRD (WB)

WWTP (District)	WWTP				Sewer Network		Source of Finance
	Capacity (000 m ³ /day)	Beneficiary Population (000)	Service Area (km ²)	Investment to 2010 (CNY mln)	Length to 2010 (meters)	Investment to 2010 (CNY mln)	
Longwangzui (Wuchang)	150	200	35.7	80	56,389	80	IBRD (WB)
Erlangmiao (Wuchang)	180	430	32.2	120	50,348	50	IBRD (WB)
Sub-total	530	900	89.17	306	160737	150	
Under Construction							
Shahu Ph II (Wuchang)	50	70	7.0	13	27,000	10	IBRD (WB)
Sangjintan (Hankou)	300	840	61.4	470	61,263	130	ADB
Hanxi (Hankou)	400	580	56.7	420	67,560	160	IBRD (WB)
Nantaizi Lake (Hanyang)	300	590	55	300	85,448	190	Poland
Zhuankou (Hanyang)	60	110	28.6	68	25,089	30	BOT
Tangxunhu (Wuchang)	50	30	20.1	0	32,917	40	BOT
Sub-total	1,160	2,220	229	1,271	299,277	560	
Planned							
Luobuzui (Wuchang)	120	390	30.1	190	30,240	40	ADB
Huangjiahu (Wuchang)	100	580	56.5	160	80,000	150	ADB
Beihu (Wuchang)	20	50	4	20	30,500	21	Pending
Huangjiadawan (Wuchang)	10	10	1.6	15	21,200	14	Pending
Sub-total	250	1030	92.2	385	161940	225	
Total	1,940	4,150	410	1,962	621,954	935	

Note: Nantaizi Lake WWTP was completed in July/August 2005, and was under start-up period.

Source: Wuhan Urban Area Wastewater Treatment and Water Reuse Facilities Construction Plan, Wuhan Municipality Flood Control Reconnaissance and Design Institute and Fanhua Construction Ltd, April 2005.

9.3.22. Wuhan 10th Five Year Plan for Urban Infrastructure Construction envisages:

- Comprehensive renovation of "Five Rivers and Two Lakes";
- Drainage network construction: (a) 356 km drainage pipes and box culverts to increase the total length of the network to 1,791 km, thereby increasing the service coverage from 81.5% to more than 90%; and (b) nine additional pumping stations to increase capacity by 382 m³/s to a total of 743 m³/s; and
- Wastewater facilities: construction of seven WWTPs (capacity 975,000 m³/d) and related collection systems, so that by the end of the five-year plan (FYP) there will be a total of 11 WWTPs with a combined capacity of 1.44 million m³/d to achieve a target of 60% wastewater treatment.

9.3.23. Wuhan Urban Area Wastewater Treatment and Water Reuse Facilities Construction Plan envisages wastewater capacity to achieve 80% coverage by 2010 and 95% by 2020, and reuse of treated wastewater should be developed.

9.3.24. Wuhan Urban Drainage Statute effective from January 15, 2003 envisions strengthening the management of the Municipality's urban drainage system to secure full utilization of existing drainage facilities, reduce flood hazards, protect the Municipality's water environment and stimulate socio-economic development.

9.3.25. Following the review of the available plans and documents, the PPTA team held a series of meetings with responsible agencies and departments within WMG, including the WPMO, Wuhan Water Bureau (WWB), Wuhan Environmental Protection Bureau (WEPB), Wuhan Urban Drainage Company (WUDC), and Wuhan Municipal Design & Research Institute (WMDRI). The main aim was to address and discuss specific issues highlighted in the TOR. The results are summarized in the following paragraphs.

9.3.26. The following Subsections present an analysis of the sector policies and plans that have been reviewed. Important observations and conclusions have been included in the section on Policy Dialogue. The main focus, as required by the TOR, has been the following topics and issues:

- assessment of the goals and targets, with specific reference to the role of public participation and support;
- general review of relevant policies;
- general review of relevant institutions;
- assessment of investment programs using least cost analysis;
- review and justification of various investment programs;
- assessment of the use and application of user charges as policy instruments to enhance environmental pollution control and reinforce plan targets; and
- evaluation of the range of funding sources to support proposed investment programs.

Assessment of Goals and Targets

9.3.27. The current framework for managing surface water quality, wastewater treatment and drainage targets in Wuhan is through a combination of:

- legal standards for surface water quality and performance targets for achieving the standards; and
- policies, plans and regulations to achieve the stated targets.

9.3.28. The standards and targets, especially for large urban areas like Wuhan, are set by central government (mainly State Council, NDRC, SEPA, MOC, etc.)

and provide a clear framework for implementation by 2010 and 2020. WMG has adopted the standards and instructed the appropriate municipal agencies to plan, implement and achieve the targets. The relevant standards and targets are set out in Chapter 5 (Section 5.1). In terms of stakeholder and / or public participation in preparing the plans and setting priorities, the following process was described:

- specific agencies and design institutes are commissioned to prepare the plans;
- expert groups from relevant agencies and selected specialists are convened periodically to review progress and comment on key topics and issues (members of the groups may include: Planning Bureau, Finance Bureau, Construction Commission, Drainage Company, other design institutes and local universities);
- draft documents would be submitted to senior agencies and the local People's Congress for review and comment; and
- final approval would depend on WMG and perhaps endorsement from the central government.

9.3.29. Direct public participation or consultation is not normally part of the recognized procedure; although, some of the agencies reported carrying out limited surveys and public awareness campaigns (through the local media) to alert residents and secure public support.

General Review of Relevant Policies

9.3.30. The policies for the water, wastewater and drainage sectors are clear and broadly well articulated in all the documents made available to the PPTA team. However, the policies and strategies are not subject to least cost assessment in order to confirm that the most efficient approach is being adopted within any given timeframe (i.e. the FYPs). This is an area where least cost analysis could be usefully employed without infringing long-term plans and targets. Least cost analysis could be used to:

- prioritize projects and project packages between different timeframes in order to optimize water quality and environmental improvements (e.g. in terms of the average and incremental costs for water, wastewater, pollutants removed, etc.);
- minimize incremental costs and hence tariff increases. This will become more important as tariffs for wastewater services get closer to the final target of "full cost recovery" based on the principle that the "polluter pays" the full cost; and
- optimize the allocation of available financial resources.

General Review of Relevant Institutions

9.3.31. Since 2001, the general lines of responsibility within the sector have been divided into two pillars:

- Wuhan Water Bureau (WWB) who is responsible for sector planning and policy management; and
- Wuhan Urban Construction Investment and Development Group Co Ltd (WUCIDC), also known as Wuhan Urban Construction Foundation (WUCF) who is responsible for project implementation and operations.

9.3.32. In theory, this structure should offer considerable advantages with a clear distinction between planning and implementation. However, it is probably still too early to determine whether the potential advantages have been secured in terms of improved efficiency and service delivery. WWB is currently in the process of preparing the Wuhan Water Resources Comprehensive Plan in three stages: (i) Stage I (April to December 2003) – preparation of TOR and guidelines; (ii) Stage II (January to September 2004) – water resources survey; and (iii) Stage III (October 2004 to September 2005) – preparation and completion of draft plan. WWB reports that the plan will incorporate the following topics, among others: (a) focus on people's real requirements to build a comprehensive, harmonious and sustainable development process; (b) sustainable resource utilization within a framework of integrated water resources management; (c) promote rational development through improved project prioritization, cost-efficient utilization and protection, and water saving; (d) improve the protection and rehabilitation of the water environment to promote socio-economic development and accelerate sustainable development in Wuhan; and (e) develop an harmonious relationship between human demands and sustainable water resource utilization. The plan is in the final stages of completion, but will not be released before it has been approved by WMG. However, from the contents outlined above, it is clear that this will be an important document for the future planning of the water sector. In addition, many of the topics are in line with ADB's general policy guidelines for the water sector.

Assessment of Investment Programs Using Least Cost Analysis

9.3.33. Least cost analysis (in terms of the conventional international definition) is not widely employed in government institutions in China. The main methods are still generally focused on bureaucratic engineering choices and outdated evaluation techniques. In general potential investment projects are identified at the municipal level, according to local priorities but subject to national objectives and regulations. The initial focus has been on the main central urban area, but WMG is now moving towards a more balanced distribution between the districts. In wastewater treatment, for example, WMG has clearly opted for a decentralized strategy related to defined drainage areas. The next phase of projects is now in the planning phase to 2010 (11th FYP) and 2020, basically using the same method of approach. In this context, least cost analysis might be usefully employed to assist in the investment assessment process and prioritization.

Review and Justification of Investment Programs

9.3.34. Official documents issued in 2005 indicate the latest investment proposals for Wuhan in the water environment from 2006 to 2020. The main justifications, as expressed in the relevant documents, are to fulfill the national and municipal policies and targets. The investment proposals are summarized in the following tables.

9.3.35. Table 9-4 proposes total investment in the water environment (related to pollution control and environmental enhancement) of CNY 22.4 billion (\$ 2.76 billion) over the next 15 years:

- nearly 30% (CNY 6.7 billion or \$ 820 million) allocated to river and lake front construction projects to modernize and enhance the city's general environment;
- investment in WWTPs in the urban and suburban areas would total CNY 4.6 billion (\$ 570 million) or 21%; and
- sewerage networks would receive a total of CNY 3.74 (\$ 460 million) or 17%.

9.3.36. In the next five years 2006 to 2010 (i.e. 11th FYP period), the proposed investment would amount to CNY 7.8 billion (\$ 960 million) with 28% allocated to the construction of WWTPs, followed by 27% for river and lake front construction, and sewerage networks with 22%.

Table 9-4 Wuhan Municipality – Proposed Investment in Water Environment Renovation and Protection Programs 2006 to 2020

Program	2006-2010		2011-2020		Total	
	CNY million	%	CNY million	%	CNY million	%
Urban Wastewater Network	935	12.0	621	4.3	1,556	7.0
Suburban Wastewater Network	808	10.3	1,377	9.4	2,185	9.8
Urban WWTP Construction	1,255	16.1	1,240	8.5	2,495	11.2
Suburban WWTP Construction	956	12.2	1,163	8.0	2,119	9.5
Urban Non-Point Pollution Control	138	1.8	1,126	7.7	1,264	5.6
River and Lake Front Construction	2,085	26.7	4,594	31.5	6,679	29.8
Water Network Construction	374	4.8	2,563	17.6	2,936	13.1
Water Body Ecological Reconstruction	1,006	12.9	866	5.9	1,873	8.4
Water Environmental Management	42	0.5			42	0.2
Water Environment Maintenance	210	2.7	1,014	7.0	1,224	5.5
Total	7,808	100.0	14,565	100.0	22,373	100.0

Source: Wuhan Municipality Water Environment Renovation and Protection Plan, Wuhan Water Bureau, March 2005.

9.3.37. Table 9-5 presents figures for the ongoing and planned investment program for the construction of specific WWTPs in the main urban area. The figures indicate an investment of CNY 2 billion (\$ 250 million) in the upgrading, expansion and construction of 11 WWTPs.

Table 9-5 Wuhan 11th FYP – Urban WWTP Development Program

WWTP	Service Area (km ²)	Existing WWTP (m ³ 000/d)	11 th FYP		2020	
			m ³ 000/d	CNY million	m ³ 000/d	CNY million
Hankou District						
Sanjintan	61.4		300	300	300	
Hanxi	157.5		400	400	800	400
Huangpu Road	7.5	100	100		200	100
Sub-total	226.4	100	800	700	1,300	500
Hanyang District						
Nantaizi Lake	67.0		200	200	250	50
Zhuangkou	28.6		60	60	180	120
Sub-total	95.6	0	260	260	430	170
Wuchang District						
Shahu	21.1	100	150	50	150	
Longwangzui	35.7	150	150		250	100
Erlangmiao	32.2	180	180		400	220
Luobuzui	30.1		120	120	180	60
Huangjia Lake	62.4		100	100	200	100
Tangxun Lake	20.1		50	50	100	50
North Lake	4.0		20	20	20	
Huangjiadawan	1.6		5	5	5	0
Sub-total	207.2	430	775	345	1,305	530
Total	529.2	530	1,835	1,305	3,035	1,200

Source: 11th Five Year Plan – Wuhan Drainage and Wastewater Treatment, Research and Analysis; and domestic FSR Volume One.

9.3.38. Table 9-6 provides details of the investment in the sewerage networks (including pumping stations) draining to the 13 WWTPs in the main urban areas of Wuhan for the existing structures, 11th FYP (2006 to 2010) and long term (2011 to 2020). Investment in existing facilities totals an estimated CNY 1.56 billion (\$ 190 million). Proposed future investment is more modest, amounting to CNY 935 million (\$ 115 million) in 11th FYP and CNY 621 million (\$ 77 million) between 2011 and 2020.

9.3.39. Finally, Table 9-7 summarizes the proposed investment in urban storm water drainage facilities during the 11th FYP. The figures indicate that the substantial sum of CNY 6.37 billion (\$ 785 million) will be invested.

Table 9-6 Wuhan 11th FYP – Urban Wastewater Collection System Development Program

Sewerage Area	Trunk Sewers (km)	Secondary Sewers (km)	Pumping Stations (numbers)	Investment (CNY million)
EXISTING				
Hankou District				
Sanjintan	37.55	107.45	6	202
Hanxi	110.31	147.5	12	444
Huangpu Road				
Hanyang District				
Nantaizi Lake	37.74	164.5	5	222
Zhuangkou	18.2	41.18	2	58
Wuchang District				

Sewerage Area	Trunk Sewers (km)	Secondary Sewers (km)	Pumping Stations (numbers)	Investment (CNY million)
Shahu	7.15	73.85		66
Longwangzui	8.52	124.95	3	109
Erlangmiao	6.47	112.7		97
Luobuzui	18.9	52.68	3	68
Huangjia Lake	33.6	155.75	4	182
Tangxun Lake	35.7	42.21	1	73
North Lake	16.5	14.0		21
Huangjiadawan	15.6	5.6		14
Total	346.24	1,042.37	36	1,556
11th FIVE YEAR PLAN (2006-2010)				
Hankou District				
Sanjintan	24.11	69.01	4	130
Hanxi	39.75	53.15	5	160
Huangpu Road				
Hanyang District				
Nantaizi Lake	32.3	140.79	5	190
Zhuangkou	9.4	21.3	2	30
Wuchang District				
Shahu	3.25	33.56		30
Longwangzui	6.25	91.7	3	80
Erlangmiao	3.34	58.1		50
Luobuzui	11.12	31.0	3	40
Huangjia Lake	27.7	128.36	3	150
Tangxun Lake	19.56	23.13	1	40
North Lake	16.5	14.0		21
Huangjiadawan	15.6	5.6		14
Total	208.88	669.7	26	935
LONG TERM				
Hankou District				
Sanjintan	13.44	38.44	2	72
Hanxi	70.56	94.35	7	284
Huangpu Road				
Hanyang District				
Nantaizi Lake	5.44	23.71		32
Zhuangkou	8.0	19.88		28
Wuchang District				
Shahu	3.9	40.29		36
Longwangzui	2.27	33.25		29
Erlangmiao	3.13	54.6		46
Luobuzui	7.78	21.68		28
Huangjia Lake	5.9	27.39	1	32
Tangxun Lake	16.14	19.08		33
North Lake				
Huangjiadawan				
Total	137.36	372.67	10	621

Source: 11th Five Year Plan – Wuhan Drainage and Wastewater Treatment, Research and Analysis

Table 9-7 Wuhan 11th FYP – Proposed Investment in Urban Storm Water Drainage Facilities

Program	Investment (CNY million)	Distribution (%)
Drainage Network Projects in Seven Areas	2,030	31.8
Urban Trunk Pipelines & Main Drainage Channels	3,694	58.0
Renovation of Channels & Lakes	533	8.4
Renovation of Pumping Stations	90	1.4
Drainage Dredgers & Maintenance Facilities	27	0.4
Total	6,374	100.0

Source: 11th Five Year Plan – Wuhan Drainage and Wastewater Treatment, Research and Analysis.

Use and Application of User Charges

9.3.40. In general, wastewater charges (and related water tariffs) in Wuhan are levied for two main reasons:

- to satisfy the guidelines and regulations issued by the central government (Section 9.5); and
- to finance the public utility companies responsible for the respective services.

9.3.41. At present, water and wastewater charges are not seen as useful market based instruments to promote more efficient water utilization and wastewater discharge and treatment. Again, there are two main reasons for this position:

- national guidelines have not yet been issued to encourage increased awareness of the relationship; and
- existing tariffs are well below the marginal cost of service provision.

9.3.42. Indeed, tariffs would need to approach the levels of “full cost recovery” and begin to reflect long run marginal costs (including relevant environmental costs) in order to have an incremental impact on long term water use efficiency and water pollution control. However, central government agencies (e.g. NDRC, MOWR, MOC, SEPA, etc.) are aware of the broader impact of user charges, but the potential application has yet to be decided in terms of policy. Central government agencies have received extensive support on the wider use and application of user charges in the environmental sector from ADB, World Bank and other bilateral donors (e.g. DFID).

Funding Sources to Support Proposed Investment Programs

9.3.43. Given the size of the proposed investment programs (Tables 9-4 to 9-7), WMG is well aware of the need to broaden the range of funding sources and is endeavoring through various mechanisms to explore other financing options. Funding sources can be broadly divided into two categories, domestic and international.

9.3.44. Domestic sources include:

- Conventional sources:
 - (a) Central, provincial and municipal governments (usually grant or equity participation); and
 - (b) Local major banks (commercial loans) e.g. Construction Bank of China, Development Bank of China, etc.
- Public private partnership:
 - (a) BOT schemes with local companies (e.g. Tangxunhu and Zhuankou WWTPs – note: it is understood that one of the plants has been taken back into public ownership); and
 - (b) Management contracts or long term concessions (e.g. 30-year concession for Pudong water and Wastewater Company in Shanghai awarded to a French company).
- Manufacturers' credits in which manufacturers provide a loan package to finance the purchase of their equipment. It is not known whether there is relevant experience of this form of funding in China.
- Corporate bonds are financial mechanism that taps into the local savings market of private companies and individuals. Shanghai is currently exploring this potential source with the support of the World Bank, and the ADB has just commissioned a similar investigation for Nanjing.
- User charges and customer contributions are another potential modest source of funds, but they do imply that local wastewater companies would be charging full cost recovery tariffs and making a reasonable profit. This may be an option in the medium to long term.

9.3.45. International sources include:

- Multilateral development agencies - ADB and World Bank are major sources of loan finance in the water and wastewater sector. Wuhan has ample experience with both institutions.
- Bilateral donors - some foreign countries have been active in the water and wastewater sector on a modest scale (grants and loans) e.g. Finland and Poland in Wuhan.
- Foreign banks - the banking sector should be more open to foreign banks in the coming years. They may be potential sources of loan finance, especially in large cities like Wuhan, providing their credit ratings and guarantees are acceptable.
- Foreign companies operating in the sector (e.g. BOT, concessions and manufacturers' credits): similar references under domestic sources.

9.4 Water Demand and Wastewater Flow Projections for Subprojects

9.4.1. This section builds on the earlier assessment of the water and wastewater demand projections presented in Chapter 3 (Sections 3.2 and 3.3). Based on the projections in the FSRs and the review by the PPTA team, Table 9-8 summarizes

the final “best estimates” for each subproject. The full details in tabular form are presented in Appendix I2. The main indicators for the five wastewater subprojects are discussed in the following paragraphs.

9.4.2. Population in wastewater service areas – the resident or registered population in the service areas is projected to increase from:

- 1.35 million in 2005 to
- 1.53 million by 2010 and
- 1.93 million by 2020.

9.4.3. In addition, the floating population (i.e. non-registered rural migrants in search of work) is officially estimated at about 15% to 20% of the resident population. This implies projected numbers for the floating population rising from about

- 208,000 in 2005 to
- 268,000 by 2010 and
- 342,000 by 2020.

9.4.4. Therefore, the total served population is forecast to rise from

- 1.56 million in 2005 to
- 1.79 million by 2010 and
- 2.27 million by 2020.

9.4.5. Per capita domestic water consumption (including residential, commercial and institutional) – the available data indicate present consumption in 2005 ranging from 182 liters per capita per day (Lpcd) in Caidian suburban area to 327 Lpcd in the Huangpu Road service area. In general terms, unit consumption is expected to experience moderate rates of growth that reflect rising real incomes and living standards tempered by progressive increases in water and wastewater tariffs (Section 9.5 and Chapter 8). By 2020, per capita water consumption is predicted to be in the range of 260 Lpcd to 340 Lpcd.

9.4.6. Industrial water use – there are three important facts that impact on industrial water use and wastewater volumes in the service areas of each subproject:

- many industries do not rely on the public water supply system but utilize groundwater sources which are not adequately recorded;
- according to the FSRs, industrial water use in the central urban service areas (Erlangmiao, Nantaizi Lake and Huangpu Road) is low to modest, and accounts for only 4% to 27% of estimated water use in 2005; and

- the Wuhan Urban Master Plan indicates that most industries will be relocated out of the main urban area by 2020.

9.4.7. In the two suburban service areas (Caidian and Dongxihu), the FSRs indicate more substantial industrial water use ranging from 35% to 65% of total projected water use.

9.4.8. Wastewater return flow factors – in the FSRs, these are assumed to be 85% for non-industrial water and 80% for industrial water.

9.4.9. Infiltration – the FSRs assume an infiltration factor of 15%, but no evidence is presented to justify the figure. Indeed, the value is probably a significant underestimate in an abundant water environment like Wuhan, with a high groundwater table (1 to 2 m in wet season and 3 to 4 m in dry season, source: Wuhan Water Bureau). This comment is supported by the fact that the WPMO, Design Institutes and WWTP operation report that influent flows to existing facilities are extremely weak – typically: BOD5 120 to 160, COD 240 to 300 as per Domestic FSR.

9.4.10. Collection ratio – the FSRs assume wastewater collection ratios in each of the services areas ranging from 62% to 85% in 2010 to 84% to 95% by 2020.

Table 9-8 WWSMP –Population, Water and Wastewater Projections

(a) Erlangmiao, Nantaizi Lake and Huangpu Road

Component	Unit	2003	2005	2010	2020
Erlangmiao					
Population					
Resident Population (Registered)	000	464	478	517	604
Floating Population	000	69	72	103	121
Total Population Served	000	533	550	620	725
Water Consumption and Use					
Per Capita Water Consumption	Lpcd	315	320	330	340
Water Sales – Domestic & Commercial	1,000 m ³ /d	168	176	205	247
Water Use – Industrial	1,000 m ³ /d	42	38	30	18
Total Water Use	1,000 m ³ /d	210	214	235	265
Wastewater Return Flow Factors					
Non-Industrial Water	%	85	85	85	85
Industrial Water	%	80	80	80	80
Infiltration Rate	%	15	15	15	15
Wastewater Generated					
Collection Ratio	%	38	46	73	95
Wastewater Collected	1,000 m ³ /d	77	95	166	245
Nantaizi Lake					
Population					
Resident Population (Registered)	000	327	354	433	648
Floating Population	000	65	71	87	129
Total Population Served	000	392	425	520	777
Water Consumption and Use					
Per Capita Water Consumption	Lpcd	203	218	260	300
Water Sales – Domestic & Commercial	1,000 m ³ /d	80	93	135	233

Component	Unit	2003	2005	2010	2020
Water Use – Industrial	1,000 m ³ /d	33	34	37	45
Total Water Use	1,000 m ³ /d	113	127	172	278
Wastewater Return Flow Factors					
Non-Industrial Water	%	85	85	85	85
Industrial Water	%	80	80	80	80
Infiltration Rate	%	15	15	15	15
Wastewater Generated					
Collection Ratio	%	60	64	75	90
Wastewater Collected	1,000 m ³ /d	65	78	125	242
Huangpu Road					
Population					
Resident Population (Registered)	000	304	299	288	212
Floating Population	000	46	45	50	42
Total Population Served	000	349	344	338	254
Water Consumption and Use					
Per Capita Water Consumption	Lpcd	331	327	318	300
Water Sales – Domestic & Commercial	1,000 m ³ /d	115	112	108	76
Water Use – Industrial	1,000 m ³ /d	6	5	3	0
Total Water Use	1,000 m ³ /d	121	117	111	76
Wastewater Return Flow Factors					
Non-Industrial Water	%	85	85	85	85
Industrial Water	%	80	80	80	80
Infiltration Rate	%	15	15	15	15
Wastewater Generated					
Collection Ratio	%	68	72	85	95
Wastewater Collected	1,000 m ³ /d	80	83	92	71

(b) Caidian, Dongxihu and Total

Component	Unit	2003	2005	2010	2020
Caidian					
Population					
Resident Population (Registered)	000	100	114	150	221
Floating Population	000				
Total Population Served	000	100	114	150	221
Water Consumption and Use					
Per Capita Water Consumption	Lpcd	175	182	200	260
Water Sales – Domestic & Commercial	1,000 m ³ /d	18	21	30	58
Water Use – Industrial	1,000 m ³ /d	8	11	22	42
Total Water Use	1,000 m ³ /d	26	32	52	100
Wastewater Return Flow Factors					
Non-Industrial Water	%	85	85	85	85
Industrial Water	%	80	80	80	80
Infiltration Rate	%	15	15	15	15
Wastewater Generated					
Collection Ratio	%	34	41	64	84
Wastewater Collected	1,000 m ³ /d	9	12	32	80
Dongxihu					
Population					
Resident Population (Registered)	000	93	104	138	244
Floating Population	000	18	21	28	49
Total Population Served	000	111	125	166	293
Water Consumption and Use					
Per Capita Water Consumption	Lpcd	280	286	300	300
Water Sales – Domestic & Commercial	1,000 m ³ /d	31	36	50	88

Component	Unit	2003	2005	2010	2020
Water Use – Industrial	1,000 m ³ /d	58	64	84	176
Total Water Use	1,000 m ³ /d	89	100	134	264
Wastewater Return Flow Factors					
Non-Industrial Water	%	85	85	85	85
Industrial Water	%	80	80	80	80
Infiltration Rate	%	15	15	15	15
Wastewater Generated					
Collection Ratio	%	56	58	62	95
Wastewater Collected	1,000 m ³ /d	47	54	78	236
Total					
Population					
Resident Population (Registered)	000	1,287	1,350	1,526	1,930
Floating Population	000	199	208	268	341
Total Population Served	000	1,486	1,558	1,794	2,271
Water Consumption and Use					
Per Capita Water Consumption	Lpcd	277	281	294	309
Water Sales – Domestic & Commercial	1,000 m ³ /d	412	438	527	702
Water Use – Industrial	1,000 m ³ /d	148	153	177	281
Total Water Use	1,000 m ³ /d	560	591	704	983
Wastewater Return Flow Factors					
Non-Industrial Water	%	85	85	85	85
Industrial Water	%	80	80	80	80
Infiltration Rate	%	15	15	15	15
Wastewater Generated					
Wastewater Collected	1,000 m ³ /d	278	323	493	873

Source: Chapter 3 and Appendix I.2.

9.5 Review of Water and Wastewater Tariffs

9.5.1. The main discussion on water and wastewater tariffs is presented in Chapter 8 (Sections 8.3 - 8.5) and Chapter 6 (Section 6.5) with special attention to the financial, poverty and social impacts. This portion of the review focuses on the level and structure of charges, and whether they reflect ADB's position on tariffs, which is clearly stated in the document.

- Setting User Charges for Public Services: Policies and Practice at the Asian Development Bank, D Dole, ERD Technical Note Series No.9, December 2003.

9.5.2. Technical Note No.9 sets out ADB's five guiding principles for tariff setting:

- Good governance;
- Financial sustainability;
- Distributive justice;
- Economic efficiency; and
- Fair pricing.

9.5.3. The issues of distributive justice, financial sustainability and good governance are addressed in Sections 6.4, 8.3 to 8.5 and 10.5 to 10.6 respectively. The ADB Note further states that tariffs should be simple, transparent and predictable; ensure financial sustainability without subsidies; assist the poor to satisfy their basic needs; promote efficient use of resources; and avoid cross-subsidies.

9.5.4. Table 9-9 presents the full range of water and wastewater tariffs for selected years between 1997 and 2005. It is important to consider the complete cycle of tariffs because they represent the main economic indicator that can affect consumption decisions and hence the total volume of wastewater that is discharged. There are a number of important observations that can be made about the level and structure of tariffs:

- Tariff rates – all tariffs are charged on a flat rate basis by consumer category. Therefore, there is no incremental charge for increasing levels of consumption that might encourage more efficient use of resources (e.g. through use of an increasing block tariff structure);
- Tariff structure and differentials – current water tariffs differentiate between customer categories (for example: the commercial tariff is 2.4 times higher than the domestic tariff). However, the international trend in water pricing is to encourage increased convergence between customer categories and a closer relationship with long run marginal costs. On the other hand, the wastewater tariffs is a single rate for all customers that is well below the average incremental cost indicated in the least cost analysis (please see: Section 9.6). In the medium to long term, it is suggested that active consideration should be given to an increasing block tariff structure with higher block charges approaching marginal costs of water and wastewater services. This would promote increased economic efficiency in the use of water resources and discharge of wastewater, and postpone potential investment requirements in the longer term; and
- Tariff levels – the figures in Table 9-9 indicate that tariffs have increased significantly over the last eight (8) years: (i) domestic tap water charges by 56% and commercial by 70%; and (ii) wastewater by 500% from CNY 0.16 per m³ in 1997 to CNY 0.8 per m³ by 2005. Over the same period, the general consumer index remained more or less static (i.e. no inflation – Appendix I.1, Table 2). The tariff increases reflect central government directives that urban water and wastewater companies should progressively move towards full cost recovery, although no target date has been set to achieve this objective. Nevertheless, the increases demonstrate a healthy awareness of the need to promote financially sustainable in public utility services.

Table 9-9 Wuhan Water and Wastewater Tariffs – Selected Years (CNY per m3)

Category	1997	1999	2001	2003	2005
Water Resources Fee					
Domestic & Institutional			0.01	0.01	0.01
Commercial & Industrial			0.02	0.02	0.02
Potable Water Tariffs					
Domestic	0.45	0.62	0.70	0.70	0.70
Institutional		0.69	0.80	0.80	0.80
Industry	0.60	0.88	1.00	1.00	1.00
Commercial	1.00	1.46	1.70	1.70	1.70
Special Industries		1.66	1.90	1.90	1.90
Wastewater Tariffs					
All Categories	0.16	0.192	0.40	0.80	0.80
Combined Tariffs					
Domestic	0.61	0.812	1.11	1.51	1.51
Institutional		0.882	1.21	1.61	1.61
Industry	0.76	1.072	1.42	1.82	1.82
Commercial	1.16	1.652	2.12	2.52	2.52
Special Industry		1.852	2.32	2.72	2.72

Source: Chapter 8, Table 8-3

9.5.5. It is important to appreciate that tariff policy (and hence charging levels) are driven by central government directives. The most important statements and regulations are listed below (in chronological order):

- Administrative Method on Urban Water Supply Price (State Council, 1998);
- Circular No. 1192 – Enhancing the Collection of Wastewater Treatment Charges and Establishing the Municipal Drainage Discharge and Common Treatment System (Pricing Policy Paper by NDPC, MOC and SEPA, 1999);
- Circular No. 36 – Enhancing Water Conservation in Urban Water Supply and Prevention of Water Pollution (Policy Paper by State Council, 2000);
- Circular No. 515 – Accelerating the Reform of Urban Water Supply Price (Pricing Policy Paper by NDPC, MOF, MOWR and SEPA, 2002);
- Circular No. 1591 – Advancing the Industrialization of Urban Wastewater Treatment and Municipal Solid Waste Disposal Sectors (Policy Paper by NDPC, MOC and SEPA, 2002);
- Circular No. 36 – Accelerating the Reform of Water Price, Promoting Water Conservation and Protecting Water Resources (Policy Paper by State Council, 2004); and
- Circular No. 153 – Opinions on Strengthening the Regulation of Urban Wastewater Treatment Plants (Policy Paper by MOC, 2004).

9.5.6. In accordance with Circular 1192, all cities are required to collect wastewater tariffs. Initially, charges were set to cover annual operations and maintenance with a progressive movement towards the ultimate objective of full

cost recovery. Table 9-10 illustrates the fact that Wuhan has the third highest domestic wastewater tariff among all the provincial capitals in China.¹

Table 9-10 Provincial Capitals – Average Domestic Wastewater Tariffs 2005

City	CNY/m ³	City	CNY/m ³	City	CNY/m ³
Wuhan	0.80	Harbin	0.50	Yinchuan	0.40
Beijing	0.90	Kunming	0.50	Jinan	0.36
Shanghai	0.90	Nanning	0.50	Xian	0.36
Guangzhou	0.70	Shenyang	0.50	Chengdu	0.35
Zhengzhou	0.65	Fuzhou	0.45	Huhehaote	0.35
Chongqing	0.60	Haikou	0.45	Lanzhou	0.30
Tianjin	0.60	Changchun	0.40	Xining	0.27
Shijiazhuang	0.60	Changsha	0.40	Taiyuan	0.25
Hefei	0.51	Guiyang	0.40	Nanchang	0.22

Source: Charge Reform in China's Wastewater Treatment Sector, Zhong Lijin and Chen Jining, August 2005 (also www.h2o-china.com).

9.6 Least-Cost Analysis

Introduction

9.6.1. The least cost analysis has been carried out on two levels:

- Level 1 - Sector development plans; and
- Level 2 - Proposed project interventions (five wastewater and four storm water subprojects).

9.6.2. In conducting the least cost analysis, the PPTA team has taken into account the relevant plans, standards and targets for surface water quality, effluent discharge and storm water alleviation. The results of the socio-economic survey have also been taken into account in terms of the revealed social preference priorities for water pollution and storm water control (see: Section 6). The aim of the review and analysis is to ensure that the proposed subprojects form an integrated package at least cost in conformity with the existing planning framework (Economic Issues in the Design and Analysis of a Wastewater Treatment Project, D Dole, ERD Technical Note Series No.4, July 2002).

9.6.3. In addition, ADB requested a brief review of the original least-cost analysis that was carried out for the Bank's ongoing project in the city (Wuhan Wastewater Management Project - WWMP) that was approved in 2003 and is being implemented from 2003 to 2008. The original report prepared by the consultant (CDM International, June 2002) contains a technical comparison of the proposed options in Chapter 3 and a basic least-cost analysis of the main alternatives for the sewer networks, treatment process and sites for the WWTPs in Chapter 7. The unit costs calculated for the three WWTPs included in the

¹ On the other hand, domestic water tariffs are comparatively low and industrial water tariffs are close to the average for large cities in the PRC. This situation is not expected to change given Wuhan's abundant water supplies.

project were: (i) Sanjintan WWTP – RMB 0.93 to 1.01 per m³; (ii) Huangjiahu WWTP – RMB 1.22 to 1.23 per m³; and (iii) Luobuzui WWTP – RMB 0.96 to 1.02 per m³ (note: the report does not make it clear whether these values are based on water consumption or wastewater flows, and at what discount rate). It is interesting to note that these values are significantly higher than the average wastewater tariff of RMB 0.4 per m³ in 2002 and the current tariff of RMB 0.8 per m³. The Bank's RRP (March 2003) presents an overview of the sector targets and planning framework, and concludes that the project package was the most cost-effective approach to achieve the stated sector objectives and the least-cost options for the proposed wastewater treatment components.

Sector Development Plans

9.6.4. Relevant aspects of the sector development plans and the application of least-cost analysis are discussed in Section 9.3 above. Although there is no overt use of least-cost analysis, there is some evidence that the basic concepts are being applied because of the increasing pressure on investment funds and the need to identify more cost-effective solutions in infrastructure development. For example, the outline contents of the Wuhan Water Resources Comprehensive Plan (Para. 9.3.32) indicate that there is more awareness of the need for cost-effective solutions. This implies that least-cost analysis could be incorporated as a useful planning tool. Indeed, it may be opportune for ADB to include a modest training component on this subject as part of the project implementation package.

Proposed Project Interventions

9.6.5. There are nine potential subprojects to be included in the Project. The wastewater management subprojects include:

- Erlangmiao WWTP Upgrade and Expansion;
- Nantaizi Lake WWTP Expansion and Collection System;
- Huangpu Road WWTP Upgrade;
- Caidian WWTP and Collection System; and
- Dongxihu Wastewater Collection System.

9.6.6. The storm water management subprojects include :

- Luoja Road Drainage Improvements;
- Yangsigang Drainage Improvements;
- Dongxihu Three Gates Connections; and
- Changqing Pumping Station Expansion.

9.6.7. All of the projects are integral components in Wuhan's drive to reduce and control water pollution and the adverse impacts of storm water flooding in the urban and suburban areas of the Municipality. They also conform to the medium and long term targets of the Wuhan Urban Master Plan (1996 to 2020) and the

subordinate plans for wastewater and storm water management (see previous sections).

9.6.8. The possible alternatives for each subproject are defined in Chapter 3 (Section 3.9) and Chapter 4 (Section 4.7). The most practical and pragmatic alternatives have been subject to a conventional least cost analysis in order to establish the most cost effective packages that will achieve the stated targets. The detailed review of the cost estimates contained in the FSRs.

9.6.9. The least cost calculations compare cost profiles over the economic life of the defined alternatives. The full calculations are presented in Appendix I.3. The components include:

- Incremental service provided by each alternative in terms of wastewater flows;
- Phased capital costs and replacement of capital items that have a shorter life than the defined discount period (say 30 years after completion of construction). The capital expenditure also includes the costs of population resettlement where this is necessary;
- Incremental annual operating and maintenance costs;
- Discount rate of 12 % to reflect the opportunity cost of capital (OCC) in China;
- Calculation of the net present values (NPV) of the cost streams for the defined alternatives; and
- Calculation of the average incremental economic and financial costs (AIEC and AIFC).

9.6.10. All the costs are expressed in mid 2005 constant prices with the application of appropriate shadow/conversion factors to reflect real resource costs. In economic terms, the alternatives with the lowest NPVs will be the preferred development solutions. However, if there are specific differences in the technical characteristics and the potential benefits or environmental impacts, then these have been assessed in both quantitative and qualitative terms, and taken into account in the final assessment.

9.6.11. In addition, the average incremental economic and financial costs (AIEC and AIFC) for the alternative wastewater developments have been calculated. These costs are important indicators of the real incremental resource costs per unit of service and hence the future increases to wastewater tariffs needed in order to encourage the efficient use of resources.

9.6.12. In general, four types of alternatives have been considered for the wastewater management subprojects:

- Alternative treatment processes;
- Alternative sites for the WWTP or storm water pumping stations;

- Alternative wastewater collection routes for trunk sewers or storm water networks; and
- Any other subproject specific alternatives.

9.6.13. For each subproject, a minimum of two and a maximum of four alternatives were assessed based on the options presented in the FSRs, with various additions and variations made by the PPTA team. In the case of the storm water subprojects, the FSRs only identified one or two options. The alternatives are generally characterized as follows:

- Alternative A – option proposed in the FSRs;
- Alternative B – same as A, with alternative treatment process;
- Alternative C – same as A, with alternative location for the WWTP site or pumping station;
- Alternative D – same as A, with alternative sewer or storm water network layouts; and
- Alternatives E and F – additional alternatives proposed by the PPTA team.

9.6.14. Further details of the alternatives are discussed in Chapters 3 and 4.

Wastewater Management Alternatives

9.6.15. The technical aspects of the wastewater management alternatives for each subproject are addressed in Chapter 3 (Section 3.9). In terms of the least cost comparison, the most important components are the treatment process, the sizing of the plants, and the location of the individual WWTPs. These aspects are important in a major urban conurbation like Wuhan which is developing rapidly with consequent changes in land use and values, especially in the central urban area and in the vicinity of the main rivers (Yangtze, Han and Fu) and lakes (Donghu Lake, Shahu Lake, Nantaizi Lake, etc).

9.6.16. The FSRs compare two treatment processes for each subproject. The processes include:

- oxidation ditch;
- anaerobic anoxic oxidation (A2O);
- biological aerated filter (BAF); and
- sequential batch reactor (SBR).

9.6.17. The preferred treatment options (as expressed in the FSRs) differ in each of the four subprojects with WWTPs. The technical reasons for the choices are discussed in Chapter 3. Site locations for the WWTPs were generally selected (in the FSRs) on the basis of four main criteria:

- upgrading and/or expansion of an existing WWTPs (e.g. Erlangmiao, Nantaizi Lake and Huangpu Road);
- ease of connection and gravity feed from the main interceptor sewers;
- local land use and availability (mainly agricultural land e.g. Caidian); and
- proximity to a suitable water course for the discharge of treated effluent.

9.6.18. Criteria (ii) to (iv) apply to the proposed site for the Caidian WWTP (Figure 3 -1). Additional or new sewers (mainly trunk interceptors) are determined by the general layout of each service area, existing sewer networks and ground profiles to optimize the opportunities for gravity flow.

9.6.19. The opportunities for transferring wastewater from one WWTP to another were examined in general engineering terms and found to be impractical and likely to be very expensive. Therefore, further site investigations and costing exercises were not undertaken.

9.6.20. With regard to the Huangpu Road subproject, there are two issues that should be highlighted. Firstly, one option proposed in the FSR was to utilize the SBR treatment process. However, this would require approximately 6.1 ha of land when the site is officially restricted to an area of 1.2 ha. Therefore, the SBR option has not been assessed. Secondly, the PPTA team has identified and made a preliminary assessment of two other downstream options for the treatment and discharge of wastewater from the service area of the existing plant. The reasons for the additional alternatives are as follows:

- The existing site is: (i) within the flood management reservation zone along the north bank of the Yangtze River; and (ii) immediately adjacent to the Hankou Jiangtan Park – this is a major recreation and cultural area that stretches 7.5 km along the entire river front of Hankou District from Wuhan Harbor (opposite Jiangnan Road) to Xiadun (near Pier No. 41). Indeed, construction of the park area next to the WWTP has only just been completed. In addition, it is important to note that the location of the existing WWTP may infringe specific articles in the Flood Control Law of the PRC, August 1997 (see: Articles 21, 22 and 27), although the PPTA team has been advised that the existing Huangpu Road WWTP has an exemption certificate under Clause 27 of the Law; and
- Land and property development along the riverfront is continuing and is likely to accelerate in the next 5 to 10 years. This will drive up land and property values in the vicinity of the existing WWTP (i.e. along Huangpu Road and between Yanjiang Avenue and Jiefang Avenue). In this situation, it is important to take account of the opportunity cost of land both now and in the future – which will be adversely affected by the existing and proposed upgrading of the Huangpu Road WWTP. The PPTA team has established that 70 year leases on two large plots of land adjacent to the WWTP were purchased by public auction on April 28, 2005. The reported purchase price was CNY 3.39 billion (\$ 418 million) for a total area of 479,600 m², which is

equivalent to CNY 7,068 (\$ 872) per m². The two plots have been purchased by a property development company - Xinqiao Company Limited, a subsidiary of the Hong Kong Shui On Group. Furthermore, it is reported that the group intends to invest a total CNY 10 billion (\$ 1.2 billion) in the construction of a prestige residential, leisure and cultural centre. Given the size of the investment, it is assumed that the developer would have carried out "due diligence" investigations and been aware of the existing WWTP and its proposed upgrading.

9.6.21. Environmental and economic factors warrant careful consideration of an alternative development strategy for the Huangpu Road WWTP. In this context, two additional sub-options have been identified, which involve closing the Huangpu Road WWTP and establishing a new treatment and discharge facility downstream. These sub-options, both based on a more economic oxidation ditch process, are briefly described as follows (Figure 9-1):

- Sub-option E – relocation of the WWTP to a point 6.5 km downstream to a river section that has been designated for wastewater discharge by the Ministry of Water Resources (1 km upstream and downstream of the mouth of the Zhujia River); and
- Sub-option F – construction of a new WWTP close to the mouth of the Hanbei River, which is about 12.5 km downstream of the existing WWTP site and outside the main urban area.

9.6.22. Table 9-11 presents the basic parameters for each wastewater subproject in terms of the WWTP capacity (upgrade and expansion), sewer lengths (interceptors, primary sewers and box culverts) and registered resident population in the service areas. The totals indicate incremental WWTP capacity of 490,000 m³/d to secondary treatment standard (37 % upgrading and 63 % new capacity) and 37.4 km of sewers (mainly in the Dongxihu suburban area). The population (registered residents and floating) within the service areas is projected to increase from 1.56 million in 2005, rising to 1.79 million in 2010 and 2.27 million by 2020.

Table 9-11 WWSMP - Wastewater Subprojects: Basic Parameters

Subproject	WWTP (x1,000 m ³ /d)			Sewers (km)	Population in Service Areas (x 1,000)			
	Upgrade	Expansion	Total		2003	2005	2010	2020
Urban Areas								
Erlangmiao	180	60	240		533	550	621	725
Nantaizi Lake		100	100	7.4	393	425	520	777
Huangpu Road	100		100	(1)	349	344	338	254
Sub-total	280	160	440	7.4	1,275	1,319	1,479	1,757
Suburban Areas								
Caidian		50	50	4.6	100	114	150	221
Dongxihu				25.4	111	125	166	293
Sub-total		50	50	30.0	211	239	315	514
Total	280	210	490	37.4	1,486	1,558	1,794	2,271

Note: (1) Excludes the trunk sewers that would be required for the relocation of the Huangpu Road WWTP.

Source: Appendix I3.

9.6.23. The capital costs and incremental annual operations costs for the wastewater management options for each subproject are summarized in Table 9 - 12 in financial prices. For the least cost analysis, the capital costs exclude the components that are common to all alternatives, namely: project management; environmental mitigation and monitoring; institutional strengthening; and sewer connections.

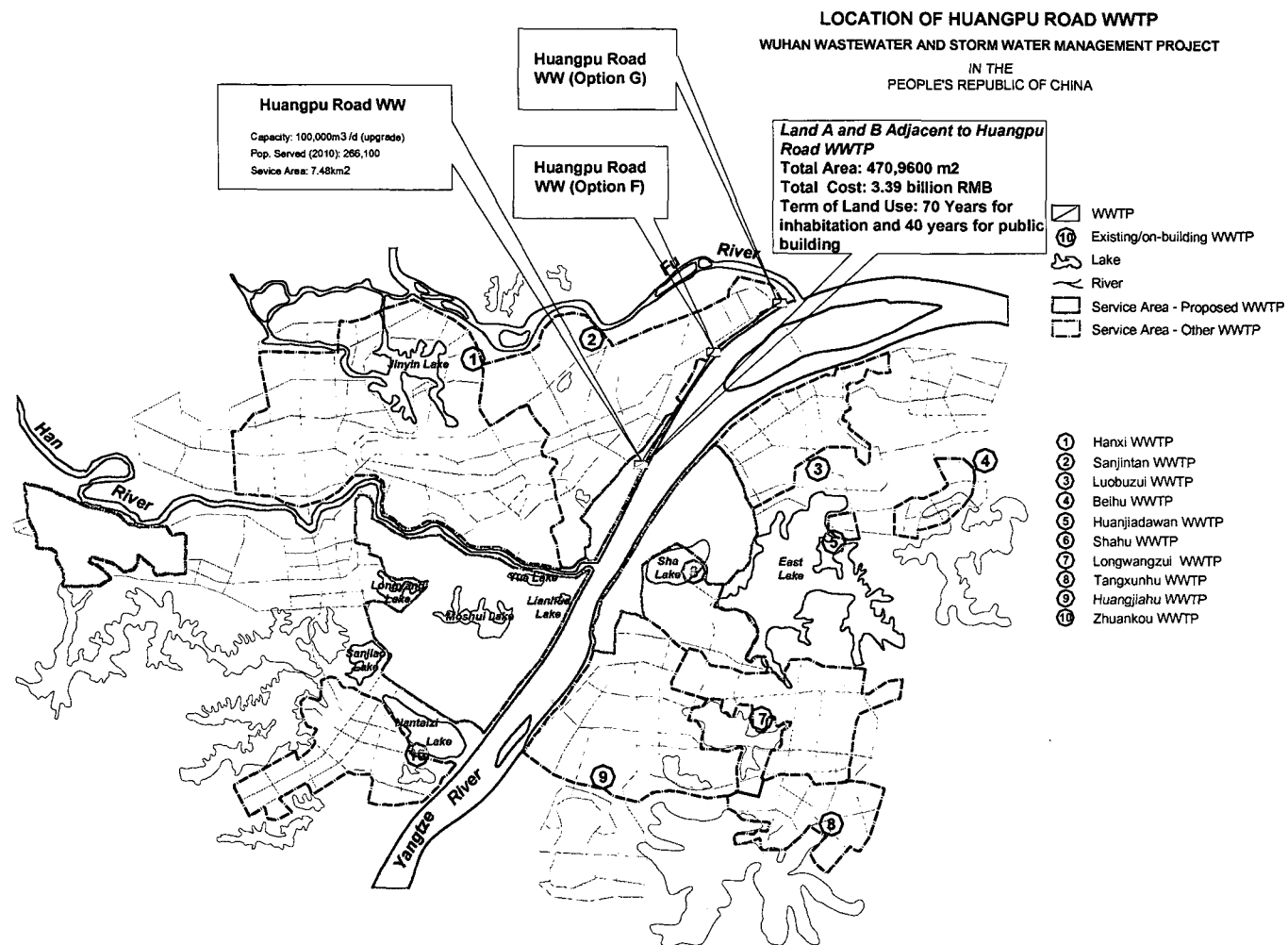


Figure 9-1 Alternatives of Huangpu Road Subproject

9.6.24. The capital cost estimates for each subproject range as follows:

- Erlangmiao WWTP upgrade and expansion – there is less than 1 % difference in the capital costs, with Alternative A (A2O process) costing CNY 199.7 million (\$ 24.6 million) and Alternative B (oxidation ditch) CNY 198.8 million (\$ 24.5 million);
- Nantaizi Lake WWTP expansion and sewers – the cost estimates vary by up to 10 % because of the higher costs for land acquisition and civil works for Alternative C (oxidation ditch treatment process at an alternative site in Hanyang West). The estimates range from CNY 199.9 million (\$ 24.6 million) for Alternative A (oxidation ditch) to CNY 201 million (\$ 24.8 million) for Alternative B (A2O) and CNY 220.9 million (\$ 27.2 million) for Alternative C (oxidation ditch);
- Huangpu Road WWTP upgrade (and trunk sewers for the two additional options) – the estimated capital costs range from CNY 131.2 million (\$ 16.2 million) for Alternative A (BAF treatment process) proposed in the FSR, compared with the downstream options costing from CNY 171.2 (\$ 21 million) for Alternative E (Zhuji River site with oxidation ditch process) to CNY 191.8 million (\$ 23.6 million) for Alternative F (Hanbei River site with oxidation ditch process);
- Caidian new WWTP and sewers – the cost variation between the alternatives is about 6 %. The capital cost estimates range from CNY 104 million (\$ 12.8 million) for Alternative A (oxidation ditch) to CNY 109.8 million (\$ 13.5 million) for Alternative B (A2O) and CNY 109.3 million (\$ 13.5 million) for Alternative C (oxidation ditch); and
- Dongxihu sewers – only one alternative is proposed at an estimated cost of CNY 174.5 million (\$ 21.5 million).

9.6.25. The incremental annual operations and maintenance costs (at full capacity) range from CNY 6.8 million (\$ 840,000) for Caidian WWTP and sewers to CNY 19.6 million (\$ 2.4 million) for the Huangpu Road WWTP at the existing site. It should be noted that the estimated incremental recurrent costs for the additional Huangpu Road options are 24 % to 28 % lower than the preferred option, because the oxidation ditch process consumes less electricity.

Table 9-12 Wastewater Alternatives – Summary Financial Costs (CNY million)

Parameters/ Alternatives	Unit	Erlangmiao	Nantaizi Lake	Huangpu Road	Caidian	Dongxihu
Parameters						
WWTP Capacity						
Upgrade	1,000 m ³ /d	180		100		
Expansion	1,000 m ³ /d	60	100		50	
Total Capacity	1,000 m ³ /d	240	100	100	50	
Sewers	km		7.4		4.6	25.4
Alternative A						
Capital Costs	CNY million	199.7	199.9	131.2	104.0	174.5
Annual O&M Costs	CNY million	18.3	12.8	19.6	6.8	9.1
Alternative B						

Parameters/ Alternatives	Unit	Erlangmiao	Nantaizi Lake	Huangpu Road	Caidian	Dongxihu
Capital Costs	CNY million	198.8	201.0		109.8	
Annual O&M Costs	CNY million	17.4	15.6		7.9	
Alternative C						
Capital Costs	CNY million		220.9		109.3	
Annual O&M Costs	CNY million		13.6		6.8	
Alternative E						
Capital Costs	CNY million			213		
Annual O&M Costs	CNY million			14.0		
Alternative F						
Capital Costs	CNY million			247.0		
Annual O&M Costs	CNY million			14.8		

Source: Appendix I.3.

9.6.26. Table 9 - 13 presents the resulting net present values (NPV) and average incremental costs (AIC) for the wastewater management alternatives in financial and economic prices at a discount rate of 12 %. The full calculations and results are presented in Appendix I.3.

9.6.27. The NPVs over 30 years of operation (after the completion of construction) indicate the following results for each subproject:

- Erlangmiao WWTP upgrade and expansion – Alternative B (oxidation ditch) is the least cost option. It is marginally cheaper (less than 2 %) than the preferred Alternative A (A2O);
- Nantaizi Lake WWTP expansion and sewers – Alternative A (oxidation ditch) is confirmed as the preferred least cost option. The NPV is 6 % to 9 % less than Alternatives B and C;
- Huangpu Road WWTP upgrade – the least cost option is Alternative A (BAF process) at the existing site. The NPVs for the other two sub-options are 20 % and 35 % higher. This relationship would only change if the prospective developer (i.e. the private sector beneficiary) of the two adjacent plots of land (see: para. 9.6.18 and Figure 9-1) was to contribute more than CNY 40 to 50 million (\$ 5 to 6 million) towards the relocation of the plant downstream. The other option (which is perhaps cheaper) would be for the private sector developer to pay for increased landscaping, odor control and flood protection works in the proposed upgrading of the existing WWTP;
- Caidian new WWTP and sewers – Alternative A (oxidation ditch) is confirmed as the preferred least cost option. The NPV is 4 % to 9 % less than Alternatives B or C; and
- Dongxihu sewerage – only one sewerage network alternative is proposed for Dongxihu, with an NPV of CNY 142 million at a 12 % discount rate over 30 years of operation after the completion of construction.

9.6.28. The average incremental financial costs (AIFC) for water sales related to each subproject provide important indicators of the incremental service costs of the proposed wastewater management subprojects:

- Erlangmiao WWTP upgrade and expansion – the AIFC is CNY 0.50 (\$ 0.06) per m³ for Alternative A (A2O process) and CNY 0.49 (\$ 0.06) for Alternative B (oxidation ditch). The plant is projected to reach full capacity by 2020;
- Nantaizi Lake WWTP expansion and sewers – the AIFC is CNY 1.19 (\$ 0.15) per m³ for Alternative A (oxidation ditch) based on the upgrading of the existing facility (100,000 m³/d) and new expansion (100,000 m³/d) which result in the combined capacity (200,000 m³/d) being fully utilized by 2017, according to the wastewater projections;
- Huangpu Road WWTP upgrade – the AIFC is CNY 1.07 (\$ 0.13) per m³ at the existing Huangpu Road site (BAF treatment process), compared with CNY 1.28 (\$ 0.16) per m³ for Alternative E (Zhujia River site with oxidation ditch process) and CNY 1.44 (\$ 0.18) per m³ for Alternative F (Hanbei River site with oxidation ditch process);
- Caidian new WWTP and sewers – the AIFC is CNY 1.10 (\$ 0.14) per m³ for Alternative A (oxidation ditch) based on the new WWTP (50,000 m³/day) which is expected to be at full capacity by 2015, according to the wastewater projections; and
- Dongxihu sewerage – the AIFC for the new sewerage network is CNY 0.42 (\$ 0.05) per m³. It should be noted this excludes the cost of treatment at Hanxi WWTP, which is where the flow will be transferred.

9.6.29. The general conclusions of the least cost analysis are as follows:

- FSR preferred options – the results confirm the preferred alternatives in the FSRs for Nantaizi Lake, Huangpu Road, Caidian and Dongxihu subprojects; and
- Erlangmiao WWTP – the least cost option is Alternative B (oxidation ditch), but the difference with the preferred Alternative A (A2O) is only small (less than 2 % in terms of the NPV). The stated reason for the original selection in the FSR is because it matches the technical characteristics of the Phase 1 development of the WWTP.

Table 9- 13 Wastewater Management Alternatives – Net Present Values and Average Incremental Costs for Water Sales

Alternative	Erlangmiao	Nantaizi Lake	Huangpu Road	Caidian	Dongxihu
Net Present Values @ 12 % (CNY million)					
Financial Costs					
A	176	175	163	97	142
B	173	185		106	
C		191		101	
E			195		
F			220		
Economic Costs					
A	167	165	159	92	132
B	164	175		100	
C		180		95	
E			184		

F			208		
Average Incremental Costs for Water Sales @ 12 % (CNY per m³)					
Financial Costs					
A	0.50	1.19	1.07	0.88	0.42
B	0.49	1.26		0.96	
C		1.30		0.91	
E			1.28		
F			1.44		
Economic Costs					
A	0.48	1.12	1.05	0.83	0.39
B	0.47	1.19		0.90	
C		1.23		0.86	
E			1.21		
F			1.37		

Source: Appendix I.3.

Storm Water Management Alternatives

9.6.30. The technical aspects of the storm water management alternatives are discussed in Chapter 4 (Section 4.7). In the FSRs, alternatives were identified for only two of the subprojects (Yangsigang Drainage Improvements and Dongxihu Three Gates Connections), and only one option was nominated for the other two subprojects (Luoja Road Drainage and Changqing Pumping Station). Table 9-14 summarizes the main components of each of the preferred subprojects.

Table 9-14 Storm Water Management Subprojects – Basic Parameters

Component	Unit	Storm Water Subprojects			
		Luoja Road Drainage	Yangsigang Drainage	Dongxihu Three Gates	Changqing Pumping St.
Infrastructure					
Storm Drains	km		1.34		
Open Channels	km	8.81		8.82	
Box Culverts	km	0.39	1.90	3.92	
Total	km	9.20	3.24	12.74	
Pumping Stations					
Numbers	nos.	1	1		1
Pumping Capacity	m ³ /s	55.0	20.0		135.0
Drainage Area Population					
2003	000	508	42	744	283
2005	000	523	43	745	295
2010	000	561	46	749	328
2020	000	646	53	756	403

Source: Appendix I.3 and Chapter 4.

9.6.31. Table 9-15 summarizes the investment and annual recurrent costs for each subproject in financial and economic prices. The full details are illustrated in Appendix I.3. For the two subprojects with alternatives, a comparison of the costs indicates the following:

- Yangsigang Drainage Improvements – Alternative A is confirmed as the preferred option, but the cost difference is only small (2 %).

- Dongxihu Three Gates Connections – the cost comparison indicates that Alternative B is 6 % cheaper than Alternative A, but the FSR recommends the selection of Alternative A because it is a better engineering match with the existing drainage network.

Table 9-15 Storm Water Management Subprojects –Financial and Economic Costs (CNY million)

Alternatives	Luoja Road Drainage	Yangsigang Drainage Improvements		Dongxihu Three Gates Connections		Changqing Pumping Station
		A	B	A	B	
Financial Costs						
Capital Costs	401.0	91.4	93.1	342.0	321.3	172.5
Annual O&M Costs	1.82	4.4	4.4	10.9	10.3	14.9
Economic Costs						
Capital Costs	368.9	84.1	85.6	314.6	295.6	158.7
Annual O&M Costs	17.2	4.1	4.1	9.8	9.2	15.0

Source: Appendix I.3.

9.7 Economic Evaluation

Introduction

9.7.1 In accordance with the TOR, the economic evaluation has been addressed through four inter-related components:

- Assessment of public investment priorities and public support for the proposed investments;
- Poverty and poverty-related issues in the subproject areas;
- Benefit-cost analysis of the proposed investments in wastewater and stormwater management by subproject and as a combined investment package; and
- General assessment of other benefit and development impacts.

9.7.2 For the economic analysis, it is also important to give specific attention to the definition of the “without” project cases i.e. what is likely to happen if the proposed subprojects are not implemented. This is particularly important in terms of poverty alleviation, environmental impact and the integrity of the existing systems.

Public Investment Priorities

9.7.3 Water quality standards provide the basis for planned investments in wastewater and storm water infrastructure in Wuhan. These are identified in Section 5.2. Key elements of the regulatory framework include: (1) a surface water quality classification system stipulating minimum requirements for various uses including water supply, (2) technology based targets for municipal wastewater treatment, (3) restrictions on the discharge of untreated wastewater. Planned investments are consistent with these regulatory elements and are

designed to help sustain existing water quality conditions where those are acceptable for municipal water supply (Class III) or to improve water quality where they are not (Class IV or higher) (Table 5.1, Chapter 5). Benefits associated with the investments are identified below and elaborated in Section 6.4.

9.7.4 Not only are proposed investments consistent with the established regulatory regime for water quality, they also appear to be widely supported by the population of Wuhan City. The results of the socio-economic survey and focus group meetings indicate high levels of public support for the proposed improvements in wastewater and storm water management services. The analysis of the survey results in Section 6.3 indicates that wastewater and storm water services were ranked first in terms of the frequency of respondents identifying them as "high need" (60%), followed by health care (58%) and solid waste management (57%). Business respondents also indicated great concern over the adverse effects of water pollution (91%), air pollution (88%) and flooding (85%). In addition, 51% of business respondents indicated that wastewater and storm water investments were the highest priority, followed by power supplies (46%) and health services (42%). These results are a clear indication of high levels of public support for the project; although it should be noted that low-income households expressed concern about affordability issues.

9.7.5 The socio-economic survey indicates high levels of public awareness concerning pollution and environmental issues that affect daily lives and living standards. This reaction is prevalent across all income levels.

Poverty and Poverty-Related Issues in Subproject Areas

9.7.6 Poverty alleviation is a major issue for both WMG and ADB. A full analysis is presented in Section 6.3. Again, the survey results show that low income and vulnerable households are more exposed to deficiencies in wastewater and storm water services. These are often coupled with poor standards of housing, lower levels of other infrastructure provision, and living areas that are low-lying and/or close to polluted watercourses. In these circumstances, poor households tend to experience higher levels of environmental pollution, adverse health impacts, and problems with access to public services and work. Therefore, it is anticipated that the proposed subprojects will provide substantial benefits for the urban poor if they are given equal access to the services and the employment opportunities.

Benefit-Cost Analysis

9.7.7 Significant achievements have been made in environmental management and pollution control in Wuhan over the last 10 years, especially through the implementation of the guidelines in the Urban Master Plan (1996-2020), 10th Five Year Plan and specific sector plans, with the active support of ADB, World Bank and a number of bilateral donors. These achievements represent early

stages in a long-term program for major environmental improvements that are supported at the highest levels of the provincial and municipal governments. However, pollution and environmental damage remain a critical problem. The proposed wastewater and storm water management package aims to promote further environmental improvements through the provision of investment resources, enterprise development, institutional capacity building, and continuing policy dialogue on key reform issues.

9.7.8 The proposed investments will provide wastewater and storm water management facilities in key districts of the main urban and suburban areas. The project as a whole will contribute to the overall plans for pollution control and the enhancement of living standards, especially among the poor and disadvantaged. The individual subprojects will offer direct local benefits and make a combined contribution to the wider objectives of pollution reduction and control in Wuhan. Therefore, the economic assessment covers the subprojects individually and as a combined package of interventions.

9.7.9 The evaluation covers the following main topics: (i) benefits and target population; (ii) wastewater management subprojects; (iv) storm water management subprojects; and (v) combined results – wastewater management and storm water. Economic internal rates of return (EIRR) have been derived for the individual subprojects and the combined packages. The main results and tables are presented in Appendix I.4.

Benefits and Target Population

9.7.10 Benefits - the proposed investments will generate benefits in terms of improvements in environmental quality, living standards, health, municipal services and institutional capacity:

- Environmental benefits: pollution reduction and improved water quality in the major rivers (Yangtze, Han and Fu), the main lakes (East Lake, Nantaizi Lake and Moshui Lake) and numerous watercourses flowing through the city. The improvements to the local environment will be felt in terms of enhanced surface water quality and alleviation from annual storm events;
- Living standards and health benefits: further improvements in the living environment will result for a large proportion of the city's population through reduced incidence of pollution-related diseases and reduced damage and inconvenience from storm water events;
- Improved urban services: the project will add significantly to the improvement and upgrading of key urban services. The proposed investments will provide: (i) upgrading and expansion in wastewater treatment capacity of 490,000 m³ per day, plus 37.4 km of interceptor and primary sewers; and (ii) improved storm water drainage for a total area of 658 km². These additional services will also create new job opportunities in the both the construction and operational phases;

- Institutional development and reform: further development of institutional capacity (including tariff, financial, management and operational aspects) through selected interventions that will promote the long-term sustainability and viability of key urban services;
- Public awareness: promote public awareness of important environmental issues relating to pollution reduction (in the local and municipal-wide context) and enhancement of living standards through the provision of modern urban infrastructure facilities. Public awareness is an issue that will need further development and encouragement; and
- Poverty: poverty is a key issue for both the Chinese authorities and the ADB. In this context, the proposed investments will make an important contribution to poverty alleviation in Wuhan (Section 6.4).

9.7.11 Target Population – the proposed subprojects will benefit a significant proportion of the population in Wuhan Municipality. The projected direct beneficiaries are summarized in Tables 9-16 and 9-17 for the wastewater and storm water components:

- Wastewater management component – the five subprojects will serve a population that is projected to increase from 1.56 million in 2005 to 1.79 million in 2010 and 2.27 million by 2020. These estimates include a floating population amounting to 20% of the resident registered population. Study estimates indicate that about 4% of the present registered population in the subproject areas is classified as “poor” with their monthly income less than CNY 600 based on the results of the socio-economic survey (Chapter 6, Section 6.2). In the wider context, the new facilities will also reduce the impact of waterborne pollution in downstream areas close to the Yangtze River. Estimates indicate that approximately 1.72 million people live within 10 km of the river for a distance of 100 km downstream from the mouth of the Zhujia River both within and beyond the municipal boundary; and

Table 9-16 Wastewater Management Subprojects – Beneficiary Population (000)

Subproject	2005	2010	2015	2020	%
Resident					
Erlangmiao	478	517	559	604	31.3
Nantaizi Lake	355	433	530	648	33.6
Huangpu Road	299	280	247	212	11.0
Caidian	114	150	182	221	11.5
Dongxihu	104	138	184	244	12.6
Total	1,350	1,526	1,702	1,930	100.0
Floating					
Erlangmiao	72	103	112	121	35.3
Nantaizi Lake	71	87	106	130	38.0
Huangpu Road	45	50	43	42	12.3
Caidian	0	0	0	0	.0
Dongxihu	21	28	37	49	14.3
Total	208	268	298	342	100.0
Total					
Erlangmiao	550	620	671	725	31.9

Nantaizi Lake	425	520	636	777	34.2
Huangpu Road	344	338	290	254	11.0
Caidian	114	150	182	221	9.7
Dongxihu	125	166	220	293	12.9
Total	1,559	1,794	1,999	2,271	100.0

Source: Appendices I.2 and I.4.

- Storm water management component – the four subprojects will benefit a population that is projected to increase from 1.61 million in 2005 to 1.68 million in 2010 and 1.86 million by 2020.

Table 9-17 Storm Water Management Subprojects – Beneficiary Population (000)

Subproject	2005	2010	2015	2020	%
Resident					
Luoja Road	454	488	524	562	34.8
Yangsigang	38	40	43	46	2.8
Dongxihu	648	651	654	657	40.7
Changqing	257	285	316	351	21.7
Total	1,397	1,464	1,537	1,616	100.0
Floating					
Luoja Road	68	73	79	84	34.8
Yangsigang	6	6	6	7	2.8
Dongxihu	97	98	98	99	40.7
Changqing	39	43	47	53	21.7
Total	210	220	231	242	100.0
Total					
Luoja Road	523	561	602	646	34.8
Yangsigang	43	46	50	53	2.8
Dongxihu	745	749	752	756	40.7
Changqing	295	328	364	403	21.7
Total	1,607	1,684	1,768	1,859	100.0

Source: Appendix I.4.

Economic Assumptions

9.7.12 The following assumptions are used in the economic analysis:

Parameter	Value
Physical Contingencies	9%
Foreign Exchange Component	
E&M Equipment	80%
Civil Works	20%
Others	0%
Capital Costs - Percentages	
Skilled Labor	5%
Unskilled Labor	15%
Electricity	5%
Total	25%
Annual O&M Costs	
Skilled Labor	40%
Unskilled Labor	60%

Shadow/Conversion Factors

Skilled Labor	1.0
Unskilled Labor	0.8
Electricity	1.1
Standard Conversion Factor	0.9
Foreign Exchange	1.0

Wastewater Management Projects

Without Project Case

9.7.13 Without the proposed subprojects, the existing situation will continue to deteriorate and Wuhan will be unable to fulfill the plans and targets for the water sector. Pollution and environmental damage will increase, public health will be adversely affected, downstream communities will be impacted, and economic growth will be inhibited. Without the project, pollution loads in the main rivers and lakes will continue to increase. The objectives of the Wuhan Urban Master Plan and subordinate sector plans for significant water quality and environmental improvements will not be achieved.

Capital Costs

9.7.14 Table 9-18 summarizes the capital cost estimates for the five (5) wastewater management subprojects in mid-2005 constant prices. The capital costs include an allowance for sewer connections from 2006 to 2015. In financial prices, the total capital investment amounts to CNY 830 million (\$ 102 million). The costs for the individual subprojects range from CNY 110 million (\$ 13.5 million) for Caidian WWTP and collection system to CNY 213 million (\$ 26.3 million) for Nantaizi Lake WWTP expansion and collection system.

9.7.15 Based on the total population served in 2010 (1.79 million), the average per capita investment costs would amount to CNY 465 (\$ 57) in financial prices and CNY 435 (US\$ 54) in economic prices.

Table 9-18 Wastewater Management Subprojects – Capital Cost Estimates (CNY million, mid-2005 prices)

Subproject	2006	2007	2008	2009	2010	Total	%
Economic Costs							
Erlangmiao	18.9	47.1	66.0	37.7	18.9	188.6	24.3
Nantaizi Lake	21.6	49.5	68.1	40.2	18.6	197.9	25.5
Huangpu Road	12.5	31.3	43.8	25.1	12.5	125.3	16.1
Caidian	9.7	26.7	36.4	19.4	9.7	101.7	13.1
Dongxihu	16.1	40.3	57.5	33.4	16.1	163.3	21.0
Total	78.7	194.9	271.8	155.6	75.8	776.8	100
Financial Costs							
Erlangmiao	20.0	49.9	69.9	39.9	20.0	199.7	24.7
Nantaizi Lake	23.3	53.3	73.3	43.3	20.0	213.1	24.6
Huangpu Road	13.1	32.8	45.9	26.2	13.1	131.2	16.2
Caidian	10.4	28.7	39.1	20.8	10.4	109.5	12.9
Dongxihu	17.4	43.6	62.3	36.2	17.4	177.0	21.6

Total	84.2	208.4	290.5	166.4	80.9	830.4	100
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Source: Appendix I.4.

Benefit Assessment

9.7.16 The benefits attributable to the wastewater management subprojects are discussed and quantified under two main headings: (i) willingness to pay (WTP) by non-industrial beneficiaries; and (ii) industrial wastewater treatment savings. Other beneficial impacts are discussed a later Subsection.

Willingness to Pay by Non-Industrial Beneficiaries

9.7.17 Willingness to pay (WTP) is a key parameter in assessing the justification for public utility investments like wastewater treatment and sewerage facilities. The concept implies that beneficiaries are willing and able to allocate a reasonable and acceptable proportion of their projected income to cover the real economic costs of providing improved urban services that are commensurate with development objectives of Wuhan and the planned targets to increase wastewater treatment. Indeed, economic growth and increasing urban disposable income in Wuhan over the last 5 to 10 years indicate that general living standards have risen significantly (see: Section 9.2). Therefore, it is not unreasonable that people will expect improved public services and a cleaner environment.

9.7.18 The Socio-Economic Survey (August-September 2005) indicates that households are willing to pay an average of CNY 1.38 (\$ 0.17) per m³ in the main urban areas (Erlangmiao, Nantaizi Lake and Huangpu Road subprojects) and CNY 1.37 (\$ 0.17) per m³ in suburban areas (Caidian and Dongxihu subprojects).

Industrial Wastewater Treatment Savings

9.7.19 In the with project case, industrial enterprises in the subproject areas will avoid the incremental investment that would be required to satisfy the existing industrial wastewater treatment standards for discharge to receiving waters, including rivers, canals and other watercourses in their respective areas. Most industries will require some form of pre-treatment facilities in order to satisfy the standards for discharge to sewers. Therefore, industrial wastewater treatment savings will be the incremental costs of constructing and operating individual secondary treatment facilities.

9.7.20 Estimation of the incremental savings is difficult without detailed information on the individual industries, including: (i) type of product and production process; (ii) age and condition of the plant; (iii) wastewater discharge volumes and pollution load characteristics (BOD, COD, trace metals, toxic substances, and other constituents); etc. Therefore, a more indicative approach has been adopted based on the results of a recent study sponsored by the United Nations (Waste-Water Treatment Technologies: A General Review,

Economic and Social Commission for Western Asia, 2003). The study indicates unit costs for small to medium sized plants of \$ 0.31 (CNY 2.51) per m³ for basic pre-treatment (mechanical process) and US\$ 0.49 (CNY 3.97) per m³ for secondary treatment (biological process), based on a 20-year life and 12% discount rate. The resulting difference is equivalent to a net saving of US\$ 0.18 (CNY 1.46) per m³ of industrial wastewater discharged.

Average Incremental Costs

9.7.21 The average incremental costs (AIC) by subproject are summarized in Table 9-19 in economic and financial prices for both billed water sales and wastewater volumes at a discount rate of 12%. In economic prices, the AICs for billed water sales range from CNY 0.47 (US\$ 0.06) per m³ for the Dongxihu wastewater collection subproject to CNY 1.30 (\$ 0.16) per m³ for the Nantaizi Lake WWTP expansion and wastewater collection subproject. The combined average AIC is CNY 0.72 (\$ 0.09) per m³ in economic prices and CNY 0.76 (\$ 0.09) per m³ in financial prices.

Table 9-19 Wastewater Management Subprojects – AICs @ 12% Discount Rate (CNY per m³, mid-2005 constant prices)

Subproject	Billed Water Sales		Wastewater Volume	
	Economic	Financial	Economic	Financial
Erlangmiao WWTP	0.51	0.54	0.62	0.65
Nantaizi Lake WWTP	1.30	1.39	1.61	1.71
Huangpu Road WWTP	1.12	1.16	1.28	1.32
Caidian WWTP	0.93	0.99	1.37	1.46
Dongxihu wastewater collection	0.47	0.50	0.61	0.65
Combined	0.72	0.76	0.90	0.95

Source: Appendix I.4.

Economic Internal Rates of Return

9.7.22 The economic internal rates of return (EIRR) are presented in Table 9-20. The combined EIRR (base case) for the five (5) wastewater management subprojects is 22.6%, which indicates that the total investment package is justified. The EIRRs for the individual subprojects, range from 12.1% for the Nantaizi Lake WWTP and collection system to 35.1% for the upgrading and expansion of the Erlangmiao WWTP. All of these EIRRs exceed the economic opportunity cost of capital, assumed at 12%.

9.7.23 Table 9-20 also presents the results for the following sensitivity tests: (i) costs +10%; (ii) costs –10%; (iii) benefits +10%; (iv) benefits –10%; (v) benefits lagged 2 years; and (vi) costs +10% and benefits lagged 2 years. The tests indicate that the results are generally robust, except in the cases of Nantaizi Lake and Huangpu Road when costs are increased by 10% and benefits are lagged by two years. The calculated EIRRs are probably conservative in view of the potential wider benefits that are highlighted in a later subsection.

Table 9-20 Wastewater Management Subprojects – EIRRs (%)

Component	Erlangmiao	Nantaizi Lake	Huangpu Road	Caidian	Dongxihu	Combined
Base Case	35.1	12.1	17.9	15.5	25.6	22.6
<u>Sensitivity Tests</u>						
1. Costs +10%	32.3	10.8	15.1	13.9	23.8	20.6
2. Costs –10%	38.2	13.5	21.1	17.5	27.7	24.9
3. Benefits +10%	37.9	13.4	20.8	17.3	27.5	24.7
4. Benefits –10%	32.1	10.7	14.8	13.7	23.7	20.4
5. Benefits Lagged 2 years	23.7	9.4	11.3	11.6	19.3	16.4
6. Tests 2 and 5	22.1	8.4	9.4	10.4	18.1	15.1

Source: Appendix I.4

Storm Water Management Projects

Without Project Case

9.7.24 In the without project case important commercial, administrative and residential areas of central Wuhan on the left and right banks of the Yangtze River will continue to experience the adverse impact of annual storm events that are increasingly disruptive to normal life and commercial activity. The rainy season lasts for five months (April to August) with the most intense rains occurring in June and July. The storm events cause extensive disruption and the return to normal activity can take between two and five days, which has a significant impact on the local economy and the lives of ordinary people. Larger storm events (i.e. more than 1 in 10 years return period) are more difficult to alleviate, but the proposed works should have some effect in reducing the impact. Without the proposed works will be unable to fulfill its planned targets to promote flood alleviation as a vital part of infrastructure development in the main urban area of the city.

Capital Costs

9.7.25 Table 9-21 presents the summary capital costs estimates for the four (4) storm water management subprojects in mid-2005 constant prices. In financial prices, the total capital investment amounts to CNY 1.04 billion (\$ 128 million). The costs for the individual subprojects range from CNY 95 million (\$ 11.7 million) for Yangsigang drainage improvements to CNY 420 million (\$ 52 million) for Luoja Road drainage improvements.

9.7.26 Based on the total population served in 2010 (1.68 million), the average per capita investment costs would amount to CNY 620 (\$ 76) in financial prices and CNY 570 (\$ 70) in economic prices.

Table 9-21 Storm Water Management Subprojects – Capital Cost Estimates (CNY million, mid-2005 prices)

Subproject	2006	2007	2008	2009	2010	Total	%
Economic Costs							
Luoja Road	36.9	100.8	137.7	73.8	36.9	386.1	40.5
Yangsigang	8.4	22.7	31.1	16.8	8.4	87.4	9.2
Dongxihu	34.3	81.5	110.1	62.9	31.5	320.2	33.6
Changqing	15.9	40.3	55.5	31.7	15.9	159.3	16.7
Total	95.4	245.2	334.5	185.3	92.6	953.0	100
Financial Costs							
Luoja Road	40.1	109.8	149.9	80.2	40.1	420.1	40.5
Yangsigang	9.1	24.7	33.8	18.3	9.1	95.1	9.2
Dongxihu	37.3	88.6	119.7	68.4	34.2	348.3	33.6
Changqing	17.3	43.8	60.4	34.5	17.3	173.2	16.7
Total	103.8	266.9	363.8	201.4	80.9	1,036.6	100

Source: Appendix I.4.

Benefit Assessment

9.7.27 The benefits of the storm water management subprojects are discussed and quantified for: (i) annual damage estimates reported by households in the socio-economic survey; and (ii) costs of disruption to normal commercial and industrial activity in the respective drainage services areas.

Damage Estimates Reported by Private Households

9.7.28 The socio-economic survey (Chapter 6) indicates that damage from annual storm events amounted to CNY 47 (\$ 6) per household for direct beneficiaries (i.e. those in the drainage service area) and CNY 41 (\$ 5) per household for indirect beneficiaries (i.e. those residing in adjacent areas who would be indirectly affected by storm events in the without project case (i.e. unable to travel into or through the affected area to work, school, or other commercial and household activities). Ratios of indirect to direct beneficiaries were derived from an examination of the registered population residing in adjacent areas in 2003 (Wuhan Statistical Yearbook 2004). The following ratios were derived: (a) Luoja Road 3.3; (b) Yangsigang 3.0; (c) Dongxihu 1.3; and (d) Changqing 3.0. Based on the direct beneficiary population in Table 9-17, these values were used to derive the flood alleviation benefits to domestic households.

Disruption to Normal Commercial and Industrial Activity

9.7.29 There is no records of damage and disruption caused by flooding from annual storm events in the city. Therefore, an indirect approach was adopted in order to derive a reasonable estimate of the economic cost. The disruption to commercial and industrial was assessed on the basis of reported retail sales of consumer goods and industrial value added for each district in 2003 (Wuhan Statistical Yearbook 2004). Values were allocated to each drainage area on a pro-rata basis relative to the respective land areas. Daily values were calculated

to indicate the approximate average value of commercial and industrial activity in each drainage area for 2003. Estimates of the number of days affected by annual storm events were derived from the FSRs and consultations with the WPMO, design institutes and other local specialists. The estimates indicate that an average of 10 days per year are affected by storm events that cause economic losses in terms of disrupted commercial and industrial activity, damage to infrastructure, clean-up costs, and additional work of welfare and emergency services. The proposed subprojects (i.e. the with project case) will reduce the adverse economic impact of the flooding. It is conservatively assumed that the storm water interventions will save approximately 25% of normal commercial and industrial activity in the following drainage areas in Luoja Road, Dongxihu and Changqing; and 40% in Yangsigang. The resulting average annual values are as follows: Luoja Road CNY 14.6 million (\$ 1.8 million); Yangsigang CNY 3.9 million (\$ 480,000); Dongxihu CNY 69 million (\$ 8.5 million); and Changqing CNY 26.1 million (\$ 3.3 million).

9.7.30 Finally, it is assumed that the flood impact values will increase in real terms by 3% per year up to 2020 for both household damage and the disruption to commercial and industrial activity in the without project case.

Economic Internal Rates of Return

9.7.31 The EIRRs are presented in Table 9-22. The combined EIRR (base case) for the four (4) storm water management subprojects is 19.6%, which indicates that the total investment package is justified. The EIRRs for the individual subprojects, range from 12.8% for the Yangsigang drainage improvements to 27.1% for the Dongxihu Three Gates subproject.

9.7.32 The sensitivity tests generally indicate that the results are robust, except in the cases of Luoja Road and Yangsigang when costs are increased by 10% and benefits are lagged by two years. However, the derived benefits are conservative estimates.

Table 9-22 Storm Water Management Subprojects – EIRRs (%)

Component	Luoja Road	Yangsigang	Dongxihu	Changqing	Combined
Base Case	12.4	12.8	27.1	22.4	19.6
Sensitivity Tests					
Costs +10%	11.0	11.4	25.1	20.3	17.9
Costs -10%	14.0	14.5	29.4	24.9	21.7
Benefits +10%	13.8	14.3	29.1	24.7	21.5
Benefits -10%	10.8	11.2	24.9	20.1	17.7
Benefits Lagged 2 years	9.5	9.6	20.0	15.9	14.8
Tests 2 and 5	8.4	8.7	18.7	14.4	13.5

Source: Appendix I.4.

Combined Wastewater and Storm water Components

Capital Costs

9.7.33 Table 9-23 presents the summary capital costs for both the wastewater and storm water components in mid-2005 constant prices. In financial prices, the total investment package amounts to CNY 1.87 billion (\$ 230 million), excluding price contingencies and financing charges during implementation, of which the wastewater accounts for 45% and the storm water component 55%.

Table 9-23 Wuhan Wastewater and Storm Water Management Project – Capital Cost Estimates (CNY million, mid-2005 prices)

Component	2006	2007	2008	2009	2010	Total	%
Economic Costs							
Wastewater Subprojects	78.7	194.9	271.8	155.6	75.8	776.8	44
Storm water Subprojects	95.4	245.2	334.5	185.3	92.6	953.0	56
Total	174.2	440.1	606.2	340.9	168.4	1,729.8	100
Financial Costs							
Wastewater Subprojects	84.2	208.4	290.5	166.4	80.9	830.4	45
Storm water Subprojects	103.8	266.9	363.8	201.4	80.9	1,036.6	55
Total	188.0	475.3	654.4	367.8	181.6	1,867.1	100

Source: Appendix I.4.

Economic Internal Rates of Return

9.7.34 The combined EIRRs are presented in Table 9-24. The base case EIRR for all nine subprojects is 21.5%, which indicates that the total investment package is justified. The sensitivity tests indicate that the results are robust, with the EIRR remaining above 12% in all cases.

Table 9-24 Wastewater and Storm Water Components – Combined EIRRs (%)

Component	Wastewater	Storm water	Combined
Base Case	22.6	19.6	21.5
Sensitivity Tests			
1. Costs +10%	20.6	17.9	19.6
2. Costs –10%	24.9	21.7	23.7
3. Benefits +10%	24.7	21.5	23.5
4. Benefits –10%	20.4	17.7	19.4
5. Benefits Lagged 2 years	16.4	14.8	15.9
6. Tests 2 and 5	15.1	13.5	14.6

Source: Appendix I.4.

9.7.35 Switching values that cause EIRR to fall below 12% were estimated for the combined project. They are as follows:

- 70% increase in costs;
- 41% decrease in benefits; and
- 4 to 5 year lag in benefits.

These switching values support the conclusion that the EIRR is robust.

Other Project Impacts

9.7.36 Health benefits - one of the main objectives for developing and improving wastewater and storm water management services is to safeguard and improve general standards of public health. The nine subprojects will contribute to health improvements through the reduction in many of the physical vectors that can transmit waterborne and water-related diseases. However, parallel initiatives will be needed in public health education and improvements in personal hygiene to ensure that all the potential benefits are realized.

9.7.37 Employment generation - the project package will create new employment opportunities during the construction program (approximately 5,000 full time jobs during the 5-year construction period) and 220 permanent jobs in the operational phase from 2010 onwards.

9.7.38 Water resources protection – improvements in water quality in the main rivers and lakes will be a direct benefit to all citizens and the local economy. The investments will: (a) protect potable water sources and generate modest savings in water treatment costs; (b) improve the local environment and recreational opportunities; and (c) reduce the adverse affect of water pollution on downstream communities.

9.7.39 Property values – property and land values will be enhanced in both the wastewater and storm water subproject areas, especially those properties adjacent to the main water bodies and in the more low-lying areas that are subject to increased flooding.

9.7.40 Recreation and amenity – the subprojects will contribute to increased recreational opportunities, which are important in a large city where real living standards are continuing to rise.

9.7.41 Urban development plans - the proposed investments will fulfill urban and sector development plans that place heavy emphasis on modern infrastructure and services that will enhance the drive to develop Wuhan as a modern international city.

9.7.42 Standard of living and the urban poor – improvements in wastewater and storm water management services will continue to raise general standards of living, especially for the urban and rural poor.

9.8 Conclusions and Recommendations

9.8.1 The overall conclusion of the economic evaluation is that the proposed investment is fully justified and will offer significant environmental and development benefits to Wuhan. It is recommended that the implementation should proceed according the proposed schedule.

10. Management Arrangements, Capacity Building and Training

10.1 Introduction

10.1.1. This Chapter of the report deals with the management and institutional arrangements necessary to ensure that:

- The Project is successfully prepared and implemented, and
- The institutional arrangements facilitate effective and sustainable operations and maintenance of the project facilities.

10.1.2. In order for the Project to be implemented in a successful manner, institutional and project management arrangements need to be agreed upon by ADB and Wuhan Municipal Government (WMG). These arrangements need to provide for:

- Ease of project preparation and approval by both ADB and relevant domestic authorities.
- Ensuring Wuhan Drainage Company (WDC) and Wuhan Urban Construction Foundation (WUCF), the Implementing Agencies (IAs) have the capability to effectively discharge their responsibilities for the implementation of the subprojects for which they are responsible.
- There is a clear definition of each IA's responsibilities and its relationship to the relevant local government, Wuhan Urban Construction Utilization of Foreign Investment Project Management Office (WPMO) as the overall Executing Agency (EA), and other agencies involved in project implementation.
- The future operations and management of the project facilities, so that the Project is fully sustainable in terms of finance and service provision.

10.1.3. A critical area for examination in assessing the potential financial sustainability of the Project will be the sources of income and the security of these sources. In practical terms this means the political acceptability and customer affordability of required wastewater charges, effective and fully enforceable income collection, and the reliability of demand forecasts on which tariff estimates are based. Thus, financial sustainability is both a financial and an institutional issue. For storm water drainage services financed from government revenues, appropriate assurances on the adequacy of future operating budgets will be required.

10.2 Institutional and Capacity Building Work within the PPTA

10.2.1. The terms of reference (TOR) of the PPTA require the following:

- Review existing institutional capacity of relevant government departments and agencies;
- Develop corporate management arrangements and financial procedures for the IAs;
- Identify deficiencies and make recommendations to strengthen IA institutional and technical capability;
- Evaluate and advise on wastewater management arrangements (some of which are technical in nature and some institutional in nature);
- Design and prepare a technical assistance program, including training; and
- Propose the most appropriate institutional arrangements and related policy framework for private sector participation in wastewater and/or storm water management.

10.2.2. Thus the PPTA work should support the establishment of strong managerial and institutional arrangements by the IAs. In this Final Report we report on the work undertaken to discharge our obligations under the TOR, the conclusions drawn and issues identified.

Review of Existing Institutional Capacity

10.2.3. This work has comprised a review of the overall project management arrangements for the Project, including the arrangements for high level Government oversight of the Project at both Municipal and Provincial levels. The arrangements have been documented and are shown in Appendix J3. The review has included human resources plans, staffing levels, and the skills and experience of key staff, where sufficient detail has been available to make such review meaningful. Progress made in establishing the project management arrangements has been discussed. Significant issues and specific preconditions for successful loan appraisal or requiring potential loan covenants have been identified and are detailed separately in the draft Report and Recommendation of the President (RRP).

Development of Corporate Management Arrangements and Financial Procedures

10.2.4. This work has included a review of the existing organizational structure of each IA, together with a review of future plans for the project operations and maintenance phase. The discussions and reviews have concentrated most on the immediate needs for successful project implementation. Recommendations have been formulated for appropriate capacity building during the implementation

phase. Corporate governance arrangements have been documented, including provisions for audit and company supervision. Preconditions for successful loan appraisal or potential loan covenants required have been identified.

Strengthening of Institutional and Technical Capability

10.2.5. Institutional capability such as the extent of financial management, business planning, and management information system (MIS) development have been discussed. Income collection systems and their current performance have been reviewed as part of an overall financial health check of WDC and to assess the reliability of estimated future income flows. This formed part of the financial management assessment (FMA) reported on within Chapter 8 of this report. Suggestions for improvements are recommended as capacity building measures. Technical capability has been assessed in a similar manner within the technical analysis part of the PPTA and strengthening needs also fed through in the form of capacity building suggestions.

Wastewater and Storm Water Management

10.2.6. Institutional issues that need to be considered under the heading of wastewater management include the extent to which industrial discharges have been identified and licensed, enforcement powers, responsibilities and procedures, sewer connections through a permitting system strategy, and review of options for the future operation of project facilities. Storm water management issues that have been considered include the coordination of pumping operations, inspections to avoid illegal connections (where a wastewater discharge is connected to a storm water pipeline) and arrangements for monitoring the nature, cause and severity of local flooding incidents.

Design of Technical Assistance and Training Program

10.2.7. During the PPTA a number of required capacity building measures have been identified. These include implementation phase consulting support and training needs. A simple training needs questionnaire was developed to guide discussion on training needs and priorities. Identified capacity building measures include actions required to further strengthen WDC as an autonomous enterprise, capacity building for improved storm water management, as well as risk reduction measures relevant to either the project construction phase or the subsequent operations phase. This identification process has continued throughout the PPTA. A set of draft terms of reference (TOR) for consulting services was developed at the interim report stage and has been refined following consultation with WPMO, WFB and MOF. This revised TOR is included as Appendix J9.

Determining Project Institutional Arrangements

10.2.8. PPTA workshops have been used as an opportunity to emphasize the importance of ensuring the Project is made both institutionally and financially sustainable. The key messages imparted were:

- To ensure the successful implementation of the Project, the IAs must have the necessary skills and experience. Key stakeholders must be involved in project preparations and implementation.
- Generally it is preferred that companies should be established to provide wastewater and drainage services. While the enterprise model of management gives natural advantages in managerial and financial terms, companies must be properly established with clear duties and responsibilities, and they must also be properly supervised.
- These utility companies should operate as businesses which in turn implies:
 - They become financially sustainable; that is they must generate sufficient income to cover outgoings (including debt servicing).
 - They have managerial autonomy. This means company managements should be largely autonomous and able to make decisions necessary to achieve agreed objectives.
 - Companies need to be adequately motivated to improve their performance through higher standards of service and greater efficiency.
- There is effective regulatory control:
 - Prices should be fair to both the companies and to customers.
 - Service levels – standards should be defined and performance monitored to ensure they are met.
 - Effective industrial pollution control is necessary to protect WWTP processes and consequentially river quality
- High standards of corporate governance are achieved whereby utility companies are able to demonstrate proper and effective use of resources and thus create public confidence through transparency of management and reporting.

10.2.9. Through the workshops and supporting tripartite dialogue, the institutional arrangements that will apply for the Project were agreed during the ADB's interim mission, and that separate implementation arrangements would apply for the wastewater and storm water components of the Project. This separation recognizes the different nature of the two services. On the one hand the wastewater service is user driven as service users (households, industries and others) determine how much wastewater they generate, primarily by how

much water they consume. There is a (quasi) commercial price/demand relationship in existence which makes the enterprise form of management particularly appropriate. For storm water drainage no such commercial relationship (quasi or otherwise) exists between the service provider and service users. This is because service needs and demand is predominantly driven by climate and individual users have little or no control over how often, or at what area and level, they require the service.

10.3 Overview of Project Management

10.3.1. Following the various discussions held the proposed institutional and project management arrangements for the Project can be summarized as follows:

- At the Municipal Government level a Project Leading Group (PLG) has been established to oversee the preparation and implementation of the overall project. This group is led by a Vice Mayor of WMG, and its full membership is listed in Appendix J1.
- Also at the Municipal Government level the WPMO has been established to represent WMG and assist it to discharge its responsibilities as EA for the Project. WPMO has played a vital coordination role during project preparations and will continue to do so during project implementation by facilitating required government decisions and action, and by ensuring smooth communications with the IAs and other project stakeholders. The organization of WPMO is provided in Appendix J2
- For the wastewater component of the Project, the existing WDC will fulfill the role of IA. WDC is already a properly constituted enterprise company established under the provisions of PRC law and largely managerially and financially autonomous. WDC will:
 - act as the IA for the wastewater subprojects, working and liaising closely with the various departments and agencies of local government, and
 - assume overall management responsibility for future operations and maintenance of project facilities, including responsibility for debt servicing and the repayment of loan principal. However, detailed operations and management arrangements for each of the individual wastewater subprojects have not yet been decided and it is proposed this matter be dealt with during the construction phase of project implementation.
- For the storm water component of the Project, WUCF will be the IA. It is further proposed that the responsibilities for construction and future operations and management be separated. This accords with the existing institutional arrangements and is justified by the fact that the existing operators (being branches of the Wuhan Water Authority and its subordinate local district level units) have no construction experience or construction license. Equally, specialized construction management

companies do not have experience or interest in the operation of government funded, non-revenue generating storm water services. The preference of WPMO is to have the Jianxing Infrastructure Facilities Construction Company Ltd to be responsible for managing the project construction. This company is a legal person company and one of three in Wuhan licensed and experienced to undertake construction of urban infrastructure projects of this type. The company has acted as the project management company for a recent World Bank transportation project. Based on this it appears it has the technical and project management capacity to undertake the role. This capacity has now been verified by the PPTA team. The Jianxing Company is government owned and jointly supervised by WUCF and Wuhan Urban Design Institute.

- The responsibility for arranging project counterpart finance is also different for the wastewater and storm water components. The responsibility for raising counterpart finance for the wastewater component is vested in the Wuhan Urban Construction Investment and Development Group Co Ltd (WUCIDC) which, as the parent company of WDC, will have overall responsibility for project construction. WUCIDC is a 100% State-owned company under the supervision of WMG.
- The responsibility for arranging finance for the public service parts of the storm water component of the Project is vested in WUCF, which is a government agency closely aligned with WUCIDC.
- Provision of advice and support services to the EA and IAs will be provided by professional institutes, consultants and specialist contractors. These services will include:
 - Design and design review;
 - Tendering and procurement;
 - Construction supervision; and
 - Implementation phase consultancy on capacity building and training.
- Independent review and scrutiny of project implementation will be undertaken in respect of:
 - Environmental monitoring and adherence to environmental impact assessment (EIA) provisions;
 - Compliance with the Resettlement Plan (RP); and
 - External audit of project accounts and compliance with loan covenants.
- Project performance will be reviewed through the establishment of an agreed project performance monitoring system (PPMS) developed from the Project Design and Monitoring Framework (PDMF).

10.3.2. It is concluded these arrangements, once fully implemented and effective, will provide a strong framework for overall project management and control. Further evidence to support this conclusion is the ongoing implementation of the ADB-funded Wuhan Wastewater Management Project, and also the implementation of World Bank funded projects in this and related sectors. Project management arrangements are illustrated in Appendix J3.

10.4 Project Agencies

Wuhan Municipal Government

10.4.1. WMG is the designated EA for the Project and is a third tier government directly responsible to Hubei Provincial Government (a second tier government) and thence to national level government. All municipal government departments have a direct responsibility to WMG and the local People's Congress, while retaining strong functional links and responsibilities to their equivalent departments at the provincial and national level.

10.4.2. Below WMG there are lower levels of government at urban district (or county in rural areas) and neighborhood / street levels. Wuhan Municipality comprises thirteen districts (seven urban and six suburban). There are also enterprise development zones. In Wuhan, key responsibilities relevant to the Project that are currently conducted at the district level are the maintenance of the local sewerage network and local storm water operations.

10.4.3. A diagram of the WMG structure, indicating the main units involved in the Project is included as Appendix J4. The main agencies and their principal responsibilities are described below:

Wuhan Municipal Water Authority

10.4.4. Created under the last major structural reorganization of WMG, the Wuhan Municipal Water Authority (WMWA) is the Government agency with overall responsibility for water and wastewater management within Wuhan Municipality. It has inherited responsibilities from the former Water Resources, Construction Administration and Public Utilities Bureau. As part of its responsibilities, WMWA exercises functional supervision over WDC and undertakes other wastewater and storm water management activities either directly itself or through subsidiary units as follows:

- administration and enforcement of municipal regulations for management of the sewerage system, including control over sewerage connections;
- monitoring of wastewater discharges to the sewerage system (undertaken by the wastewater discharge monitoring center);
- coordination with District Governments on operation of the sewerage system; and

- management of major storm water pumping facilities and coordination of storm water operations and urban flood alleviation.

10.4.5. WMWA also exercises functional supervision of urban water supplies, services that are provided by the Wuhan Municipal Water Supply Company (WWC), and which is a subsidiary of WUCIDC (see below). WWC currently undertakes the main billing and income collection activity in respect of wastewater charges.

Wuhan Urban Construction Investment and Development Group Co Ltd

10.4.6. WUCIDC is a 100% State owned company under the supervision of WMG. WUCIDC has a wide range of business interests organised into 11 groups / companies:

- Wuhan Water Service Group (WWSG);
- Gas supplies;
- Mass rail transit;
- Bridge and road construction;
- Toll roads management;
- Real estate (three separate companies);
- Investment capital management;
- Daqiao Group (responsible for construction of Wuhan Yangtze River 4th Bridge); and
- Technology (Green Water Company).

10.4.7. WUCIDC was initially formed in 1997 but was reorganized and the Wuhan Water Service Group (WWSG) was included in 2002. The latest organization chart of WUCIDC is provided as Appendix J5. The WWSG (see Appendix J6) has departments responsible for the provision of water supply services and in addition has the following subsidiary companies/units:

- Wuhan Drainage Company (100% owned)
- Three Towns Company (70% owned and 30% public on the Shanghai stock market)
- Wastewater treatment and sewerage operations units (these are not individually corporatized, but are effectively departments of WWSG)
- Others as shown in Appendix J6.

10.4.8. The Three Towns Company is an investment company that owns some water assets that include one large storm water pumping station and one large water treatment plant. It has no involvement in the design, preparations or implementation of the proposed Project.

Wuhan Drainage Company

10.4.9. WDC is the designated IA for the wastewater component of the Project. It is also the designated IA for the ongoing WWMP and was one of the IAs for the World Bank (WB) funded Hubei Urban Environment Project (HUEP). WDC is a subsidiary of the WWSG, which is in turn a subsidiary of WUCIDC. Functional supervision of WDC is exercised by WMWA. The history and development of WDC is dealt with in more detail in Paragraphs 10.5.1 to 10.5.5 below. The current organization and staffing is described in Paragraph 10.5.10 below and Appendix J7 shows the organizational structure.

10.4.10. WDC currently owns the assets for all Wuhan's operational WWTPs and sewer network. However, management, operations and maintenance are contracted out ("entrusted") to the separate wastewater treatment and trunk sewerage operations units within its parent Water Services Group Company. Local sewer operations and maintenance are performed by the District Governments who are paid a fee by WDC to do this work

Wuhan Municipal Construction Commission

10.4.11. The Wuhan Municipal Construction Commission (WMCC) is responsible to WMG for overseeing all urban construction. Its role is however, essentially a policy and regulatory role and it is not directly involved in construction activity. Compliance with design and construction standards, accreditation of design institutes and construction supervision companies all come within the remit of the WMCC. It is also involved in urban master planning.

Wuhan Urban Construction Foundation

10.4.12. WUCF is a government agency responsible for financing and implementing public sector construction projects that cannot be implemented on a commercial basis. Most non-revenue generating urban construction is therefore carried out by WUCF or one of its subsidiary units. WPMO is one sub-unit of WUCF and another unit will act as the IA for the storm water component. WUCF will also undertake debt servicing and repayment in respect of the storm water component.

Wuhan Municipal Development and Reform Commission

10.4.13. The Wuhan Municipal Development and Reform Commission (WDRC) is responsible for the planning and approval of all government investment in Wuhan. WDRC is thus most active during the project preparation phase and in particular in processing the Project through the domestic approval procedures. This includes seeking the necessary approvals required of Hubei Provincial Development and Reform Commission (HDRC) and by the National Development and Reform Commission (NDRC) at the national level. WDRC will

also be involved in the final commissioning and acceptance of completed project works to ensure these have been constructed in accordance with approvals given and are of satisfactory quality.

Wuhan Municipal Environmental Protection Bureau

10.4.14. The Wuhan Municipal Environmental Protection Bureau (WEPB) is responsible for environmental protection within Wuhan Municipality and is the principal environmental regulator. It has responsibilities that cover air, noise, solid waste and water pollution. Environmental monitoring is performed on behalf of WMEPB by a series of environmental monitoring stations that operate at both the Municipal and District/County level. This network of monitoring stations provides data for environmental management, planning and the enforcement of environmental regulations. Monitoring includes individual point sources and the quality of watercourses (rivers, lakes, etc).

10.4.15. WEPB also administers the EIA procedures and is the local enforcement agency for EIA compliance. WMEPB has an information center that undertakes environmental education, training and public awareness activity.

10.4.16. WEPB will need to be closely involved in many aspects of the Project, including several aspects of the required policy dialogue. Of particular importance, WMEPB support will be needed to facilitate the processing of the Project EIA through the domestic approvals procedure and the ultimate approval of SEPA.

Wuhan Municipal Price Bureau

10.4.17. The Wuhan Municipal Price Bureau (WMPB) is the Government's local price regulator for those prices, which are still under the control of the State. This includes the administration of water supply and wastewater tariff levels and the review and processing of any increases proposed by the utility companies responsible for these services. WMPB can confirm price increases only acting under delegated powers given by superior price authorities. In the case of wastewater tariffs WMPB has no power to approve any proposed increase, but refers WMG proposals for the review and endorsement of the Hubei Provincial Price Bureau.

Wuhan Municipal Finance Bureau

10.4.18. The Wuhan Municipal Finance Bureau (WMFB) prepares and administers the overall WMG budget which in turn dictates the funding of directly managed public services such as storm water operations, and the level of subsidy provided to the utilities and the extent of their operations, maintenance and renewals budgets.

10.4.19. At the lower district-level of government there are district-level Finance Bureaus that set budgets for public services provided at the local district level, which includes localized storm water and urban flood relief activities.

Wuhan Poverty Alleviation Office and District Level Offices

10.4.20. These offices are responsible for poverty alleviation and prevention. They are important consultees in relation to the poverty and social protection aspects of the Project, including relevant policy dialogue. They have been encouraged to participate in project workshops etc and in the socio-economic assessments performed.

Wuhan Land Administration Bureau and District Level Offices

10.4.21. These bodies have responsibility for the control of detailed land use in accordance with overall urban development plans. In relation to the Project these offices have been consulted over the choice of sites for WWTPs and pumping stations and give approval to any required land acquisition. They are also involved in both the preparation and subsequent implementation of the project resettlement plans.

All China Women's Federation, Wuhan Branch

10.4.22. This organization represents the interests of women. It has been consulted over gender and women's issues relevant to the Project.

Wuhan Municipal State Asset Administration Commission

10.4.23. The Wuhan Municipal State Asset Administration Commission (WMSAAC) oversees the administration and management of all State owned assets, including state owned enterprises such as WUCIDC. The objective of WMSAAC is to protect and enhance the value of state owned assets. Increasingly actual day to day asset management and operation of assets is carried out by enterprise companies.

Dongxihu and Caidian District Governments

10.4.24. Dongxihu and Caidian are two suburban districts of Wuhan Municipality that will participate in the Project. They are subordinate to WMG but for historical reasons have a greater degree of autonomy than the 7 main urban districts that form the central core of the city. Both districts are represented on the PLG thus allowing for unified project management of the Project. As referred to in Chapter 8, no wastewater charges are currently levied in Caidian and only a nominal charge is levied in Dongxihu. Both districts have their own autonomous water companies and are administratively responsible for the construction, management and operation of wastewater infrastructure in their own area of

jurisdiction. Wastewater services in Caidian are undertaken by the local Urban Administration Department, and in Dongxihu by the local Water Bureau. Currently WDC has no involvement in the wastewater operations in these two districts.

10.5 Institutional Arrangements for Wastewater Management Component

History and Development of Wuhan Drainage Company

10.5.1. WDC was initially established as a wastewater construction company for the purpose of implementing the Wuhan wastewater component of the WB financed HUEP. Its origins in this form date back to 1995/96 at which time the HUEP was under preparation. At this time WDC's sole responsibility was for the WB project and it acted as a PMO responsible for HUEP implementation but with no operational responsibilities for any part of Wuhan's wastewater system. WMG, in common with other HUEP cities, made no real attempt to implement the program of institutional reforms agreed with the WB during the early years of HUEP implementation. This resulted in the project implementation of HUEP being designated as "unsatisfactory" by the WB in 1998.

10.5.2. In response to this situation in January 1999, WMG issued a document reconfirming their "in principle" support to the institutional reform process and stipulating that:

- all wastewater assets should be transferred to WDC;
- WDC should inherit full managerial and operational responsibility for the Wuhan wastewater system; and
- WDC be allowed to collect and retain wastewater charges.

10.5.3. The WMG document specified no timescale for the implementation of the reforms; however, under the auspices of WB promoted technical assistance to WDC an institutional action plan was developed and agreed with WDC management and the WB in mid 1999. Despite this action plan the institutional reforms continued to meet resistance from within different departments of WMG, however the following steady but slow progress has been made over the intervening years :

- WDC has a Board of Directors, a valid business license, and a Company Charter. Details of the existing Board of Directors and an outline of the Charter are provided in Paragraphs 10.5.10 and 10.5.11 below under the heading of Corporate Governance.
- The Shahu WWTP was transferred to WMWC in 1999 and in the autumn of 2001 WDC took over additional operational responsibilities for the trunk sewerage system and six major pumping stations in the contributing

service area. It was an important step in becoming an integrated wastewater company.

- In 2002 all wastewater assets were transferred to WDC from various government agencies.
- Also since 2003, all wastewater tariff revenues have been transferred to and collected by WDC and retained by the company, albeit in a special account under the close control of the WMFB. However, this was nevertheless an important step to provide financial autonomy.

10.5.4. WDC has received capacity building assistance under the WB funded HUEP and is currently a recipient of further assistance under the ADB's ongoing Wuhan Wastewater Management Project (WWMP). This assistance has included institutional and financial management strengthening together with domestic and overseas training.

10.5.5. Despite the progress made and capacity building support provided WDC does not yet operate as a fully integrated wastewater company. Instead WDC continues to operate primarily as a construction management company with the day to day operation of WWTP, and sewerage and pumping operations being performed by other units under the Water Services Group Company. See also Appendix J6.

Functional Arrangements for Wastewater Management

10.5.6. Current arrangements and responsibilities for wastewater and storm water management in the central urban area of Wuhan can be summarized as set out in Table 10.1 below.

Table 10.1 Summary of Wastewater and Storm Water Management Responsibilities

Function or Activity	Responsibility	Others Involved
Wastewater master planning	WMWA	WMCC, WMEPB
Development and review of policy, laws and regulations	WMWA	WMG, WMCC
Feasibility studies and project preparations	WPMO	WDC, WMWA, WDRC
Financing of major wastewater projects	WUCIDC	WDRC
Financing of major storm water projects	WUCF	WMFB, WDRC
Construction of new wastewater Infrastructure	WDC	WMCC, WPMO
Construction of new storm water infrastructure	WUCF	WPMO
Setting operational standards	WMWA	
Monitoring of operational performance	WMWA	WMEPB
Asset management	WDC	
Coordination of flood control (urban area)	WMWA	WDC
Management of trunk sewer network (urban area)	WDC*	
Management of local sewers (urban area)	DGs	WMCC
Management of wastewater pumping stations	WDC*	

Management of WWTP	WDC*	
Income collection (management responsibility)	WDC	WMWSC
Determination of storm water budgets	WMFB	WMWA
Determining tariff levels	WMG	WMPB, WMWA
Approval of new sewer connections	WMWA	
Making new sewer connections	DGs	
Approval of new discharges to sewer	WMWA	WMEPB
Monitoring of wastewater discharges to sewer	WMWA	WMEPB
Monitoring of WWTP effluent discharges	WMEPB	WMWA
Monitoring of sludge disposal activity	WMEPB	WMWA
Enforcement of wastewater laws and regulations	WMWA	WDC, DGs,
Training and development of staff	WDC	WMWA

Note

* Actual operations are carried out by separate units under the WWSG and not by WDC directly.

Key

WMWA	-	Wuhan Municipal Water Authority
WDC	-	Wuhan Drainage Company
DG	-	District Government
WMG	-	Wuhan Municipal Government
WMCC	-	Wuhan Municipal Construction Commission
WMFB	-	Wuhan Municipal Finance Bureau.
WMPB	-	Wuhan Municipal Price Bureau.
WMEPB	-	Wuhan Municipal Environmental Protection Bureau.
WMPD	-	Wuhan Municipal Development & Reform Commission
WWSG	-	Wuhan Water Services Group
WPMO	-	Wuhan Project Management Office
WUCF	-	Wuhan Urban Construction Foundation
WUCIDC	-	Wuhan Urban Construction Investment & Development Group Company

Wastewater Charging Arrangements

10.5.7. Significant wastewater charges are applied within the central urban area of Wuhan only. In this area the charges are applied to all properties taking water from the municipal water supply system and are also applied to those drawing private water supplies (from wells or rivers) and discharging wastewater to an urban sewer. Wastewater charges are levied based on the volume of water supplied, with the chargeable volume for wastewater being 100% of the chargeable water supply volume (that is, it is assumed all of the water supplied is returned to the sewerage system as wastewater).

10.5.8. There are two separate billing systems in operation. For those customers of the Wuhan Tap Water Company (WTWC) an one bill-two charges on both water and wastewater is issued by WTWC. Customers with private water supplies (direct abstractors) are charged for wastewater through bills

issued by the WDC. All wastewater charges that are collected are remitted to a special account in the name of WDC, but under the effective control of WMFB, which authorizes drawing from the account for either day to day operations or as counterpart funding for wastewater investments. It is understood that no formal income collection agreement exists between WDC and WTWC, but that an agreed commission rate of 3.5% is deducted by WTWC.

10.5.9. In Dongxihu District a token wastewater levy of CNY 0.05 /m³ is applied on all water supply bills. In Caidian District there is currently no wastewater charge levied.

Organization and Staffing of WDC

10.5.10. Although WDC owns all wastewater assets within the central urban area of Wuhan it is essentially a construction company and has no day to day involvement in the management and operations of either WWTPs or the sewerage network. As identified above the day to day operational wastewater management is performed by others. This operational management is nominally on behalf of WDC and reimbursed by WDC. No formal contractual relationship appears to exist, and the basis for payments made by WDC to these other operational units is not known. In all, WDC has 77 staff organized into the following sections:

- Comprehensive management;
- Planning;
- Finance;
- Engineering;
- Technical;
- Equipment; and
- Tariff Collection.

10.5.11. The current staffing level and the organizational structure appear adequate and appropriate for WDC's primary role as a construction management company. However, the intended institutional reform under both the HUEP and WWMP projects were that WDC would be an integrated wastewater management company. We note CDM Consulting Co are engaged to advise WPMO/WDC on the implementation of this reform as part of their WWMP consulting services contract. The organizational design for WDC to become an integrated wastewater management company, as developed during WWMP preparations appears to remain largely valid but will need some updating in its detailed implementation. The failure to implement this reform is discussed further in Paragraph 10.5.21 below:

Direction and Supervision

10.5.12. WDC has a Board of Directors for the overall management of the Company, which currently comprises 5 persons as follows:

Qu Zhaochun	-	Chairman
Pan Heping	-	Board Member
Tian Zhongkai	-	Board Member
Yao Hahua	-	Board Member
Gong Bi'an	-	Board Member.

10.5.13. There is no separate and independent Board of Supervision, but supervision is instead exercised by the parent companies (WWSG and WUCIDC). WDC has a Company Charter which provides an overall framework for the management of the company. The Company Charter has been reviewed and found to be in a form that is fairly standard in China. It comprises the following sections:

- General Information;
- Purpose of Company and intended scope of business and operations;
- Assets;
- Institutional arrangements (including appointment and duties of the General Manager);
- Financial management;
- Company formation, modification and arrangements for break up or dissolution;
- Staffing matters, staff representation and trade (labor) union arrangements;
- Party and Youth League arrangements; and
- Supplementary articles.

Audit Arrangements

10.5.14. Audit arrangements for WDC have been dealt with under the financial management assessment made of the Company and as discussed in Chapter 8.

Internal Control

10.5.15. The Company appears to have a reasonably comprehensive suite of internal management regulations, which the Company Charter provides for. These comprise:

- Meetings and decision taking;
- Regulations for incurring administrative expenditure;
- Financial management regulations;
- Labor discipline regulations;

- Security regulations;
- Procurement and tendering regulations;
- Computer system management regulations;
- File management and document control regulations; and
- Transport (use of cars) regulations.
- Regulations for management of the print room
- Medical fees management regulations
- Safety management regulations.

10.5.16. Due to time constraints these regulations have not been reviewed in detail.

Wastewater Management

10.5.17. Wastewater management arrangements in Wuhan understandably reflect the fact that the city has only limited operational WWTP capacity (although this situation is soon to change as a result of investments under implementation). In this situation WEPB should (and does) exercise control over industrial wastewater discharges, as much of the wastewater that is generated in the city still flows untreated into rivers and other water bodies. In this situation the only legitimate interest of the managers and operators of the municipal sewerage system (whether this is WDC or the District Governments responsible for the secondary and local network) is in possible damage to the sewers or danger to the safety of employees that harmful wastewater discharges might cause. As WWTPs are constructed and connected to sewerage collection systems, this situation changes. WEPB interest should now focus on WWTP performance. WDC management, in order to achieve acceptable WWTP performance, must be able to exercise control over wastewater entering the sewerage system and, thus, have the capability of safeguarding the treatment process.

10.5.18. This suggests that WDC, supported as necessary by Government enforcement action, should take responsibility for monitoring and control of discharges to the sewerage system, largely taking this role over from WMEPB. The existence of an operational WWTP also increases the importance of effective monitoring and control of wastewater discharges to sewer, if repeated operational problems and failings are to be avoided. Steps necessary include the clear definition of responsibilities with these reflected in strong local enforcement regulations and the progressive expansion of the discharge permits system. These needs are already recognized by WDC and WMG and are reflected to a degree in the WWMP legal documents.

10.5.19. Ensuring adequate provision of local sewers and individual property connections to the sewerage system has proved to be a problem that has reduced the effectiveness of some past investments in wastewater infrastructure in the PRC. The PPTA team has therefore reviewed this issue from both technical and institutional perspectives. This report has already concluded that

Wuhan already has a reasonably high coverage rate (percentage of properties with sewer connections), and that adequate provision exists within the engineering proposals for ensuring connections are made where sewers are replaced. City regulations require all new buildings to be connected to a sewer at the developers' cost. The majority of unconnected properties are small, older buildings, most of which will be redeveloped within the next 10 years. Assurances given under WWMP are designed to provide adequate safeguards in this respect.

10.5.20. The PPTA for the ongoing WWMP identified consulting services and training in WWTP operations as a capacity building need. This conclusion was based on the operating performance of the Shahu WWTP. In dialogue with the Consultant providing consulting services and training support under WWMP, it is confirmed that a comprehensive program of training is envisaged which will ultimately lead to the adoption of operational procedures capable of meeting the ISO 9000 quality management standard. Whilst this training program has yet to get underway, it does appear to make further WWTP operations training under the Project unnecessary, except for specific manufacturers provided training on specialized equipment operation and maintenance. It is suggested the success of WWMP training be reviewed during ADB supervisory missions and if shortcomings are identified then these be addressed by the Project at the mid term review stage of project implementation.

Institutional Issues Relating to WDC and Implementation of Wastewater Component.

10.5.21. The two main institutional issues identified during the PPTA in relation to the implementation of the wastewater component are:

- WDC continues to function primarily as a wastewater construction unit and not as an integrated wastewater management company.
- To date WDC has had no involvement in the wastewater management in the suburban districts of Dongxihu and Caidian.

10.5.22. Creation of WDC as an integrated wastewater management company serving the core urban area of Wuhan was an institutional reform initially promulgated under the WB funded HUEP and further emphasized during design and preparations of the WWMP. A core objective of the consulting services under WWMP is the institutional development of WDC as an integrated wastewater management company. However, at present WDC has no real direct involvement in wastewater operations and in reality operates as a wastewater construction company. Fulfillment of the HUEP and WWMP institutional reforms requires a merger of WDC and the separate WWTP and sewerage operation units within the WWSG. It is understood there is a commitment on the part of WMG to this reform, but practical and political issues impede its implementation.

Resolution of this issue is probably best undertaken as part of WWMP implementation rather than WWMSPP, but such a resolution is important to the success of both projects and indeed the future institutional development of the Wuhan wastewater sector, including its potential attractiveness to private investors.

10.5.23. The suburban Dongxihu district does not have a distinct wastewater catchment with its own WWTP and instead forms part of a larger wastewater catchment area also comprising much of the urban Qiaokou district. Wastewater will drain to the newly constructed Hanxi WWTP. In these circumstances it is logical that wastewater operations in Dongxihu become fully integrated with those of WDC. This reform has been agreed in principle with WPMO.

10.5.24. In contrast the wastewater subproject in Caidian district is part of a separated distinct catchment outside the existing WDC service area. Institutional options under these circumstances are:

- (i) for Caidian to set up its own drainage company;
- (ii) for wastewater operations in Caidian to be integrated into WDC; or
- (iii) A semi-autonomous branch company of WDC to be established in Caidian.

10.5.25. These options have been discussed with WPMO and the concept of a branch company is seen as offering a number of advantages:

- There would be full access to WDC expertise and technology;
- Economies of scale in management and sharing of specialist resources would be possible; and
- The Caidian branch could have its own local identity and be an independent accounting unit.

Wastewater Regulatory Issues

10.5.26. All wastewater companies are natural monopolies that operate in imperfect markets. This means that continuing regulation of WDC either by Government directly, or on behalf of Government is required. This regulation is necessary to protect the interests of customers (in terms of service provision and charges) and to avoid the company generating excessive profits. As a legally independent enterprise, WDC should be subject to the same laws and regulations as any other enterprise company and where it fails to comply with such laws and regulations it should be subject to the same penalties.

10.5.27. Part of the process of corporatization should be to give WDC the freedom to properly manage the activities for which it has been made responsible. In this context new issues of economic regulation will arise,

particularly so if various forms of private sector involvement were to be contemplated. WMG will have as regulatory objectives:

- the efficiency of service provision;
- fairness in pricing (without undue cross subsidization between either classes or generation of customer) and prevention of abuse of monopoly market power;
- the financial sustainability of WDC (that is allowing a reasonable return on capital employed);
- that adequate investment is made to maintain/improve the condition of the wastewater infrastructure; and
- that excessive investment and hence cost to the consumer is avoided and that capital investment is made in an efficient manner.

10.5.28. At present, the setting of price is the only area where real control is exercised by Government and historically the price setting process has been shown to be unduly influenced by local considerations. This situation is now changing with clearer and more precise guidance being issued by State level government. This guidance specifically covers a procedure for establishing a fair level of price that provides for the financial sustainability of utility enterprises. This guidance is however still fairly recent and robust and appropriate methodologies have yet to be fully established. Local considerations continue to play a significant role in utility pricing decisions, as evidenced by the lengthy deliberations within government over proposed increases.

10.5.29. Although referred to under the title “economic regulation”, the issues involved in this form of regulation, and in the protection of customer interests, are both economic and technical. The main responsibility for approving any price increase clearly rests with Wuhan Municipal Price Bureau. However decisions on service levels, optimum asset replacement and maintenance programs to preserve asset integrity, investment required meeting future water demand and costing effectiveness of capital investment, and assessment of operational efficiency are matters currently within the domain of Wuhan Construction Commission and Wuhan Municipal Water Authority.

10.5.30. Under the current government arrangements it appears that economic regulation of WDC needs to be a joint responsibility. Ultimately it would be desirable if this were undertaken by a single office, the price setting rules and procedures to become more institutionalized, and preferably made independent of government (and hence potential political interference). This independence of regulation and increased certainty in pricing would become much more important if complete or partial privatization of WDC were to be contemplated; it would reduce investor risk and hence the cost of capital to WDC (and Government would get higher proceeds). Further development of the process of economic regulation of water supply and wastewater utilities is a matter that should be

addressed at a national level rather than on a project by project, or a provincial basis.

10.5.31. The other key aspect to the regulation of wastewater companies concerns their environmental stewardship. The main objectives of environmental regulation in relation to activities of urban wastewater companies concern the safe disposal of treated effluent and sludge in a manner that avoids environmental damage or nuisance. This objective (and hence laws and regulations) is no different in respect of government-owned utilities than for other companies. The only main difference is WDC will have a larger scale of operation than most other companies, making it all the more important that WDC is subject to the same laws and enforcement procedures, including penalties for noncompliance. Environmental compliance of WDC should be enforced by the WMEPB, just as it does for other enterprises.

10.5.32. At present in many PRC cities there appears to be duplication of responsibilities over licensing and control of wastewater discharges to sewerage systems. This situation is largely historic as the sewer systems until recently were, in most cases, simply conduits for conveying wastewater to a nearby watercourse where it was discharged without treatment. As urban WWTPs are constructed and brought into operation the sewer systems become collection systems for the WWTPs and discharges to them need to be controlled by the wastewater company to ensure the effective operation of the WWTPs. Thus, as WWTPs are commissioned the regulation of discharges should transfer from WEPB to WDC. The WMEPB role should then be to monitor and enforce the compliance of the wastewater company's WWTP discharges. Where combined sewerage systems exist, special arrangements to minimize environmental damage from storm overflows may be necessary.

10.5.33. The responsibility for compliance with the discharge standards of effluent, or for adherence to regulations covering the disposal of sludge, must rest with WDC. WDC must therefore set up sampling programs and analysis and control procedures to ensure its operations remain compliant. Generally the relevant Government regulatory authority (in this case WMEPB) should try to rely as much as possible on the WDC controls rather than undertaking its own detailed independent program of sampling. It would do this by auditing the adequacy of WDC's sampling program and the degree of compliance with the program. WMEPB should have access to the monitoring results of WDC, examine these, and undertake supplementary sampling and analysis to verify them. It should also be a requirement that all noncompliant results must be reported to regulatory authorities.

10.5.34. Effective regulation will require capacity building and training, it will not happen by accident. There are two main potential areas of training:

- promoting a greater understanding of utility institutional reforms, the changing relationship between Government and utility companies in PRC and how this affects regulatory activity; and
- training in the conduct of regulatory activities themselves.

10.5.35. Most cities have established training programs for staff engaged in environmental regulation. In contrast the whole process of economic regulation is underdeveloped in relative terms and this is where training in regulatory activities should concentrate. This training can only take place once the regulatory processes and activities have themselves been defined, and responsibility for them assigned. Specific areas of potential training relevant to staff engaged in regulatory activities would include:

- institutional responsibilities and regulatory objectives;
- economic theory of regulation and its practical application;
- economic theory of competition and its practical application;
- financial analysis and techniques of capital investment appraisal;
- measurement of customer affordability;
- "benchmarking" and use of comparative analysis to assess relative performance;
- use of customer research and analysis and interpretation of results;
- statistical sampling (theory and practice); and
- audit techniques.

10.5.36. The primary role of regulation is to protect public interest. For the most part utility companies will share this objective for the benefit of their own customer relationships. Regulators need to remain objective and independent but should not aim to duplicate or unnecessarily "second guess" utility company sampling and quality control procedures. Instead, they should seek to make maximum use of WDC programs and recommend improvements in them where they appear deficient.

10.5.37. The process of self-reporting of compliance failures should be encouraged and detailed regulations and penalties framed accordingly. For example a self-reported failure should attract a lower level of penalty than other cases of non-compliance. This principle should also be applied to cases of industrial non-compliance.

10.5.38. Economic regulation should be a process used to control imperfections in the market. It should be kept as simple and easy to understand as possible and should not be used as a substitute for the application of natural competitive forces. Effective competition, where this can be applied, will always lead to

greater and more demonstrable efficiencies than any form of regulation. The operation of competition is also easier to make transparent than the regulatory process.

10.6 Institutional Arrangements for Storm Water Management Component

Current Storm Water Management

10.6.1. Storm water management in the PRC is currently considered a non-revenue generating public service. As such the responsibility for service provision is vested in local governments, although some governments assign / contract day to day operations to the local wastewater utilities. These operations are often funded by the local Finance Bureau.

10.6.2. Prior to the construction of WWTPs it was logical for cities to construct combined wastewater and storm water drainage systems as all flows ended up in the nearest local watercourse without treatment. Under such circumstances, the construction and separation of flows into separate wastewater sewerage and storm water drainage systems was an unnecessary expense with no obvious benefit. However, the construction of municipal WWTPs fundamentally changes the approach to the design of sewerage systems and a separation of flows (wastewater and storm water) becomes more economic as the treatment of storm water flows can be largely avoided.

10.6.3. Quite naturally, the historic approach to combined sewerage was replicated in the institutional arrangements, with one single government department assuming responsibility for sewerage operations and maintenance. In Wuhan this was a department under the former Construction Administration Bureau and its district level equivalents dealt with the operations and maintenance of the secondary and local networks.

10.6.4. The policy of wastewater and storm water separation together with the recent institutional and financial reforms have also led to a division in responsibilities for management and operation of the separated networks. Whilst the wastewater network is under the management of WDC as the local wastewater utility company, the storm water network is under the overall management of the Wuhan Municipal Water Authority, with most operations performed at a local level by units at the district level under the jurisdiction of the relevant district level water bureau. These operations and associated expenditures are subject to normal PRC local government financial control and audit arrangements.

10.6.5. Currently in the PRC there is no legal provision for levying a user charge for storm water drainage and the service is funded from the local government budget, and subject to whatever resource constraints apply from time to time on the local budget. As with most services so funded, this leads to uncertainty in planning and, on occasions, restrictions in funds for necessary maintenance of

equipment. Although to date it is reported that funding has been generally adequate within the central urban area of Wuhan, with the WMG paying close attention to the adequacy of urban drainage.

10.6.6. The decentralized nature of storm water operations (with most activities being at the local district level) almost certainly results in operational inefficiencies and makes it much harder to introduce modern and use sophisticated planning, operating methods and equipment. Quantifying the extent of such inefficiencies is beyond the scope of this PPTA and would require more in-depth study. However, in total it is understood some 2,000 operatives are engaged in operations and maintenance activities of the storm water drainage and pumping facilities in the urban areas of the city. The staffing and organization arrangements are undoubtedly appropriate for the existing modus operandi, but should be re-examined in the context of a broader study of storm water management, that would include a review of the possible use of outsourcing contracts to modernize technology and working methods.

10.6.7. In summary, the current storm water management arrangements potentially suffer from:

- lack of a dedicated source of funding;
- inefficiencies due to a loss in economy of scale through use of local operations; and
- inefficiencies due to a lack of modern operating methods and equipment.

10.6.8. However there are some benefits gained from the detailed localized knowledge that local operators possess, enabling them to focus maintenance on known trouble spots in the local collection systems.

Potential Institutional Reforms for Improving Storm Water Management

10.6.9. The storm water issues identified above are by no means unique to the PRC and continue to be faced by many cities across the world. The funding and institutional arrangements can in theory be decoupled, but in practice these are often closely interrelated. Internationally, and especially in developed countries, there are trends for :

- More funding from user charges or specific tax levies to provide dedicated funding and thus better ensure adequate and stable financing of the storm water service;
- More corporatization by forming either separate storm water utilities or making the wastewater utility responsible for service provision. This is seen as a way of promoting accountability for service standards and also (if the utilities are large enough) facilitates efficiency improvements through economies of scale and more readily introducing modern operational techniques and equipment; and

- Use of limited private sector involvement to promote competition and hence further operational efficiencies. This is most commonly done through short to medium-term outsourcing contracts, but some fuller forms of private sector participation (PSP) do exist.

10.6.10. The issue is firstly whether any of this international experience is relevant in seeking improvements in storm water management in the PRC, and especially so in Wuhan in the context of the upcoming Project. Secondly, whether this international experience could be successfully applied or adapted having regard to the local situation in Wuhan. The answer to the first question is undoubtedly "yes" - the international experience is relevant. The applicability to the local situation then becomes the main issue to address.

Dedicated Funding

10.6.11. At present the PRC generally finances storm water services from the local government budget. No dedicated financing sources exist for either storm water operations or capital improvements, although it is understood that there are some dedicated funds earmarked by MWG for major flood relief schemes, as opposed to localized urban storm water relief. Given the frequency and intensity of summer storms experienced in many PRC cities it appears appropriate that the funding of storm water be reviewed. This would best be done as a national initiative, but appears to be a natural follow-on to the support provided earlier by ADB in respect of water, wastewater and municipal solid waste charging arrangements. Wuhan as a large flood prone city, and with a close association with ADB, would be an ideal case study city for such a Technical Assistant (TA). Alternative storm water charging options are identified and discussed under the policy dialogue options in Chapter 11.

Corporatization

10.6.12. It is unlikely that converting existing district level storm water operational units into corporate enterprises would lead to viable companies, as they would not have sufficient scale. Corporatization of storm water operations, if pursued would therefore probably need to be combined by an amalgamation of local district operational units to form one or perhaps two separate utilities for the city as a whole. This would potentially give the required scale to realize operational improvements and efficiencies. Two separate utilities would create a basis for competition and bench marking, and may thus be preferred.

10.6.13. An alternative approach to independent corporatization of storm water management would be to merge the storm water units into WDC creating one city wide wastewater / storm water utility. A variant of this approach would be to create two such utilities (one north and one south of the Yangtze River) and thus provide a degree of competition between the two.

10.6.14. A probable impediment to both corporatization across district boundaries or a merger with the wastewater utility would be the lack of dedicated funding, unless a system of funding allocation by each district could be devised. This would be difficult to organize. Thus the financing and institutional development of storm water management appears to be inextricably linked.

10.6.15. It is important to state that successful implementation of the Project is not considered dependent on either institutional or financial reforms. Rather these reforms should be considered separately on their own merits, and subject to specific local circumstances.

Private Sector Participation

10.6.16. The scope for PSP in storm water management is also limited by the lack of a dedicated funding source and by the highly decentralized nature of the operational activity. Nevertheless, and as an initial step, outsourcing contracts could be introduced on an experimental basis to assess the efficiency improvements potentially available. This could lead to fuller forms of PSP later and once institutional and financing reforms are implemented. An experiment in outsourcing storm water operations and maintenance could be carried out separately but in parallel with a national financing and institutional study.

Implementation of WWSMP Investments to Improve Storm Water Management

10.6.17. As referred to above the WUCF will act as the IA for the construction of the WWSMP storm water subprojects. However, WUCF will not be involved in future operations and maintenance. The intention is that the new assets, once commissioned, would then be handed over to the relevant district level water bureau as follows:

<u>Subproject</u>	<u>Future Owner</u>
• Changqing Pumping Station Expansion	- Dongxihu District Water Bureau
• Dongxihu Three Gates Connections	- Dongxihu District Water Bureau
• Yangsigang Drainage Improvements	- Hanyang District Water Bureau
• Luojia Road Area Drainage Works	- Wuchang District Water Bureau

10.6.18. In order to carry out the proposed construction activities WUCF will appoint the Jianxing Company as a suitably qualified construction management company. The role and responsibility of Jianxing will include the management of the procurement and construction processes. They will also coordinate the land acquisition and resettlement activity for the storm water subprojects. Jianxing is considered technically competent and sufficiently experienced to perform these duties. The organization and staffing of the Jianxing Company is provided in Appendix J8. Jianxing was formed in April 2002 and has a total staff of over 50,

of which 37 are technical or professional staff. A financial management assessment of the company has not been undertaken as it will not be directly involved in the disbursement of project funds.

10.6.19. Since WUCF, WPMO and Jianxing are all closely associated with each other there is a need to ensure that potential conflict of interest issues can be dealt with on a satisfactory basis. Firstly, assurances have been obtained that there are no staff with overlapping roles and responsibilities between these organizations. Secondly, it has been established that WPMO :

- is the more senior level unit within the WUCF umbrella;
- is therefore able to undertake the duties of EA on behalf of WMG in a relatively independent manner; and
- can exercise a degree of supervision over the IA unit.

10.6.20. As WUCF is a government agency acting on behalf of WMG, we believe these arrangements are acceptable. Jianxing is a wholly government-owned company under the overall WUIDC umbrella.

10.6.21. Decisions have not yet been taken on whether the District Water Bureaus in Dongxihu and Hanyang will operate the facilities by their existing direct labor, or through outsourcing, or a combination thereof. The current practice is for such facilities to be operated under direct labor arrangements. However this should be reviewed during project implementation and in accordance with government policies to encourage private sector involvement and promote efficiency of operations through competitive bidding.

10.7 Capacity Building Needs

10.7.1. WDC has received capacity building support under the WB funded HUEP and continues to receive similar support under the ongoing ADB funded WWMP. Training in operations and equipment maintenance has also been provided under other bilateral aid funded projects.

10.7.2. The ongoing WWMP capacity building support includes project implementation advice and assistance, managerial improvements, financial management strengthening, and operational improvements, as well as advice in the implementation monitoring of ADB safeguard policies and the development of PPMS.

10.7.3. Unfortunately, the consultant initially appointed to provide the program of consulting services to WDC had to be replaced and a new consultant (CDM Inc of USA) was only mobilized in the summer of 2005. This delay means it is not possible yet to determine what the eventual outcome of this consulting support will be, and whether follow on support to WDC will be needed. However, it would be more logical for the new Project to focus capacity building mostly on the

storm water component, except where specific wastewater capacity building is identified as being required. WPMO has also advocated this approach in the discussions held during the PPTA.

10.7.4. The following supplementary potential capacity building needs have been identified:

- *Wastewater Management component*
- Development of a sludge management strategy;
- GIS development;
- Use of hydraulic modeling techniques for sewer system management; and
- Reduction of inflow and infiltration into sewerage systems.
- *Storm water Management component*
- Project implementation planning, support and training for WUCF and Jianxing;
- Operational improvements (including equipment upgrading);
- MIS and GIS development;
- Use of hydraulic modeling techniques to analyze existing and proposed drainage system improvements; and
- Overseas study tour(s) to review international practice in storm water management, including funding arrangements.
- General needs
- Development of procurement documents for outsourcing operations and other PSP approaches, and possibly the pilot testing of these.

10.7.5. These potential capacity building measures have been discussed with WPMO and agreed as relevant. However, we are advised that there is already a local initiative to develop a GIS for both the wastewater collection and storm water drainage networks, with the potential to incorporate hydraulic modeling into the system. WPMO consider it would be preferable for this initiative to continue and for it to not be included under the WWMSPP capacity building program.

10.7.6. In addition, under the WWMP there is a capacity building initiative identified in relation to the development and use of water quality modeling as a tool to refine the Wuhan wastewater management master plan. CDM are charged with preparing the terms of reference for the water quality modeling work and an action plan for its implementation. It is currently envisaged that these terms of reference will be prepared in the first quarter of 2006 with the procurement process commencing in late spring or early summer and the

modeling work itself starting in late summer 2006. It is not therefore possible at this time to identify whether further water quality modeling work will be needed as a follow on to the WWMP initiative. It is suggested that this issue be reviewed during the WWSMP mid term review, subject to needs and funds being available at that time.

10.7.7. An important aspect of capacity building is the provision of appropriate and timely training. Training needs for WWMP were identified for WWMP and are in the process of implementation. This training provision includes management, business planning, financial management, WWTP operations and water quality modeling. The success of this training program and whether an extension to it is desirable should be made at the time of WWMP completion/WWSMP mid term review. Initially WPMO expect the WWSMP training to focus on the storm water component together with some other specialist training. The PPTA has identified the following potential training needs:

- regulation (see Paragraph 10.5.34 for detailed needs)
- the design and procurement of private sector initiatives
- best practice in storm water management (technology and operating methods)
- detection and elimination of water infiltration into sewers
- hydraulic modeling
- use of GIS
- ADB procedures and requirements (for the stormwater IA staff and Jianxing)

10.7.8. Most of these needs have been incorporated into the proposed loan consulting services (Appendix J9), except it is currently assumed the GIS and hydraulic modeling training needs would be met by a locally funded GIS initiative currently underway.

10.8 Summary and Conclusions

Implementation Arrangements

10.8.10 The institutional and managerial framework for implementation of the Project has been defined and appears generally consistent with proven arrangements in the PRC for this type of project. The broad structure of the proposed implementation has already been confirmed at the discussions held during the ADB inception and interim missions in July and September 2005. It is considered these arrangements will prove adequate and ensure an effective implementation of the proposed Project.

10.8.11 In particular it has been confirmed:

- WMG is the designated EA and WPMO is charged with the day to day coordinating work on behalf of the government.

- WDC would be the IA for the whole of the wastewater management component of the Project.
- The responsibilities for project construction and project operations for the storm water components of the Project would be separated. WUDF would be the designated IA, and that the Jianxing Company would assume responsibility for construction of the storm water components.
- Storm water operations, including operation of the completed WWSMP facilities will continue to be the responsibility of local district level Water Bureau.

10.8.12 The WDC as the designated IA for the wastewater component is already an experienced IA both under the ongoing ADB funded WWMP, and under the WB funded HUEP.

10.8.13 Similarly WUCF and the Jianxing Company have previous foreign funded project implementation experience under the WB funded Wuhan Urban Transport Project. Whilst the Jianxing Company does not specialize in storm water construction there are checks and balances provided by the domestic approvals required and through the appointment of other accredited advisors. Specifically:

- The project FSRs will be approved by Hubei Development and Reform Commission.
- The preliminary design will be approved under arrangements notified by Hubei Development and Reform Commission.
- The detailed engineering design will be approved by Wuhan Construction Commission.
- An authorized tendering company will be engaged to manage the procurement process.
- An accredited construction supervision company will be appointed
- The qualified design institute responsible for detailed design will be retained to deal with design issues that arise during construction.

Potential Improvements - Integrated Wastewater Management

10.8.14 International experience suggests that wastewater systems are best managed as an integrated process "from drain to river." That is, activities from the point of discharge to the sewerage system to ultimate disposal of treated wastewater and residual sludge, should be managed as a single process albeit comprising many linked activities within the process. This suggests that one agency, WDC the logical agency in Wuhan, is given overall management responsibility for this process. This integrated approach is also consistent with policy guidance issued by PRC State Government in Circular No 1192,

September 1999. For the ongoing WWMP, the designation of WDC as the IA provides the basis for arrangements that meet the objectives of integrated wastewater management, even though required institutional reforms have yet to be fully implemented. It should also be pointed out that existence of an integrated wastewater management company does not mean that all wastewater activities should be performed directly by WDC. In appropriate cases it will be sensible for WDC to contract out all or some of the activities for which it is responsible. WMG should therefore be encouraged to continue to develop WDC as an integrated wastewater management company within the Wuhan Water Services Group and under the overall umbrella of WUCIDC.

10.8.15 The transition from limited wastewater treatment to more comprehensive treatment requires that greater attention be paid to industrial pollution control and the owner / operator of WWTPs becomes an important stakeholder in the industrial pollution control process. The extent of monitoring of industrial discharges, together with arrangement and responsibilities for enforcement, need to be reviewed. The role of the WMEPB should progressively focus more on discharges from WWTPs and less on individual discharges to sewers. As a basic principle, WDC as owner of the sewerage network should determine and control what is discharged, and be accountable for the satisfactory performance of WWTPs.

Potential Improvements - Future Wastewater Institutional Developments

10.8.16 Assuming WDC is developed into an integrated wastewater management company as envisaged under WWMP then it is appropriate to consider potential future institutional developments. Any such developments should be to facilitate government objectives for the sector. The objectives which primarily relate to :

- ensuring the effectiveness and efficiency of services;
- making available investment funds for any capital improvements needed; and
- at the same time decreasing the reliance on government funding.

10.8.17 To meet these objectives there needs to be:

- an adequate and sustainable source of funding;
- effective competition where market forces can be utilized; and
- effective regulation to correct inadequacies in the market (for example the effects of monopoly service providers).

10.8.18 The introduction of wastewater charges and the progressive move to full cost recovery will achieve a basis for meeting the first objective. In addition the corporatization of services providers (such as WDC) will in the medium term

facilitate access to a wider selection of sources of investment capital. WMG has therefore made good progress in this respect. One concern is the enforceability of wastewater charges levied on self-supplied industries.

10.8.19 Regulations have been developed that stipulate standards for water quality in rivers and lakes, and in discharges from WWTPs. Other regulations stipulate the obligations of WDC, land developers, property owners and others in relation to connections and discharges to the sewerage system and its maintenance. Wastewater tariffs are also subject to regulation. There is therefore a fairly comprehensive set of regulatory arrangements in place. The concern is that responsibilities for the different elements of regulation are fragmented across different government agencies thus reducing regulatory effectiveness and potentially creating regulatory conflict. This is not an issue that WMG can address alone as governmental responsibilities are defined in documents issued from the national level.

10.8.20 Less progress has been made by WMG in efforts to promote competition in the delivery of wastewater services or to actively introduce PSP. This is understandable as policies to actively encourage PSP are only recently established at national level. The WWSMP, like the WWMP before it, has been proposed, designed and prepared as a public sector funded project. It would not appear sensible to change the basis of project financing for the WWSMP at this stage, however it would be appropriate for WMG to develop a strategy for increasing PSP in the future, and by doing so reduce the reliance of the water / wastewater sector on public funding in the future. Development of such a strategy is further discussed in Chapter 11 of this report.

10.8.21 The preferred institutional reforms for wastewater management in Dongxihu and Caidian districts would be for full integration with WDC in Dongxihu and for a WDC branch company to be established in Caidian. However, WPMO further agreed to establish another WDC branch in Dongxihu during the Loan-Fact finding Mission.

Potential Improvement – Storm Water Management

10.8.22 Both financing and institutional arrangements for storm water management are less well developed than for wastewater management. However, the service is a vital one, especially so in Wuhan due to its climate (with high intensity of summer rainfall) and its location in the flood plain (which increases its proneness to flooding).

10.8.23 Financing and institutional arrangements for storm water management are required that safeguard service sustainability and facilitate service improvements. The current arrangements quite clearly do not achieve these objectives. Earlier in this section it was identified that international experience suggests this be best achieved through creation of a dedicated funding source, a

form of corporatization and potentially PSP. However, full implementation of such a strategy would require changes in national policies and laws.

10.8.24 Under these circumstances it would be inappropriate to make ADB financing in any way conditional on financial or institutional reforms as these actions are outside the jurisdiction of WMG as the project EA. However, this does not mean they should not be further investigated - indeed they should be. This can be taken forward initially as a policy dialogue issue (see Chapter 11), and potentially as an ADB supported policy technical assistance.

Capacity Building Needs Identified

10.8.25 Capacity building needs have been identified in Section 10.7 above and endorsed by WPMO. On the basis of these needs a draft TOR for loan consulting services has been prepared and is included as Appendix J-9. In designing this capacity building program the existence of ongoing capacity building under WWMP has been recognized and taken into account. WWSMP capacity building seeks to build on the WWMP program and not duplicate it.

10.8.26 The overlap of WWMP and WWSMP and their respective capacity building components is unusual for ADB projects in the PRC. It is more normal for follow on projects to be designed after the initial project has been substantially completed and thus the outcome can be more clearly assessed. It is quite conceivable that either the WWMP or the local GIS capacity building initiative will require follow up initiatives and it may be appropriate to make some contingency provision for these. The need for such initiatives could be reviewed at the mid term point of WWSMP, by which time the outcome of the WWMP and GIS capacity building should be known.

Specific Assurances Required

10.8.27 The WWMP legal documents (the loan and project agreements) provide a logical starting point for defining the conditions for the WWSMP. For the wastewater component of WWSMP only minor updating and refinement of the WWMP documents appear necessary, together with specific assurances that:

- WMG will prepare a sludge management strategy and implement this
- Wastewater tariffs are to be introduced in Caidian District.
- Wastewater operations in Dongxihu are to be integrated with WDC's
- A WDC branch company is to be established in Caidian District.

10.8.28 These assurances are not considered matters that should be conditions of loan effectiveness, but instead are matters to be addressed during project implementation.

10.8.29 For the storm water management component of the Project the key assurance required of the Government is that storm water operations and maintenance continue will be adequately funded.

10.8.30 Draft assurances have been prepared on the above basis and are included in the draft "Report and Recommendation of the President" (RRP) which forms Volume IV of this Final Report.

11. Policy Dialogue

11.1 Introduction

11.1.1. The terms of reference (TOR) for the PPTA require the Consultant to prepare notes for policy dialogue, based in part on discussions with the relevant bureaus and offices of Wuhan Municipal Government (WMG) on the following aspects:

- upstream / basin wide pollution prevention and control;
- integrated industrial and domestic wastewater management;
- storm water management and urban drainage;
- enterprise reform and corporate governance for the implementing agencies;
- cost recovery and tariff reform based on full cost recovery; and
- private sector participation (PSP).

11.1.2. The expectation is that these notes should highlight any issues and constraints, and provide possible approaches and required actions / measures to address these issues. In addition, the PPTA consultant is required to explore other areas for policy dialogue and this has resulted in the following further policy issues being identified as relevant to the proposed Project:

- urban poverty reduction;
- regulatory enforcement, monitoring, and environmental management strengthening;
- recycling of treated wastewater effluent; and
- sludge disposal arrangements.

11.1.3. The results of individual dialogues are presented in Sections 11.3 to 11.12 of this section of the Final Report. It has been assumed that wherever possible policy dialogue notes should be practical and project related. There are obviously some linkages and inter-dependencies between some of the issues identified which we endeavor to identify where applicable. The most important issues from the dialogue have been extracted and included in a draft policy framework which is summarized below and forms Appendix K1 of this Final Report.

11.2 Overall Policy Framework

11.2.1. Discussions with Wuhan Urban Construction Utilization of Foreign Investment Project Management Office (WPMO) and relevant municipal agencies, together with reference to specific national People's Republic of China (PRC) policy documents, reveals a favorable set of Government policies in support of the Project and the establishment of institutional arrangements that can provide for project sustainability. These policies include:

- Public services should be corporatized and not provided directly by Government;
- The Government role should become that of enabler and regulator of services;
- There should be separation of Government and the management of enterprises;
- Utility services should be financed from user charges, with tariffs set in accordance with full cost recovery principles;
- Water and wastewater charges should be jointly billed under the "one bill – two items" system;
- Where appropriate competition and PSP should be encouraged for both investment in infrastructure construction and also for operations and maintenance;
- Adoption of the "polluter pays" principle; and
- Promotion of social stability through poverty alleviation and equal opportunities.

11.3 Upstream / Basin-wide Pollution Prevention and Control

Relevance

11.3.1. In a densely populated province such as Hubei, and generally within a major river basin such as that of the Yangtze, the pollution generated by one city can have a significant and detrimental downstream effect. Conversely, many cities rely on interventions by upstream cities to protect their water sources and general environment from the effects of pollution. Internationally, an integrated and coordinated basin-wide approach to investment planning and environmental management has been shown to give optimum results. The proposed Project, through the implementation of specific wastewater infrastructure improvements, will contribute locally to pollution control, but the Project should also be assessed in the broader context of pollution control within the river basin.

Notes from Policy Dialogue

11.3.2. The policies and planning approach adopted by State Environmental Protection Administration (SEPA) in order to control water pollution identifies clearly the problems of cross-boundary pollution and also the need for adopting an integrated basin-wide approach in water pollution management. The need for an integrated approach is further reinforced in the PRC Water Law as made effective in 2002 which emphasizes the need to adopt a basin-wide approach to water resources planning and strengthens the various river basin organizations, charging them with a duty to prepare comprehensive basin plans.

11.3.3. The PRC embraces the concept of "polluter pays" and places emphasis on the responsibilities of local governments to deal with pollution originating from within their area of jurisdiction. The proposed Project is an example of WMG and the participating district governments responding to those responsibilities. The financing plans for several of the wastewater

subprojects also place particular emphasis on the polluter pays concept as equity contributions to the Project, and future debt servicing will largely fall on local water users to finance.

11.3.4. National and Provincial government have set specific targets to stimulate local city governments into action and ensure they discharge their responsibilities in respect of pollution control.

11.3.5. The concept of "beneficiary contributes" to pollution alleviation projects has been discussed and acknowledged within PRC, but has yet to be translated into any concrete policy that can be applied to the circumstances of an individual project or situation. This creates difficulties for cities when proposing projects they (legitimately) believe justifies a contribution from a downstream beneficiary, unless such contribution is fully agreed and budgeted for by the downstream government.

11.3.6. The concepts of "polluter pays" and "beneficiary contributes" can perhaps best be reconciled by placing primary responsibility on the polluter to cease or control pollution to within accepted norms. Then, where a downstream beneficiary requires special action in terms of enhanced environmental standards, a contribution equivalent to the incremental costs of the enhanced standards is justified. However, this approach is not an established PRC policy and there is the practical implementation issue of establishing "accepted norms" as a baseline for determining the incremental requirement.

11.4 Integrated Industrial and Domestic Wastewater Management

Relevance

11.4.1. The success of wastewater management policy will impact on the sector objective of pollution reduction and also on the cost effectiveness of wastewater management and operations. Allowing industries to discharge their waste to urban sewer systems, provided this has been properly pretreated to required standards, can greatly improve the cost effectiveness of wastewater treatment for industry and construction of large centralized municipal wastewater treatment plants (WWTPs) will normally result in overall economies of scale.

Notes from Policy Dialogue

11.4.2. Asian Development Bank (ADB) has supported the Government's policies for wastewater management by providing a number of related environmental loans that included wastewater treatment components in Beijing, Anhui (Chao Lake), Hebei, Qingdao, Shanghai, Tianjin and also in Wuhan itself. Other projects are pending in Jilin, Henan and Shandong. At a national level the importance of wastewater treatment was also addressed under the Urban Environmental Improvement Planning Study (TA 2015 – PRC) that strengthened institutions responsible for environmental improvement in a number of cities, and identified future infrastructure

requirements. More recently the National Guidelines in Urban Wastewater Tariffs and Management Study (TA 3749 – PRC) made specific proposals in relation to the financing and management of the wastewater sector. These ADB projects and related initiatives provide a solid basis for ongoing policy dialogue in wastewater management.

11.4.3. The area of the proposed Project is densely populated with a mix of housing and industrial developments, although much of the industry has been relocated from the central urban area. However, industrial wastewater in the suburban districts of Caidian and Dongxihu accounts for more than half of the total flow, a fact that makes integrated industrial and domestic wastewater management a key aspect of policy dialogue for the upcoming project.

11.4.4. WMG and district level governments have prepared wastewater plans, including sewers, interceptors, and centralized WWTPs which make provision for both domestic and industrial wastewater flows. These plans have been reviewed during the PPTA and it is concluded that they reflect the development needs of the project area and that the proposed subprojects are themselves consistent with those plans.

11.4.5. Wuhan has an existing set of urban management regulations that make provision for various aspects of wastewater management. These regulations include provisions for the approval and supervision of sewer connections and a requirement that all new developments are connected to the public sewerage system. Currently the Wuhan and local district level environmental protection bureaus (EPBs) are the main regulatory agencies for controlling industrial wastewater discharges to the municipal sewerage system. This makes sense as, in the absence of an operational WWTP, the sewerage system acts as a simple conduit and all wastewater discharged ends up in a water body in untreated form. However, after the WWTP become operational, the focus of the EPB should change and Wuhan Drainage Company (WDC) should take the lead role in controlling discharges to sewer. Some larger PRC cities have introduced the use of wastewater discharge permits and these permit systems potentially enhance the regulatory and control framework for managing wastewater discharges. In Wuhan, such a system was introduced in 2002 and a total of 101 permits (discharge licenses) have been issued to date, covering some 80% of the industrial pollution discharge. It is anticipated that by the end of 2005 this system would lead to a 10% reduction in industrial pollution discharge from the large industries it covers.

11.4.6. Permit systems also lay the foundation for differential charging of industrial wastewater discharges based on the quality / composition of the discharge (and hence the level and cost of treatment required). Such charging systems can promote economic efficiency in the treatment of industrial wastewater and are used quite extensively in more developed countries. ADB's advisory TA on wastewater charging completed in 2003 advocated such an approach in the PRC. Please see Section 11.7 and Appendix K3 for a further discussion on this issue.

11.5 Storm Water Management and Urban Drainage

Relevance

11.5.1. A core objective of the proposed Project is to improve storm water management and urban drainage in areas of Wuhan that are subject to or at an unacceptable risk of flooding when storms occur. The climate in Wuhan, with frequent high intensity storms during the summer rainy seasons, means that areas susceptible to flooding as a result of poor drainage infrastructure are quite frequently affected. Where combined storm water and wastewater sewers exist then sewer surcharges contain a proportion of foul sewage creating associated health risks.

Notes from Policy Dialogue

11.5.2. The WMG has prepared and approved a wastewater master plan that provides for the progressive separation of wastewater sewerage and storm water drainage. Where effective separation of wastewater and storm water can be achieved this will help alleviate the health risks created by urban flooding and also help protect the WWTPs from hydraulic overloading.

11.5.3. WMG has an urban greening policy that seeks to ensure a prescribed proportion of the developed urban area (excluding lakes and rivers) is urban parkland or areas under some form of plant cultivation. If impermeable areas can be reduced, then storm water runoff is also reduced.

11.5.4. Storm water management in Wuhan (as elsewhere in the PRC) is currently viewed as a public service that should be financed from government revenues. Alternative means of financing the storm water drainage service have not been explored in detail as this would be contrary to national policy. This could be a possible area for ADB TA support to examine alternative financing mechanisms, such as a form of user charging or through a property tax / levy. Alternative financing and institutional arrangements for storm water management have been identified and are further discussed in Appendix K2.

11.6 Corporate Governance and Enterprise Reform

Relevance

11.6.1. Progressive transformation of the WDC, the IA for the wastewater component of WWSMP, into a financially and managerially autonomous enterprise creates an institutional framework for project implementation and future operation that is potentially sustainable in the medium to long term. Managerial autonomy can be used to lever improvements in levels of service and in service efficiency. Corporate enterprises have wider and more flexible access to financial markets in order to finance capital investment that may be required in future. The trend in PRC is for wastewater utilities to become more managerially and financially autonomous. This autonomy must be matched by high standards of financial stewardship and responsibility if public confidence, and the confidence of government as principle stakeholder, is to

be maintained. This confidence is crucial for ultimate project success. Both IAs for the proposed Project will handle large sums of project finance and it is essential that these funds are put to the proper purpose and utilized in an efficient manner.

Notes from Policy Dialogue

11.6.2. Relevant mechanisms of corporate governance in this context include the establishment of an effective Board of Directors to supervise and direct Company activity, strong systems of internal financial and management control, adoption of open and competitive procurement methods, internal and external audit arrangements, public information and accountability policies, and a progressive introduction of modern financial management.

11.6.3. The current and proposed arrangements for corporate governance have been discussed in Chapters 8 and 10, covering the financial management assessment and general governance arrangements respectively. This discussion identifies that WDC is already a managerially autonomous enterprise with its own Board of Directors and a well developed set of internal control regulations. The financial management assessment (FMA) conducted indicates no significant concerns with audit arrangements and the adopted accounting policies. Financial management arrangements are being further strengthened under the Wuhan Wastewater Management Project (WWMP) capacity building program.

11.6.4. Revised supervisory arrangements and increased management autonomy of the WDC will, over time, change the role of Government agencies in how they exercise regulatory control of the wastewater sector.

11.6.5. WMG is progressively implementing central government policies to separate government from direct involvement in the management of state owned enterprises whilst at the same time improving their supervision arrangements. WMG also intends to increase the use of competitive and transparently bid outsourcing contracts to improve the efficiency and reputation of public services.

11.7 Cost Recovery and Tariff Reform

Relevance

11.7.1. If tariff levels are based on the principles of full cost recovery and the project IA is able to implement and collect these tariffs adequately, then they will be able to operate as financially autonomous and sustainable entities. The need for Government subsidies will be eliminated over time, and the availability of adequate funds for loan repayment, operations, maintenance, and ultimate replacement of project facilities will be assured. Moreover, appropriate tariff policies attract investment, end the need for government subsidies and provide incentives to conserve water.

Notes from Policy Dialogue

11.7.2. The Project supports the Government's economic and enterprise reform programs that require wastewater management projects to be financially sustainable and capable of cost recovery. ADB is actively encouraging this transition in its policy dialogue and lending operations. Two ADB water tariff studies supported State Government tariff initiatives.¹ Recommendations from the first TA were incorporated into the National Guidelines for Water Tariffs (NGWT) promulgated by the National Development & Reform Commission (NDRC)² and the Ministry of Construction (MOC) in September 1998. These include:

- a two part tariff with a volumetric charge and fixed charge;
- full cost recovery as the main objective in tariff policies;
- public hearings for public information and consultation; and
- a simplified process for tariff approvals.

11.7.3. The second TA focused on implementation of the NGWT. The TA provided assistance in preparation of NGWT implementation regulations for the City of Zhangjiakou. This implementation regulation, approved by the Zhangjiakou Municipal Government in September 2000, was the first local water tariff regulation under the NGWT.

11.7.4. Impacts of these tariff reforms are best illustrated by benefits in Zhangjiakou, which include the following:

- A transparent mechanism for tariff approvals with the Price Bureau's in a lead role;
- A full cost recovery financial plan for the Zhangjiakou Water Supply Company that will generate funds for future development;
- Affordable tariffs for domestic customers and a new subsidy program to help poor households pay their water bills; and
- Improved public understanding of and support for tariff increases.

11.7.5. Multi-year tariff adjustment proposals such as the one developed for Zhangjiakou can serve as a tool to control costs and provide a financial framework with which to attract private investors.

11.7.6. The PRC policy guidance on wastewater tariffs was provided in Circular No. 1192, issued jointly in September 1999 by the State Development Planning Commission (SDPC), Ministry of Construction (MOC) and SEPA. The Circular supports wastewater tariffs set on the basis of full cost recovery principles but allows local governments flexibility in deciding the time scale for implementation.

¹ PRC Water Supply Tariff Study, (TA No. 2773, 1997-98), and PRC Water Tariff Study II, (ADB TA No. 3250, 2000-2001).

² Previously State Development and Planning Commission.

11.7.7. The ADB's wastewater tariff study, implemented in 2002-03, contributed to wastewater tariff reform initiatives.³ The major output of this TA was a draft national guideline for wastewater tariffs covering topics such as the tariff setting rationale, a calculation methodology, the agreement for tariff billing and collection, recommended remedies for non-payment, and a model contract for industrial discharges to the sewer network. Recommendations on wastewater tariff policies, objectives and structure were supported by MOC, who indicated their intention to use the study in preparing a draft wastewater tariff guideline for submission to the State Council. A comprehensive package of wastewater tariff guidelines currently awaits State Council endorsement.

11.7.8. The project is consistent with these ongoing reforms that require that all wastewater projects be financially sustainable and capable of cost recovery. Current wastewater charges levied in the main urban area of Wuhan, at CNY 0.8 /m³, are high compared to wastewater charges in other PRC cities. However, no charges are levied in suburban districts of the City. WMG is committed to increased wastewater charges in the urban area and the introduction of charges in suburban areas and due course but has not set a definite timescale for this.⁴

11.7.9. Once WWTPs are commissioned the public can better appreciate the benefits of good wastewater management. Improved public awareness of the benefits accruing from effective drainage and treatment of wastewater can significantly enhance users' willingness to pay wastewater charges. Socio-economic surveys undertaken during the PPTA indicate there is already a significant level of public willingness to pay (higher than has been found in other PRC cities). This is a positive indicator of public support for the proposed WWSMP investments (Sections 6.5 and 9.7). With increasing public acceptance of tariff reforms, the WMG should consider introducing more sophisticated charging systems to encourage greater economic efficiency.

11.7.10 Introduction of wastewater tariffs is a vital step, but is only worthwhile if backed by effective income and collection systems. In Wuhan, income collection is undertaken by the local water supply company using the "one bill – two items" approach, which has been shown internationally to be the most effective procedure for wastewater bill collection.

11.7.11 The main income collection difficulties occur where water is directly abstracted by users from their own wells. Much of the industrial water supply in the suburban districts is understood to be taken in this manner. Enforceability of wastewater charges in these circumstances has proved a national problem and needs to be addressed. Local government can take some actions by ensuring interdepartmental cooperation in identifying and billing these supplies and using selective administrative measures to enforce collection. It is important that income collection rates be monitored under the

³ China National Guidelines in Urban Wastewater Tariffs and Management Study, (TA 3749, 2002-2003)

⁴ A discussion of wastewater charges and their history in Wuhan is provided in Chapter 8 and Appendix K3 of this report.

project performance monitoring system (PPMS) since non-collection is a significant financial risk to the success of the Project.

Storm water management is currently viewed as a non-revenue generating activity in the PRC, although this may change in the future as discussed in Section 11.5 above and Appendix K2.

11.8 Private Sector Participation

Relevance

11.8.1. PSP in wastewater subprojects can provide a valuable source of financing and thus, potentially reduce the degree of reliance on government and traditional forms of multilateral / bilateral finance. Private sector involvement in operations and maintenance (O&M) has been shown to increase service efficiency. For the proposed Project, the main financing decisions had already been taken prior to the commencement of the PPTA and these sources of finance appear to be secure, thus rendering new or innovative forms of financing superfluous.

Notes from Policy Dialogue

11.8.2. While the intention is for the proposed Project to be financed by traditional means, WMG is nevertheless committed to encouraging PSP in urban management and has already sanctioned a number of build-operate-transfer (BOT) initiatives with varying degrees of success.

11.8.3. Within the Project itself an opportunity for the involvement of the private sector exists as one of the viable options for the operations phase. WWTP O&M can be contracted out or outsourced in whole or in part as a measure to make operations more efficient.

11.8.4. PRC government policy now fully encourages PSP in both the provision of water sector infrastructure and in its subsequent operation and maintenance. HPG plays a facilitating role by trying to coordinate private sector interest and link investors to specific opportunities that potentially interest them. A reliable income base for a private sector project is recognized by HPG and WMG as a prerequisite for attracting private sector interest and hence the government tariff policies and private sector initiatives are closely inter-related.

11.8.5. Whilst the use of the private sector as a source of both finance and expertise is now largely recognized and accepted by local governments in the PRC there remains much work to be done to ensure the market is adequately regulated so that procurement is open and transparent, and that the respective interests of investor, government and customer are safeguarded. These aspects of PSP will require ongoing policy dialogue and merit capacity building initiatives at a national level. Also local "model" implementation initiatives could be developed as part of individual projects in support of

national policy developments. The capacity building proposed for WWSMP include for such an initiative.

11.8.6. The use of PSP should be carefully planned and executed in response to predefined government objectives. A possible strategy and approaches are provided in Appendix K4. WWSMP capacity building could support the refinement of this strategy and detailed examination of alternatives.

11.9 Urban Poverty Reduction

Relevance

11.9.1. Poverty alleviation is an overriding objective of the ADB and all projects supported by ADB are expected to result in a positive impact on poverty alleviation, either directly or indirectly. In PRC, a side effect of the transition from a planned to a market economy is that jobs and employment are no longer guaranteed for the urban workforce and non-viable enterprises close down as they no longer continue to be supported by government.

Notes from Policy Dialogue

11.9.2. Municipal wastewater treatment projects have a direct impact on poverty through their capacity to generate employment both directly during construction and operations and also indirectly through follow on impacts on material and equipment suppliers. Municipal wastewater treatment is also related to poverty alleviation in a more systemic fashion as a result of its beneficial impact on industry:

- Centralized wastewater treatment reduces overall wastewater treatment costs for industry, allowing them to meet wastewater discharge standards in a more economical manner thus avoiding fines and other sanctions such as the threat of closure for noncompliance. The existence of a WWTP is increasingly a prerequisite for approval of new industrial developments. The lack of a WWTP can therefore be a growth, (and hence a poverty alleviation) inhibitor.
- Small factories using obsolete, highly-polluting technology risk closure on environmental grounds. The establishment of municipal WWTPs averts this risk of closure by eliminating the direct discharge from these factories. There is an overall benefit since small factories have a negligible impact on the treatability of the municipal sewage provided their effluents are treatable. This preservation of small factories protects jobs and thus helps diminish poverty in urban and suburban areas.
- After cleanup of polluted urban waterways by improved wastewater collection and treatment, several PRC cities, including Wuhan, have developed urban amenity plantings and ribbon parklands along the waterways. Such developments create job opportunities for the poor directly in construction and parks maintenance and indirectly through

the commercial development that often follows on riparian restoration projects.

11.9.3. The possible downside to the Project from the perspective of the urban poor is that new and / or increased user charges for wastewater services might increase their financial hardship. This is especially so if users are required to pay a connection charge to access the service, although such charges are not used in Wuhan.

11.9.4. Like all cities in China, Wuhan provides subsidies to households below the official poverty line through the Lowest Living Level Security program. These subsidies cover basic living expenses. In addition, a monthly subsidy, financed by the Wuhan Urban Drainage Development Co., is provided to poverty households to offset the wastewater bill. This subsidy largely offsets the wastewater bill. Details of its operation are provided in Chapter 6 of this Final Report.

11.9.5. These programs are progressive and well designed. The outcome of the policy dialogue is therefore that they be maintained and evaluated periodically so that they effectively capture all poor households. An evaluation should be conducted at the time of any tariff adjustment to ensure that the user charges remain affordable to poor households.

11.10 Regulatory Enforcement and Monitoring

Relevance

11.10.1. Environmental management is critical to both the protection of Project facilities and also the receiving watercourses. This includes the control of discharges to the municipal sewerage systems. Success in environmental management will potentially impact both on the structural integrity of the wastewater system and its operational performance (with impacts on effluent quality, costs and safety of operations).

Notes from Policy Dialogue

11.10.2. Meetings with the representatives of the Wuhan Municipal EPB and a review of environmental laws, rules and regulations suggests that environmental legislation and supporting regulations are generally up to international standards, with amendments being made from time to time as needed.

11.10.3. During the PPTA it has not been possible within the resource constraints available to undertake a detailed review of individual monitoring programs or of the effectiveness of follow-up enforcement action where those monitoring programs reveal problems with individual discharges. However as WWTPs are commissioned, these monitoring and control arrangements will

need to be strengthened, especially in Caidian and Dongxihu where there is a high proportion of industrial wastewater discharged.

11.10.4. This issue has already been referred to under the subject of wastewater management and the introduction of discharge permits is an important initiative. Traditionally the monitoring and enforcement role has been undertaken by EPBs at the different levels, but monitoring has been restricted to roughly three or four samples per year for most industrial enterprises. In due course, each WWTP operator will need to establish its own monitoring program and establish a capability to undertake this work. This is necessary so that WWTP operators fully understand the sources and composition of the wastewater they receive and takes steps to control the discharges to the sewerage systems that serve their WWTP.

11.10.5. For effective industrial pollution control the legal ability of the WDC to monitor and enforce discharges to its sewers must be clearly established. This legal ability should include the right of the WDC to stipulate specific forms and standards of pretreatment (provided always this is no more onerous than national standards) before an industrial discharge can be made.

11.10.6. Both WWSMP IAs have acknowledged their responsibilities to ensure that the commitments given in the environmental impact assessment (EIA) documentation are adhered to during the implementation of the Project. In each case this responsibility will be discharged by the relevant IA and a specific member of staff will undertake a monitoring and coordination role.

11.11 Wastewater Reuse

Relevance

11.11.1. PRC policy is to encourage the beneficial reuse of wastewater, however in Wuhan there are abundant natural sources of water available. In these circumstances there is no apparent economic justification for significant recycling and reuse of WWTP effluent.

Notes from Policy Dialogue

11.11.2. The PRC Government has a policy of encouraging the reuse of treated wastewater and cities have been set targets to achieve a beneficial reuse percentage of 50% of treated effluent. Some large cities such as Beijing already have plans in hand to achieve this target. One of the criteria for PRC cities to be designated as environmental cities is where treated wastewater is recycled.

11.11.3. In the local circumstances of Wuhan, this national policy makes little sense and indeed would appear to encourage investment that could not be justified on economic criteria. This fact seems to be recognized by WMG. Other than Nantaizi Lake WWTP treated effluent may be used for recharging a nearby ecological park / wetland, no proposals for wastewater recycling are

included in the proposed Project. Nevertheless any policy that sets uniform targets and without consideration of ignores local circumstances and economics should be reviewed and modified, so that wastewater reuse is promoted on a more selective basis where economically justified.

11.12 Sludge Disposal Arrangements

Relevance

11.12.1. The proposed Project will significantly increase sludge production from WWTPs in the Wuhan urban area. At present there is no government endorsed strategy for the treatment and disposal of this sludge, although this is needed to ensure that no secondary pollution is created from sludge disposal activities.

Notes from Policy Dialogue

11.12.2. Discussions during the PPTA indicate that WMG recognizes the sludge disposal issue needs to be dealt with and have stated this will be dealt with during project implementation.

11.12.3. However, it is not only the proposed Project facilities that will generate sludge. Existing WWTPs and those under construction within other projects financed by World Bank, the ADB's own WWMP, and other WWTP investments will all generate significant volumes of sludge.

11.12.4. The fallback strategy for sludge disposal appears to be one of codisposal with municipal refuse, but this has not been formally endorsed by WMG and has certainly not been a strategy that has emerged from any considered study of alternative options. There are also some recently developed proposals for disposal of sludge to refuse incineration facilities although the need for sludge drying prior to incineration does not appear to have been fully considered.

11.12.5. Development of a city wide sludge disposal strategy appears to be urgently required and it is recommended that this be covered as an assurance to be included in the project documents. Discussions during the PPTA have indicated there is support for the development of a sludge disposal strategy and also that this is an appropriate capacity building initiative to be financed under the WWSMP. The TOR of the proposed implementation consulting services has been framed accordingly.

12. Project Design Monitoring Framework and Benefit Evaluation

12.1. General

This Chapter of the report considers how the success of the Project should be assessed and measured. In accordance with ADB guidance, a project design and monitoring framework (PDMF) and a project monitoring and evaluation (PME) plan have been prepared. These tools provide a mechanism for the post completion evaluation of the Project but will require implementation of procedures for data acquisition and analysis. The PDMF and the PME are closely linked and many of the PME measures are drawn from the PDMF. As the WWSMP is a follow-on project to the WWMP it is logical that some of the performance targets for the two projects are similar and that there should be a degree of continuity and consistency (and avoidance of duplication) in the project performance monitoring arrangements.

12.2. Project Design and Monitoring Framework

A unified PDMF has been prepared in draft having regard to ADB guidance. The draft PDMF is provided in Table 12-1. The current version of the PDMF reflects consultations with WPMO and feedback received on the Interim Report version. The PDMF has been revised with the following objectives in mind:

- Maintain the integrity of the PDMF as a monitoring tool;
- Select indicators that rely as much as possible on readily available data;
- Recommend benefit indicators that are appropriately matched to anticipated benefits both in terms of type of impact and timing of measurement; and
- Coordinate the design of the PDMF with the project monitoring framework used by the PRC Ministry of Finance (MOF) so that there is minimal duplication of effort and maximum efficiency.

The current PDMF targets are based on our current knowledge of the Project and its impacts. We have examined the MOF project monitoring system and believe this is compatible with ADB requirements.

12.3. Project Monitoring and Evaluation

Project monitoring and evaluation is undertaken to measure project achievements against intended outcomes. Monitoring mechanisms and parameters proposed for the PME are based on the PDMF. Recommendations are provided regarding the source of each of the selected parameters, including identification of baseline information against which project performance can be assessed. Performance indicators are provided in Table 12-2.

**Table 12-1 Draft Design and Monitoring Framework,
Part a - Performance Targets and Indicators**

Design Summary	Performance Targets and Indicators	Data Sources and Reporting Mechanisms	Assumptions and Risks
<p>Impact</p> <p>Improved environment and quality of life for urban and suburban residents and businesses in Wuhan regardless of household income level.</p>	<p>Water quality of Yangtze River within the Wuhan section is sustained at Class III, Fu River is sustained at Class V and the Han River is sustained at Class III beyond 2010.</p> <p>Risk of exposure to pathogens diminishes as determined from: (1) the occurrence of Escherichia coli in tap water monitored in the distribution system, (2) the occurrence of Escherichia coli in surface waters monitored at existing sampling stations.</p> <p>Composite annual incidence of waterborne infectious disease drops below: (1) year 2005 total cases of 73 per 1000 persons; (2) year 2000 reported cases of 26.3 per 100,000 persons</p> <p>Maintenance and periodic evaluation of wastewater tariff subsidies to assure that wastewater services are affordable to poor households.</p> <p>Implementation of measures (e.g. pro-poor hiring policy) to ensure that poor</p>	<p>Environmental monitoring data of Wuhan EPB and SEPA (surface water and tap water)</p> <p>Wuhan Health Bureau and Wuhan Centre for Disease Control</p> <p>ADB Review Missions.</p> <p>Public feedback at public hearing meetings for tariff adjustments.</p>	<p>Assumptions</p> <ul style="list-style-type: none"> • Wuhan Master Plan for infrastructure is effectively implemented. • All applicable local and national environmental laws in PRC are effectively enforced. <p>Risks</p> <ul style="list-style-type: none"> • River water quality monitoring data do not provide sufficient information to detect trends. • Health statistics may not indicate the real Project impact due to the large number of factors affecting diseases associated with water supplies.

Design Summary	Performance Targets and Indicators	Data Sources and Reporting Mechanisms	Assumptions and Risks
	households have equal access to wastewater and storm water benefits. Increased satisfaction with wastewater services, storm water management and the control of drainage and flooding.	Household survey in 2015.	
Outcome Improved management of surface water resources in Wuhan Municipality.	Wastewater effluent BOD loading to surface waters from the Project WWTPs in Wuhan fall to 20,000 kg/a by 2010. Increase wastewater service coverage of the population in built up areas of Caidian by 2010. Reduced frequency of disruption and damage due to local storm water flooding.	Wastewater effluent quality and quantity monitoring data. Wuhan Statistical Yearbook. Wuhan Water Bureau (may require a new monitoring initiative by WRB).	Assumptions <ul style="list-style-type: none"> Continued growth in demand for wastewater services to achieve full capacity utilization and generate revenue to finance investments. Customers are willing to pay increased tariffs. Infrastructure assets are properly maintained. Adequate enforcement of non-residential connection and pretreatment requirements WRB acquires the resources and direction to monitor local flooding Risks <ul style="list-style-type: none"> Surface water run-off increases due to increasing catchment size and surface imperviousness

Design Summary	Performance Targets and Indicators	Data Sources and Reporting Mechanisms	Assumptions and Risks
Outputs			
1. Improve and expand wastewater services in Caidian.	65% of wastewater collected and treated from built up areas of Caidian by 2010. Provide wastewater service to 65% of the population in built up areas of Caidian by 2010	Site inspection and project implementation reports. Wastewater system data (rate of capacity utilization, influent and effluent flow volumes)	Assumptions <ul style="list-style-type: none"> Timely construction of the Caidian WWTP, pumping stations and sewers. Wuhan EPB enforces environmental standards including non-residential connection and pretreatment requirements.
2. Improve wastewater services in Dongxihu suburban area.	60% of wastewater collected and treated from built up areas of Dongxihu by 2010. Provide wastewater service to 60% of the population in built up areas of Dongxihu by 2010.	Site inspection and project implementation reports. WWTP data.	Assumptions <ul style="list-style-type: none"> Timely completion of improvements to sewer collection system in Dongxihu District. Wuhan EPB enforces environmental standards including non-residential connection and pre-treatment requirements.
3. Improve and expand wastewater services in the urban area of Wuhan.	Increase the volume of wastewater collected and treated in Wuhan 160,000 m ³ /d by 2010. Upgrade the treatment of wastewater currently collected in Wuhan by 2010 as follows: <ul style="list-style-type: none"> Treatment of 180,000 m³/d upgraded from primary to secondary treatment. Treatment of 100,000 m³/d upgraded from basic pre- treatment to secondary. 	Site inspection and project implementation reports. WWTP data.	Assumptions <ul style="list-style-type: none"> Timely completion of upgrades/expansions of the Erlangmiao, Nantaizi Lake and Huangpu Road WWTPs. Timely completion of improvements to sewer collection systems in Nantaizi Lake WWTP service area. Wuhan EPB enforces environmental standards including non-residential pretreatment requirements.

Design Summary	Performance Targets and Indicators	Data Sources and Reporting Mechanisms	Assumptions and Risks
4. Reduce flooding in Qiaokouqu District and the Yangsigang and Liujiao Road storm water drainage areas.	Reduced frequency of drainage overflow and local flooding in Project storm water service areas after 2010.	Wuhan Water Bureau (may require a new monitoring initiative by WRB).	Assumptions <ul style="list-style-type: none"> • Timely completion of drainage improvements. • Adequate funding of ongoing storm water management operations so that drains and storm sewers are maintained and cleaned regularly. • Adequate management of solid waste to prevent impairment of drains by solid waste
5. Increase the institutional capacity of WDC and WUCF (the IAs).	<p>IAs provide staff and resources to implement projects.</p> <p>WDC produces timely financial statements and gets an unqualified audit report annually</p> <p>Wastewater tariffs are reviewed annually and adjusted as needed to achieve the full cost recovery targets of 2005 for the central urban district, and 2010 for Dongxihu & Caidian districts.</p> <p>Public acceptance of wastewater tariffs increases.</p>	<p>WDC records concerning tariff adjustments and related public hearing meetings.</p> <p>WDC annual financial statements and audit reports.</p> <p>ADB Review Missions.</p> <p>Household survey in 2015.</p>	Assumptions <ul style="list-style-type: none"> • WDC is allowed to exercise independent management. • Government approves necessary tariff adjustments Risks <ul style="list-style-type: none"> • Adjustments in tariffs may be blocked by opposition at public hearing meetings

Table 12-1 Draft Design and Monitoring Framework
Part b - Activities with Milestones

Activities with Milestones	Inputs
<ol style="list-style-type: none"> 1 Improve and expand wastewater services in Caidian suburban area <ul style="list-style-type: none"> - Build 50,000 m³/d WWTP by 2009 - Build 4.59 km of new sewers by mid 2010 - Build one new pump station by mid 2010 - Land and resettlement 2 Improve wastewater services in Dongxihu suburban area <ul style="list-style-type: none"> - Build 15.55 km of new sewers by mid 2010 - Build 9.80 km of box culverts by mid 2010 - Build 5 new pump stations by mid 2010 - Land and resettlement 3 Improve and expand wastewater services in the urban area of Wuhan <ul style="list-style-type: none"> - Erlangmiao: <ol style="list-style-type: none"> 1. Expand and upgrade Erlangmiao WWTP from 180,000 m³/d primary to 240,000 m³/d secondary by 2009; - Nantaizi Lake: <ol style="list-style-type: none"> 1. Extend 100,000 m³/d secondary treatment capacity to the existing Nantaizi Lake WWTP (100,000 m³/d secondary) by 2009; 2. Rehabilitate 7.43 km of sewers by mid 2010; 3. build 3 new pumping stations by mid 2010; 4. Land and resettlement - Huangpu Road: <ol style="list-style-type: none"> 1. Upgrade Huangpu Road 100,000 m³/d WWTP to secondary treatment by 2008 	<ul style="list-style-type: none"> • ADB inputs <ul style="list-style-type: none"> - Provide \$ 100 million loan. - Undertake review missions. - Provide training in ADB procedures. • Governments and IAs <ul style="list-style-type: none"> - Provide \$72.3 million equivalent in counterpart funds. - Secure \$ 94.1million equivalent local bank loans. - Undertake on-lending arrangements and loan management. - Hire design institutes, and secure other consulting services. - Contract tendering, select contractors, contract management. - Initiate and support institutional reforms and capacity building. - Provide planning and resources for public information and consultation activities.

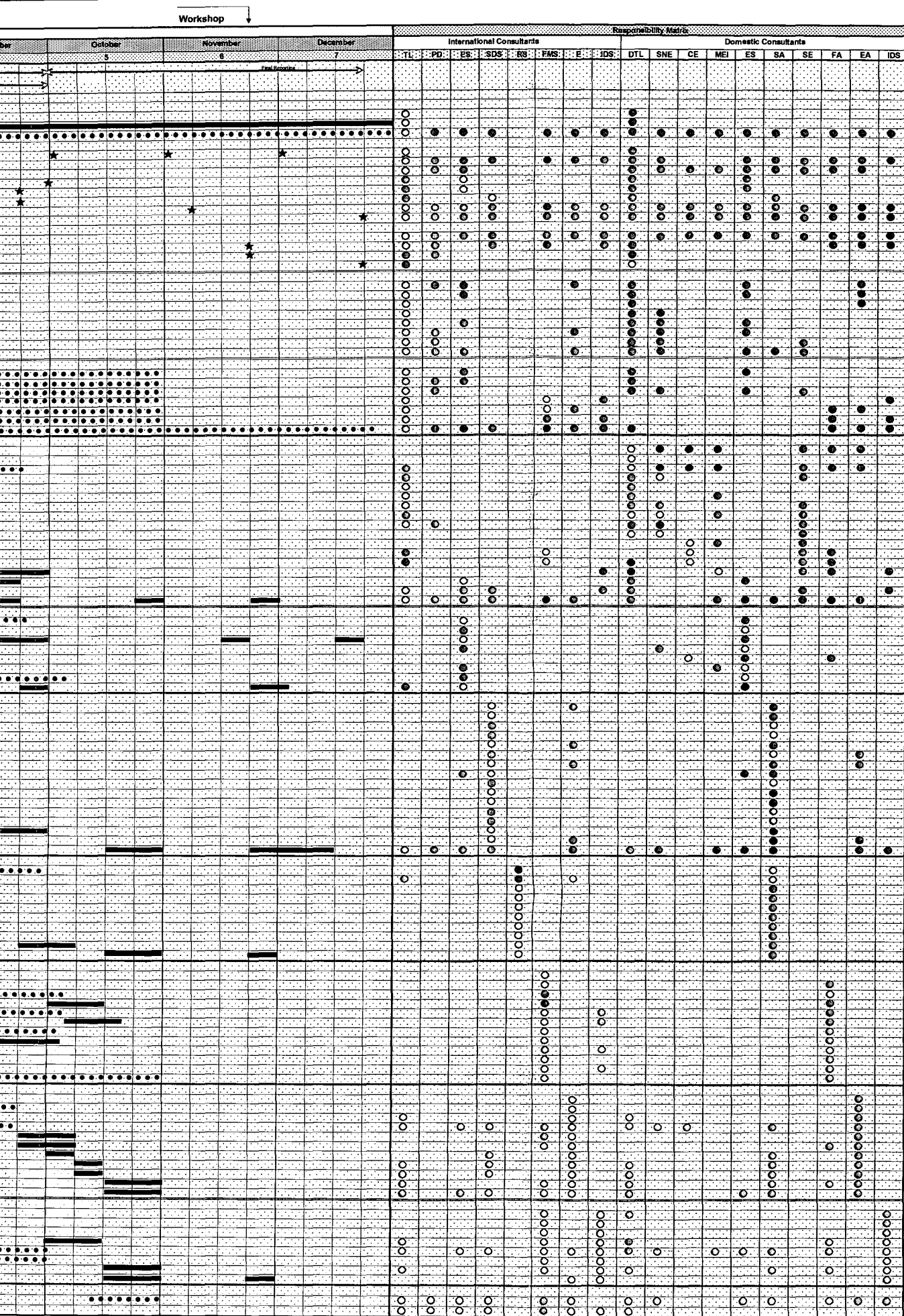
TABLE 12-2 Project Monitoring Indicators

Project Monitoring Indicators	Baseline and Future Data Sources and Reporting Mechanisms
<p>Impact Improved environment and quality of life for urban and suburban residents and businesses in Wuhan regardless of household income level:</p> <ul style="list-style-type: none"> • Water quality of Yangtze River in the Wuhan section is sustained at Class III, Fu River is sustained at Class V and the Han River is sustained at Class III beyond 2010. • Risk of exposure to pathogens diminishes as determined from: (1) the occurrence of <i>Escherichia coli</i> in tap water monitored in the distribution system, (2) the occurrence of <i>Escherichia coli</i> in surface waters monitored at existing sampling stations. • Composite annual incidence of waterborne infectious disease drops below: (1) year 2005 total cases of 73 per 1000 persons; (2) year 2000 reported cases of 26.3 per 100,000 persons • Maintenance and periodic evaluation of wastewater tariff subsidies to assure that wastewater services are affordable to poor households. • Implementation of measures (e.g. pro-poor hiring policy) to assure that poor households have equal access to wastewater and storm water benefits • Increased satisfaction with wastewater services, storm water management and the control of drainage and flooding. 	<p>Environmental monitoring data of Wuhan EPB and SEPA</p> <ul style="list-style-type: none"> • Annual water quality reports (surface water, potable water) <p>Wuhan Health Bureau and Wuhan Centre for Disease Control data on the incidence of infectious disease.</p> <ul style="list-style-type: none"> • Annual disease incidence reports [Hepatitis A, Dysentery (Shigellosis), Cholera, Typhoid, Bilharzias (Schistosomiasis), Others] <p>ADB Review Missions</p> <ul style="list-style-type: none"> • Mission reports <p>Public feedback at public hearing meetings for tariff adjustments.</p> <ul style="list-style-type: none"> • Consultation with agency staff (Price Bureau, Drainage Company) • Newspaper clippings <p>Household survey in 2015</p> <ul style="list-style-type: none"> • Household attitudes and opinions • Total water related disease incidence (Schistosomiasis, Diarrhea, nausea, Skin or eye infections from exposure to flood water and swimming in lakes and rivers, Dysentery, Cholera, Hepatitis A, Typhoid/paratyphoid, Other) <p>Loan implementation consultant:</p> <ul style="list-style-type: none"> • Capacity building and institutional reform reporting • Environmental impact progress reporting

Project Monitoring Indicators	Baseline and Future Data Sources and Reporting Mechanisms
<p>Outcome Improved management of surface water resources in Wuhan Municipality:</p> <ul style="list-style-type: none"> • WW effluent BOD loading to surface waters from the Project WWTPs in Wuhan fall to 20,000 kg/a by 2010 • Increase wastewater service coverage of the population in built up areas of Caidian by 2010 • Reduced frequency of disruption and damage due to local storm water flooding. <p>Outputs</p> <ol style="list-style-type: none"> 1. Improve and expand wastewater services in Caidian: <ul style="list-style-type: none"> • 65% of wastewater collected and treated from built up areas of Caidian by 2010 • Provide wastewater service to 65% of the population in built up areas of Caidian by 2010 2. Improve wastewater services in Dongxihu suburban area: <ul style="list-style-type: none"> • 60% of wastewater collected and treated from built up areas of Dongxihu by 2010 • Provide wastewater service to 60% of the population in built up areas of Dongxihu by 2010 3. Improve and expand wastewater services in the urban area of Wuhan: <ul style="list-style-type: none"> • Increase the volume of wastewater collected and treated in Wuhan 160,000 m³/d by 2010. • Upgrade the treatment of wastewater currently collected in Wuhan by 2010 as follows: <ol style="list-style-type: none"> i. Treatment of 180,000 m³/d upgraded from primary to secondary treatment. 	<p>WDC performance monitoring data</p> <ul style="list-style-type: none"> • WWTP effluent quality and quantity reports • Customer records • Wuhan Statistical Yearbook <p>Wuhan Water Bureau</p> <ul style="list-style-type: none"> • To be determined (requires a new flood monitoring initiative by WWB) <p>Loan implementation consultant:</p> <ul style="list-style-type: none"> • Site inspection and project implementation reporting <p>WDC performance monitoring data</p> <ul style="list-style-type: none"> • WWTP effluent quality and quantity reports • Customer records <p>Loan implementation consultant:</p> <ul style="list-style-type: none"> • Site inspection and project implementation reporting <p>WDC performance monitoring data</p> <ul style="list-style-type: none"> • WWTP effluent quality and quantity reports • Customer records <p>Loan implementation consultant:</p> <ul style="list-style-type: none"> • Site inspection and project implementation reporting <p>WDC performance monitoring data</p> <ul style="list-style-type: none"> • WWTP effluent quality and quantity reports

Project Monitoring Indicators	Baseline and Future Data Sources and Reporting Mechanisms
<p>ii. Treatment of 100,000 m³/d upgraded from pre treatment to secondary.</p> <p>4. Reduce flooding in Qiaokouqu District and the Yangsigang and Liujiao Road storm water drainage areas:</p> <ul style="list-style-type: none"> • Reduced frequency of drain overflow and local flooding in Project storm water service areas after 2010 <p>5. Increase the institutional capacity of IAs in Wuhan:</p> <ul style="list-style-type: none"> • WDC produces unqualified financial statements and audit report. • IAs provide staff and resources to implement projects. • Wastewater tariffs are reviewed annually and adjusted as needed to achieve full cost recovery on a continuous basis in central Wuhan, and by 2010 in Caidian and Dongxihu. • Public acceptance of wastewater tariff increases. 	<p>Wuhan Water Bureau</p> <ul style="list-style-type: none"> • To be determined (requires a new flood monitoring initiative by WWB) <p>Loan implementation consultant:</p> <ul style="list-style-type: none"> • Capacity building progress reports <p>Loan implementation consultant:</p> <ul style="list-style-type: none"> • Capacity building and institutional reform reporting <p>Wuhan Drainage Company</p> <ul style="list-style-type: none"> • records concerning tariff adjustments and related public hearing meetings • annual financial statements and audit reports <p>ADB Review Missions</p> <ul style="list-style-type: none"> • Mission reports <p>Household attitudes and opinions</p> <ul style="list-style-type: none"> • Household survey in 2015

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				June	July	August	September	June	July	August	September								
				INCEPTION				SUB-PROJECT APPRAISALS				PROJECT REGULATION							
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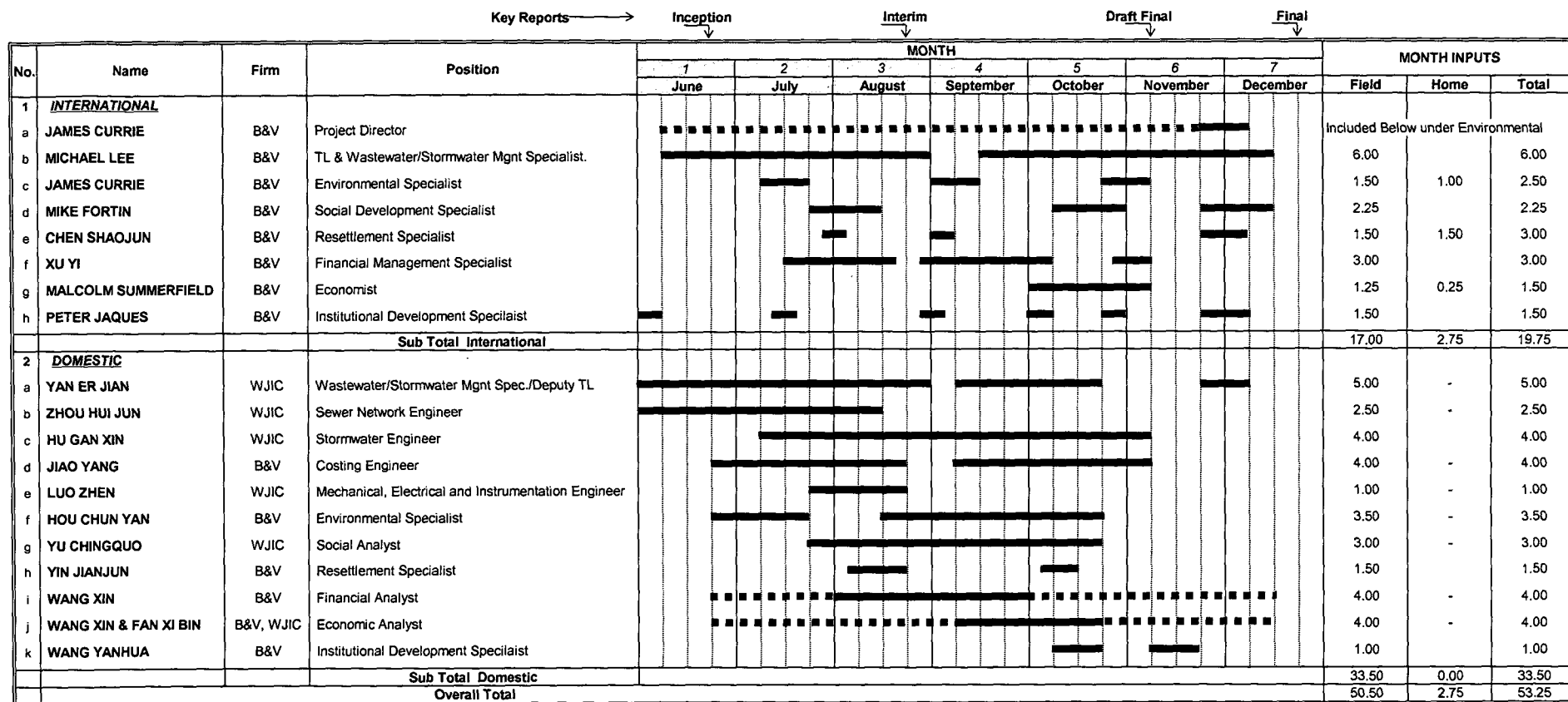




Deputy Team Leader/Wastewater Management
Sewer Network Engineer
Storm Water Engineer
Costing Engineer
Mechanical Electrical and Instrumentation Engineer
Social Analyst
Financial Analyst
Economic Analyst

IR
INTR
FR
SEIA
RP
MPR

Inception report
Interim Report
Draft Final Report
Summary EIA
Resettlement Plan
Monthly Progress Report

Figure 1-1
Work Program
Reporting Output and Responsibility Matrix



LEGEND:
 : Continuous
 : Intermittant

B&V = Black & Veatch (Asia) Ltd
WJIC = Wuhan Jianxing Infrastructure Construction Co., Ltd

Fig 2-2: LOCATION OF WASTEWATER SUBPROJECTS
WUHAN WASTEWATER AND STORM WATER MANAGEMENT PROJECT
 IN THE
 PEOPLE'S REPUBLIC OF CHINA

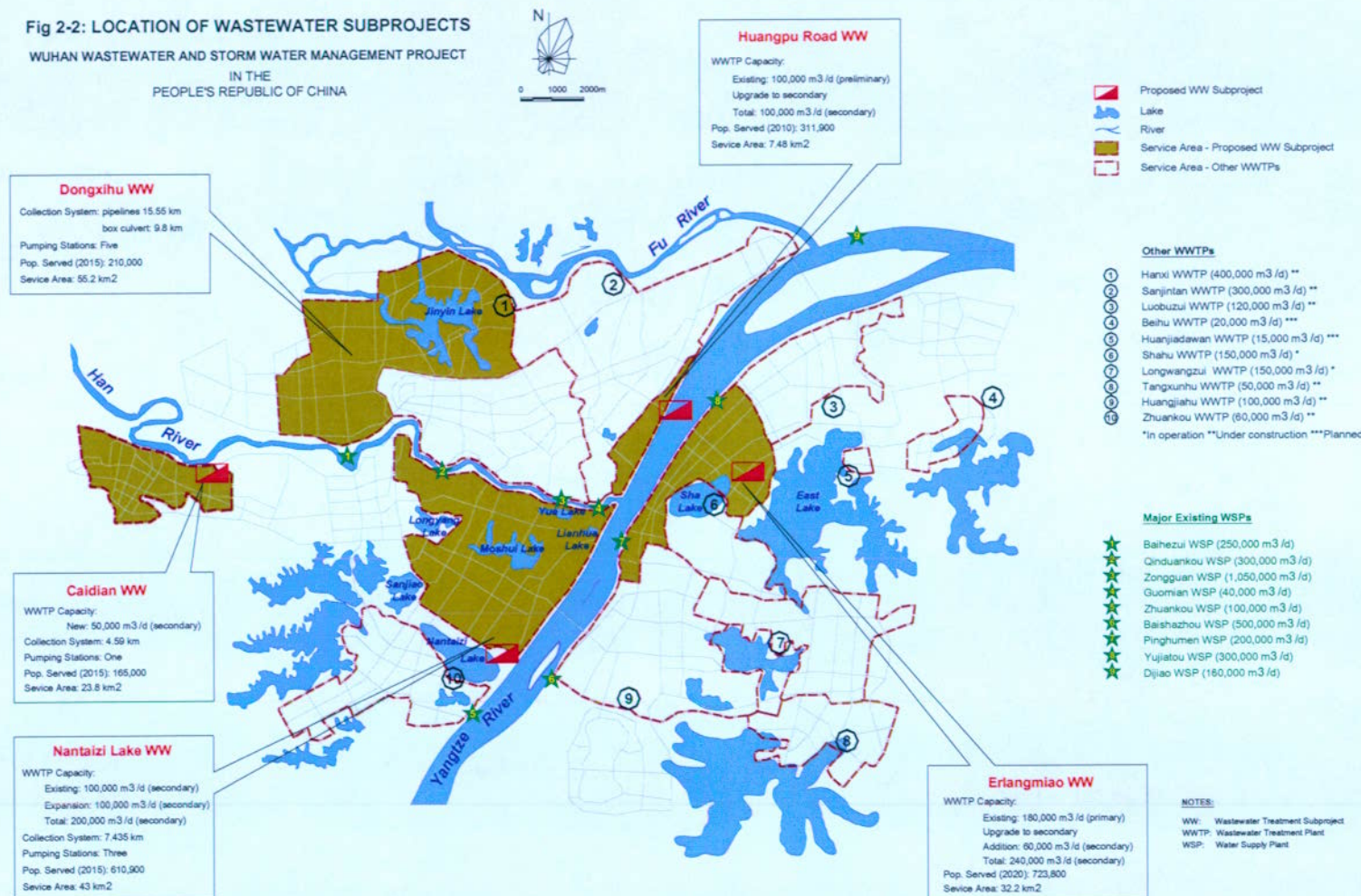


Fig 2-3: LOCATION OF STORM WATER SUBPROJECTS

WUHAN WASTEWATER AND STORM WATER MANAGEMENT PROJECT
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PEOPLE'S REPUBLIC OF CHINA

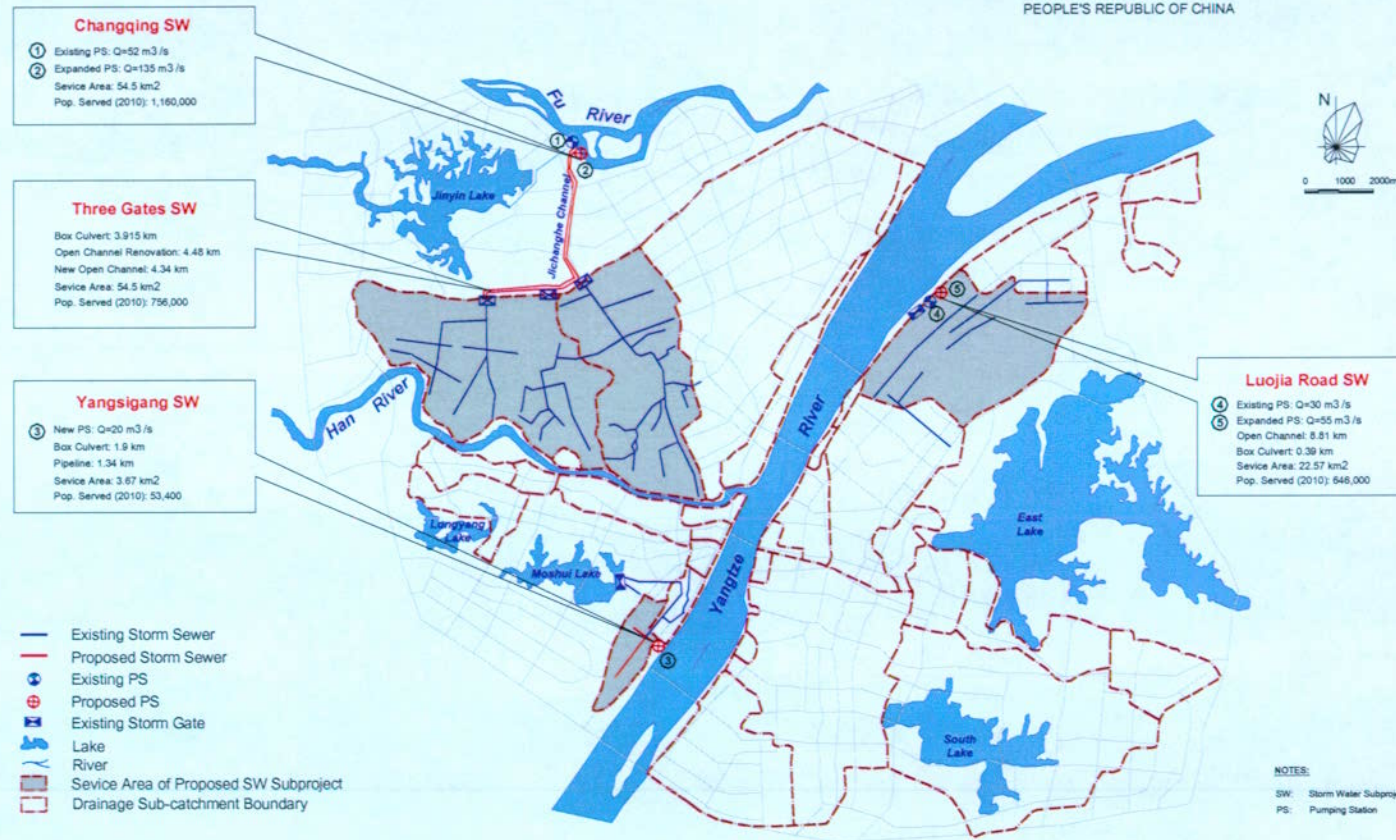
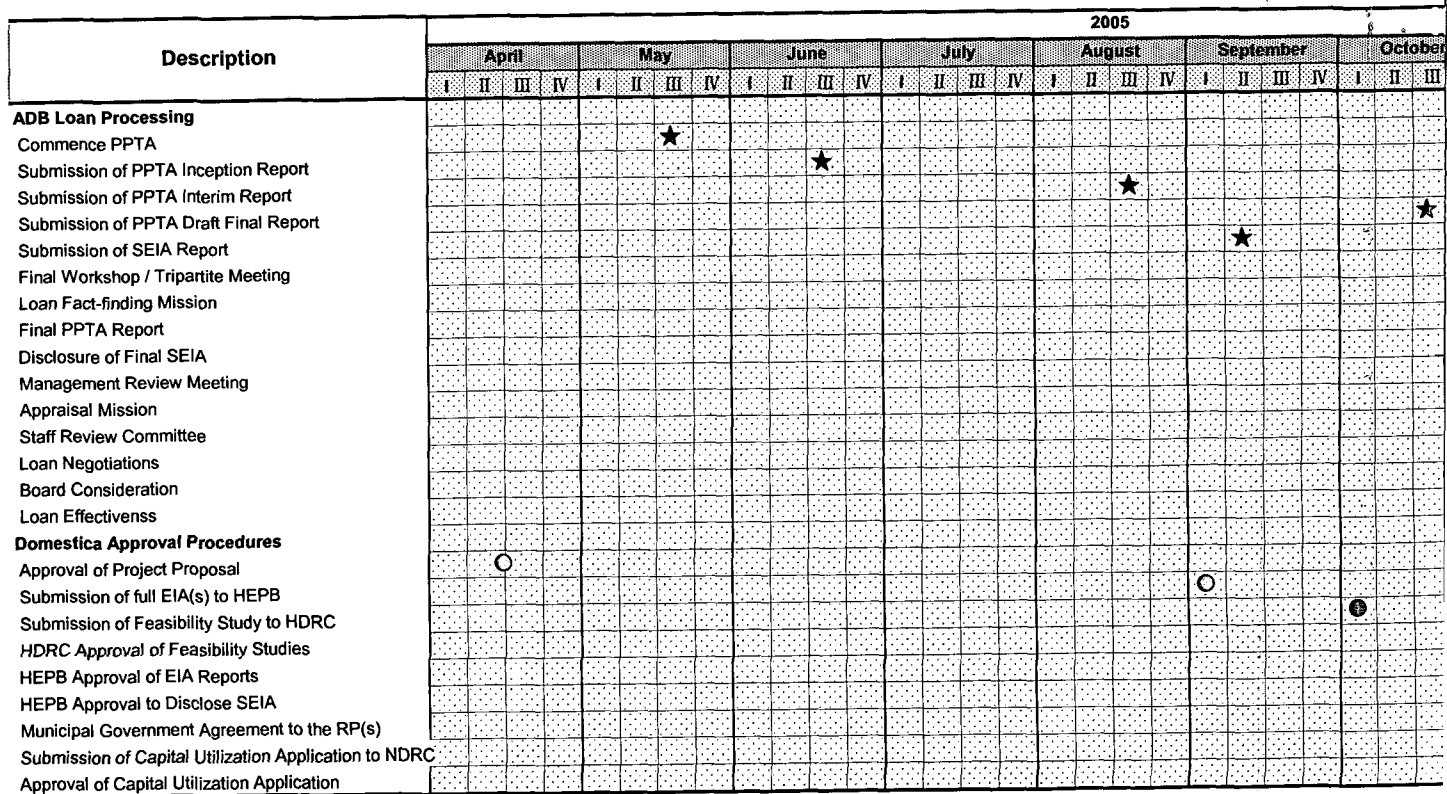


Fig 2-4 ADB Loan Processing & Domestic Approval Procedures



Legend

- ★ ADB Activities
- Domestic Activities

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Fig 3-1: Wastewater Management Subprojects

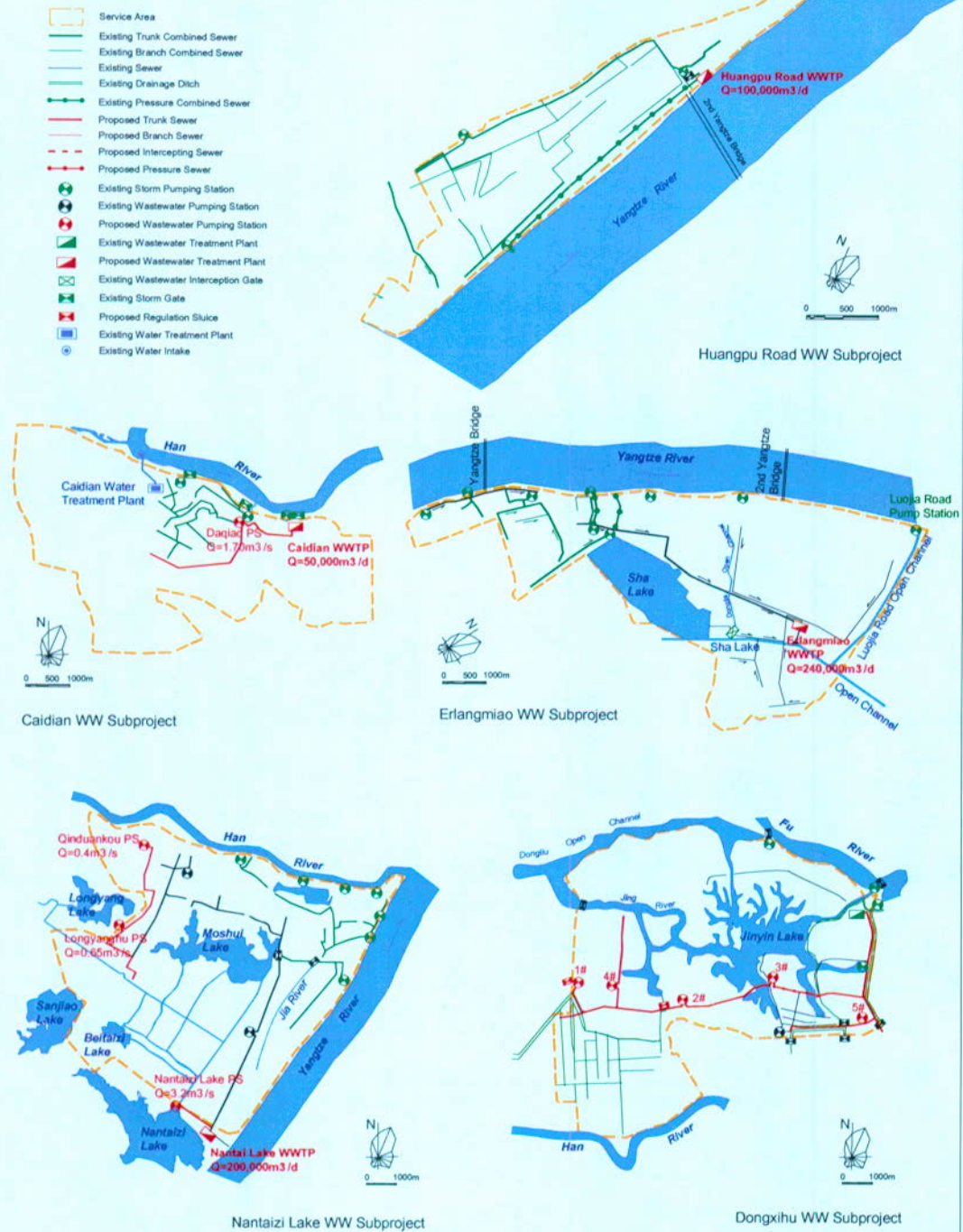
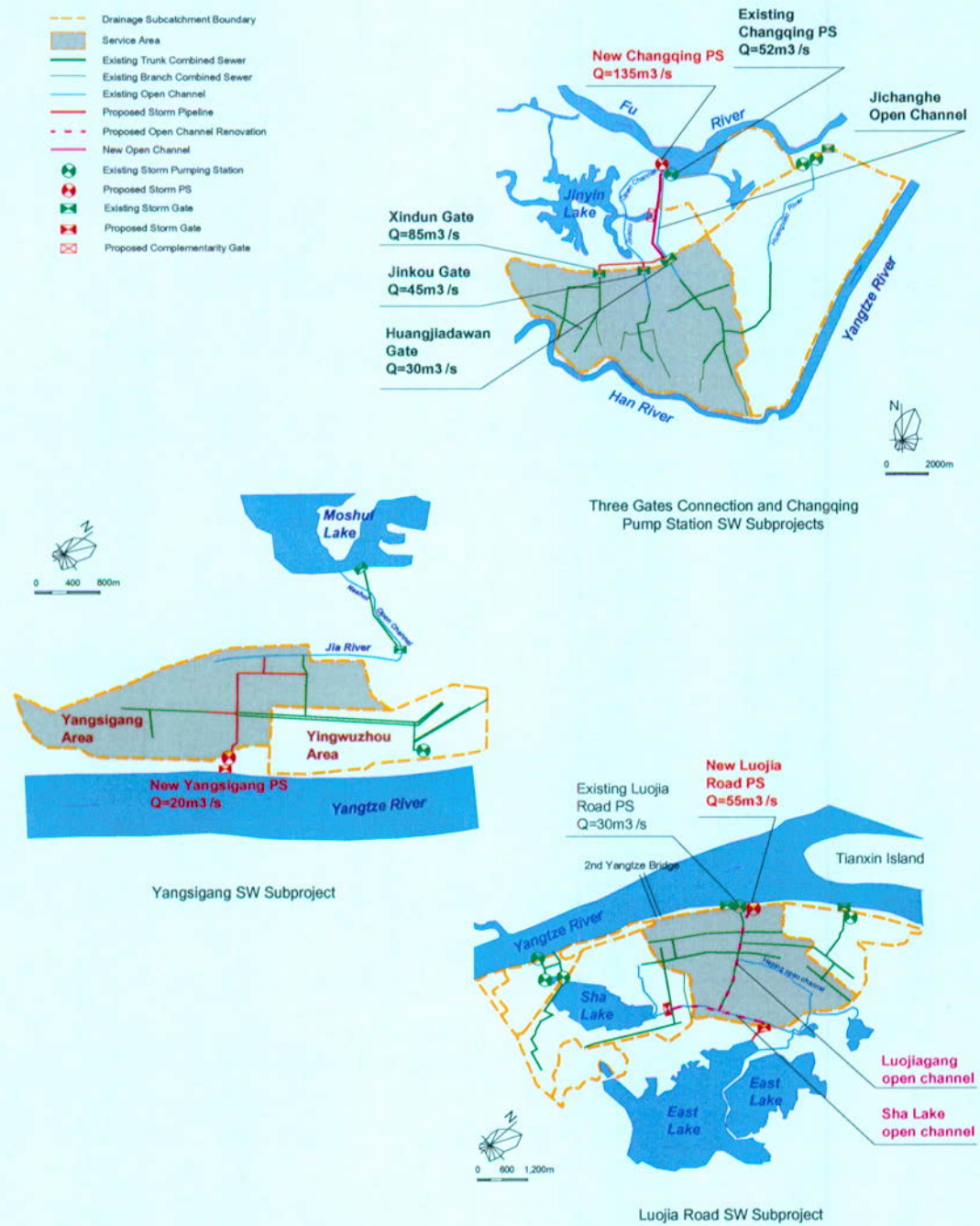


Fig ES4-1: Storm Water Management Subprojects



ADB TA - 4436 - PRC

Project Preparatory Technical Assistance Wuhan Wastewater and Storm Water Management Project

**Final Report
December 2005**



**Volume 1
Project Analysis**

**Part 2 of 2
Appendices**

**Consultant
Black & Veatch (Asia) Ltd**

**Executing Agency
Wuhan Municipal Government**

ADB TA - 4436 - PRC

**Project Preparatory Technical Assistance
Wuhan Wastewater and Storm Water
Management Project**

Final Report

December 2005

Volume 1

Project Analysis

Part 2 of 2

Appendices

Consultant

Black & Veatch (Asia) Ltd

Executing Agency

Wuhan Municipal Government

APPENDIX A1

PPTA OUTLINE TERMS OF REFERENCE FOR CONSULTANTS

Review of Sector Development Plans

1. The consultants will review long- and medium-terms plans for water resources management and pollution control in the Yangtze River Basin (YRB), focusing on the part of the Wuhan municipality within the basin, and downstream beneficiaries. Among others, reference will be made in the Yangtze River Water Resources Protection Plan, which was prepared by the Yangtze River Basin 2002. Based on the review of this plan, the consultants will assess the Wuhan municipal government (WMG) policies and strategies for water resources management and pollution control to ensure that a comprehensive approach has been adopted throughout the river basin, and all appropriate options have been considered on a least-cost basis. The consultants will recommend any changes in policies and strategies, and improvements to these plans as a consequence of the recommended changes in policies and strategies.

2. The consultants will analyze wastewater and/or storm-water management practice in the city in the context of basin-wide water resources management, including water supply, irrigation and drainage. Reference will be made to sewerage master plan, drainage master plan, industrial wastewater pollution control plan, and various feasibility studies, where these exist, among others. Based on the analysis, the consultants will recommend improvements to these plans, including policies and strategies for wastewater and/or storm-water management. The proposed Project will be evaluated in the context of these plans. Based on the evaluation, the consultants will undertake technical, environmental, social, financial, economic, and institutional feasibility studies of the Project.

Policy Dialogue Related Activities

3. The consultants will prepare notes for policy dialogue, based in part on discussions with the relevant bureaus and offices of WMG on the following aspects: (i) upstream/basin-wide pollution prevention and control, (ii) integrated industrial and domestic wastewater management, (iii) storm-water management and urban drainage; (iv) enterprise reform and corporate governance for the implementing agencies; (v) cost recovery and tariff reform based on full cost recovery; and (v) private sector participation. These notes will highlight any issues and constraints, and provide possible approaches and required actions/measures to address these issues. In addition, the consultants will explore other areas for policy dialogue.

Technical Aspects

4. The consultants will review domestic project proposals, feasibility studies, environmental assessments and resettlement plans for the proposed Project, and other related reports used to substantiate the analyses of the feasibility studies. Major water users, major effluent discharges, and need for storm-water drainage will be identified to evaluate the overall environmental impacts and benefits of the proposed Project. The findings of the domestic feasibility studies will be confirmed and/or modified, as required. Where details are lacking, the consultants will carry out the necessary studies.

5. The consultants will undertake the following tasks:

- (i) Develop plans to connect existing sewers to future project treatment facilities and/or storm-water drainage systems, including coordination and phasing schedules to complete the sewer network and a financing strategy.
- (ii) Estimate wastewater flows and plant capacity based on economic forecasts of water demand, including flexibility to accommodate future changes in flow rate.
- (iii) Confirm treatment process, including flexibility to accommodate future changes in treatment requirements, and suitability for effective treatment of pretreated wastewater discharged by industry, sludge treatment and disposal, effluent standards, potential for effluent reuse, and impact of wastewater collection and treatment on water quality in the receiving water courses.
- (iv) Estimate urban runoffs and storm-water drainage facility capacities.
- (v) Develop design criteria and standards for wastewater collection and treatment and/or storm-water drainage system, outline designs, and stage construction; and verify the planning horizon for project facilities and other facilities that will interface with.
- (vi) Estimate quantities of major civil works items and schedules of major items of plant and equipment, including instrumentation and control systems.
- (vii) Develop unit rates for civil works items, manufacturers' budget quotations for major plant items, and detailed construction estimates (by foreign exchange cost and local currency cost), following ADB guidelines and standards. The consultants should use costing models incorporating ADB's requirements for physical and price contingencies and interest during construction.
- (viii) Prepared detailed financial plans and disbursement schedule, implementation schedule, and propose procurement packages in accordance with the *Guidelines for Procurement under ADB Loans*.
- (ix) Develop environmental monitoring systems for influents entering sewer collection systems and wastewater treatment plants to protect the biological processes from toxic wastes.
- (x) Estimate consulting services inputs needed for project implementation, including institutional strengthening and development, engineering design, and construction supervision over the project implementation period.

- (xi) Develop a draft project administration memorandum in accordance with ADB's guidelines.

Environmental Impact Assessment

6. The consultants will review and update the environmental impact assessment and prepare a summary environmental impact assessment (EIA) with appropriate environmental monitoring and management plans, following ADB guidelines.

7. The consultants will accomplish the following tasks:

- (i) Review the domestic EIA for the proposed Project and the rapid environmental assessment during technical assistance (TA) preparation to ensure they conform to ADB's Environmental Policy, 2002 and Environmental Assessment Guidelines, 2003. The consultants will help WMG carry out further investigations and analysis, as required, and finalize the EIA, management plan, and monitoring plan by incorporating comments from ADB and the municipal Environmental Protection Bureau. The environmental management plan has to specify the participating parties and their responsibilities and budget.
- (ii) Recommend mitigation measures and an environmental management program for each of the wastewater management and storm-water management components. The environmental issues to be considered will include on-site pretreatment of industrial effluents from larger factories, and identification processes that discharge effluent directly without pretreatment.
- (iii) Determine costs of the proposed measures, help WMG incorporate mitigating measures into the project design, and prepare contractor specifications for environmental management and monitoring.
- (iv) Help WMG consult the public at least twice: once at the early stage of EIA fieldwork, again when the draft EIA report is available, and before loan appraisal by ADB.
- (v) Prepare a summary EIA, providing technical descriptions of the representative projects and how they will improve the environment. Discuss major alternatives and how the potential negative impacts or concerns will be mitigated.

Poverty and Social Analysis

8. The consultants will review the initial poverty and social assessment conducted during TA preparation, and carry out a detailed poverty and social analysis, including a baseline socioeconomic profile of the population living in the project areas, and undertake social analysis and develop a broad-based participatory strategy.

9. The consultants will accomplish the following tasks:

- (i) Prepare socioeconomic and poverty profiles for the project areas to be served by the improved wastewater and/or storm-water services. Collect data through statistical records, field surveys,¹ participatory rapid appraisal, and interviews with key informants (e.g., local government officials, women's federations, business associations, community groups, etc.)
- (ii) Conduct poverty and social analysis in accordance with ADB's handbook on Poverty and Social Analysis of Projects and Handbook for Integrating Poverty Impact in Economic Analysis of Projects. Assess how the ensuing project will help improve people's living conditions and thus enhance public health, and support sustainable economic growth. Identify and prioritize needs for public investment in the project areas, evaluate the given project relative to other needs and determine how other needs are being addressed. Estimate the number of project beneficiaries by area, occupation, gender, and income level (poor,² low, medium, and high); and the number of adversely affected people by type of impact. The data collected should be disaggregated by gender.
- (iii) Assess the social impact of the ensuing project including willingness to pay the projected tariffs, income levels and distribution, socioeconomic benefits, and possible negative impacts differentiated by income level and gender.
- (iv) Review existing arrangements and procedures for involving beneficiaries in project design and implementation, hold workshops with beneficiaries and other key stakeholders, develop a tailored information and health education campaign with provisions for monitoring benefits, prepare programs to promote public awareness and participation, and document past and expected future public consultation programs.
- (v) Collect and analyze health data, including incidence of morbidity and mortality rates due to waterborne diseases.
- (vi) Assess whether or not any ethnic minority will be affected by the ensuing project. If any, prepare an ethnic minorities development plan as set out in ADB's Indigenous People's Policy 1998.
- (vii) For project monitoring, develop a set of verifiable monitoring performance indicators, including operations, financial environmental, socioeconomic, and poverty reduction parameters. Specify baseline targets for the socioeconomic and poverty indicators disaggregated by gender, and sustainable mechanisms for monitoring during and beyond the construction stage. Assess the development impact of the ensuing project, focusing on benefits and beneficiaries. Draw up a project performance monitoring system, following the ADB's project performance monitoring system guidelines.

Resettlement

10. The consultants will review and update the resettlement plan prepared by the

¹ About 500 households are anticipated to be surveyed.

² Below the official poverty line.

WMG in accordance with ADB policy and guidelines. The consultants will undertake the following tasks:

- (i) Review the resettlement plan for the proposed Project and assist WMG to revise the resettlement plan, as required, to comply with ADB's Handbook on Resettlement. Conduct resettlement household surveys³ to ensure adequate understanding of socioeconomic impacts of the project. The resettlement plan must include a village-level impact assessment of project-affected people, land, assets, and occupations.
- (ii) Define categories of impact and eligibility of affected people, for compensation and prepare a matrix of entitlements covering compensation and other assistance for all types of impacts to achieve full replacement for lost assets, income, and livelihoods.
- (iii) Identify gender impacts, and prepare relevant mitigation and/or rehabilitation measures for vulnerable groups, including woman-headed households.
- (iv) Assist WMG and relevant district government officials initiate and expand consultation with affected communities, local leaders, proponents, and other stakeholders. Prepare a consultation plan for WMG and a format for documenting consultation with affected people. Assist WMG prepare a resettlement information booklet⁴ and conduct public disclosure information including distribution of the booklet to all affected villages and households prior to an ADB loan fact-finding mission.
- (v) Justify that compensation standards are based on replacement value, and assist WMG to prepare detailed resettlement budget based on the proposed entitlements matrix and rehabilitation plans.
- (vi) Review the organization structure and capacity for resettlement implementation and recommended improvements and actions required before resettlement plan is implemented. Help WMG prepare a detailed resettlement implementation schedule and a plan for internal and external monitoring and evaluation. Data collected for internal and external monitoring and evaluation should be disaggregated by gender.

Financial Management Assessment and Financial Analysis

11. The consultants will extend the financial analysis presented in the domestic feasibility studies. The purpose is to assess the financial viability and fiscal sustainability of the ensuing project, and financial viability to the municipal wastewater company (MWC) and water bureau of WMG. The financial analysis will be undertaken in accordance with ADB's Guidelines for the Financial Governance and Management of Investment Projects Financed by ADB.

12. The consultant will undertake the following tasks:

³ For household surveys, ADB requires 10-20% of affected people and enterprises, including 20% of seriously affected people, to be included.

⁴ AND has sample formats.

- (i) Review current accounting and administrative capabilities, the internal control system, and internal and external auditing procedures, and develop an action plan to rectify gaps and weakness identified.
- (ii) Establish financial objectives and targets for each representative project and prepare financing plans and projections, including income statements, balance sheets, cash-flow statements, and other relevant financial statements in normal terms, for operations for the 10- year period after project completion.
- (iii) Examine the availability of local counterpart funds and assess the liquidity of the various governments for different levels of borrowing.
- (iv) Compute in real terms the financial internal rate of return and the average incremental cost in financial terms for each representative project.
- (v) Propose possible commercial co-financing and private sector involvement in the financing plan.
- (vi) Prepare cost estimates (including physical and price contingencies and computation of interest and other charges during implementation) and confirm the financing plan to the activities allocated to the financial analyst/financial management specialist.

Economic Analysis

13. The economic analysis will include, but not be limited to, sector analysis of the basin-wide management plan, wastewater management master plan, and urban drainage master plan, which identifies and prioritizes future sector developments; standard least-cost analysis of the ensuing project; and distribution analysis, including poverty impact assessment. The economic analysis will be done in accordance with ADB's Guidelines on Economic Analysis of Project, Handbook for Integrating Risk Analysis in the Economic Analysis of Projects, and Economic Analysis in 2002: A retrospective, and Economic analysis Retrospective: 2003 Update, and other relevant ERD publications.

14. The consultants will review the investment program under the long- and medium-term sector development plans, and the justification of the investment program should be based on meeting broad social goals at least cost. Analysis of the goals should include a review of the process of establishing them, the role of public participation and input, and public support for the resulting goals. Given the goals, the analysis should then consider how to achieve them at least economic cost. The analysis will cover selection criteria for additional projects, relevant policies, and institutions. The analysis should aim to identify enhancements or improvements to policies and institutions to promote attainment of the goals. Policy analysis should also cover user charges but consider them as a general policy tool, not merely for raising revenue. The consultants will also review and evaluate sources of funds for the investment program, including revenue, use charges, commercial credit, concession credit, and foreign aid.

15. The economic analysis will include, but not be limited to, the following specific

tasks.

- (i) Work with other technical specialists on the project team to review and evaluate the standards or targets for surface water quality and effluent discharge. Determine if existing standards or targets are economically and socially justified, and recommend changes as needed.
- (ii) Identify the least-cost option to meet both the existing and any recommended changes to standards or targets. Least-cost analysis should cover both policy and investment options.
- (iii) Work with the Financial analyst and Social Analyst to review tariffs for water and sewerage in accordance with ADB's position on tariffs, as described in ERD Technical Note#9, and elaborated in other related Technical Notes. The review should cover, among other things, the extent and justification of any subsidies, helping the poor satisfy their basic needs, and using charges to encourage efficient use of resources. Recommend changes to existing tariffs, as need.
- (iv) Forecast demand for water based on projected tariffs, and use those forecasts and other relevant information to forecast wastewater flows. If changes to existing tariffs are recommended, the forecasts should be based on both existing tariffs and the recommended changes.
- (v) Use the forecasts of wastewater flows to estimate the scale of investment in treatment capacity that minimizes the expected present value of current and future capacity costs. The scale for the proposed project should balance the cost of both present and future capacity expansions, as needed. Estimate the cost of any proposed deviations from the least-cost expansion plan.
- (vi) Evaluate identified investments relative to other opportunities for public investments. The evaluation may be based on standard benefit-cost analysis, to the extent feasible, as described in ADB's Guidelines on Economic Analysis of Projects, Economic Analysis in 2002: A Retrospective, and Economic analysis Retrospective: 2003 Update, and other relevant ERD publications. The evaluation should also be based on an analysis of poverty in the project's areas; an identification of priorities for public investments and estimate of public support for the given project, based social surveys; and a general evaluation of how other priorities are being addressed.

Capacity Building and Training

16. The consultants will review and assess the institutional capacity of the municipal government departments and/or agencies responsible for wastewater and/or storm-water design and management, including financial management and audit requirements, economic analysis, and monitoring and evaluation systems. The consultants will also review and assess the existing institutional capacity of the municipal wastewater company and the water bureau of WMG responsible for project implementation, and O&M of the project facilities upon completion of the ensuing project.

17. Based on the assessment, the consultants will accomplish the following tasks:

- (i) Identify deficiencies and prepare recommendations to strengthen the departments' and/or agencies' institutional and technical capability, encompassing administrative, management, organizational, technical (monitoring and evaluation, economic analysis), and financial aspects; and develop outline terms of reference for a capacity-building and/or institutional-strengthening technical assistance, and internal and external training programs.
- (ii) Develop corporate management arrangements and finance procedures for the implementing agencies, particularly the preparation and implementation of improved organizational structure and human resources plan, full financial analysis of the municipal wastewater company and the water bureau of WMG to verify its financial status and ensure its financial health, budgeting and business plan development, management information system, and internal and external training programs.
- (iii) Design and prepare a technical assistance program, including studies and training of managers and staff responsible for service delivery, to strengthen their capacity to efficiently implement, operate, and maintain the facilities and techniques to be introduced under the ensuing project; and to ensure sustainability of project benefits.
- (iv) Propose most appropriate institutional arrangements and related policy framework for private sector participation in wastewater and/or storm-water management.

Schedule and Reporting Requirements

18. The consultants will submit (i) an inception report, within 1 month of starting work, including a comprehensive review of the overall wastewater and storm-water management programs for Wuhan and the identification and integration of the specific components for ADB financing as well as full details on the methodological approaches used in the economic analysis and a preliminary social analysis; (ii) brief monthly progress reports; (iii) an interim report, within 3 months of starting work; (iv) a draft summary EIA together with the EIA and resettlement plan, within 3 months of starting work; (v) a draft final report, within 5 months of starting work, to be discussed at meeting of the Government, ADB, and consultants; and (vi) the final report, within 2 weeks of the tripartite meeting. All reports will be submitted to ADB in English (three copies) and to the Government and HPG in English and Chinese (three copies). The consultants will present all key findings in the draft final workshop.

19. The consultants will help ADB prepare a draft report and recommendation to the President by preparing relevant sections, appendixes, and supplemental information. The consultants will also help ADB and WMG develop a project framework in accordance with ADB guidelines.

Appendix A2 - Table of Responses to TOR

TOR Item	Chapter & Section
	Chapter 3
<p>4 - The consultants will review domestic project proposals, feasibility studies, environmental assessments and resettlement plans for the proposed Project, and other related reports used to substantiate the analyses of the feasibility studies. Major water users, major effluent discharges, and need for storm-water drainage will be identified to evaluate the overall environmental impacts and benefits of the proposed Project. The findings of the domestic feasibility studies will be confirmed and/or modified, as required. Where details are lacking, the consultants will carry out the necessary studies.</p>	3.1. General
<p>5(i) - Develop plans to connect existing sewers to future project treatment facilities and/or storm-water drainage systems, including coordination and phasing schedules to complete the sewer network and a financing strategy.</p>	3.2. Municipal Wuhan Wastewater Master Plan and Population Predictions
<p>5(ii) - Estimate wastewater flows and plant capacity based on economic forecasts of water demand, including flexibility to accommodate future changes in flow rate.</p> <p>15(iv) - Forecast demand for water based on projected tariffs, and use those forecasts and other relevant information to forecast wastewater flows. If changes to existing tariffs are recommended, the forecasts should be based on both existing tariffs and the recommended changes.</p>	3.3. Wastewater Flow Predictions
<p>5(ii) – Ditto</p> <p>5(iii) - Confirm treatment process, including flexibility to accommodate future changes in treatment requirements, and suitability for effective treatment of pretreated wastewater discharged by industry, sludge treatment and disposal, effluent standards, potential for effluent reuse, and impact of wastewater collection and treatment on water quality in the receiving water courses.</p>	3.4. Wastewater Characteristics
<p>5(v) - Develop design criteria and standards for wastewater collection and treatment and/or storm-water drainage system, outline designs, and stage construction; and verify the planning horizon for project facilities and other facilities that will interface with.</p>	3.5. Wastewater Collection Systems

TOR Item	Chapter & Section
<p>5(iii) - Ditto</p> <p>5(v) - Ditto</p> <p>5(vi) - Estimate quantities of major civil works items and schedules of major items of plant and equipment, including instrumentation and control systems.</p> <p>5(vii) - Develop unit rates for civil works items, manufacturers' budget quotations for major plant items, and detailed construction estimates (by foreign exchange cost and local currency cost), following ADB guidelines and standards. The consultants should use costing models incorporating ADB's requirements for physical and price contingencies and interest during construction.</p> <p>15(i) - Work with other technical specialists on the project team to review and evaluate the standards or targets for surface water quality and effluent discharge. Determine if existing standards or targets are economically and socially justified, and recommend changes as needed.</p> <p>15(v) - Use the forecasts of wastewater flows to estimate the scale of investment in treatment capacity that minimizes the expected present value of current and future capacity costs. The scale for the proposed project should balance the cost of both present and future capacity expansions, as needed. Estimate the cost of any proposed deviations from the least-cost expansion plan.</p>	3.6. Wastewater Treatment Facilities
5(iii) - Ditto	3.7. Effluent Reuse
5(iii) - Ditto	3.8. Sludge Treatment and Disposal
<p>15(ii) - Identify the least-cost option to meet both the existing and any recommended changes to standards or targets. Least-cost analysis should cover both policy and investment options.</p>	3.9. Alternatives Considered
<p>5(viii) - Prepared detailed financial plans and disbursement schedule, implementation schedule, and propose procurement packages in accordance with the <i>Guidelines for Procurement under ADB Loans</i>.</p> <p>5(ix) - Develop environmental monitoring systems for influents entering sewer collection systems and wastewater treatment plants to protect the biological processes from toxic wastes.</p>	3.10. Recommendations on Proposed Wastewater Subprojects
	Chapter 4
4 - Ditto	4.1. General

TOR Item	Chapter & Section
5(i) - Ditto	4.3. Municipal Wuhan Storm Water Master Plan
5(iv) Estimate urban runoffs and storm-water drainage facility capacities	4.4. Urban Runoffs and Storm Water Flow Predictions
5(v) - Ditto	4.5. Storm Water Drainage Facilities and Networks
5(vi) - Ditto	
5(vii) - Ditto	
15(ii) - Ditto	4.6. Alternatives Considered
5(viii) - Ditto	4.7. Recommendations on Proposed Storm Water Subprojects
	Chapter 5
6 - The consultants will review and update the environmental impact assessment and prepare a summary environmental impact assessment (EIA) with appropriate environmental monitoring and management plans, following ADB guidelines.	5.1. General
7(iv) - Help WMG consult the public at least twice: once at the early stage of EIA fieldwork, again when the draft EIA report is available, and before loan appraisal by ADB.	5.3. Current Approval Status of EIAs
7(i) - Review the domestic EIA for the proposed Project and the rapid environmental assessment during technical assistance (TA) preparation to ensure they conform to ADB's Environmental Policy, 2002 and Environmental Assessment Guidelines, 2003. The consultants will help WMG carry out further investigations and analysis, as required, and finalize the EIA, management plan, and monitoring plan by incorporating comments from ADB and the municipal Environmental Protection Bureau. The environmental management plan has to specify the participating parties and their responsibilities and budget.	5.4. Review of the EIAs and Further Information Collection and Assessment
7(ii) - Recommend mitigation measures and an environmental management program for each of the wastewater management and storm-water management components. The environmental issues to be considered will include on-site pretreatment of industrial effluents from larger factories, and identification processes that discharge effluent directly without pretreatment.	5.5. Specific Issues

TOR Item	Chapter & Section
<p>5(ix) - Ditto</p> <p>7(ii) - Ditto</p> <p>7(iii) - Determine costs of the proposed measures, help WMG incorporate mitigating measures into the project design, and prepare contractor specifications for environmental management and monitoring.</p>	<p>5.6. Environmental Management and Monitoring</p>
	<p>Chapter 6</p>
<p>8 - The consultants will review the initial poverty and social assessment conducted during TA preparation, and carry out a detailed poverty and social analysis, including a baseline socioeconomic profile of the population living in the project areas, and undertake social analysis and develop a broad-based participatory strategy.</p>	<p>6.1. General</p>
<p>9(i) - Prepare socioeconomic and poverty profiles for the project areas to be served by the improved wastewater and/or storm-water services. Collect data through statistical records, field surveys, participatory rapid appraisal, and interviews with key informants (e.g., local government officials, women's federations, business associations, community groups, etc.)</p> <p>9(ii) - Conduct poverty and social analysis in accordance with ADB's handbook on Poverty and Social Analysis of Projects and Handbook for Integrating Poverty Impact in Economic Analysis of Projects. Assess how the ensuing project will help improve people's living conditions and thus enhance public health, and support sustainable economic growth. Identify and prioritize needs for public investment in the project areas, evaluate the given project relative to other needs and determine how other needs are being addressed. Estimate the number of project beneficiaries by area, occupation, gender, and income level (poor, low, medium, and high); and the number of adversely affected people by type of impact. The data collected should be disaggregated by gender.</p>	<p>6.2. Socio-economic and Poverty Profile</p>
<p>9(v) - Collect and analyze health data, including incidence of morbidity and mortality rates due to waterborne diseases.</p>	<p>6.3. Public Health Impact Analysis</p>

TOR Item	Chapter & Section
<p>9(ii) - Ditto</p> <p>9(iv) - Review existing arrangements and procedures for involving beneficiaries in project design and implementation, hold workshops with beneficiaries and other key stakeholders, develop a tailored information and health education campaign with provisions for monitoring benefits, prepare programs to promote public awareness and participation, and document past and expected future public consultation programs.</p> <p>15(i) - Ditto</p> <p>15(vi) - Assess whether or not any ethnic minority will be affected by the ensuing project. If any, prepare an ethnic minorities development plan as set out in ADB's Indigenous People's Policy 1998.</p>	<p>6.4. Perception of Wastewater and Storm Water Services</p>
<p>9(iii) - Assess the social impact of the ensuing project including willingness to pay the projected tariffs, income levels and distribution, socioeconomic benefits, and possible negative impacts differentiated by income level and gender.</p> <p>15(iii) Work with the financial analyst and Social Analyst to review tariffs for water and sewerage in accordance with ADB's position on tariffs, as described in ERD Technical Note#9, and elaborated in other related Technical Notes. The review should cover, among other things, the extent and justification of any subsidies, helping the poor satisfy their basic needs, and using charges to encourage efficient use of resources. Recommend changes to existing tariffs, as need.</p>	<p>6.5. Social Impact Assessment of the Project</p>
<p>9(iii) - Ditto</p> <p>15(iii) - Ditto</p>	<p>6.6. Willingness to Pay for Improvements</p>
<p>9(vii) - For project monitoring, develop a set of verifiable monitoring performance indicators, including operations, financial environmental, socioeconomic, and poverty reduction parameters. Specify baseline targets for the socioeconomic and poverty indicators disaggregated by gender, and sustainable mechanisms for monitoring during and beyond the construction stage. Assess the development impact of the ensuing project, focusing on benefits and beneficiaries. Draw up a project performance monitoring system, following the ADB's project performance monitoring system guidelines.</p>	<p>6.7. Project Risks and Mitigations</p>
	<p>Chapter 7</p>
<p>10(i) - Review the resettlement plan for the proposed Project and assist WMG to revise the resettlement plan, as required, to comply with ADB's Handbook on Resettlement. Conduct resettlement household survey to ensure adequate understanding of socioeconomic impacts of the project. The resettlement plan must include a village-level impact assessment of project-affected people, land, assets, and occupations.</p>	<p>7.2. Review of Domestic RPs</p>

TOR Item	Chapter & Section
<p>10(ii) - Define categories of impact and eligibility of affected people, for compensation and prepare a matrix of entitlements covering compensation and other assistance for all types of impacts to achieve full replacement for lost assets, income, and livelihoods.</p> <p>10(iii) - Identify gender impacts, and prepare relevant mitigation and/or rehabilitation measures for vulnerable groups, including woman-headed households.</p>	7.3. Resettlement Impacts
<p>10(v) - Justify that compensation standards are based on replacement value, and assist WMG to prepare detailed resettlement budget based on the proposed entitlements matrix and rehabilitation plans.</p> <p>10(vi) - Review the organization structure and capacity for resettlement implementation and recommended improvements and actions required before resettlement plan is implemented. Help WMG prepare a detailed resettlement implementation schedule and a plan for internal and external monitoring and evaluation. Data collected for internal and external monitoring and evaluation should be disaggregated by gender.</p>	7.4. Resettlement Organizational Arrangement
<p>10(iv) - Assist WMG and relevant district government officials initiate and expand consultation with affected communities, local leaders, proponents, and other stakeholders. Prepare a consultation plan for WMG and a format for documenting consultation with affected people. Assist WMG prepare a resettlement information booklet and conduct public disclosure information including distribution of the booklet to all affected villages and households prior to an ADB loan fact-finding mission.</p>	7.5. Public Participation and Consultation
10(iv) - Ditto	7.6. Disclosure of Resettlement Information Booklet and RPs
10(vi) - Ditto	7.7. Resettlement Monitoring and Evaluation
	Chapter 8
<p>11 - The consultants will extend the financial analysis presented in the domestic feasibility studies. The purpose is to assess the financial viability and fiscal sustainability of the ensuing project, and financial viability for the municipal wastewater company (MWC) and water bureau of WMG. The financial analysis will be undertaken in accordance with ADB's Guidelines for the Financial Governance and Management of Investment Projects Financed by ADB.</p>	8.1. General

TOR Item	Chapter & Section
<p>5(vii) - Ditto</p> <p>5(viii) - Ditto</p> <p>12(vi) - Prepare cost estimates (including physical and price contingencies and computation of interest and other charges during implementation) and confirm the financing plan to the activities allocated to the financial analyst/financial management specialist.</p>	<p>8.2. Project Cost Estimates (COSTAB) and Procurement Contract Package</p>
<p>12(ii) - Establish financial objectives and targets for each representative project and prepare financing plans and projections, including income statements, balance sheets, cash-flow statements, and other relevant financial statements in normal terms, for operations for the 10- year period after project completion.</p> <p>12(iii) - Examine the availability of local counterpart funds and assess the liquidity of the various governments for different levels of borrowing.</p> <p>12(v) - Propose possible commercial co-financing and private sector involvement in the financing plan.</p>	<p>8.3. Project and Subproject Financing Plans</p>
<p>12(ii) - Ditto</p> <p>12(iv) - Compute in real terms the financial internal rate of return and the average incremental cost in financial terms for each representative project.</p>	<p>8.4. Discounted Cash Flow Analysis and Financial Statement Projections</p>
<p>12(i) - Review current accounting and administrative capabilities, the internal control system, and internal and external auditing procedures, and develop an action plan to rectify gaps and weakness identified.</p> <p>14 - The consultants will review the investment program under the long- and medium-term sector development plans, and the justification of the investment program should be based on meeting broad social goals at least cost. Analysis of the goals should include a review of the process of establishing them, the role of public participation and input, and public support for the resulting goals. Given the goals, the analysis should then consider how to achieve them at least economic cost. The analysis will cover selection criteria for additional projects, relevant policies, and institutions. The analysis should aim to identify enhancements or improvements to policies and institutions to promote attainment of the goals. Policy analysis should also cover user charges but consider them as a general policy tool, not merely for raising revenue. The consultants will also review and evaluate sources of funds for the investment program, including revenue, use charges, commercial credit, concession credit, and foreign aid.</p>	<p>8.5. Financial Management Assessment</p>
<p>12(iv) - Ditto</p>	<p>8.6. Tariffs, Cost Recovery, and Affordability</p>

TOR Item	Chapter & Section
	Chapter 9
<p>13 - The economic analysis will include, but not be limited to, sector analysis of the basin-wide management plan, wastewater management master plan, and urban drainage master plan, which identifies and prioritizes future sector developments; standard least-cost analysis of the ensuing project; and distribution analysis, including poverty impact assessment. The economic analysis will be done in accordance with ADB's Guidelines on Economic Analysis of Project, Handbook for Integrating Risk Analysis in the Economic Analysis of Projects, and Economic Analysis in 2002: A retrospective, and Economic analysis Retrospective: 2003 Update, and other relevant ERD publications.</p>	9.1. General
<p>A - Review of Sector Development Plans</p> <p>13 - Ditto</p>	9.3. Sector Development Plans Review
<p>13 - Ditto</p> <p>15(ii) - Identify the least-cost option to meet both the existing and any recommended changes to standards or targets. Least-cost analysis should cover both policy and investment options.</p>	9.4. Least-Cost Analysis
<p>15(iii) - Work with the Financial analyst and Social Analyst to review tariffs for water and sewerage in accordance with ADB's position on tariffs, as described in ERD Technical Note#9, and elaborated in other related Technical Notes. The review should cover, among other things, the extent and justification of any subsidies, helping the poor satisfy their basis needs, and using charges to encourage efficient use of resources. Recommend changes to existing tariffs, as need.</p> <p>15(iv) - Forecast demand for water based on projected tariffs, and use those forecasts and other relevant information to forecast wastewater flows. If changes to existing tariffs are recommended, the forecasts should be based on both existing tariffs and the recommended changes.</p>	9.5. Review of Tariff

TOR Item	Chapter & Section
<p>14 - The consultants will review the investment program under the long- and medium-term sector development plans, and the justification of the investment program should be based on meeting broad social goals at least cost. Analysis of the goals should include a review of the process of establishing them, the role of public participation and input, and public support for the resulting goals. Given the goals, the analysis should then consider how to achieve them at least economic cost. The analysis will cover selection criteria for additional projects, relevant policies, and institutions. The analysis should aim to identify enhancements or improvements to policies and institutions to promote attainment of the goals. Policy analysis should also cover user charges but consider them as a general policy tool, not merely for raising revenue. The consultants will also review and evaluate sources of funds for the investment program, including revenue, use charges, commercial credit, concession credit, and foreign aid.</p> <p>15(v) - Use the forecasts of wastewater flows to estimate the scale of investment in treatment capacity that minimizes the expected present value of current and future capacity costs. The scale for the proposed project should balance the cost of both present and future capacity expansions, as needed. Estimate the cost of any proposed deviations from the least-cost expansion plan.</p> <p>15(vi) - Evaluate identified investments relative to other opportunities for public investments. The evaluation may be based on standard benefit-cost analysis, to the extent feasible, as described in ADB's Guidelines on Economic Analysis of Projects, Economic Analysis in 2002: A Retrospective, and Economic analysis Retrospective: 2003 Update, and other relevant ERD publications. The evaluation should also be based on an analysis of poverty in the project's areas; an identification of priorities for public investments and estimate of public support for the given project, based social surveys; and a general evaluation of how other priorities are being addressed.</p>	9.7. Investment Assessment
<p>16 - The consultants will review and assess the institutional capacity of the municipal government departments and/or agencies responsible for wastewater and/or storm-water design and management, including financial management and audit requirements, economic analysis, and monitoring and evaluation systems. The consultants will also review and assess the existing institutional capacity of the municipal wastewater company and the water bureau of WMG responsible for project implementation, and O&M of the project facilities upon completion of the ensuing project.</p>	<p>Chapter 10</p> <p>10.1. General</p>

TOR Item	Chapter & Section
<p>5(x) - Estimate consulting services inputs needed for project implementation, including institutional strengthening and development, engineering design, and construction supervision over the project implementation period.</p> <p>17(i) - Identify deficiencies and prepare recommendations to strengthen the departments' and/or agencies' institutional and technical capability, encompassing administrative, management, organizational, technical (monitoring and evaluation, economic analysis), and financial aspects; and develop outline terms of reference for a capacity-building and/or institutional-strengthening technical assistance, and internal and external training programs.</p> <p>17(ii) - Develop corporate management arrangements and finance procedures for the implementing agencies, particularly the preparation and implementation of improved organizational structure and human resources plan, full financial analysis of the municipal wastewater company and the water bureau of WMG to verify its financial status and ensure its financial health, budgeting and business plan development, management information system, and internal and external training programs.</p> <p>17(iii) - Design and prepare a technical assistance program, including studies and training of managers and staff responsible for service delivery, to strengthen their capacity to efficiently implement, operate, and maintain the facilities and techniques to be introduced under the ensuing project; and to ensure sustainability of project benefits.</p>	10.2. Institutional Capacity Building and Training
<p>12(v) - Propose possible commercial co-financing and private sector involvement in the financing plan.</p> <p>14 - Ditto</p> <p>15(ii) - Ditto</p> <p>17(iv) - Propose most appropriate institutional arrangements and related policy framework for private sector participation in wastewater and/or storm-water management.</p>	10.3. Policy Framework
	Chapter 11
B - Policy Dialogue Related Activities	11.1. General
B - Policy Dialogue Related Activities	11.2. Pollution Prevention and Control
B - Policy Dialogue Related Activities	11.3. Storm Water and Urban Drainage
B - Policy Dialogue Related Activities	11.4. Enterprise Reform and Corporate Governance
B - Policy Dialogue Related Activities	11.5. Private Sector Participation

TOR Item	Chapter & Section
B - Policy Dialogue Related Activities	11.6. Tariff Reforms and Cost Recovery
B - Policy Dialogue Related Activities	11.7. Others
	Chapter 12
<p>7(iii) - Ditto</p> <p>9(iv) - Ditto</p> <p>17(i) - Ditto</p> <p>19 - The consultants will help ADB prepare a draft report and recommendation to the President by preparing relevant sections, appendixes, and supplemental information. The consultants will also help ADB and WMG develop a project framework in accordance with ADB guidelines.</p>	12.2. Project Design and Monitoring Framework
<p>9(vii) - Ditto</p> <p>16 - The consultants will review and assess the institutional capacity of the municipal government departments and/or agencies responsible for wastewater and/or storm-water design and management, including financial management and audit requirements, economic analysis, and monitoring and evaluation systems. The consultants will also review and assess the existing institutional capacity of the municipal wastewater company and the water bureau of WMG responsible for project implementation, and O&M of the project facilities upon completion of the ensuing project.</p> <p>17(i) - Ditto</p>	12.3. Project Monitoring and Evaluation

Appendix A3 Reference

1. Feasibility Study Report (draft) on Wuhan wastewater and storm water management project financed by ADB, Wuhan Municipal Engineering Design & Research Institute Co., Ltd. & Wuhan Urban Planning and Design Institute, May 2005
2. Project Proposal on Wuhan wastewater and storm water management project financed by ADB, Wuhan Municipal Engineering Design & Research Institute Co., Ltd. & Wuhan Urban Planning and Design Institute, March 2005
3. Eleventh Five Year Plan for Wuhan Urban Construction (Solid Waste Treatment)
4. Circular on Strengthening Environmental Impact Assessment Management for Construction Projects Financed by International Financing Organizations (June 1993)
5. Environmental Impact Assessment Law of PRC (September 2003)
6. Environmental Protection Law of PRC (26 December, 1989)
7. Environmental Impact Assessment Technical Guidelines (18 September, 1993)
8. Air Pollution Prevention Act of PRC (29 August, 1995)
9. Water Pollution Prevention Act of PRC (15 May, 1996)
10. Solid Waste Pollution Prevention Act of PRC (30 October, 1995)
11. Environmental Noise Pollution Control Act of PRC (29 October, 1996)
12. Environmental Impact Assessment Law of PRC (1 September, 2003)
13. Environmental Quality Standards for Surface Water of the PRC (GB3838-2002)
14. Water Quality Standards for Fisheries (GB11607-89)
15. Integrated Wastewater Discharge Standard (GB8978-1996)
16. Environmental Quality Standards for Air of PRC (GB3095-1996)
17. Guidelines for Environmental Management for Construction Projects (1986)
18. Comprehensive Standards of Air Pollutants Emission of PRC (GB16297-1996)
19. The Standards of Odor Emission of PRC (GB14554-93)
20. The Control Standards of Pollutants in Sludge for Agricultural Use of PRC

(GB4284-84)

21. Environmental Policy of the Asian Development Bank (ADB, 2002)
22. Environmental Assessment Guidelines (ADB, 2003)
23. Water Pollutant Discharge Standard (GB 18918-2002)
24. Hubei Statistical Yearbooks 2001 to 2003, Hubei Provincial Statistics Bureau, China Statistics Press
25. Hubei Yearbook 2004, Hubei Provincial Government, Hubei Yearbook Edit Commission
26. Wuhan Yearbook 200 to 2004, Wuhan Almanac Press
27. Wuhan Statistical Yearbook 2002, 2004, China Statistical Press
28. Statistical Communique of Wuhan Municipality Statistical Bureau on 2000 to 2004 National Economic and Social Development, Wuhan Statistical Bureau
29. Statistical Communique of Hubei Province Statistical Bureau on 2001 to 2004 National Economic and Social Development, Hubei Statistical Bureau
30. China Statistical Yearbook 2003, National Bureau of Statistics of China
31. Wuhan Urban Area Wastewater Treatment and Water Reuse Facilities Construction Plan by Wuhan Municipality Flood Control Reconnaissance and Design Institute and Fanhua Construction Ltd, Apr 2005
32. Wuhan Suburban Area Wastewater Treatment and Water Reuse Facilities Construction Plan, Wuhan Municipality Flood Control Reconnaissance and Design Institute and Fanhua Construction Ltd, Apr 2005
33. Wuhan Municipality Water Environment Renovation and Protection Plan by Wuhan Water Bureau, Mar 2005
34. Wuhan Storm Water Drainage Handbook 2004, by Wuhan Water Bureau
35. Wuhan 10th Five-Year Plans for Urban Infrastructure Construction (Chinese) ,Wuhan Municipal Engineering Design Institute, June 2001
36. Wuhan Basic Facts 2005, Wuhan Statistic Bureau & Wuhan DRC, 2005
37. Public health data from Wuhan center for disease control and prevention
38. Resettlement plan (draft) on Wuhan wastewater and storm water management project financed by ADB, Wuhan urban construction utilization of foreign investment project management office & Wuhan wastewater and storm water management project resettlement office, May 2005

39. ADB Resettlement Handbook , A Good Practice , 1995
40. ADB Involuntary Resettlement, August 1995
41. Land Administrative Law of PRC (effective Jan. 1st, 1999)
42. Implementing Regulations of Land Administrative Law of PRC (effective Jan. 1st, 1999)
43. The Regulations on Administration of Urban House Demolition and Relocation (effective Sep 1st, 2001)
44. Decision on deepening reform in land administration of state council, (issued by state council [2004] No.28)
45. The guidelines on perfecting land acquisition and relocation regulations, (issued by Ministry of land resource [2004] No.238)
46. Implementing regulation of land Administrative law of Hubei province (2nd revision) (effective Sep. 27th, 1999)
47. Method of collective land acquisition and compensation for housing demolition on collective land of Wuhan municipality, (Wuhan Government No.148, effective Feb. 1st, 2004)
48. Management & Implementation Method of Urban Housing Demolition of Wuhan municipality, (Wuhan Government No.130, effective Mar. 1st, 2002)
49. Audited financial statements for last 3 year of WDC
50. Management accounts of WDC (6 months of 2005)
51. Official documents on water and wastewater tariffs
52. Wuhan, the Past 50 Years, Wuhan Statistical Bureau Press

Other data obtained from Wuhan Water Bureau, IAs, related public hearing meetings, household surveys, regular report by CIECC are also used as reference for the preparation of the Interim Report.

Appendix A4 List of PPTA Participants

Name	Position	Organization
WPMO		
Hu Changhua	Director of WPMO	WPMO
Li Fuxing	Deputy Director of WPMO	WPMO
Wang Li	Deputy Chief of Comprehensive Management Section, WPMO	WPMO
Wang Xiaoyun	Chief of Wastewater and Storm Water Management Section, WPMO	WPMO
Wan Yongsheng	Engineer of Wastewater and Storm Water Management Section, WPMO	WPMO
Huang Nian	Secretary of Wastewater and Storm Water Management Section, WPMO	WPMO
Zhang Li	Project Secretary	WPMO
PPTA CONSULTANTS		
INTERNATIONAL		
James Currier	Project Director/Environment Specialist	B&V
Michael Lee	Team Leader/Storm Water Management Specialist	B&V
Peter Jacques	Institutional Specialist	B&V
Malcolm Summerfield	Economic Specialist	B&V
Mike Fortin	Social Development Specialist	B&V
Chen Shaojun	Resettlement Specialist	B&V
Xu Yi	Financial Management Specialist	B&V
DOMESTIC		
Yan Erjian	Wastewater/Storm Water Management Specialist/Deputy Team Leader	WJIC
Hou Chunyan	Environmental Specialist	B&V
Jiao Yang	Costing Engineer	B&V
Luo Zhen	Mechanical, Electrical and Instrumentation Engineer	WJIC
Wang Xin	Financial/Economic Analyst	B&V
Wang Yanhua	Institutional Development Specialist	B&V
Yin Jianjun	Resettlement Specialist	B&V
Yu Qingguo	Social Analyst	WJIC
Zou Huijun	Sewer Network Engineer	WJIC
OTHERS		
Wei Lijun	Project Officer ,IFI3, International Department	FM,PRC
Cheng Dening	Associate Professor, Resettlement Research Center	Wuhan University
Chen Peichong	Chief Engineer, Junbang Environment Technology Co.,Ltd	

Hubei Provincial Government	
Hu Weicheng	Hubei Provincial Development and Reform Commission
Lu Caiyu	Deputy Director of Foreign Funds Utilization Department, Hubei Province Development and Reform Committee
HuangMao	Director of Project Management Department, Hubei Province Environment Protection Bureau
Yu Jun	Officer of Foreign Investment Department, Hubei Province Finance Bureau
Cheng Jieru	Division Chief , Wuhan Municipal Government Administrative Office
Wuhan Municipal Government	
Wang Qingping	Deputy Director of Foreign Investment Department ,Wuhan Municipal Finance Bureau
Yu Sha	Officer of of Foreign Investment Department ,Wuhan Municipal Finance Bureau
Li Zhan	Deputy Director of Environment Monitoring Department, Wuhan Environment Protection Bureau
Ming Shan	Officer of Important Project Department ,Wuhan Municipal Construction Commission
Zhang Liyao	Deputy Director of Municipal Administration Planning Department, Wuhan Municipal Planning Bureau
Cai Hui	Deputy Director of Important Project Department ,Wuhan Municipal Construction Commission
Cheng Chunsheng	Director of Foreign Affairs Division, Wuhan Development and Planning Committee
Liu Jisheng	Director of Investment and Development Department, Wuhan Urban Investment & Development Company
Chen Yueqing	Deputy Chief Engineer, Wuhan Urban Investment & Development Company
District Government	
Zhou Jin	Deputy Director of Dongxihu District Water Authority
Zhang Yufeng	General Manager of Dongxihu District Urban Investment & Development Company
Huang Ranfei	Deputy Director of Caidian District Water Authority

Appendix A5 Responses to Comments on Interim Report - Resettlement

COMMENT	RESPONSE
POVERTY REDUCTION AND SOCIAL ASSESSMENT	
1. The presentation on the household survey is quite detailed and comprehensive in providing demographic profile and socioeconomic background of the surveyed household. However, the report has not provide adequate information on the poverty profile of general beneficiaries in the project area, particularly on the background of lowest income people.	Additional information provided.
2. The report also required to provide methodological background of the assessment, particularly on the type of poverty analysis has been done. See the format of Summary Poverty Reduction and Social Strategy (SPRSS).	Revisions made to Section 6.1
3. Para. 6.1.1, please provide more detailed objective of conducting poverty and social assessment. You could refer to ADB's Handbook on Poverty and Social Analysis. 2001.	Revisions made to Section 6.1
4. Table 6.2 provides comprehensive monthly income and expenditures from secondary and surveyed data. Could you provide more detailed analysis on the expenditures for utilities (water, electricity, and fuels). Do you have quantiles data for income and expenditures and what percentage of income and expenditure/capita or per household for utilities. Is it possible to provide an analysis on the expenditure for water and sanitation based on the different income categories? Could you also provide more analysis on the lowest income category in terms of expenditure on utilities, particularly water and sanitation.	Information and discussion of on water and wastewater expenditures by income class was added. The analysis uncovered a potential deficiency in government poverty alleviation programs.
5. The report clearly identified some typical low income households (section 6.2.10) that required some assistance in case of tariff increase. Could you provide more detailed information on the existing government (central and local) social assistance program beside the MLSS for these people. This information is quite useful to provide justification that present social safety net is in place for those vulnerable groups. It would be also useful to get information on government poverty alleviation programs.	Additional information provided.

<p>6. Section 6.2.16 an 19 - The report mentioned that ethnic minority households comprised 0.4% of sample surveyed. Could you provide information on the ethnic composition in project area, socio-demographic and economic characteristics of these ethnic minority. This information is important to address the social safeguard issues (see SPRSS form).</p>	<p>Available data sources were checked for information (almanacs, statistical yearbooks). Data on the proportion of ethnic minorities confirmed that these represent <1.0% of the population. No other information were available.</p>
<p>7. Section 6.2.20 - The report stated that the nonresident or floating population in project service areas comprises 13% of the total population., making the largest vulnerable group in Wuhan. They are not registered and have informal living arrangements. However, the executive summary showed that the government of Wuhan has been leader in poverty alleviation program including the Temporary Resident Certificate allowing temporary workers or floating population to stay in Wuhan and the granting of legal status to private schools for the children of nonresident households. It seems these two statements are in contradiction. If the floating population get temporary residency, are they counted as project beneficiary? Please clarify.</p>	<p>Text was edited to reflect information on new programs.</p>
<p>8. Section 6.2.21, Public Health - Are they any government awareness program on public health as well as monitoring system for water-related diseases. I would suggest that during fact-finding mission we meet local health bureau to find out about their programs.</p>	<p>New information provided in the report.</p>
<p>9. The report stated that the data in Table 6-9 imply an annual health care cost of CNY 0.6 million and 35,500 days of lost work time each year in association with the water related diseases. Could you provide an analysis of health impact due to the project during project life time starting from 2010 with an assumption of NPV 12%? Moreover, could you convert the days lost working time in monetary terms and saving due to reduction of health cost and lost of work time? In addition, could you also provide an analysis on the qualitative health impact due the project?</p>	<p>Analysis completed and documented.</p>

<p>10. Section 6.4.2, project benefit - The report stated there will be direct creation of 5,000 full time jobs over the 5 year period of construction and 220 permanent jobs in the project facilities. How many unskilled job that will go for poor people and women. To develop pro-poor project, could we ask the implementing agency what percentage of the job will go to women and the poor. Could you also provide information what type of jobs for unskilled labor. Please also convert the calculation of job being created in person-years.</p>	<p>Analysis of skilled vs unskilled was completed and documented.</p>
<p>11. On the indirect creation throughout the regional economy of 8,100 person years of work over the 5 year period of construction and 130 permanent job once operation begin, could you also provide an analysis on the number of job that go to the poor and women as well as type of jobs.</p>	<p>The requested information can not be generated within the scope and resources of the PPTA study. A general discussion has been provided.</p>
<p>12. The report stated that one of the benefit is "poverty cycle intervention such as reduction in school days lost due to waterborne and water washed disease." Please clarify this statement.</p>	<p>Poverty interventions have been elaborated.</p>
<p>13. On this section, I would request the consultant to provide narrative of how the project contribute to poverty reduction. This section would be part of a section for the SPRSS. This contribution could come from the following (i) contribution of the project for achieving millennium development goal, MDG 7 target 10 (please see detailed in the website), (ii) health impact, and (iii) employment opportunities, particularly for the poor.</p>	<p>Text provided</p>
<p>14. The report also stated that the project would reduce women's burden of work by reducing time spent cleaning after flooding. One of the social assessment objective is how to maximize project's impact on women. Please elaborate this section further and there are so many literature and research have been done on impact of water project on women as well as how to maximize the impact. Please check ADB website on Gender Checklist as well as world bank website on some of the studies on this topic.</p>	<p>Text provided</p>

15. Section 6.4.10 - The report stated that "participatory methods such as consumers committees could be used by the IAs to address such concerns, alter erroneous perceptions, improve customer relations and get feedback on the quality of services". This suggestion is very commendable. Did you discuss this proposal with EA and IAs? If yes, please provide working arrangements.	Discussions were held during fact finding and the recommendation was modified as a result.
16. Section 6.7.4 provides recommendation on consumer participation and health awareness program as part of participatory strategy during and after project implementation. Did this proposal have been discussed with EA and IAs?	Discussions were held during fact finding and the recommendation was modified as a result
17. Finally, please prepare a summary of SPRSS using the ADB's template (attached). This summary should not be more than 3 pages.	Done
ECONOMIC ANALYSIS	
The major shortcoming in the economic analysis is the least-cost analysis and analysis of alternatives. The say that the economic analysis should consider "how to achieve [the goals] at least economic cost", and how to set the size of the investments to "minimize the expected present value of present and future capacity costs". ...	A separate technical note was prepared dealing with this issue. Further discussions identified opportunities to pursue this topic through an upcoming TA on urbanization.
What are expected future usage charges for water, and how will they affect water use and hence wastewater discharge? The report discusses future wastewater charges, but I couldn't find any discussion of water charges. Water charges are probably much more important. I suppose water charges will not change significantly, though, so probably this is not a big problem for the projected wastewater discharges. The discussion of water charges also needs to cover metering, especially Wuhan's plans for installing meters at the consumer level in large apartment blocks.	Text added comparing water tariffs to those of other large cities and commenting on their expected stability.

<p>What is the expected maximum wastewater treatment capacity in the service territories of each plant? The projections of wastewater discharge extend only to 2020, which is the design capacity of most of the plants. The service territory for the Huangpu plant is apparently fully developed, and so Huangpu reaches its maximum wastewater discharge in 2010. The maximum treatment capacity needed for Huangpu is clear, but what is the maximum needed capacity for the other service territories? A perfectly good answer could be that the maximum discharge is unknown and much larger than discharge in 2020, but the answer should be given one way or the other.</p>	<p>Total capacity development to 2020 provided by district added in Table 9.5. Forecasts beyond 2020 are not available.</p>
<p>What is the long-run marginal cost of wastewater management? The report cites the "Average Incremental Economic Cost", which is (more or less) only the average cost of the next plant. The long-run marginal cost should be derived from the least-cost expansion plan (another need for least-cost analysis). Of course the least-cost expansion plan is unknown, but an estimate of long-run marginal cost could at least be based on the given expansion plan (optimal or not).</p>	<p>AIC is widely recognized as a reasonable estimate of long run marginal cost in applied studies provided it is based on a least cost capacity expansion plan.¹ Information required for an alternative estimation is not available.</p>
<p>Are the surface water quality standards reasonable or justified? Can we accept a project based on those standards? The consultants describe the standards in various places, following their TOR, but do not state a firm conclusion on whether the standards are justified. Evaluating standards is especially relevant to the benefit cost analysis, which is at least partly based on the standards -- the industrial cost-savings in particular. The industrial cost savings are not relevant benefits if the standards are not justified.</p>	<p>Additional text added in Section 9.7.</p>

¹ S. Fane, S. White, 2003. Levelized costs, a general formula for calculation of unit cost in integrated resources planning. Institute for Sustainable Futures, University of Technology Sydney. <http://www.isf.uts.edu.au/publications>. Jeremy J. Warford, 2003. Marginal Opportunity Cost Pricing for Municipal Water Supply. IDRC Economy and Environment Program for Southeast Asia. <http://203.116.43.77/publications/specialp2>

What are the cost of funds from the other potential funding sources? The economic analysis merely describes the sources of funds, but the analysis can't draw any conclusions about the fiscal impact or relevance of ADB's funds without knowing how ADB's interest rate (and other terms) compares with the cost of funds from the other sources.	Assumed cost of funds provided in Ch 8 (para 8.3.28)
What is the Project's net impact on the poor? The economic analysis says the poor will benefit from better wastewater management, but the poor will also pay wastewater charges. Do the poor get a net benefit? How does the net benefit to the poor compare to net benefits of others?	Required information provided in Ch 6. Cross references provided in Ch 9.
What are the main assumptions or parameters behind the benefit-cost analysis? The analysis should state the conversion factors used, how tradables were separated from non-tradables, etc.	New section added
What are switching values for the main assumptions or parameters? The report presents only a superficial sensitivity analysis, with +/- 10% changes, and without any real interpretation of even those simple changes. The weak sensitivity analysis is especially inexcusable since the DFR cites as a reference ERD's Retro 2002 report, which specifically condemned the kind of sensitivity analysis presented in the DFR.	Switching values calculated for the overall project. (para 9.7.35)

Appendix B - Subproject Summary

Item	Location	Subproject Name	Components	Length & Capacity	Land Acquisition
Wastewater	Urban Area	Wuchang Erlangmiao WWTP Expansion & Upgrade	WWTP expansion (Phase II) & upgrade from treatment to secondary treatment	by 60,000 m ³ /d (expanding to 240,000 m ³ /d)	Already been reserved
		Hanyang Nantaizi Lake WWTP Expansion & Collection System	1. 3 new pumping stations 2. Sewers (D800 - 1800) 3. WWTP (Phase II) expansion	0.31 m ³ /s; 0.53 m ³ /s; 2.1 m ³ /s 7.435 km by 100,000 m ³ /d (expanding to 200,000 m ³ /d)	139.4 mu for WWTP, 1 mu for three pumping stations and (188) mu for pipelines
		Hankou Huangpu Road WWTP Upgrade	WWTP (Phase II) upgrade from pretreatment to secondary treatment	100,000 m ³ /d (upgrade)	Already been reserved
	Suburban Area	Donxihu Collection System	1. Sewerage box culvert along Jichang Creek	BH 3.2×1.8m: 1.1 km BH 4.0×2.0m: 3.5 km	24.3 mu for pumping stations (119.8) mu for collection system
			2. Jinshan Street trunk sewer + Box culvert + Lift pumping station + 2 Control gates	D800: 1 km; D1800: 2.21km; D2000: 2.29 km; DN1200: 3.46 km; BH 2.0×1.8m: 3.58 km; BH 2.0×2.0m: 1.62 km No.1PS: 1.5 m ³ /s; No.2PS: 1.8 m ³ /s; No.3PS: 2.0m ³ /s	
			3. Wujiashan District collection system	D600: 0.75 km; D1000: 1.63 km; D1200: 1.01 km; No.4PS: 0.3 m ³ /s,	
			4. Jinyinhu South District collection system	D1350: 3.2 km; No.5 PS: 0.5m ³ /s	
		Caidian WWTP & Collection System	1. One new WWTP	50,000 m ³ /d	81.05 + (30) mu for WWTP, 2.55 mu for pumping stations
			2. Sewers (D1200 - 1800) 3. Daqiao pumping station	main trunk sewers: 4.59 km 1.00 m ³ /s	
Storm Water	Urban Area	Luojiagang Open Channel Rehabilitation & Luoja Road Pumping Station Expansion	1. pumping station expansion	by 55 m ³ /s	19.4 mu for pumping stations, 188.7 + (24) mu for collection system
			2. Rehabilitation of open channel	Open channel: 8.81 km (3.54+4.27+1.0 km)	
		Hanyang Yangsigang Pumping Station & Storm Water Pipework	1. One new pumping station	20m ³ /s	34.8 + (18.9) mu for pumping stations
			2. Reinforced concrete pipeline	D1200: 0.36km; D1500: 0.3km; D1800: 0.68km	
		Donxihu Three Gates Connection	1. Box culvert	BH=2.8×1.8m: 0.6km; BH=3.4×1.8m: 0.24km; BH=3.6×2.0m: 0.4km; BH=5.5×2.4m: 0.66km	422.6 + (10) mu for collection system
				3-BH=7.0×2.7: 2.38km from Xindun to Jinkou 3-BH=7.0×2.7: 1.1km from Jinkou to Huangjiadawan	
				2-BH=7.0×2.7: 0.235km outlet reach of Jinkou 3-BH=7.0×2.7: 0.03km outlet reach of Huangjiadawan	
	Suburban Area	Changqing Pumping Station Expansion	pumping station expansion	by 135 m ³ /s	18.9 mu for pumping stations

Notes

- All data are obtained from the FSR and the length of the pipelines is obtained from cost estimation table in the FSR.
- For storm water drainage system, "Service Area" means the catchment area.
- The serviced population are the beneficiaries in 2015 for each WWTP subproject except for Erlangmiao WWTP and Huangpu Road WWTP Subprojects. The projected wastewater volume of Erlangmiao Subproject in 2015 is close to that in 2020, hence the capacity is chosen based on the figure in 2020. The beneficiaries of Huangpu Road Subproject are expected to keep decreasing within the planning horizon, and the number of the serviced population is that in 2010 by which the collected wastewater is expected to reach the peak volume. Exact planning horizon for each subproject is shown in Chapter 3.
- In "Land Acquisition" column, the figure in the bracket indicates temporary land acquisition.

Location	Service Area	Beneficiaries (×1,000)	Receiving Water & Water Quality Standard	Process	Estimated Capital Cost (million RMB)	Notes
Completed in 1999	32.2 km ²	723,800 in 2020	Yangtze River (Class III)	A ² O; Modified Carrousel Oxidation Ditch	16,543	Phase I was funded by the World Bank.
1.5+1.9+3.2 stations, lines	67 km ²	610,900	Yangtze River and Nanataizi Lake (Class III)	Anaerobic Tank + Carrousel Oxidation Tank; A ² O	13,470	Phase I was funded by Poland Government.
Completed in 1998	7.48 km ²	311,900 in 2010	Yangtze River (Class III)	High-density Sedimentation Tank + BAF; SBR	10,857	Phase I was funded by Finland Government.
stations and on network	55.2 km ²	210,000	Fu River (Class V)	Not applicable	13,720	To serve Hanxi WWTP to be in operation in 2006
WWTP and station	23.8 km ²	165,000	Han River (Class III)	Anaerobic Tank + Carrousel-2000 Oxidation Ditch; A ² O	7,034	-
station and channels	22.57 km ² / 132 km ²	Not applicable	Yangtze River (Class III)	Not applicable	20,974	Luojialu storm water drainage system: 22.57 km ² ; Donghu storm water drainage system: 132 km ²
mu	3.67 km ²	Not applicable	Yangtze River (Class III)	Not applicable	5,478	-
mu	54.5 km ²	Not applicable	Fu River (Class V)	Not applicable	23,022	-
	500.2 km ²	Not applicable	Fu River (Class V)	Not applicable	13,906	-

Appendix C1 - Wastewater Volume Projection

Domestic Projection

Erlangmiao Subproject

Item	Unit	2003	2010	2015	2020*
Permanent residents	persons	463,600	516,600	554,900	593,300
Population growth rate (5 year duration)	%	-	12.4	12.4	12.3
Floating population at 22%	persons	69,500	113,700	122,100	130,500
Serviced population	persons	533,100	630,300	677,000	723,800
Per capita water supply	L/pc-d	316	340	340	340
Return flow factors		0.9	0.9	0.9	0.9
Non-industrial wastewater	m³/d	151,900	189,100	203,100	217,100
Industrial water consumption index	m³/ha-d	106.2	-	-	90
Industrial land area	ha	-	-	-	149.7
Return flow factors		0.78	0.78	0.78	0.78
Industrial wastewater	m³/d	26,500	19,500	15,000	13,500
Sub-total	m³/d	178,400	208,600	218,100	230,600
Infiltration/inflow at 15%	m³/d	26,800	31,300	32,700	34,600
Sub-total	m³/d	205,200	239,900	250,800	265,200
Collection rate	%	38	73	84	90
Total wastewater collected	m³/d	-	175,200	210,700	238,700
Design capacity	m³/d		240,000		

Nantaizi Lake Subproject

Item	Unit	2003	2010	2015*	2020
Permanent residents	persons	327,200	434,100	531,200	650,000
Population growth rate (5 year duration)	%	-	4.1	4.1	4.1
Floating population at 15%	persons	49,100	65,100	79,700	97,500
Serviced population	persons	376,300	499,200	610,900	747,500
Per capita water supply	L/pc-d	203	260	290	300
Return flow factors		0.9	0.9	0.9	0.9
Non-industrial wastewater	m³/d	72,200	116,800	158,800	201,800
Industrial water consumption index	m³/ha-d	282	-	-	160
Industrial land area	ha	-	-	-	278
Return flow factors		0.8	0.8	0.8	0.8
Industrial wastewater	m³/d	26,400	29,800	32,600	35,600
Sub-total	m³/d	98,600	146,600	191,400	237,400
Infiltration/inflow at 15%	m³/d	16,100	22,800	28,700	35,600
Sub-total	m³/d	123,700	175,000	220,100	273,000
Collection rate	%	60.0	75.2	86.5	90.5
Total wastewater collected	m³/d	-	131,600	190,400	247,100
Design capacity	m³/d		200,000		

Huangpu Road Subproject

Item	Unit	2003	2010*	2015	2020
Permanent residents (growth rate at -0.76% ¹)	persons	303,600	287,800	277,100	266,700
Permanent residents ²	persons	-	-	-	157,400
Permanent residents (Average 1 and 2)	persons	303,600	266,100	239,100	212,050
Floating population ratio	%	15.0	18.0	20.0	22.0
Floating population	persons	45,500	47,600	47,700	46,650
Serviced population	persons	349,100	311,900	285,300	258,700

PPTA Projection

Erlangmiao Subproject

Item	Unit	2003	2010	2015	2020*
Permanent residents	persons	463,600	517,013	558,893	613,651
Population growth rate	%	-	1.57	1.57	1.57
Floating population at 20% (15% in 2003)	persons	69,500	103,403	111,779	122,730
Serviced population	persons	533,100	620,416	670,672	736,381
Per capita water supply	L/pc-d	316	339	339	330
Return flow factors		0.85	0.85	0.85	0.85
Non-industrial wastewater	m³/d	143,191	178,665	193,137	206,811
Industrial water consumption index	m³/ha-d	-	-	-	120
Industrial land area	ha	-	-	-	149.7
Return flow factors		0.8	0.8	0.8	0.8
Industrial wastewater	m³/d	34,000	25,917	20,143	14,369
Sub-total	m³/d	177,191	204,581	213,280	221,180
Infiltration/inflow at 15%	m³/d	26,579	30,687	31,992	33,177
Sub-total	m³/d	203,769	235,269	245,272	254,357
Collection rate	%	38	73	86	94
Total wastewater collected	m³/d	-	171,746	210,934	239,096
Design capacity	m³/d		240,000		

Nantaizi Lake Subproject

Item	Unit	2003	2010	2015*	2020
Permanent residents	persons	327,200	434,100	531,200	650,000
Population growth rate (5 year duration)	%	-	4.1	4.1	4.1
Floating population at 20%	persons	65,440	86,820	106,240	130,000
Serviced population	persons	392,640	520,920	637,440	780,000
Per capita water supply	L/pc-d	203	260	290	300
Return flow factors		0.85	0.85	0.85	0.85
Non-industrial wastewater	m³/d	67,750	115,123	157,129	198,900
Industrial water consumption index	m³/ha-d	282	-	-	160
Industrial land area	ha	-	-	-	278
Return flow factors		0.8	0.8	0.8	0.8
Industrial wastewater	m³/d	26,400	29,800	32,600	35,600
Sub-total	m³/d	94,150	144,923	189,729	234,500
Infiltration/inflow at 15%	m³/d	14,123	21,738	28,459	35,175
Sub-total	m³/d	108,273	166,662	218,188	269,675
Collection rate	%	60.0	75.2	86.5	90.5
Total wastewater collected	m³/d	-	125,330	188,733	244,056
Design capacity	m³/d		200,000		

Huangpu Road Subproject

Item	Unit	2003	2010*	2015	2020
Permanent residents (growth rate at -0.76% ¹)	persons	303,600	287,800	277,100	266,700
Permanent residents ²	persons	-	-	-	157,400
Permanent residents (Average 1 and 2)	persons	303,600	265,903	238,976	212,050
Floating population ratio	(%)	15.0	17.1	18.5	20.0
Floating population	persons	45,500	45,339	44,272	42,410
Serviced population	persons	349,100	311,242	283,248	254,460

Return flow factors		0.9	0.9	0.9	0.9
Non-industrial wastewater	m³/d	104,000	87,000	77,000	69,800
Industrial wastewater	m³/d	4,500	2,600	1,300	0.0
Sub-total	m³/d	108,500	89,600	78,300	69,800
Infiltration/inflow at 15%	m³/d	16,300	13,400	11,800	10,500
Sub-total	m³/d	125,000	103,000	90,000	80,000
Collection rate	%	68	83	92	94
Total wastewater collected	m³/d	-	86,000	83,000	76,000
Design capacity	m³/d		100,000		

Caidian Subproject

Item	Unit	2003	2010	2015*	2020
Population	persons	<100,000	128,000	165,000	226,000
Population growth rate	%	-	5.5	4	4
Per capita water supply	L/pc·d	185	200	225	250
Return flow factors		0.9	0.9	0.9	0.9
Non-industrial wastewater	m³/d	12,700	23,000	33,000	50,900
Industrial water consumption index	m³/ha·d	-	90 ^a	-	90 ^a
		-	120 ^b	-	120 ^b
Industrial land area	ha	-	172.15 ^a	-	272.46 ^a
		-	52.21 ^b	-	152.39 ^b
Return flow factors		-	0.8	-	0.8
Industrial wastewater	m³/d	6,700	17,300	25,800	34,200
Sub-total	m³/d	19,400	40,300	58,800	85,100
Infiltration/inflow at 15%	m³/d	2,900	6,100	8,800	12,800
Collection rate	%	34	64	72	84
Total wastewater collected	m³/d	7600	29700	48700	82200
Design capacity	m³/d	-	50,000	-	100,000

Dongxihu Subproject

Item	Unit	2005	2010	2015*	2020
Population	persons	104,000	138,000	183,000	244,000
Population growth rate	%	-	5.88	5.88	5.88
Floating population at 15%	persons	16,000	21,000	27,000	37,000
Serviced population	persons	120,000	159,000	210,000	281,000
Per capita water supply	L/pc·d	306	304	302	300
Return flow factors		0.9	0.9	0.9	0.9
Non-industrial wastewater	m³/d	33,000	43,600	57,100	75,900
Industrial wastewater consumption index	m³/ha·d	190	180	170	160
Industrial land area	ha	305	468	719	1,103
Return flow factors		0.8	0.8	0.8	0.8
Industrial wastewater	m³/d	46,400	67,400	97,800	141,200
Sub-total	m³/d	79,400	111,000	154,900	217,100
Infiltration/inflow at 15%	m³/d	11900	16600	23200	32600
Wastewater volume	m³/d	91,300	127,600	178,100	249,700
Collection rate	%	56.3	61.5	75.9	95
Total wastewater collected	m³/d	51,400	78,500	135,200	237,200
Design collection capacity	m³/d	-	-	135,200	237,200

Notes

1. *** indicates the planning horizon of each subproject. The civil works is to meet the needs in 2020 for all the subprojects;
2. "a" indicates the water consumption index for the "first class industry" and "b" indicates the water consumption index for the "second class industry".

Return flow factors		0.85	0.85	0.85	0.85
Non-industrial wastewater	m³/d	98,219	84,191	74,423	64,887
Industrial wastewater	m³/d	4,500	2,600	1,300	0
Sub-total	m³/d	102,719	86,791	75,723	64,887
Infiltration/inflow at 15%	m³/d	15,408	13,019	11,359	9,733
Sub-total	m³/d	118,127	99,810	87,082	74,620
Collection rate	%	68	85	93	95
Total wastewater collected	m³/d	-	84,838	80,986	70,889
Design capacity	m³/d		100,000		

Caidian Subproject

Item	Unit	2003	2010	2015*	2020
Population	persons	99,600	149,035	181,324	220,609
Population growth rate	%	-	5.5	4.0	4.0
Per capita water supply	L/pc·d	176	213	235	260
Return flow factors		0.85	0.85	0.85	0.85
Non-industrial wastewater	m³/d	14,900	26,983	36,220	48,755
Industrial water consumption index	m³/ha·d	-	90 ^a	-	90 ^a
		-	120 ^b	-	120 ^b
Industrial land area	ha	-	172.15 ^a	-	272.46 ^a
		-	52.21 ^b	-	152.39 ^b
Return flow factors		-	0.8	-	0.8
Industrial wastewater	m³/d	6,700	17,300	25,800	34,200
Sub-total	m³/d	21,600	44,283	62,020	82,955
Infiltration/inflow at 15%	m³/d	3,240	6,642	9,303	12,443
Collection rate	%	34	64	72	84
Total wastewater collected	m³/d	8,446	32,592	51,352	80,134
Design capacity	m³/d	-	50,000	-	100,000

Dongxihu Subproject

Item	Unit	2005	2010	2015*	2020
Population	persons	104,000	138,000	183,000	244,000
Population growth rate	%	-	5.85	5.85	5.85
Floating population at 20%	persons	20,800	27,600	36,600	48,800
Serviced population	persons	124,800	165,600	219,600	292,800
Per capita water supply	L/pc·d	288	302	315	300
Return flow factors		0.85	0.85	0.85	0.85
Non-industrial wastewater	m³/d	30,551	42,510	58,798	74,664
Industrial wastewater consumption index	m³/ha·d	190	180	170	160
Industrial land area	ha	305	468	719	1,103
Return flow factors		0.8	0.8	0.8	0.8
Industrial wastewater	m³/d	46,400	67,400	97,800	141,200
Sub-total	m³/d	76,951	109,910	156,598	215,864
Infiltration/inflow at 15%	m³/d	11,543	16,486	23,490	32,380
Wastewater volume	m³/d	88,494	126,396	180,088	248,244
Collection rate	%	56.3	61.5	75.9	95
Total wastewater collected	m³/d	49,822	77,734	136,686	235,831
Design collection capacity	m³/d	-	-	136,686	235,831

Notes

1. No significant adjustment to the industrial wastewater volume projection has been made because there is no supplementary data that can provide more accurate information to help the PPTA team with industrial wastewater projection.
2. All the domestic return flow factors have been changed to 0.85, which is more acceptable as a common practice.

Appendix C2 BAF (Biofor) Cost Estimates

Scope of Work

Notes:

- 1) Assume existing screens are not adequate for location upstream of Biofor.
- 2) Assume inlet pumping station is required
- 3) Assume Biofor is constructed above ground
- 4) Assume piling is required for entire structure
- 5) Biofor equipment comprises: filter floor, media, aeration system, backwash system, air scour system
- 6) Assume odour control is not required
- 7) Assume Sludge treatment is thickening and dewatering with centrifuges, no cake storage
- 8) Assume Admin building is required
- 9) Assume Workers accomodation is required
- 10) Assume loading rate on Biofor of 2m³/m²/hr and depth of 5m

Preliminary Sizing of Biofor

Design Flow =	100,000 m ³ /day	Incoming BOD =	200 mg/l	Loading rate =	1.92 Kg/m ³ /day
Design Plan Area =	2,083 m ²				
Total Volume =	10,417 m ³				

1.0 Inlet Pumping Station & Fine Screens & Grit removal

Item	Description	Qty	Unit	Rate	Cost	Currency	RMB Cost	
1.01	3mm Rotating Band Screen - say 3 duty, 1 standby, 1,4C	4	nr	110000	440000	USD	\$ 3,553,000.00	RMB
1.02	Submersible pump - 3 duty, 1 standby, 10m lift, 1,400m ³	4	nr	75000	300000	USD	\$ 2,422,500.00	RMB
1.03	Isolation Penstocks (manual operation) - 1m x 1m	6	nr	10000	60000	USD	\$ 484,500.00	RMB
1.04	Pump Isolation Valves (450mm diameter Gate Valve)	12	nr	5000	60000	USD	\$ 484,500.00	RMB
1.05	Detritor rakes	2	nr	10000	20000	USD	\$ 161,500.00	RMB
1.06	grit classifiers	2	nr	15000	30000	USD	\$ 242,250.00	RMB
1.07	MCC Panel	1	sum	250000	250000	USD	\$ 2,018,750.00	RMB
1.08	Cabling	1	sum	50000	50000	USD	\$ 403,750.00	RMB
1.09	Instrumentation and Control System	1	sum	50000	50000	USD	\$ 403,750.00	RMB
1.10	Installation						\$ 3,052,350.00	RMB
1.11	Miscellaneous						\$ 1,526,175.00	RMB
1.12								
							\$ 14,753,025.00	RMB

2.0 Biofor (Assume 8 cells, each 260m²)

Item	Description	Qty	Unit	Rate	Cost	Currency	RMB Cost	
2.01	Proprietary floor system including piping	2,083	m ²	200	416666.7	GBP	\$ 6,041,666.67	RMB

2.02 Aeration system (Coarse bubble)	6 nr	20000	160000 USD	\$ 1,292,000.00 RMB
2.03 Aeration Blowers (for aeration and air scour)	6 nr	100000	600000 USD	\$ 4,845,000.00 RMB
2.04 Backwash pumps	3 nr	100000	300000 USD	\$ 2,422,500.00 RMB
2.05 Piping	1 sum	250000	250000 USD	\$ 2,018,750.00 RMB
2.06 MCC Panel	1 sum	250000	250000 USD	\$ 2,018,750.00 RMB
2.07 Cabling	1 sum	100000	100000 USD	\$ 807,500.00 RMB
2.08 Instrumentation and Control System	1 sum	150000	150000 USD	\$ 1,211,250.00 RMB
2.09 Installation				\$ 5,833,850.00 RMB
2.1 Miscellaneous				\$ 2,916,925.00 RMB

\$ 29,408,191.67 RMB

3.0 Sludge system

Item	Description	Qty	Unit	Rate	Cost	Currency	RMB Cost
3.01	Sludge Thickeners (Centrifuge)	3	nr	100000	300000	USD	\$ 2,422,500.00 RMB
3.02	Sludge Dewaterers (Centrifuge)	3	nr	100000	300000	USD	\$ 2,422,500.00 RMB
3.03	Polymer System	2	nr	25000	50000	USD	\$ 403,750.00 RMB
3.05	Piping	1	sum	50000	50000	USD	\$ 403,750.00 RMB
3.06	MCC Panel	1	sum	150000	150000	USD	\$ 1,211,250.00 RMB
3.07	Cabling	1	sum	150000	150000	USD	\$ 1,211,250.00 RMB
3.08	Instrumentation & Control System	1	sum	150000	150000	USD	\$ 1,211,250.00 RMB
3.09	Installation						\$ 2,422,500.00 RMB
3.1	Miscellaneous						\$ 1,211,250.00 RMB

\$ 12,920,000.00 RMB

4.0 Civil Works

Item	Description	Qty	Unit	Rate	Cost	Currency	RMB Cost
4.01	Screens & Pump Channels				206493.4	USD	\$ 1,667,433.90 RMB
4.02	Biofor Structure				1178495	USD	\$ 9,516,345.82 RMB
4.03	Sludge Area				153887.4	USD	\$ 1,242,640.57 RMB
4.04	Admin Building				313216.2	USD	\$ 2,529,220.88 RMB
4.05	Roads / Drains / Miscellaneous				926045.9	USD	\$ 7,477,820.59 RMB

\$ 22,433,461.76 RMB

\$ 79,514,678.43 RMB

<u>SUMMARY</u>		<u>Concrete Tank Construction</u>	
<u>Description</u>		<u>Mat'l cost each</u>	<u>Manhours</u>
Screens & pumping		\$208,493	11,978
Biofor		\$1,178,495	65,229
Sludge	4	\$153,887	7,134
Admin Building		\$313,216	1,723

[illegible]

Pumping Pump Station	Tank Volume V (cu.m.) 952.5	Length L (m.) 10	Width W (m.) 15	Depth D (m.) 8.33	Thickness t (m.) 0.835	Unit Rate US\$	Cost US\$
Concrete Volume	walls	211.85	cu.m.				
	floor	116.44	cu.m.				
	top	0 0.00	cu.m.				
	barries	2 60.48	cu.m.				
		388.77	cu.m.				
					Materials	Manhours	
					Labor	488	\$120 ~ \$48,653
Rebar Quantity	volume	5.05	cu.m.			\$3 ~	\$972
	100kg/cu.m.						
	weight	38.88	tonne		Materials	1,012	\$573 ~ \$22,284
					Labor		\$52 ~ \$2,025
Formwork	walls	687.26	sq.m.		Materials		\$19 ~ \$24,374
	floor on-grade	1 55.08	~ 55.08	sq.m.	Labor	4,708	\$7 ~ \$9,415
	elev'd floor	0 238.44	~ 0.00	sq.m.			
	top	0 238.44	~ 0.00	sq.m.		6,208	Total Cost= \$105,724
	barries	3 190.50	571.50				Total Mat= \$93,311
	total area		1293.04	sq.m.			

Blofor		Total Materials Total Manhours		\$1,178,495 65,220					
Blofor Plant Room		Tank Volume V (cu.m.) 915 ~	Length L (m.) 25 X	Width W (m.) 20 X	Depth D (m.) 1.85 ~	Thickness t (m.) 0.3	Unit Rate US\$		Cost US\$
Concrete Volume	walls	50.07	cu.m.	Ignore overlap w/new filters					
	floor	158.21	cu.m.	No fids included					
	top	0 0.00	cu.m.						
	baffles	0 0.00	cu.m.						
		208.28	cu.m.			Manhours			
				Materials			\$120	~	\$24,993
				Labor	260		\$3	~	\$521
Rebar Quantity	volume	2.71	cu.m.						
	100kg/cu.m.			Materials			\$573	~	\$1,938
	weight	20.83	tonne	Labor	542		\$52	~	\$1,085
Formwork	walls	333.79	sq.m.	Materials			\$19	~	\$25,220
	floor on grade	1 92.40	~ 92.40	Labor	4,871		\$7	~	\$9,742
	elev'd floor	0 819.78	~ 0.00						
	top	1 619.78	~ 619.78			5,674		Total Cost=	\$73,500
	baffles	4 73.20	292.60					Total Mat==	\$82,152
	total area		1338.75	sq.m.					

Rebar Tanks		Tank Volume	Length	Width	Depth	Thickness	Unit Rate	Cost
8 New		V (cu.m.)	L (m.)	W (m.)	D (m.)	t (m.)	US\$	US\$
		1344	32	8.4	5	0.5		
Concrete Volume	walls	207		cu.m.	Notes: Ignore cut-outs (minimal)			
	floor	2	310.2	cu.m.				
	top	0	0	cu.m.	200 mm thick pre-cast top			
	channels	2	21	cu.m.	inlet & outlet			
		536.2		cu.m.				
Rebar Quantity	volume	6.997		cu.m.	Materials			
	100kg/cu.m.				Labor	673	\$120	~ \$64,584
	weight	53.82		tonne			\$3	~ \$1,348
					Materials		\$573	~ \$30,849
					Labor	1,402	\$52	~ \$2,803
Formwork	walls	828		sq.m.	Materials		\$19	~ \$27,802
	floor on-grade	1	84.8	~ 84.8	Labor	5,370	\$7	~ \$10,740
	elev'd floor	0	395	~ 0				
	top	1	395	~ 395		7,444		
	beetles	2	84	168			Total Cost=	\$138,124
	total area			1475.8	sq.m.		Total Mat=	\$123,238

Productivity /Price Rates

			Conversion factors	
Mechanical Equip. Fdns		US	Metric	35.32 cu.ft.=cu.m 1.308 cy/cu.m.
Vessels, separators	120	0.956 MH/CY	1.250448 mh/cm	2.2046 lb./kg.
Tanks, pumps, sumps	120	0.765 MH/CY	1.00062	10.765 sq.ft./sq.m.
Embeds	1.75 \$/lb.	0.032 MH/lb.	0.070547 mh/kg.	
Formwork				
Foundations	1.75 \$/sfca	0.338 mh/sfca	3.63857 mh/m2	
	18.83875 \$/m2			
Slab on grade	1.75 \$/sfca	0.225 mh/sfca	2.422125 mh/m2	
	18.83875 \$/m2			
Reinforcing Steel	520 \$/ton	18.9 mh/ton	20.83347 mh/T	573.196 \$/T
	0.26 \$/lb.	28.35 mh/ton	31.25021 mh/T	
	ave.	23.625 mh/ton	26.04184 mh/T	

Appendix E1

Stakeholder Participation and Public Consultation (Environment)

1. The Objectives and Functions of Public Consultation

1.1 As a key to evaluating and coordinating the social and environmental impact of the proposed Project, public consultation not only gives reference to the handling of various project-related problems by relevant government authorities through consideration and ensuring compensation for the potentially affected households or entities but also plays a positive role in the promotion of citizens' environmental awareness, public health protection, and appreciation of a safe and comfortable living environment.

1.2 Through public consultation, the public may know more about the proposed project and have the opportunity to express their ideas, opinions and demands, which would make project planning and design more reasonable and comprehensive so that the comprehensive and long-term benefits of the proposed Project could be substantially realized.

2. Public Consultation Methods

2.1 The public consultation for the proposed Project has been made up of two rounds. In the first round, two meetings were held. In the second round, based on the characteristics of individual subprojects as well as the education level, lifestyle, and environmental awareness of households in the neighborhood among others, we went to nearby enterprises, neighborhoods, and local government agencies adjacent to individual subprojects to conduct surveys by explaining the contents and organizing the public to fill in questionnaires.

3. First Round of Public Consultation

3.1 Two public consultation meetings have been held for this Project. On July 21, 2005 in Wuhan Erlangmiao WWTP, the first meeting was hosted by Wuhan Project Management Office (PMO), with the focus of the public consultation on the following three subprojects: Erlangmiao WWTP upgrade, Huangpu Road WWTP upgrade, and the Dongxihu Three Gates Connection.

3.2 The 15 participants in the meeting included representatives from Wuhan City Planning and Design Institute, Wuhan Water Affairs Bureau, Hubei Junbang Environment Technology Co.Ltd (responsible for the environmental assessment of the Project), local citizens and enterprises. In the meeting, all the representatives agreed to the proposed project construction and gave their valuable suggestions as follows:

(i) The construction period should be shorten while environment

management (especially its implementation) during construction, be strengthened so as to minimize the impacts of construction on the surrounding environment.

- (ii) Emphasis should be paid on the adequacy and upgrading of collection systems.
- (iii) Overall planning should be taken into account in selecting the construction sites (especially those alongside the Yangtze River) so that a harmonious landscape could be attained.
- (iv) The beneficial use of sewage sludge should be strengthened, while the management of odor nuisance generated by the WWTPs be enhanced so as to minimize the negative impact on surrounding citizens with a focus on human well-being.

3.3 The second public consultation meeting, namely, Public Consultation on the Environment Impacts of Caidian Sewage Collection and Treatment Subproject of Wuhan Sewage and Storm Water Project Funded by Loans from ADB, was held on September 19, 2005 in Caidian District Construction Bureau. Eleven representatives from Wuhan City Planning and Design Institute, Caidian District Construction Bureau, Hubei Junbang Environment Technology Co. Ltd (responsible for the local environmental assessment of the Project), local citizens and enterprises attended the meeting.

3.4 In the meeting, PMO gave a briefing on the basic information about the project; the environmental specialist gave a brief analysis of the positive and negative impacts of the Project during construction and operation; and the representatives from local households and enterprises expressed their opinions and suggestions toward the project as follows:

- (i) They pledged their full support for project construction;
- (ii) The management of odor nuisance from the WWTPs and pumping stations should be strengthened to avoid negative impacts on surrounding residential areas;
- (iii) Overall planning should be taken into account in selecting the construction sites;
- (iv) Compensation to farmers for land acquisition should be adequate; and
- (v) The operation and maintenance cost of the subprojects and its feasible sources should be adequately considered.

4. Second Round of Public Consultation

4.1 With a survey focusing on the construction of the proposed WWTPs, the second round of public consultation chose those survey contents that were sensitive to social and public impact, including:

- (i) project awareness;
- (ii) the benefits of subproject construction to local economic and social development;
- (iii) the environmental impact of the proposed WWTPs during construction and operation;
- (iv) the classification of positive impacts on public interests and the effectiveness of water quality improvements due to subproject construction; and
- (iv) the necessity of constructing WWTPs, the logic of site selection and the approval rate for subproject construction.

Erlangmiao WWTP Subproject

4.2 From August 22 - 24 2005, a total of 60 questionnaires were distributed at random to neighborhoods/residential areas surrounding the planned site, as well as to enterprises, public institutions, government agencies, and neighborhoods/residential areas in the sewage service area; 55 completed questionnaires were returned. Among the respondents were cadres, residents, workers, teachers, businessmen and so on, aged from 20 to 60, with a male: female proportion of 3:1.

(i) Project Awareness

4.3 The results of questionnaire survey show that 85% of those surveyed were aware of the project, with mass media (newspaper, TV and radio programs), relevant meetings and public discussion as the main dissemination methods. The results also demonstrate that citizens in the WWTP service area and neighborhoods surrounding the WWTPs pay great attention to the impacts that project construction could have on their own interests.

(ii) The Benefits of Subproject Construction to Local Economic and Social Development

4.4 A majority of the public believe that the subproject construction could be quite beneficial or beneficial to the economic and social development in the northern areas of Wuchang Old City and new urban development zones of

Wuchang such as Xujiapeng, Yangyuan and Liyuang. Those respondents who believe the subproject quite beneficial or beneficial amount to 92.7% of the total, while those who believe the subproject will have moderate benefits reach 7.3% of the total.

(iii) The Environmental Impact of WWTPs during Construction and Operation Period

4.5 The majority of the public believe that the construction of the WWTPs will have significant impact on nearby neighborhoods - the construction contractor should pay particular attention to, in order of importance, construction wastes, noise, dust and soil erosion. The details of questionnaire results are listed in Table E1-1. The public also believe that the WWTPs will have a conspicuous impact on the surrounding environment during operation - the construction contractor should pay particular attention, in terms of importance, to odor nuisance, wastewater discharge, sludge disposal, noise and landscape. The details are listed in Table E1-2.

Table E1-1 Questionnaire Results in Term of Subproject's Impacts on the Environment during Construction

Environmental Impacts	Construction Waste	Noise	Dust	Soil Erosion	Others
Percentage of Respondents(%)	25.5	30.9	30.9	9.1	3.6

Table E1-2 Questionnaire Results in Term of Subproject's Impacts on the Environment during Operation

Environmental Impacts	Odor	Wastewater Discharge	Sludge Disposal	Noise	Landscape	Others
Percentage of Respondents(%)	50	25	20	15	8.3	11.6

(iv) The Classification of Positive Impacts on Public Interests and The Effectiveness of Water Quality Improvement in Yangtze River Due to Subproject Construction

4.6 The questionnaire results show that subproject construction has the following positive impacts, in order of effectiveness, namely life quality improvement, enterprise development, and urban construction development. The details of questionnaire results are listed in Table E1-3. A majority of the public also believe that subproject construction may conspicuously improve water quality in Yangtze River. The details of questionnaire results are listed in Table E1-4.

Table E1-3 Questionnaire Results of (Subproject) Construction Impact on Different Categories of Public Interests

Categories Of Public Interests	Life Quality	Enterprise Development	Urban Construction Development	Others
Percentage Of Respondents (%)	66.7	27	25	8.3

Table E1-4 Questionnaire Results of (Subproject) Construction Impacts on the Improvement of Water Quality in Yangtze River

Effectiveness Of Improving Water Quality In Yangtze River	Conspicuous	Moderate	Ineffective	Do Not Know
Percentage Of Respondents (%)	75	16.7	0	8.3

(v) The Necessity of Constructing WWTPs, the Logic of Site Selection and Approval Rate for Subproject Construction

4.7 The questionnaire results show that 52.7% of the respondents believe it is very much necessary to expand the WWTP, while 43.6% of respondents believe that it is necessary to expand the WWTP, and 3.7% of respondents believe that it is unnecessary to expand the WWTP in the short term.

4.8 As for the results of logic site selection in the questionnaire, 90.9% of respondents believe the planned site is reasonable or almost reasonable while 3.6% of respondents chose the item of Do Not Know. Some of the respondents believe that if the construction scale of the subproject is expanded, the existing impact of odor nuisance will be deteriorated, thus causing severe negative impacts on the surrounding environment. However, after we gave an introduction of odor treatment in the WWTP, 5.5% of the respondents kept a reserved attitude toward this issue.

4.9 As for approval rate for subproject construction, 92.7% of respondents expressed their support, 3.6% of respondents said they do not care, while 3.7% held a reserved attitude toward subproject construction with the main concern for the odor nuisance from the WWTP.

Huangpulu WWTP subproject

4.10 From August 15 -18, 2005, a total of 70 questionnaires were distributed at random to residents in the neighborhoods/residential areas surrounding the planned site, travelers in Riverside Park, employees of relevant government agencies in Jiangnan District and Jiangnan District, among which 60 pieces were returned. Among the respondents were cadres/government employees, residents, workers, clerks, travelers, students and so on, aged from 18 to 60, with a male:female proportion of 2.5:1.

(i) Project Awareness

4.11 The results of questionnaire survey show that the dissemination rate of subproject construction reaches 88%, with mass media (newspaper, TV and radio programs), relevant meeting and public discussion as the main dissemination modes. The results also demonstrate that citizens in the sewage service area and neighborhoods surrounding the WWTP pay great attention to the impacts that project construction could have on their own interests.

(ii) The Benefits of Subproject Construction to Local Economic and Social Development

4.12 The results of questionnaire survey show that a majority of the public believe that the subproject construction could be quite beneficial or beneficial to the economic and social development of Wuhan Municipality. Those respondents who believe the subproject quite beneficial or beneficial amount to 92% of the total, while those who believe the subproject will have moderate benefits reach 8% of the total.

(iii) The Environmental Impact of WWTPs during Construction and Operation Period

4.13 The majority of the public believe that the construction of WWTP will have conspicuous impact on nearby neighborhoods and the construction contractor should pay particular attention to, in order of importance, noise, dust, construction wastes, and soil erosion. The details of questionnaire results are listed in Table E1-5. The public also believe that the WWTP will have a conspicuous impact on surrounding environment during its operation and the construction contractor should pay particular attention, in terms of importance, to odor nuisance, landscape, wastewater discharge, sludge disposal, noise and others. The details are listed in Table E1-6.

Table E1-5 Questionnaire Results in Term of Subproject's Impacts on the Environment during Construction

Environmental Impacts	Noise	Dust	Construction Waste	Soil Erosion	Others
Percentage of Respondents (%)	30	25	15	13.3	6.7

Table E1-6 Questionnaire Results in Term of Subproject's Impacts on the Environment during Operation

Environmental Impacts	Odor	Landscape	Sludge Disposal	Water Discharge	Noise	Others
Percentage Of Respondents (%)	25	25	16.6	15	11.7	6.7

(iv) The Classification of Positive Impacts on Public Interests and The Effectiveness of Water Quality Improvement in Yangtze River Due to Subproject Construction

4.14 The questionnaire results show that subproject construction has the following positive impacts, in order of effectiveness, namely life quality improvement and economic development. The details of questionnaire results are listed in Table E1-7. A majority of the public also believe that subproject construction may conspicuously improve water quality in Yangtze River. The details of questionnaire results are listed in Table E1-8.

Table E1-7 Questionnaire Results of (Subproject) construction impact on Different Categories of Public Interests

Categories Of Public Interests	Life Quality	Economic Development	Others
Percentage Of Respondents(%)	55.3	35	11.7

Table E1-8 Questionnaire Results of (Subproject) Construction Impacts on the Improvement of Water Quality in Yangtze River

Effectiveness Of Improving Water Quality In Yangtze River	Effective	Ineffective	Do Not Know
Percentage Of Respondents (%)	90	0	10

(v) The Necessity of Constructing WWTPs, Logic Site Selection and Approval Rate for Subproject Construction

4.15 The questionnaire results show that 58.3% of the respondents believe it is quite necessary to expand the WWTP, while 38.3% of respondents believe that it is necessary to expand the WWTP, and 3.4% of respondents believe that it is unnecessary to expand the WWTP in the short term.

4.16 As for the results of logic site selection in the questionnaire, 100% of respondents believe the planned site is reasonable or almost reasonable

4.17 As for approval rate for subproject construction, 93.3% of respondents expressed their support, while 6.7% of respondents said they do not care.

Nantazihu WWTP/subproject

4.18 From August 15 - 17 2005, a total of 75 questionnaires were distributed at random to neighborhoods/residential areas surrounding the planned site, nearby enterprises, relevant government agencies in Hanyang District, among which 60 pieces were returned. Among the respondents were cadres/government

employees, residents, workers, peasants, clerks and so on, aged from 20 to 60, with a male : female proportion of 2.2:1.

(i) Awareness of Project

4.19 The results of questionnaire survey show that the dissemination rate of subproject construction reaches 85%, with mass media (newspaper, TV and radio programs), relevant meeting and public discussion as the main dissemination modes. The results also demonstrate that citizens in the sewage service area and neighborhoods surrounding the WWTP pay great attention to the impacts that project construction could have on their own interests.

(ii) The Benefits of Subproject Construction to Local Economic and Social Development

4.20 The results of questionnaire survey show that a majority of the public believe that the subproject construction could be quite beneficial or beneficial to the economic and social development of the economic development zones. Those respondents who believe the subproject quite beneficial or beneficial amount to 95% of the total, while those who believe the subproject will have moderate benefits reach 5% of the total.

(iii) The Environmental Impact of WWTPs during Construction and Operation Period

4.21 The majority of the public believe that the construction of WWTP will have conspicuous impact on nearby neighborhoods and the construction contractor should pay particular attention to, in order of importance, construction wastes, noise, dust and soil erosion. The details of questionnaire results are listed in Table E1-9 The public also believe that the WWTP will have a conspicuous impact on surrounding environment during its operation and the construction contractor should pay particular attention, in terms of importance, to odor nuisance, wastewater discharge, sludge disposal, noise and landscape. The details are listed in Table E1-10.

Table E1-9 Questionnaire Results in Term of Subproject's Impacts on the Environment during Construction

Environmental Impacts	Construction Waste	Noise	Dust	Soil Erosion	Others
Percentage Of Respondents (%)	35.0	31.7	25.0	6.7	1.6

Table E1-10 Questionnaire Results in Term of Subproject's Impacts on the Environment during Operation

Environmental Impacts	Odor	Wastewater Discharge	Sludge Disposal	Noise	Landscape	Others
Percentage Of Respondents (%)	33.3	28.3	26.7	6.7	3.3	1.7

(iv) The Classification of Positive Impacts on Public Interests and The Effectiveness of Water Quality Improvement in Yangtze River Due to Subproject Construction

4.22 The questionnaire results show that subproject construction has the following positive impacts, in order of effectiveness, namely life quality improvement, agricultural production, and aquiculture production. The details of questionnaire results are listed in Table E1-11. A majority of the public also believe that subproject construction may conspicuously improve water quality in Yangtze River. The details of questionnaire results are listed in Table E1-12.

Table E1-11 Questionnaire Results of (Subproject) construction impact on Different Categories of Public Interests

Categories Of Public Interests	Life Quality	Agricultural Production	Aquiculture Production	Others
Percentage Of Respondents (%)	38.3	31.7	25	5

Table E1-12 Questionnaire Results of (Subproject) Construction Impacts on the Improvement of Water Quality in Yangtze River

Effectiveness Of Improving Water Quality In Yangtze River	Effective	Ineffective	Do Not Know
Percentage Of Respondents(%)	66.7	25.0	8.3

(v) The Necessity of Constructing WWTPs, Logic Site Selection and Approval Rate for Subproject Construction

4.23 The questionnaire results show that 60% of the respondents believe it is quite necessary to expand the WWTP, while 36.7% of respondents believe that it is necessary to expand the WWTP, and 3.3% of respondents believe that it is unnecessary to expand the WWTP in the short term.

4.24 As for the results of logic site selection in the questionnaire, 100% of respondents believe the planned site is reasonable or almost reasonable.

4.25 As for approval rate for subproject construction, 96.7% of respondents expressed their support, while 3.3% of respondents said they do not care.

Caidian District WWTP

4.26 On August 18, 2005, a total of 100 questionnaires were distributed at random to neighborhoods/residential areas surrounding the planned site, nearby enterprises, relevant government agencies in Caidian District, among which 85 pieces were returned. Among the respondents were cadres/government employees, residents, workers, peasants, teachers, clerks and so on, aged from 20 to 60, with a male:female proportion of 2:1.

(i) Awareness of Project

4.27 The results of questionnaire survey show that the dissemination rate of subproject construction reaches 90%, with mass media (newspaper, TV and radio programs), relevant meeting and public discussion as the main dissemination modes. The results also demonstrate that citizens in the sewage service area and neighborhoods surrounding the WWTP pay great attention to the impacts that project construction could have on their own interests.

(ii) The Benefits of Subproject Construction to Local Economic and Social Development

4.28 The results of questionnaire survey show that a majority of the public believe that the subproject construction could be quite beneficial or beneficial to local economic and social development. Those respondents who believe the subproject quite beneficial or beneficial amount to 94% of the total, while those who believe the subproject will have moderate benefits reach 6% of the total.

(iii) The Environmental Impact of WWTPs during Construction and Operation Period

4.29 The majority of the public believe that the construction of WWTP will have conspicuous impact on nearby neighborhoods and the construction contractor should pay particular attention to, in order of importance, construction wastes, noise, dust and soil erosion. The details of questionnaire results are listed in Table E1-13. The public also believe that the WWTP will have a conspicuous impact on surrounding environment during its operation and the construction contractor should pay particular attention, in terms of importance, to odor nuisance, wastewater discharge, sludge disposal, noise and landscape. The details are listed in Table E1-14.

Table E1-13 Questionnaire Results in Term of Subproject's Impacts on the Environment during Construction

Environmental Impacts	Construction Waste	Noise	Dust	Soil Erosion	Others
Percentage Of Respondents (%)	28.2	27.1	24.7	16.5	3.5

Table E1-14 Questionnaire Results in Term of Subproject's Impacts on the Environment during Operation

Environmental Impacts	Odor	Wastewater Discharge	Sludge Disposal	Noise	Landscape	Others
Percentage Of Respondents (%)	32.9	23.5	22.4	14.1	5.9	1.2

(iv) The Classification of Positive Impacts on Public Interests and The Effectiveness of Water Quality Improvement in Yangtze River Due to Subproject Construction

4.30 The questionnaire results show that subproject construction has the following positive impacts, in order of effectiveness, namely life quality improvement, agricultural production, and economic development. The details of questionnaire results are listed in Table E1-15. A majority of the public also believe that subproject construction may conspicuously improve water quality in Han River. The details of questionnaire results are listed in Table E1-16.

Table E1-15 Questionnaire Results of (Subproject) construction impact on Different Categories of Public Interests

Categories Of Public Interests	Life Quality	Agricultural Production	Economic Development	Others
Percentage Of Respondents (%)	48.2	24.7	23.5	3.6

Table E1-16 Questionnaire Results of (Subproject) Construction Impacts on the Improvement of Water Quality in Yangtze River

Effectiveness Of Improving Water Quality In Yangtze River	Conspicuous	Moderate	Ineffective	Do Not Know
Percentage Of Respondents (%)	76.5	17.6	0	5.9

(v) The Necessity of Constructing WWTPs, Logic Site Selection and Approval Rate for Subproject Construction:

4.31 4.30 The questionnaire results show that 54.1% of the respondents believe it is quite necessary to expand the WWTP, while 43.5% of respondents believe that it is necessary to expand the WWTP, and 2.4% of respondents believe that it is unnecessary to expand the WWTP in the short term.

4.32 4.31 As for the results of logic site selection in the questionnaire, 90.6% of respondents believe the planned site is reasonable or almost reasonable while 9.4% of respondents replied with "Do Not Know".

4.33 4.32 As for approval rate for subproject construction, 96.5% of respondents expressed their support, 3.5% of respondents said they do not care.

5. Public Demands and Suggestions

5.1 The public demands and suggestions on proposed project/subprojects, environment protection and construction contractor are summarized as follows:

(i) As the construction of WWTP could improve water qualities in Yangtze River and Han River and be beneficial to the life quality of citizens, business & production, and economic development in the service area, the public urge the Government and construction contractor to start construction as soon as possible so as to bring about well-being for the public. The construction progress should be accelerated with a delay of several years.

(ii) The construction contractor should guarantee construction quality and avoid project of inferior quality by increasing transparency in construction.

(iii) Environment protection during construction should be conducted well to mitigate the nuisances such as dust and noise generated in construction through planting trees, spraying water, setting up sound baffle, proper arrangement for construction location and time, and timely cleanup of construction wastes. In addition, rainy season construction should be avoided to reduce soil erosion. With all these measure, it is possible to reduce the negative impact of project construction on environment to the lowest level.

(iv) Supporting facilities such as pipeline networks and collection systems should be improved/upgraded as soon as possible.

(v) Advanced sewage treatment techniques should be adopted in the project so that tailwater quality could meet primary discharge criterion and be used comprehensively to avoid the generation of a new pollution source.

(vi) As for the odor generated by existing, expanded, and newly-built WWTPs under this project, a sanitary protection zone should be set up between WWTPs and surrounding environment. In addition, effective odor treatment measures

should be taken to minimize the impact of odor and sludge nuisance on the environment.

(vii) It is expected that local government and construction contractor could pay due attention to the results and opinions from public consultation, since the process of public consultation is also the process of coordinating and solving construction, social and environmental problems. Therefore, the above opinions and suggestions gathered from public consultation should be integrated into the environmental protection and management practices of the project as well as its operation monitoring process.

Questionnaire Survey

Introduction

As a city abundant in rivers and lakes, there are many lakes and river in Wuhan along Yangtze River and Hanjiang River. The elevation of its downtown area is between 20 and 28m, and the elevation of its built-up area is between 21 and 24m, which is below the perennial floodwater lever of Yangtze River. In the flood season, the storm water in the urban area influxes along the natural landform and flows into rivers through pipe culvert, canal and pump station. Part of the storm water is stored in lakes, while most of the storm water is drained out by the pump stations into the rivers.

Due to underdeveloped urban drainage facilities in the city as well as terrain conditions, most of the wastewater is discharged into the nearby water body without treatment, which results in a deteriorating water quality. In addition, the capacity of existing pump stations is so seriously insufficient that in flood seasons storm waterlogging is rampant in most urban areas, which has greatly affected people's life, and restrained further development of the city to some extent.

The governments of Hubei Province and Wuhan Municipality as well as relevant departments and bureaus have realized the seriousness of this issue, and paid great attention to it. From the perspective of sustainable development and on the basis of extensive investigation, they decide to get loans from ADB to upgrade the construction of municipal sewage plants, storm water collection systems and drainage pump stations.

This project involves Hangkou District, Jiangnan District, Jiang'an District, Wuchang District, Hongshan District, Hanyang District, Dongxihu District and Caidian District, with a total service area (water collection area) of 248.74 square kilometers.

The service area covers Changfennanbeihuan and Jichanghe area in the western part of Hangkou District (service area is 56.7 square kilometers); riverside area in Jiang'an District (service area is 7.2 square kilometers); Wujiasan area in Dongxihu District and Jinyinhu area (service area is 61.4 square kilometers); western part of Hanyang District (service area is 41.2 square kilometers), Erlangmiao area in Wuchang District (service area is 32.2 square kilometers), old city area in Caidian District (service area is 23.8 square kilometers), Luoqialu area in Wuchang District (service area is 22.57 square kilometers), and Yingwuzhou area in Hanyang District (service area is 3.67 square kilometers).

As to the pollutants generated during the construction and operation, including wastewater, waste gas, noise and solid waste, the construction unit will take measures in accordance with national environment management regulations.

- (i) Wastewater: Secondary sewage treatment techniques including anaerobic, aerobic and biological aeration filter tanks are adopted to ensure that the national drainage standard is met before wastewater is discharged into the receiving water body.
- (ii) Waste gas: measures such as biological deodorization, encapsulation and partial encapsulation are adopted to meet the Odor Pollutant Drainage Standard (GB14554-93).
- (iii) Noise: the machines that cause noise are moved to the centre of construction site, and green belts will be built to achieve attenuation. Machines that make least noise will be purchased and used. In this way, when the noise reaches the edge of the plant, it will be within the limit set in the national noise standard.
- (iv) Solid waste: the solid waste will be buried in the dumping grounds.

According to the national environment management requirements on construction projects, it is construction units' responsibility to hold public consultation, collect the comments and suggestions of residents and units, provide reference for the government's environment control, and make the pollution in the construction and operation the lowest possible.

For the sake of better environment protection, please fill in the following questionnaire and give us your comments and suggestions. Thank you for your cooperation!

Questionnaire

Family Address _____ District (County) _____ (Town) _____ Village
 Name _____ Sex _____ Age _____ Nationality _____ Career _____ Education _____
 Service Place _____ Numbers of Family Member _____

Please read the following questions, and mark "√" in the () if you agree with the choice.

- (1) Your residence in the district is _____.
- () within 10 years () within 20 years () within 30 years () over 30 years
- (2) Your residence is _____ from the construction site.
- () within 100m () within 500m () within 1000m () over 1000m
- (3) Are you satisfied with the environment of your residence?
- () satisfied () dissatisfied () hard to say
- (4) If the project isn't implemented, will your life and production be affected?
- () greatly affected () little affected () not affected () no idea
- (5) Do you think the project is important?
- () very important () important () not important () no idea
- (6) Do you agree with removal of the residence for the project?
- () agree () disagree () no idea
- (7) Do you think what is the biggest negative impact of this project?
- () noise () odor () night construction () dust
- () construction safety () passage blocked
- () impact on cultural relics and vegetation
- () impact on transportation () removal and resettlement
- (8) Are you satisfied with the measures taken to reduce the impact on environment?
- () satisfied () dissatisfied () not sure of the result () no idea of the measures
- (9) How do you think this project will improve the quality of water environment and civic landscape?
- () significantly () possibly () not much () no idea
- (10) Do you think this project has more positive impact or more negative impact?
- () more positive impact () more negative impact () equal () hard to say
- (11) What is your attitude toward the site selected for the project?
- () approved () disapproved () indifferent
- (12) What do you think is the overall impact of this project on the area?
- () positive () negative () no idea
- (13) Do you have any comments or suggestions on this project?
- (14) As to the negative impact of this project, what specific measures do you suggest should be taken?

Appendix E2

Contractor Specifications for Environmental Management and Monitoring

1. Introduction

Contractors would be required to comply with all relevant regulations and legislation. In addition some particular specifications could also be included with the tender and contract documents for implementation of the proposed works. Some examples of such specifications are given below.

Example Contractor Specifications

1.1 Site Constraints

The Site is constrained by the boundary to the Board's property and as a result there is insufficient space for the Contractor to have a temporary stockpile area for excavated earth or for workers' quarters. Both of these shall be off-Site at a suitable location determined by the Contractor. Furthermore, the area available for the Contractor's office and storage area is limited as is shown in the Drawings. The Contractor may propose to the S.O. a suitable temporary location for storage facilities, but the Contractor shall take all necessary steps and bear all costs of relocating the storage area as and when this interferes with the progress of the Works. Where this is not feasible, the Contractor shall make arrangements to provide off-Site storage for his equipment and consumables etc. and shall bear the cost of doing so.

1.2 Temporary Working Areas

Where any parts of the Works are to be constructed on, over, under, in or through land or other areas outside the Site and subject to any provision stated below, the Contractor shall arrange for temporary occupation of Temporary Working Areas and such areas shall be deemed to be part of the Site during the period of occupation.

Work in such areas shall be the subject of formal method statements, which shall be prepared by the Contractor and will be subject to review and approval by the Board and the S.O. The Contractor shall ensure that his methods of working cause the minimum of disturbance to the areas and to the continued operation of the existing waterworks. Where necessary, similar arrangements shall apply to access routes to Temporary Working Areas and such routes shall be deemed to form part of the temporary working areas.

The extent of each Temporary Working Area and the period of time for its occupation shall be such as the S.O. considers necessary having regard to the

Contractor's reasonable requirements which shall be submitted to the S.O. in the form of a method statement as soon as practicable after commencement of the Works on the Site and having regard to the Contractor's programme furnished pursuant to Clause 9 of the PSSCOC and the relevant clauses in the Specification.

1.3 Reinstatement of Temporary Working Areas

The Contractor shall reinstate Temporary Working Areas to the standards specified in the Contract as soon as possible after other work in those areas has been completed so as to keep the period of occupation to a minimum. If the standards of reinstatement are not so specified the Contractor shall in any event restore the areas to a tidy, workmanlike and "as found" condition and shall carry out such additional reinstatement work as may be ordered by the S.O.

1.4 Working In Existing Waterworks Roads

Where any work is to be carried out in or adjacent to existing waterworks roads the Contractor shall comply with any requirements and recommendations of the Board regarding traffic safety measures for road works.

1.5 Existing Services

The Contractor shall be responsible for the security of all water, electricity, telephone and other services, drains, pipes and other apparatus belonging to or under the control of any public authority, company or person, which may be, or be liable to be, interfered with, by or in connection with the execution of the Works. The Contractor shall fully indemnify the Board against any claim, action, expense, loss, damage or injury arising in this respect.

The Contractor shall ensure that the location of all existing electrical cables is identified using proprietary cable detection equipment by personnel qualified to carry out such work.

1.6 Trespass on Adjacent Property and Care of The Environment

In carrying out the Works due regard shall be paid to the amenities of adjacent property and to the interests of owners, tenants and occupiers. The Contractor shall take adequate steps to prevent trespass by his employees and shall be wholly responsible for making good any loss or damage caused by such trespass.

The adjacent area is owned by the National Parks Board (Nparks) and is a nature conservation area, highly valued and regarded by the people of Singapore. The Contractor shall take all necessary steps to ensure that the

activities of his employees (and those of his subcontractors) do not have any detrimental effect on the surrounding environment

1.7 Amenities to Be Preserved

The Contractor shall not cause interference with existing amenities, whether natural or man-made. No trees shall be felled except on the instructions of the S.O. and clearance of vegetation of any sort shall generally be kept to the minimum necessary for the Works and Temporary Works.

1.8 Sanitation

The Contractor shall maintain the Site and all working areas in a hygienic condition and in all matters of health and sanitation shall comply with the requirements of the Board, the S.O. and the relevant Authorities.

The Contractor shall be responsible for providing all sanitary services necessary to keep all offices and stores in a clean, neat and hygienic condition.

The Contractor shall provide all proper temporary sanitary facilities for his workmen. The sanitary facilities provided within the Waterworks shall be of the portable type. Discharges shall be disposed of outside the Waterworks in a manner to the approval of the S.O. All such arrangements shall meet all the requirements as stipulated by the relevant Authorities and the Contractor's proposals shall be submitted to and approved by the S.O.

In particular, the Contractor shall ensure that his employees (and those of his subcontractors) only use the toilet facilities provided by him as part of his site establishment. Any person found urinating or defecating elsewhere on the Site shall be removed from the Site immediately, and shall not be re-employed on the Site. Toilets shall be of the chemical type and shall be emptied regularly by vacuum tanker.

The Contractor shall also provide for the removal and legal disposal off the Site of all rubbish and solid waste from offices and other areas of the Site, with collections being made at least twice weekly.

1.9 General Hygiene and Medical Examination of Contractor's Employees

Before commencing work on the Site, the Contractor shall ensure that all his employees are instructed about the necessity for the prevention of pollution. The Contractor shall immediately dismiss and remove from the Site any of his employees or representatives who have been polluting or fouling the Site or any of the water supply installations and shall take appropriate remedial measures to

prevent a repetition of the occurrence and to disinfect the areas concerned all to the satisfaction of the S.O.

The Contractor shall not employ upon the Site, or on periodic visits thereto, persons who are known to have any disease which could be water-borne or who is suffering from an illness associated with looseness of the bowels or who are carriers of typhoid bacillus or other potential pathogenic organisms or who are otherwise unsuited on medical grounds to be employed in or around water supply installations. In particular the Contractor shall ensure that any personnel proposed to carry out work in existing operational water tanks shall be free of disease so certified by a medical doctor practising in Singapore.

The Contractor shall if and when required to do so, arrange for his employees to be examined and tested in the manner approved by the Government's Medical Officer of Health.

The Contractor shall immediately remove from the Site any such employees who as a result of such examination and testing may in the opinion of the Medical Officer or the S.O. constitute a danger to water supplies or who refuse to undergo an examination.

1.10 Works to Be Kept Clear of Water

The Contractor shall keep the Works well drained and clear of water until the S.O. certifies that the whole of the Works is substantially complete and shall ensure that so far as is practicable all work is carried out in the dry. Excavated areas, including cable trenches, shall be kept well drained and free from standing water, except where this is impracticable having regard to methods of Temporary Works properly adopted by the Contractor.

The Contractor shall construct, operate and maintain all temporary dams, cofferdams, watercourses and other works of all kinds including pumping plant that may be necessary to exclude water from the Works while construction is in progress. Such temporary works and plant shall not be removed without the approval of the S.O.

Notwithstanding any approval by the S.O. of the Contractor's arrangements for the exclusion of water, the Contractor shall be responsible for the sufficiency thereof and shall be liable for keeping the Works safe at all times particularly during any floods and for making good at his own expense any damage to the Works including any that may be attributable to floods. Any loss of production or additional costs of any kind that may result from floods shall be at the Contractor's own risk. Floods shall not be an "excepted risk" under the Conditions of Contract.

Costs incurred by the Contractor in complying with the requirements of this clause shall be deemed to be included in the Contract Rates unless item(s) have otherwise been provided in the Schedules of Prices.

1.11 Discharge of Water and Waste Products

The Contractor shall make provision for the discharge or disposal from the Works and Temporary Works of all water and waste products howsoever arising and the methods of disposal shall be to the satisfaction of the S.O. and of any Authority or person having an interest in any land or watercourse over or in which water and waste products may be so discharged. The requirements of this Clause shall not limit any of the Contractor's obligations or liabilities, under the Conditions of Contract.

1.12 Dust Hazard and Nuisance

The Contractor shall take necessary measures including the spraying of water and sweeping in order to keep down dust, which would otherwise be raised by the carrying out of the Works.

1.13 Water Supplies

All water for use in the Works shall be fresh and free from harmful impurities to the satisfaction of the S.O. The Contractor shall make adequate arrangements to deliver sufficient water to the Site for drinking, washing, sanitation and general cleaning down, in addition to any required for the construction, erection, testing, setting to work, testing for performance and guarantee at Site, commissioning and maintenance of the Works. Water supply obtained from the Board shall be metered. Charges on water consumption shall be calculated based on the Board's current non-domestic rate and shall be deducted from the Contractor's progress payment. Supplies for the Contractor's office and compound area shall be taken from a service connection to be established adjacent to the compound by the Contractor after agreement with the Board.

1.14 Road Opening for Pipe Laying Work

The Contractor shall give the S.O. or other relevant authority at least ten days' notice of his intention to open up a metalled road for pipe laying or other purposes of the contract, so that prior notification can be given to and prior approval obtained from the Land Transport Authority and the Traffic Police.

All the warning/caution signs required by Land Transport Authority shall be provided by the Contractor.

Proper standard warning/caution signs shall be placed prominently and in such a manner as not to impede or obstruct the flow of traffic. Warning lights of the

"flashing" type shall be used at night around the working area, and as and when directed by the Superintending Officer. Excavations shall be properly cordoned off to prevent accidents to pedestrians and vehicles. Provision shall be made for easy and safe passage of pedestrians and vehicles around these excavations. The Contractor shall provide men to direct traffic around the working area whenever necessary to prevent traffic congestion. The Contractor shall ensure that sufficient lanes are kept open to traffic.

At busy or major road crossings, the Contractor shall provide sufficient labour, plant and materials to complete the crossing within the shortest possible time, by working non-stop day and night, employing shift work, until the crossing is successfully completed.

Excess soil from excavation shall not be dumped in the roadway, but shall be removed immediately for disposal. The contractor shall not place materials, plant and vehicles in such a manner as to interfere with or unnecessarily restrict the flow of traffic. On completion of the work, the Contractor shall immediately remove all plants and equipment and the surplus earth and other materials from the sites, so that traffic may be returned to the original unimpeded condition.

The Contractor shall also note the provisions concerning "Watching" and "Soil Stabilisation" in the General Specifications, the provisions for "Excavation in Metalled Road" and "Backfilling and Reinstatement" in the Particular Specification PS2 – "Earthworks", and the General Specification GS4 – "Working on Public Roads".

The Contractor shall be fully responsible for the safe custody of all plant and materials supplied or hired to him by the Board for use or incorporation in the Works. He shall make good and compensate the Board for any damage, loss or injury to such plant and materials, and the Board may deduct any such assessed amount of compensation from any monies due to the Contractor. The cost for safekeeping of such materials and plant, if any, shall be allowed for by the Contractor in this tender.

1.15 Scheduling of Pipe Laying Work within Road Reserve

Trench excavation shall not proceed too far ahead of pipelaying especially in metalled road where the trench shall not advance more than one pipe length ahead of the pipelaying.

Backfilling and reinstatement works shall not be delayed unnecessarily, and shall not lag behind the pipelaying by more than 15 metres. Road reinstatement shall not lag behind the backfilled trench by more than 25 metres.

For road crossings each length of pipe must be laid, jointed or welded (for steel pipe), wrapped (for steel pipe) and backfilled before proceeding with the

excavation for the next section of pipeline for the crossing. The cycle of excavation, pipelaying, jointing or welding (for steel pipe), wrapping (for steel pipe) and backfilling for each section of pipeline must be carried out non-stop to completion, until the full crossing has been successfully completed.

For pipelaying along a busy street, excavation by machine and laying of pipes or specials by mobile crane shall not be carried out during peak traffic hours but preferably at night and during weekends. However, all work inside a pipeline such as cleaning of the pipeline shall be carried out only during daylight hours. Pipelaying shall be carried out in sections not exceeding two pipe lengths at a time. Each section shall be laid, jointed or welded (for steel pipe), wrapped (for steel pipe) and backfilled before proceeding with the next section.

1.16 Contractor To Clear Up Site

On completion of Works, the Contractor shall remove all temporary works, surplus materials, plant and equipment and shall leave the Works in a clean and tidy condition to the entire satisfaction of the S.O.

All reinstatement shall be carried out by the Contractor as part of the Contract. The Works shall not be deemed complete until the new pipeline has been tested by this Department when it shall then be "taken over" provided the test is to the complete satisfaction of the S.O.

The taking over of the Works by the S.O. shall not relieve the Contractor of his responsibility for maintenance after the date of taking over certificate for the full Period of Maintenance stipulated in the General Conditions of Contract.

1.17 Protection Against Damage

The Contractor shall take all necessary precautions to avoid causing any unwarranted damage to roads, lands, properties, trees and other features and, during the currency of the Contract, shall deal promptly with any complaints by owners or occupiers.

Where any portion of the Works is close to, across, or under any existing apparatus of utilities or services, the Contractor shall work around, under or adjacent to all services in a manner designed to avoid damage, leakage or danger, and to ensure uninterrupted operation.

Should any leakage or damage be discovered, the Contractor shall at once notify the S.O., Authority and services company concerned, and the Contractor shall afford every facility for the repair or replacement of the apparatus affected.

The Contractor shall be responsible for the preservation of all public and private properties, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private properties by or on

account of any act, omission, neglect or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor at his own expense to a condition similar or equal to that existing before the damage was done or he shall make good the damage in other manner acceptable to the S.O.

All repair works shall be done and completed within reasonable periods to the entire satisfaction of the S.O. The Contractor shall submit his proposal for the remedial works to the S.O. for approval prior to commencement of such works. In addition, the Contractor shall bear all direct and consequential damages and losses arising from the execution of the works.

The Contractor shall also note that the works would be carried out in areas close to well-established commercial and residential areas. The Contractor is responsible for restricting his workman to the site of the work. No equipment and material shall be stored at places other than those areas allocated to him by the S.O. Temporary barricading shall be erected to separate the worksite from the rest of private premises at the contractor's own expense.

The Contractor shall include in his rates for complying with all the foregoing requirements of this clause.

1.18 Nuisance Caused by The Littering of Public Highways With Earth, etc

The Contractor shall be responsible for, and shall not create any nuisance caused as a result of the public highways being littered with earth, mud, debris, etc. by the Contractor's vehicles and/or the sub-contractors' vehicles used for the purpose of this Contract. To prevent littering of the public highways by vehicles moving out of a muddy site with mud and earth stuck on the wheels, the Contractor shall provide for such facilities and labourers to wash off the said mud and earth before vehicles leave the said site and/or station sweepers at positions where indicated along the highways. Alternatively timber, planks or gravel chipping may be laid at the site so as to prevent the earth/mud adhering to the tyres of the vehicles or any other precautions as directed by the S.O.

The Contractor shall include in his tender for complying with this requirement. Should the Contractor fail to comply with this requirement, the S.O. may employ labourers and/or take whatever necessary actions to comply with the requirement and the cost incurred shall be deducted from any monies due or to become due to the Contractor.

1.19 Mosquitoes Breeding

The Contractor shall take care that at all stages of the work, the site shall be kept properly drained and that standing pools of surface water which provide breeding places for mosquitoes are not allowed to form. The Contractor shall take all

necessary steps to prevent the breeding of mosquitoes in the site handed over to him during the period of Contract.

1.20 Dumping of Unwanted Materials, etc

Contractor to find his own dumping grounds. The Contractor is required to seek his own dumping grounds at his own cost for the disposal of all unwanted materials excavated or dredged and all other construction waste materials, resulting from the site clearance, dredging, excavation and all works under this Contract.

The Contractor is prohibited from dumping unwanted building debris, excavated materials, dredged material etc, on any vacant plot of land, roadside or drains. The S.O. may employ workers, machinery and all else necessary for the removal and proper disposal of such dumping and all costs incurred thereof shall be deducted from any monies due or to be due to the Contractor.

1.21 Diesel Piling Hammers

The use of diesel piling hammers shall not be permitted unless otherwise specified.

1.22 Erosion and Silt Control Measures

The Contractor shall be responsible for preventing silt from being washed into public drains by implementing an Earth Control Measure (ECM) for the construction site to meet the requirements under the latest Sewerage and Drainage Act Cap 294. (Information on ECM requirements can be found in PUB website (<http://www.pub.gov.sg/ECM>)).

In his tender submission, the Contractor shall submit his schematic ECM plans of the construction site for the contract duration taking into account the different phases of construction activities. He shall also provide the name of the PE who will be endorsing the ECM plan after the tender is awarded. These schematic ECM plans shall make the Contractor aware of the ECM requirements and the cost to implement an effective ECM. Notwithstanding the submission of ECM plans at the tender stage, any costs related to changes deemed necessary to the ECM plan to ensure compliance with the relevant authorities requirement is deemed to be included in the Contractor's pricing for implementation and maintenance of the ECM.

Before construction works commence on site, the Contractor shall engage a Professional Engineer (PE) to plan and design the ECM, and he shall install the ECM according to the PE's design. The ECM plan and design shall be submitted 1 week after the award of the contract. During the course of the construction works, the PE shall review the ECM proposal regularly to meet the changing needs of the construction activities. The Contractor shall improve the ECM as

advised by his PE. The planning and design of the ECM shall meet the minimum requirements stipulated and in accordance to the Code of Practice on Surface Water Drainage. An item has been allowed for the Contractor to price for the engagement of a PE to design and submit the ECM proposal and to review the ECM regularly to the need of the site conditions throughout the contract period.

The Contractor shall maintain the ECM for the whole duration of the contract to ensure that it is effective at all times. Proper records detailing the maintenance works, supported by dated photographs, shall be kept by the Contractor for verification by the S.O. and the relevant authorities.

The Contractor shall not remove the ECM until all works are completed and only upon the advice of his PE. The Contractor shall submit all ECM removal plans together with his PE concurrence to the proposal, to the S.O. before any works to remove the ECMs are carried out.

The Contractor shall submit the ECM proposal duly endorsed by his PE to Director, Drainage for records. The proposed ECM shall consist of the following three parts:

I. Project Particulars

The following information shall be provided under the Project Particulars:

- (a) Project description
- (b) Name and address of site occupier;
- (c) Site area and contract period;
- (d) Location map and site plan.

II. Erosion Control Plan (described in 1.60.7)

III. Sediment Control Plan (described in 1.60.8)

During construction, the Contractor shall minimize the formation of bare surfaces under the ECM's Erosion Control Plan. The Plan shall depict graphically the activities, including sequence of work, type and duration for each phase of construction activities to include the following measures to:

- (a) Sequence and schedule of the earthworks/ demolition works in stages and progressively with the subsequent construction activities and building works.
- (b) minimise site disturbance by keeping site clearance works to a minimum by retaining as much of the existing vegetation as possible.
- (c) Pave up the bare surfaces and all construction access by concrete or milled waste or other suitable materials.
- (d) Protect the bare slopes with close-turfing, concrete grouting, canvas or erosion control blanket.
- (e) Protect the earth stockpiles with canvas or erosion control blanket.

- (f) restore ground cover over disturbed areas, which are or have become bare, as soon as possible.

The Contractor shall put in place the ECM's Sediment Control Plan, which aims to capture the sediments washed down from the construction sites. Some of these sediment control measures and facilities, which must be in place before the works start, shall include but not limited to the following:

- (a) Concrete-lined cut-off drains (minimum C7 precast channel) along the perimeter of the construction sites.
- (b) Silt fence properly installed and embedded onto the ground along the perimeter cut-off drains (between the construction site and the cut-off drain).
- (c) Sedimentation basins or any other sediment filtering or settling system of adequate size and sufficient numbers along the perimeter cut-off drain and before the discharge points into public drain.
- (d) a chemical treating system to be provided before the discharge points into public drain.

The PE shall submit full basis of design back up with design calculations to show clearly how the perimeter cut-off drains, silt fence and sedimentation basins are designed and sized as well as how such design will effectively filter off silt and allow only clean water to discharge into public drains. The discharge into the storm water drainage system shall not contain Total Suspended Solids in concentrations greater than the limit stipulated in the latest Surface Water Drainage Regulations and Code of Practice on Surface Water Drainage. The intensity of a one-in-two year storm should be adopted for the proposed design.

1.23 Pest Control at Construction

The Contractor shall implement comprehensive pest control and surveillance for the site, including all necessary measures to prevent the site from becoming favourable to the breeding or harbouring of vectors.

The Contractor shall engage an experienced and qualified pest control company approved by the Vector Control and Research Department (VCRD), Ministry of the Environment to carry out pest control and surveillance at the site for the whole contract period. The Contractor shall make all necessary submissions as set by VCRD. All submissions to and approvals received from VCRD shall be copied to the S.O.

1.24 Existing Mains and Service

Some mains and services will be encountered along the route of the pipeline. Approximate positions of the mains are indicated in the Contract Drawings. The Board accepts no responsibility for the accuracy or reliability of the information. The

Contractor is solely responsible for locating the exact positions of the mains and services and shall exercise all necessary precautions when doing so.

The Contractor shall take every precaution that in the opinion of the S.O. is necessary for the protection from injury of all existing and proposed water, drain, sewer and other pipes, electric and telephone conduits, and other existing works, roads and services wherever encountered or which are adjacent to the works, and to maintain the same until in the opinion of the S.O. the general progress of the work renders further protection unnecessary. All damage occasioned by the Contractor to these works and services shall be repaired at once at the Contractor's cost, as directed by and to the satisfaction of the S.O.

The Contractor is required to set out the whole route for the pipe laying, carry out trial holes, and other preliminary surveys within six months of the start of the contract. The resulting information are to be carefully plotted and a copy of all preliminary surveys, photos and the results of exploratory excavations must be supplied to the S.O., to facilitate the finalisation of manhole and shaft locations and enable the Board to initiate diversion of services with the relevant agencies early if necessary. If within the first six months the Contractor fails to provide all the necessary information related to services and if such delay causes a corresponding delay in the completion of the Contract, the Contractor will be liable for such delay and liquidated damages will be imposed on him. An item has been allowed in Bill No 4 for the Contractor to price for complying with the above requirements

The Contractor shall not interfere with the operation of any existing or proposed services. If in the opinion of the S.O., permanent relocation of any services is required, the Contractor shall notify the relevant authorities, Statutory Boards, Power Grid and/or appointed Licensed Electricity Supplier and other relevant companies to perform the work as expeditiously as possible. The Contractor shall fully co-operate with the S.O. and the relevant authorities, Statutory Boards, Power Grid and/or appointed Licensed Electricity Supplier and other relevant companies and shall have no claim for delay due to such relocation.

Where the pipeline route is too restricted or blocked and diversion of services are needed to facilitate the Works, the need for such diversion works by the Statutory undertakers will be judged solely by the S.O. The Contractor is required to give ample warning if diversions are required in order for the work to be estimated, ordered and carried out in advance of the pipe laying operation.

1.25 Existing Trees and Plants

Certain sections of the works will be laid in close proximity to existing trees and plants. The Contractor shall take all necessary precautions when performing work in these areas so as not to cause any damage to these trees and plants. If excavation work cannot be kept to a minimum distance of 2.0 m from the girth of a

tree, the Contractor must notify the S.O. in which the S.O. will have to seek approval from National Parks Board.

The Contractor is warned that no trees or plants may be felled, lopped or transplanted without the written permission of the S.O. Any tree so damaged shall be made good or replaced entirely at the expense of the Contractor.

Where permission to fall trees is given, the Contractor shall grub up and destroy or remove the roots, lop off and destroy the branches and dispose of the trunk as directed by the S.O.

The holes resulting from the grubbing up of the roots shall be backfilled with approved materials and consolidated in 300 mm layers.

1.26 Protection of Adjacent Grounds and Excavation

As the depths of the NEWater pipelines are generally not more than 5 metres, no soil investigation has been carried out for this contract, and therefore, no borelogs will be provided for the Contractor. However, if at certain localized stretches where the pipelines are laid deeper, it shall be the responsibility of the Contractor to satisfy himself as to the soil conditions along the route of the pipelines and if he judges it to be necessary, he shall carry out additional soil investigation at his own cost.

In general, the Contractor shall assume the soil to be of an unstable nature and the ground water table to be usually high. It shall be the responsibility of the Contractor to maintain stable soil conditions on the grounds adjacent to the excavation. Prior to carrying out any excavation work, the Contractor must design and submit to the S.O. his proposal for the protection of the excavation such as the use of steel sheet piles, soil stabilisation or other methods as necessary. The Contractor is to note that any methods, which require dewatering of the ground, will not be accepted.

1.27 Protection of Property

The Contractor shall be responsible for the preservation of all public and private properties; and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private properties by or on account of any act, omission, neglect or misconduct in the execution of the work on the part of the Contractor, such property shall be restored by the Contractor at his own expense to a condition similar or equal to that existing before the damage was done or he shall make good the damage in other manner acceptable to the S.O.

Prior to commencement of works, the Contractor shall inspect all adjacent properties for any existing cracks or damages observed.

It shall be the sole responsibility of the Contractor to record and submit to the S.O. all levels, photographs of visible damages as well as signs and indications thereof

on all those existing structures likely to be affected by the excavations, jacking or piling works. Crack measurement devices shall be provided to monitor closely the transformation of cracks during the NEWater pipeline works. All expenses incurred shall be deemed to be included in his rates and no additional payment will be made to the Contractor on any aspect to this requirement.

The Contractor shall not commence work until all necessary and desirable information on the conditions of existing structures has been collected, properly recorded and submitted to the S.O. and approval obtained to commence work.

The Contractor shall on the S.O.'s instruction repair all damages to existing properties when such faults, however minor, are detected after commencement of work.

All repair works shall be done and completed within reasonable periods to the entire satisfaction of the S.O. The Contractor shall submit his proposal for the remedial works to the S.O. for approval prior to commencement of such works. In addition, the Contractor shall bear all direct and consequential damages and losses arising from the execution of the works.

1.28 Night Work

No work shall be done between the hours of seven in the evening and seven in the following morning without the written permission of the Superintending Officer.

Should the contractor need to carry out any night-work, written permission must be sought from the S.O., at least 2 weeks beforehand. If sufficient notice is not possible due to the urgent nature of the work, permission from the S.O. is still required.

In granting the permission to the Contractor, the S.O. may impose conditions to be complied with by the Contractor. The Contractor shall comply with the conditions, which shall include the following:

The Contractor shall inform the residents in the immediate vicinity of the works of the impending night-work through letters or notices from the Department. The letters or notices shall be cleared by the S.O.

The Contractor shall assist the S.O. in the distribution or circulation of such letters/notices to the residents, including Town Councils, management committees, etc., and also carry out other public relations tasks such as putting up signboards and posters, etc. and carry out door-to-door visits if necessary.

The Contractor's supervisor must be present full-time on site during the course of the night-work and shall expeditiously handle all complaints/ feedback with regard to the night-work.

The Contractor's safety officer must be present during the night-work if his presence is deemed necessary by the S.O. or is required under existing regulations.

The Contractor is to note that the abovementioned conditions are not exhaustive and shall depend on the nature of the night-work. The Contractor is deemed to have included in his rates/prices for compliance with the above conditions and for all the other conditions that may be deemed necessary as a result of the night-work.

1.29 Temporary Water Supply and Waste Disposal

The Contractor shall provide at his work-sites modern sanitary facilities including proper bathing places on concrete floors, subject to the approval of the S.O. and clear away within one week on completion of the Contract. The Contractor shall ensure that water-borne wastes from toilets, bathing places, sinks, etc., installed at the sites are discharged into public sewers if available, otherwise, into approved temporary sewerage facilities to be provided by the Contractor. He shall ensure that such waste disposal facilities are in good condition at all times. Application showing the proposed waste disposal facilities is to be submitted to the Sewerage Department for approval before commencement of work.

On completion of the works, disconnect and seal off all temporary connections to the public sewers or remove temporary sewerage facilities and carefully reinstate all works disturbed to the satisfaction of the S.O. (The Contractor's attention is drawn to the fact that water supply to the site will be given by the Water Department of the PUB only on compliance with the above provisions).

1.30 Environmental Pollution Control

The Contractor shall comply with the Environmental Pollution Control Act (EPCA) on the control of air, water and noise pollution, and the safe management of hazardous substances, etc. The Contractor shall ensure that plants and equipment that have pollutive emissions or discharges or cause excessive noise are not used at site. As and when required to do so by the S.O., the Contractor shall maintain or repair or remove from the site immediately plants and equipment found to be causing a nuisance to the public.

1.31 Cleaning Up Periodically

All rubbish shall be cleared from the site and buildings under construction from time to time. The Contractor shall provide purpose made bulk bins at locations approved by the S.O. and shall deposit the waste and debris into these bins and shall make necessary arrangements for ultimate disposal of these wastes and debris at approved dumping grounds. The bins should be designed to carry debris of density 1.6 T/cu m and preferably be of volume 3 cu m.

1.32 Turfing

All turf disturbed or destroyed by excavation, site huts, dumps of materials, lorries and the building works, etc. shall be carefully reinstated on completion, watered, rolled etc., and maintained for a period of three (3) months until properly established and to the satisfaction of the S.O.

1.33 Cleaning Up On Completion

The Contractor shall leave every part of the Works included in this Contract in a clean, sound and perfect condition free from all flaws, cracks and settlements whatsoever on completion of works. The Contractor shall touch up all paintwork and make good at his own expense any damage to the structure, fittings or decorations resulting from his operations to the complete satisfaction of the S.O. On completion, huts, sheds, etc., shall be removed and the same area occupied by and used by the Contractor shall be left clean and perfect to the complete satisfaction of the S.O.

1.34 No Worker's Quarters Within Work Site

The Contractor shall note that no worker's quarters are allowed to be erected within the work site.

1.35 Precondition Survey

The Contractor shall engage an independent condition surveyor, approved by S.O., to carry out a precondition survey of all structures in the vicinity of the Works. The precondition survey is to record photographic evidence including description of all existing cracks, defects, etc prior to commencement of work. A precondition survey report with completed set of photographs shall be submitted to the S.O. within 1 month from the date of site possession and prior to the commencement of Works.

Every attempt shall be made to survey all premises likely to be affected by the construction work, and the Contractor shall remain responsible for any damages arising from the construction work irrespective of whether the survey was carried out damaged premises.

1.36 Perimeter Hoarding

The Contractor shall provide and maintain temporary hoarding around the construction site/site office/storage areas, strictly to the requirements of the S.O. The Contractor is to erect perimeter hoarding of either timber or durable mild steel/aluminium material. Rates have been allowed in the contract for the Contractor to price for both timber and durable mild steel/aluminium materials.

The type of hoarding to be provided shall be decided by the S.O., whose decision is final. Hoarding shall be of such design and construction suitable for the works in-progress and shall be at least 2 metres in height. They shall be close-boarded and not themselves pose an inconvenience or a danger to the public due to poor construction or maintenance. The hoarding must also not block the line of sight of traffic and other road users or pose any danger to the road users. Where the hoarding is facing sensitive developments such as residential developments, these hoarding shall be with presentable paintings, murals, etc. Details of hoarding shall be submitted to the S.O. for approval. If any part of the hoarding becomes disjointed, unsightly or is in a derelict condition, at any time during the whole duration of the work, the Contractor shall rectify the defects at his own expense. The Contractor shall remove the hoarding on completion of the works or as directed by the S.O.

1.37 Environmental Control Officer (ECO)

The Contractor shall comply with all the provisions of the Environmental Public Health (Employment of Environmental Control Officers) Order 1999, the Environmental Public Health (Qualifications of Environmental Control Officers) Notification 1999 and the Environmental Public Health (Registration of Environmental Control Officers) Regulations 1999.

The ECO shall discharge his duties set out in the Code of Practice for ECO and advise the Contractor in the following main areas:

- Control of disease-bearing vectors and rodents
- Proper management and disposal of solid waste and liquid waste
- Control of noise and dust pollution
- Drainage Control
- General Housekeeping

Full-Time ECOs are required to spend at least 40 hours a week in the construction site while Part-Time ECOs are required to spend at least 15 hours a week in the construction site exclusively on environmental health matters. Full-Time ECO shall not also be the site foreman.

1.38 Control of Noise at Construction Sites

The contractor shall ensure that the level of noise emitted from machines, generators, etc from the sites shall not exceed the maximum permissible noise levels as set out in Clause 3 (1) and the First Schedule of the Environmental Public Health (Control of Noise for Construction Sites) Regulations 1990 as the table 1 below:

Table 1

Type Of Building Affected	Max. noise level permitted for construction sites (reckoned as an equivalent continuous noise level over a period of 12 hours) in decibels (A)		Overall maximum permitted noise level for construction sites (reckoned as an equivalent continuous noise level over 5 minutes) in decibels (A)	
	7 a.m. - 7 p.m.	7 p.m. - 7 a.m.	7 a.m. - 7 p.m.	7 p.m. - 7 a.m.
Hospitals, schools, institutions of higher learning, homes for the aged sick, etc	60	50	75	55
Buildings other than the above	75	65	90	70

For the purpose of determining the maximum or overall maximum permitted noise level, the readings shall be taken:

- 50 metres from the boundary of the construction site if there is any building located within 50 metres of that boundary and;
- One metre away from the outside of the affected building if the affected building is more than 50 metres from the boundary of the construction site and there is no building located within 50 metres of that boundary.

If there are other sources of noise affecting the measurement of the level of noise emitted from a construction site, the maximum permissible noise level shown in the table above shall be adjusted and the adjusted value shall be obtained by adding the correction factor corresponding to the difference between the maximum permissible noise level and the background noise level, as set out in the table 2 below, to the higher of the two noise level. The adjusted value shall be taken as the maximum permissible noise level:

Table 2

Difference between 2 noise levels in decibels (A)	Correction Factor in decibel (A)
Below 2	3
2 to not more than 4	2
4 to not more than 10	1
10 and above	0

APPENDIX F1 Social Impact Analysis Focus Groups

F1-1. INTRODUCTION

Focus groups were used to gain an informal insight into the attitudes, opinions and situation of urban households. The focus group findings were expected to be indicative of what may be revealed through a formal household survey and were used to inform the process of designing the survey instrument.

Procedures and an agenda for the meetings were prepared in advance and translated into Chinese. The agenda provided a basic framework for the meetings but discussions were allowed to take their natural course within that framework.

F1-2. FOCUS GROUP METHOD

Groups were structured to be relatively homogenous in terms of income and gender. Four groups were used as follows: low income women, low income men, higher income women, and higher income men. These four groups were not mixed in order to minimize the risk of domination of the discussion by a few individuals representing only one perspective.

The discussion was informal but structured around a pre-arranged set of questions. These are provided below under 'Meeting agenda'.

Each group had a facilitator who guided the discussion and a recorder to document the discussion.

The facilitator introduced the questions, encouraged participants to offer their ideas and opinions, made sure the discussion does not get off topic, timed the discussion so that all questions were covered, and provided background information to explain the process and clarify questions about things such as the project impacts. The facilitator did not interfere with the frank and open discussion of participants for instance by arguing with participants, offering his or her own opinions or attitudes, or suggesting that there were right or wrong answers.

Each facilitator prepared a brief report summarizing the discussion of each focus group noting where there was agreement and disagreement.

F1-3. FOCUS GROUP MEETING AGENDA

F3-1.1. Opening remarks

Welcome. Let everyone know this is a casual meeting. Invite them to help themselves to refreshments.

Information to provide in introductory statements:

- Your names
- Who you work for – member of a project team studying the impact of the Wuhan Wastewater and Drainage Management Project
- Why is this work being done – To help design a sustainable project and secure approval for a loan from the ADB to help pay for the project
- Project description – general overall description and a more detailed description of the subprojects closest to the area, use a map
- Why has this meeting has been called – To better understand the people who will benefit from the project and to get their ideas on the project
- What do we want from people at the meeting – think about our questions and answer them frankly

F3-1.2. Questions

1. What do people know about the project
2. What do they think of wastewater or storm water management now? Are they good or poor? Have they improved or gotten worse in the last 10 years?
3. How do wastewater or storm water services affect them now: quality of life, local environment, housework, health status, expenditures, work or business activities
4. What sorts of diseases do they think can be caused by contaminated wastewater and storm water? Have family members experienced such diseases in the recent past?
5. How will wastewater or storm water service improvements affect them: quality of life, local environment, housework, health status, expenditures, work or business activities? Will women and men be affected differently?
6. How do they rank wastewater or storm water services against other government services in terms of priority for investment and improvement (gas, roads, bus services, electric power, tap water, garbage collection, education, medical services)? Where should investment money be spent first (highest priority) and where last (lowest priority)?
7. Taxes and wastewater charges will have to increase to pay for the project. Would they support a tariff increase in order to make sure that the project can be built? Discuss WHY or WHY NOT.

8. How will the increased cost affect the household? How will they likely make up for the added cost (e.g., cut back expenditures on entertainment, education, food, other utility services; reduce savings)?

F1-4. RESULTS

Focus group meetings were conducted on August 2nd and 3rd in a neighborhood of Dongxihu District, an area of the city that is close to both storm water and wastewater components. Meetings were held with 4 groups representing respectively low income men, low income women, average income men and average income women. Based on their behavior and dress, the low income groups probably represented low to average income households and not registered poverty households. The floating population was not represented in these groups.

Results of the focus groups are summarized below and detailed meeting notes are provided in the attachment:

1. Opinion regarding wastewater or storm water management now:
 - Most believe that conditions are better now. One group thought them worse due to increasing pollution.
 - Reservations were expressed about conditions that persist in older areas of the city and about government capacity to operate new facilities effectively.
2. Impact of storm water and wastewater services on households:
 - Most agreed that there are problems with odor and mosquitoes and that flooding problems persist in older areas of the city.
 - No one experiences any impact on household chores or expenditures caused by existing storm water and wastewater problems but some thought these may occur where flooding is a problem.
3. Diseases caused by contaminated wastewater and storm water:
 - Skin infections were identified as a disease caused by exposure to flood water.
 - No one is currently experiencing any water borne disease.
 - The hygiene habits of the urban population are generally good and prevent water borne disease.
4. Impacts of wastewater or storm water service improvements:
 - Anticipated impacts include elimination of odor and insect problems and increased tariffs.
5. Rank wastewater or storm water services against other government services:
 - Three groups supported the project and ranked it top or near the top, while one group, average income women, ranked it last and stressed the need for improvements in electricity and water supply services.
 - Other services ranked at the top were education, health and public transport.
6. Support a tariff increase:

- All expressed support for a modest tariff increase reflecting income and ability to pay.
7. Impact of an increased tariff:
- Three groups said the water bill is small and a tariff increase would not affect them.
 - Lower income women expressed concern about a tariff increase and said they would probably respond by reducing consumption.

ATTACHMENT – FOCUS GROUP MEETING NOTES

HOUSEHOLD FOCUS GROUP – LOWER INCOME WOMEN	
Date and time	2005 08 02, 10:00 to 12:00
Location	Changqing Garden, Dong Xi Hu District This is a redeveloped area of town started in 1999. Buildings and grounds are new in appearance and well maintained. The area is fully served with sewers and water supply.
Attendees	7 women ranging from lower to middle income. Their occupations included retired, unemployed and home care. All attendees were very involved and participated actively in discussions. No one appeared to withhold their opinion.
Staff facilitators	M. Fortin, Ms Zhang
Summary of discussion	<ol style="list-style-type: none"> 1. Facilitators introduced the project and explained the purpose of the meeting. A map of project areas was used to help explain the project. Attendees live in the Dong Xi Hu area near the Tr-Gate Drainage Connection project. 2. QUESTION: What do they think of wastewater or storm water management now? <ul style="list-style-type: none"> • Conditions have improved a lot but there are still problems • Attendees have little faith in the government ability to manage projects properly to achieve promised benefits 3. QUESTION: How do wastewater or storm water services affect them now? <ul style="list-style-type: none"> • Main problem now is odor especially: in summer, near the drains and on higher floors of apartment buildings • There are no impacts on housework or living expenditures but such impacts do occur in older areas of the city • The major concern of attendees was the quality of drinking water and the impact of wastewater on drinking water quality 4. QUESTION: Diseases do they think can be caused by contaminated wastewater and storm water? <ul style="list-style-type: none"> • Skin infections were a problem in earlier times and old areas of the City. They would occur on the feet when people had to walk through flood streets. • Sometimes people get skin infections now from swimming in natural areas. This problem is getting worse since natural waters are more polluted now. • There is good sanitation education in the schools and most people have good sanitary practices such as hand washing. 5. QUESTION: How will wastewater or storm water service improvements affect them? <ul style="list-style-type: none"> • Attendees were very concerned about higher tariffs. 6. QUESTION: How do they rank wastewater or storm water services against other government services? <ul style="list-style-type: none"> • Health and education have top priority • Of all the utility services, wastewater and storm water have higher priority than others such as roads, electricity and garbage collection 7. QUESTION: Would they support a tariff increase? <ul style="list-style-type: none"> • They would support a very modest tariff increase, say 0.1 yuan per tonne • The average household uses 20 tonnes per month and some use 30 or more, especially in summer when people may take several showers each day to stay cool • The government doesn't have programs to promote water conservation among domestic customers 8. QUESTION: How will the increased cost affect the household? <ul style="list-style-type: none"> • Will not reduce expenditures on things like education, food, health,... • Would probably try to reduce their water consumption <p>ADDITIONAL COMMENTS:</p> <ul style="list-style-type: none"> • This is the first time they have been consulted like this on a government project

HOUSEHOLD FOCUS GROUP – LOWER INCOME WOMEN**HOUSEHOLD FOCUS GROUP – AVERAGE INCOME WOMEN**

Date and time	2005 08 02, 10:00 to 11:30
Location	Changqing Garden, ... This is a redeveloped area of town started in 1999. Buildings and grounds are new in appearance and well maintained. The area is fully served with sewers and water supply.
Attendees	5 women in higher income. Most of them are housewives; one of them is working for the community club. All attendees were very involved and participated actively in discussions. No one appeared to withhold their opinion.
Staff facilitators	Qingguo Yu, Jiping Xia
Summary of discussion	<p>9. Facilitators introduced the project and explained the purpose of the meeting. A map of project areas was used to help explain the project. Before introduction, they aren't familiar with our project. And they concern the project of Tr-Gate and improvement of the Ji Chang He. Attendees live in the Dong Xi Hu area near the Tr-Gate Drainage Connection project.</p> <p>10. QUESTION: What do they think of wastewater or storm water management now?</p> <ul style="list-style-type: none"> • In the past, there are many waterlog after raining. • Conditions have been improved a lot with the strength of the wastewater and storm water project. Environment has been better than before. <p>11. QUESTION: How do wastewater or storm water services affect them now?</p> <ul style="list-style-type: none"> • At present, there are no big problems. • There are no impacts on housework or living expenditures <p>12. QUESTION: Diseases do they think can be caused by contaminated wastewater and storm water?</p> <ul style="list-style-type: none"> • They all think wastewater and storm water could cause diseases. • Skin infections, eye infections and Malaria were a problem in earlier times and old areas of the City. Many years ago, in Dongxi Hu district there were schistosomiasis. • There is good sanitation education in the schools and most people have good sanitary practices such as hand washing. So currently few people got these diseases. <p>13. QUESTION: How will wastewater or storm water service improvements affect them?</p> <ul style="list-style-type: none"> • Attendees were very concerned about Tr-Gates project. <p>14. QUESTION: How do they rank wastewater or storm water services against other government services?</p> <ul style="list-style-type: none"> • Power, Electricity and water supply have top priority • Of all the utility services, wastewater and storm water should be the last one <p>15. QUESTION: Would they support a tariff increase?</p> <ul style="list-style-type: none"> • They would support a very modest tariff increase • Most of them use 10 tons water per month, that is 15yuan per month for the tariff. So the increase of the tariff will not affect them greatly. They will not cut the expenditure of the household. • The government doesn't have programs to promote water conservation among domestic customers • They suggest that government should punish the enterprises which discharge the waste water without any treatment .e.g. Factories, hospitals, chemical plant and paper mill. <p>16. QUESTION: How will the increased cost affect the household?</p> <ul style="list-style-type: none"> • Will not reduce expenditures • Would not try to reduce their water consumption

HOUSEHOLD FOCUS GROUP – LOWER INCOME MEN	
Date and time	2005 08 03, 9:30 to 11:00
Location	Changqing Garden, ... This is a redeveloped area of town started in 1999. Buildings and grounds are new in appearance and well maintained. The area is fully served with sewers and water supply.
Attendees	5 men ranging from lower to middle income. Their were all retired. Two attendees were more involved and participated actively in discussions. The other three were less interested but talked when something of interest came up. No one appeared to withhold their opinion.
Staff facilitators	M. Fortin, Ms Zhang, Wang Xiao Yun (part of meeting)
Summary of discussion	<p>17. Facilitators introduced the project and explained the purpose of the meeting. A map of project areas was used to help explain the project. Attendees live in the Dong Xi Hu area near the Tri-Gate Drainage Connection project.</p> <p>18. QUESTION: What do they think of wastewater or storm water management now?</p> <ul style="list-style-type: none"> • Conditions are worse than before, more pollution because of the larger population • There is no proper management of drains and water bodies • The city has lost a lot of its waterways and connecting channels, so it is no longer possible to travel all over the city by boat • Remaining bodies of water have too little flow and this causes poor water quality <p>19. QUESTION: How do wastewater or storm water services affect them now?</p> <ul style="list-style-type: none"> • Main problem now is odor and mosquitoes • Odors bother people living within one km of the drains, and further if the wind is in the right direction • There are no impacts on housework or living expenditures • Flooding problems occur in older areas of the city <p>20. QUESTION: Diseases do they think can be caused by contaminated wastewater and storm water?</p> <ul style="list-style-type: none"> • Skin infections are a problem when people walk through flooded streets. <p>21. QUESTION: How will wastewater or storm water service improvements affect them?</p> <ul style="list-style-type: none"> • Eliminate problems with odor and mosquitoes <p>22. QUESTION: How do they rank wastewater or storm water services against other government services?</p> <ul style="list-style-type: none"> • Two attendees give high priority to improved public transportation but not higher than wastewater and storm water • Others give highest priority to wastewater and storm water • All respondents support the project <p>23. QUESTION: Would they support a tariff increase?</p> <ul style="list-style-type: none"> • They support tariffs based on income and ability to pay • Three attendees reported using the following amounts of water: (a) 27 tonnes per month (5 people, 80 yuan/2 months), (b) 15 tonnes per month (3 people), (c) less than 10 tonnes per month (2 people) <p>24. QUESTION: How will the increased cost affect the household?</p> <ul style="list-style-type: none"> • They believe that the water bill is small and would not change their behavior or expenditures after a tariff increase of even 0.5 yuan per tonne <p>ADDITIONAL COMMENTS:</p> <ul style="list-style-type: none"> • They are not confident that the government will manage the project efficiently, concerned about corruption

APPENDIX F2 Household Survey Questionnaire

F2-1. INTRODUCTION

A household survey is planned in accordance with the PPTA terms of reference. The survey will be used to develop socioeconomic and poverty profiles for the project areas, characterize the social impact of the project and determine willingness to pay of beneficiaries. The survey will have a sample of 500 households.

F2-2. SURVEY QUESTIONNAIRE

A draft questionnaire was provided in the inception report for review and comment by the ADB. Comments made in response to this draft indicated the need for a major redrafting of the instrument. There were general concerns with structural flow and logic, excessive length, and lack of focus. Specific concerns included the following:

- Need for a pre-test of the instrument and quality control during field implementation.
- Need for additional questions regarding length of residence, property value, current payments for wastewater, willingness to pay a higher wastewater tariff, household water use, and the severity, cause and consequence of flooding by storm water.
- Concerns were raised regarding the structure of questions about wastewater services and household income.

A new survey instrument was prepared based on the Project and the community profile. The new instrument drew on material in the first draft and survey instruments from other studies as well as comments from ADB reviewers. Basic principles applied to the task of survey design included:

- Grouping of questions by topic, with more sensitive questions about household characteristics kept till the end of the survey.
- Use of simple direct questions and separation of multiple part questions into distinct questions.
- Avoidance of open-ended questions by means of pre-specified responses (usually with a provision for additional responses under a category called 'other').

The new draft was circulated to PPTA team members and ADB staff for review. ADB reviewers were generally favorable. A discussion of the need for

willingness-to-pay questions was resolved by including questions that fulfilled the needs of social impact assessment and the financial analysis.

A request was made by ADB staff to include questions that would allow an assessment of household preferences for public investment options. Two questions were accordingly prepared using ranking and rating formats across a range of public services.

The revised questionnaire was translated and pre-tested on Thursday August 11 using an encounter approach in the urban area of Wuhan. The pre-test was undertaken by the survey crew team leaders and Mr. Yu Chingquo, the national social impact specialist. Two interviews were completed. Editorial changes were made as a result of the pre-test but no major design issues arose.

The final English version of the household questionnaire is provided in the Attachment.

F2-3. SURVEY SAMPLE

A household was defined as a group of people who share the same food and living budget. Therefore a household may include immediate family members plus relatives and other unrelated people who live with them, and share all living expenses with them.

The sample consisted of 500 households selected using a block randomised sampling protocol. Survey respondents were selected randomly within pre-selected neighbourhoods. The pre-selection of neighbourhoods targeted specific groups as follows:

TARGET GROUP	% OF SAMPLE	APPROACH
Beneficiaries of storm water and wastewater projects	Based on populations in each group	Allocated based on mapping and populations of project sewer sheds
Direct beneficiaries living within project sewer sheds	100%	Allocate 100% in project sewer sheds
Low income households	20%	Allocate 30% to low income neighborhoods

Pre-selection of neighborhoods was based on neighbor characteristics as understood by local project staff and as seen in the attributes of the urban landscape in each.

F2-4. SURVEY IMPLEMENTATION METHODOLOGY

Following were key features of the field methods used in the household survey:

- Sample size of 500.

- Block randomized sampling protocol with 20% of the sample allocated to poor households.
- The sample allocated across project impact areas based on populations within each area.
- Respondents were household heads, targeted so that about 50% were male and 50% female.
- Sampling approach relying on pre-selection of neighborhoods in the project impact areas based on characteristics of the neighborhoods. Prospective respondents will be selected by a sampler who will visit randomly selected homes within the neighborhood to request cooperation. An interview will be scheduled with volunteers.
- Trained interviewers briefly described the project with the help of maps and proceeded through the questionnaire.
- A small gift will be given to volunteers at the end of the interview.

F2-4.1. Training

Two interviewer team leaders were trained on August 10 prior to the pre-test. They reviewed the project, the survey instrument and the field manual at this time.

Preliminary training of 15 interviewers began on August 12. Training was undertaken by PPTA staff and advisors from the Wuhan Statistical Bureau. At this time, the interviewers were introduced to the project, the survey instrument and the field manual by PPTA staff. The advisors from the Wuhan Statistical Bureau then proceeded to provide a more in depth review of the survey instrument discussing field methods for asking questions and related matters.

Training continued during the week of August 15 and involved guided practice in asking the questions. Samplers were also be trained at this time.

F2-4.2. Schedule

The survey was undertaken in late August by a local design institute under the guidance of advisors from the Wuhan Statistical Bureau. Team leaders assumed a primary role in quality control.

F2-4.3. Selection of Respondents

Households were randomly selected in pre-selected neighborhoods by a sampler. Using a randomized protocol, the sampler selected households (or buildings and apartments within those buildings) as prospective interviewees. Selected residents were asked in person to participate in the interview. If a favorable response was given, an interview time was set.

F2-4.4. Questionnaire Numbering

Questionnaires are numbered using 7 digit codes as follows:

Digit order	Refers to:
1 – 2	Sub-Project number: 01 - Dong Xi Hu tri-gate connection & Chang Qing pump station 02 - Dong Xi Hu collectors 03 - Caidian WWTP and collectors 04 - Nantiazi Lake WWTP expansion and collectors 05 - Yangsigang pump station and SW culvert 06 - Huangpu Road WWTP upgrade 07 - Erlangmiao WWTP upgrade and expansion 08 - Erlangmiao WWTP and Luoja Road drainage network
3 – 4	Interviewer number, 01 to 99
5 - 7	Serial number of questionnaire, 001 to 999.

F2-4.5. Questionnaire Mapping

The supervisor marked the location of neighborhood where interviewing took place on a City map and recorded the questionnaire numbers that are completed in that neighbourhood and the date of the survey work.

F2-4.6. Preparation for Interviews

Each interviewer received:

1. An interviewer number.
2. An official letter identifying them by name and authorizing them to do the work.
3. A set of cards to show the respondent as per the instructions given on the questionnaire.

At the beginning of each work day, each interviewer received:

1. An interview schedule with names and addresses.
2. A bundle of questionnaires.
3. A clip board and ballpoint pens to fill in the questionnaire.

Each interviewer copied the questionnaire number and the address on to the front page, the 'passport', of the questionnaire and the questionnaire number on every page of the questionnaire.

F2-4.7. Filling the Questionnaire Forms

All questionnaires are completed in black ballpoint pen. Supervisors used blue ball point pen to make notes or corrections to avoid confusion for data coding staff when they look at data alterations.

The supervisor filled in items 1 to 6 and 10 on the passport page before giving questionnaire forms to interviewers. The supervisor filled in item 11 after the quality control check is done. The interviewer filled in items 7, 8, and 9 on the passport page before returning the completed form to the supervisor.

F2-4.8. Confidentiality

Respondents were assured that the survey was confidential when they were first contacted.

In order to maintain confidentiality of the respondents the Questionnaire passport with address and name of respondent was permanently detached from the questionnaire after data entry. After the data analysis was completed the passport pages were destroyed by the PPTA team.

F2-4.9. Conducting the Interview

The survey was conducted at the respondent's house. The interviewer asked to interview the head of household or the spouse of the head of household. If the head of household was elderly and unable to answer clearly another adult household member was interviewed.

Response cards were used:

- To encourage respondent to answer very personal questions e.g. income. The respondent can read out an index number instead of saying the actual amount of money that they earn
- To help respondent to remember what type of response is required
- To avoid interviewer bias. The interviewer's tone of voice can affect which response a respondent may use. Whereas if the respondent reads from a card, they are not affected by this,

The interview form is the original record of what each respondent said to the interviewer. Only responses provided by the respondent were marked down on the interview form.

A blank field means that the question was not asked. A field marked '99' means that the question was asked but the respondent refused to answer or answered 'don't know'.

F2-4.10. Notes on Individual Questions

The following notes were provided to the interviewers to help guide them in their work:

QUESTION	COMMENT / INSTRUCTION
INTRODUCTION	

QUESTION	COMMENT / INSTRUCTION
1. Are you knowledgeable about the Wuhan municipal government master plan to improve wastewater and storm water drainage? 2. Are you knowledgeable about the Wuhan Wastewater and Storm water Management Project, which is part of the master plan?	The answer to these questions will help us understand the respondent's answers to subsequent questions. It also provides the respondent a chance to ask for more information.
A. WASTEWATER SERVICE	
A1. Where does most of your wastewater go?	Circle only one response. If two answers are given, ask where the toilet wastewater goes.
A2. I will read you a list of possible problems with wastewater disposal and I want you to tell me for each one whether it is a major or minor problem or not a problem at all for you.	Disposal includes the method of removal away from the house and the treatment, if any, before discharge into a river or lake. Read each response and wait for the answer before proceeding. Circle #3 in row 6 if there are no other problems.
A3. We want to know if wastewater problems affect your household expenditures and chores.	Read each question and record response. Fill in zero for 'no increase'.
A4. Who in the family is mainly responsible for the extra cleaning and other chores caused by problems with wastewater?	If necessary, clarify that we want to know the person who does most of the work. This question is used to evaluate gender impacts.
A5. Please tell me how satisfied or unsatisfied you are overall with the management of wastewater here in your neighbourhood and for the whole city.	Be sure to distinguish between the immediate neighbourhood and the whole city. The whole city is important when they are out shopping or working or maybe in a city park by the water. Get a response for each.
A6. How does your household pay for wastewater disposal?	If they don't know, ask to see a recent water and wastewater bill to determine the answer.
A7. How much does your household pay each month for wastewater?	Make sure that the amount given is for wastewater only and not the total water and wastewater bill. If necessary ask to see a recent bill. Skip this question (leave blank) if A6 response is #5, 'don't pay'.
A8. VERSION 1: The wastewater tariff in this area of the city is 0.8 yuan per tonne. ... VERSION 2: Currently, there is no wastewater tariff in this part of the Wuhan. ...	There are 2 versions of this question. Use the 2 nd version in the suburban areas where there is no wastewater charge (Chong Qing pump station, Caidian WWTP and collectors). If the respondent is uncertain, stress that the choice is between having the improvements and paying more, or not having the improvements. Be careful to follow the routing commands in for question A8. If the 1 st answer or the answer to A8b is yes, then go to Section B.

QUESTION	COMMENT / INSTRUCTION
A8a VERSION 1: Tell me why you will not support a tariff increase to pay for the project. VERSION 2: Tell me why you will not support a new tariff to pay for the project.	See comment for A9 on the 2 versions of this question. Do not read the statements. Just let respondents answer with their own words and interpret these words in terms of the statements or write in another statement in the last row.
A8b. Would you support the higher tariff if it was introduced gradually over 5 years?	Be careful to follow the routing commands in for question A8. If the answer to A8b is yes, then go to Section B.
A8c. If 1.5 is too high, then what wastewater tariff would you support at a public hearing meeting?	Show the respondent card 1 for this question and circle one response. There are 2 nd versions of the card for this question. Use the 2 nd version in the suburban areas where there is no wastewater charge (Chong Qing pump station, Caidian WWTP and collectors). The lowest amount in the urban area is the tariff the respondent is already paying. If the respondent will only pay a tariff less than this, explain that they are already paying the lowest on the card.
B. WATER SUPPLY	
B1. Please identify your main water source.	Only fill in one row for the main source. Sources 4 and 5 are not metered at the house. If the family has tap water and buys bottled water for drinking, the main source is tap water.
B2. How does your household pay for water from the source you identified?	Circle only one.
B3. How much does your household pay each month for this water?	Skip this question (leave blank) if B2 response is #6. , 'don't pay'.
C. STORM WATER DRAINAGE	
C1. How is rain water drained away from your neighbourhood?	Circle 1 or 2 for each row. Do not leave a row unmarked when that method is not used. You may have to explain the difference between wastewater and storm water again.
C2. I will read you a list of possible problems with storm water drainage and I want you to tell me for each one whether it is a major or minor problem or not a problem at all.	Read each response and wait for the answer before proceeding. Circle #3 in row 7 if there are no other problems.
C3. How frequently do you experience flooding to each of the following levels?	Use card 2 showing the frequency categories to help the respondent.

QUESTION	COMMENT / INSTRUCTION
C4. We want to know how storm water affects your household and costs you in damages and repairs. I will read several examples of flood damage. Please indicate for each, how often you experience that kind of damage and how much it costs you in direct expenditures and lost work time.	Skip C4 if all responses to C3 are '7-NEVER'. This is a complex question so do not rush the respondent. Use card 2 showing the frequency categories to help the respondent.
C5. Who in the family is mainly responsible for cleaning and repairs after a flood?	If necessary, clarify that we want to know the person who does most of the work. This question is used to evaluate gender impacts.
C6. How satisfied you are with the storm water control in your neighbourhood and for the whole city:	Be sure to distinguish between the immediate neighbourhood and the whole city. The whole city is important when they are out shopping or working or maybe visiting friends. Get a response for each.
C7. The storm water operations are paid for out of government tax revenues. ...	If they ask about the taxes, say that they are the value added tax and other taxes charged by the city. Stress that the choice is between paying more to get the benefits and not getting the project.
a. If 5 yuan is too much, what extra tax would you be willing to pay for the storm water improvements?	Show the respondent the card 3 for this question and circle one response. Stress that the amount we are asking about is an increase in the taxes, not the total amount.
D. HEALTH	
D1. I am going to name some diseases that can be caused by polluted water and poor sanitation. For each one, please tell me how many members of your household were sick over the year from the disease, the number of days of sickness, days in the hospital and total medical costs.	This is a complex question—don't go too fast and make sure the respondent understands. Gastroenteritis and Enteritis are grouped together because symptoms are similar the respondent may not distinguish between them. One is caused by bacteria and the other by a virus.
D2. How many days of work were lost by family members due to these illnesses last year?	If the respondent says 99, write in 100.
D3. How many days of school were lost by family members due to these illnesses last year?	If the respondent says 99, write in 100.
D4. Who in the family is mainly responsible for taking care of sick persons?	If necessary, clarify that we want to know the person who does most of the caring. This question is used to evaluate gender impacts.

QUESTION	COMMENT / INSTRUCTION
<p>D5. Over the last year did you get medical help during an illness of any of your household members, or did you treat them yourself without consulting anyone?</p> <p>a. Why did not you consult anyone?</p> <p>b. Who did you consult?</p>	<p>This is for any illness and is not restricted to water borne or water washed disease. It is used to help evaluate impacts by income level</p>
E. GENERAL ATTITUDES	
E1. Using the rating: "great concern", "medium concern", "low concern", and "no concern", how do you rate the following environmental issues in Wuhan?	<p>Explain that their response should reflect their own priorities for improving the city and should reflect their needs. There is no right answer.</p>
E2. Using the rating: "high need", "medium need", "low need", and "no need", how do you rate the need for government investments to improve in the following public services in Wuhan?	<p>This does not require that the different services be ranked 1st, 2nd, 3rd and so on. For example, more than one service can be rated 'high need' or 'no need'.</p>
E3. Comparing these different government services, where do storm water and wastewater rank in priority in your opinion?	<p>Stress that this question does require the respondent to rank the project based on a comparison of the different services.</p>
E4. We want to know what your frank opinion about wastewater and storm water services in general and about the government. I will read a number of statements and I want you to indicate how strongly you agree or disagree with each one.	<p>Explain that their response should reflect their own opinions and will be confidential. There is no correct answer.</p>
F. HOUSEHOLD INFORMATION	
<p>F1. Please provide information on your house (apartment).</p> <p>a. How much do you pay for rent and property fees each month</p>	<p>The ground floor is the 1st floor and is the floor you are on if you come in the front door. Rented room or rooms means that the respondent lives in only part of an apartment or house.</p> <p>The floor level where the apartment is located.</p> <p>The property fees are paid by apartment owners for maintenance of building and grounds.</p>
F2. How long have you lived in this house (apartment)?	<p>Circle one response.</p>
<p>F3. What is the market value of your house (apartment)?</p> <p>a. What do you think the value will be if local wastewater and storm water conditions improve?</p>	<p>Ask for their closest estimate (or guess) of the current market value, not what they bought it for originally unless it was purchased recently.</p>

QUESTION	COMMENT / INSTRUCTION
F4. Please provide information for each member of the household—including people who are considered family members but live away for work or school. Please begin with yourself.	The first row refers to the male or female head of household, or (when head of household is absent) then the adult person that you interviewed. Note that code 3 in the last column refers to someone who is part of the household (usually a spouse or a child) who is away from home on a seasonal or annual basis for school or work.
F5. How many people in your household are invalids due to their work or for other reasons (e.g. stroke, chronic illness, born with disability)?	This includes a chronic mental illness such as depression.
F6. Total monthly household income? Include salaries, pensions, scholarships, allowances, remittances from relatives, government subsidies and all other sources.	Ask respondent to estimate the monthly amount. If there is no expenditure for an item, enter 0, do not leave blank.
F7. Indicate the number of each of these items in useable condition in your home?	Where the item is not found in the home, enter 0, do not leave blank.
F8. Please say how much your household spends each month in total for each of the following items?	If the respondent is having trouble, ask for total expenditure first, then go on to each category of expenditure. When these estimates are finished, add them up and then go back to adjust the total on the first line. Where the expenditure item is not applicable enter 0, do not leave blank.
F9. Does the local government provide your family with a minimum livelihood income subsidy?	Circle one response.

F2-5. CODING OF QUESTIONNAIRE DATA

Data coding was done in excel using a data entry form. This program has a front page for data entry that provides a space for each data item including the questionnaire number. The second page of the data entry spreadsheet contains the entered data. The third sheet provides documentation of the data entry spreadsheet.

All data entry operations are automated and there are built in checks to prevent certain types of data entry error.

The excel spreadsheet was designed so that individual data items are arranged sequentially in columns and each row represents one completed survey form. Row identifiers are the questionnaire numbers. Column identifiers are the data field codes that are entered in italics after each data item in the survey form.

F2-6. QUALITY CONTROL

Quality control checking of questionnaires of all interviewers was completed by the supervisor. The following items were checked:

- The questionnaire number was on the front page of the questionnaire and was copied accurately onto every page of the same questionnaire.
- The questionnaire was complete. No sections, pages or individual questions that should have been asked were missed.
- Individual questions were properly filled in.
- Directions regarding the sequence of questions were followed

The checked questionnaire was filed by subproject and in numerical sequence in appropriate boxes in preparation for data coding.

A further check of completed questionnaires was completed by the international SIA consultant in October. Systematic problems with coding were detected at this time and corrected by reference to the original survey forms. A final check of entered data was made following this. All data items in a 5% sample of coded surveys were checked against data in the original survey forms. The coding error rate was determined to be 0.2% and did not exceed 0.7% for any single question. This was deemed to be acceptable.

F2-7. SUMMARY OF SURVEY RESULTS

Summary statistics are provided for the total data set below. To understand the following data tables, please refer to the questionnaire form in the attachment. The questionnaire form can be used to understand questions and data formats. Data counts are only provided for categorical data.

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
KNOW MP1	456	2.23	2.21	2	2	3	1	0.51
KNOW PRJ2	456	2.36	2.35	2	2	3	1	0.51
A1. WW go	456	1.90	1.75	1	1	6	1	1.38
A2.1 drain	456	1.70	1.70	2	1	3	1	0.72
A2.2 road	456	1.61	1.63	1	1	3	1	0.71
A2.3 pollute	456	1.61	1.58	1	1	3	1	0.68
A2.4 smell	456	1.57	1.58	1	1	3	1	0.69
A2.5 vermin	456	1.48	1.44	1	1	3	1	0.61
A2.6 other	454	2.85	2.81	3	3	3	1	0.44
A4. ww resp	388	2.24	1.85	2	2	4	1	0.84
A5.1 satis niegh	456	2.71	2.70	2	2	5	1	0.96
A5.2 satis city	456	2.97	3.01	3	2	5	1	0.90
A6.1 WS bill	456	1.14	1.17	1	1	2	1	0.35
A6.2 WW bill	456	1.99	1.99	2	2	2	1	0.09
A6.3 pay slip	456	1.95	1.94	2	2	2	1	0.21
A6.4 private	456	2.00	2.00	2	2	2	1	0.05
A6.5 other	456	1.99	1.99	2	2	2	1	0.08
A6.6 don't pay	456	1.91	1.90	2	2	2	1	0.28
A7. payment	451	9.09	9.89	8	8	60	0	7.87
A8. WTP 1.5	456	1.41	1.36	1	1	2	1	0.49
A8a.1 afford	189	1.57	0.59	2	2	2	1	0.50
A8a.2 trust	188	1.79	0.64	2	2	2	1	0.41
A8a.3 priorities	187	1.63	0.56	2	2	2	1	0.49
A8a.4 other service	187	1.87	0.66	2	2	2	1	0.34
A8a.5 not needed	187	1.89	0.66	2	2	2	1	0.32
A8a.6 other	187	1.84	0.64	2	2	2	1	0.37
A8b. WTP gradual	187	1.56	0.54	2	2	2	0	0.51
A8c. WTP less	107	3.35	0.76	3	3	99	1	9.41

	No ob.	Counts							
		1	2	3	4	5	6	7	D/A
KNOW MP1	456	19	311	126					0
KNOW PRJ2	456	8	278	170					0
A1. WW go	456	308	3	53	67	23	2	0	0
A2.1 drain	456	207	178	71					0
A2.2 road	456	237	159	60					0
A2.3 pollute	456	232	172	52					0
A2.4 smell	456	246	158	52					0
A2.5 vermin	456	265	163	28					0
A2.6 other	454	14	42	398					0
A4. ww resp	388	80	159	126	23				0
A5.1 satis niegh	456	9	258	52	128	9			0
A5.2 satis city	456	2	178	113	157	6			0

	No ob.	Counts							
		1	2	3	4	5	6	7	D/A
A6.1 WS bill	456	391	65						0
A6.2 WW bill	456	4	452						0
A6.3 pay slip	456	21	435						0
A6.4 private	456	1	455						0
A6.5 other	456	3	453						0
A6.6 don't pay	456	39	417						0
A7. payment	451								0
A8. WTP 1.5	456	267	189						0
A8a.1 afford	189	82	107						0
A8a.2 trust	188	39	149						0
A8a.3 priorities	187	70	117						0
A8a.4 other service	187	25	162						0
A8a.5 not needed	187	21	166						0
A8a.6 other	187	30	157						0
A8b. WTP gradual	187	80	107						0
A8c. WTP less	107	34	8	53	5	6	0		1

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
B1 WS source	456	1.05	1.05	1	1	3	1	0.26
B1a metered	456	1.07	1.04	1	1	2	1	0.26
B1b cu m	432	15.01	15.42	12	10	90	3	9.20
B2. how pay	456	1.18	1.19	1	1	4	1	0.62
B3. payment	456	21.39	23.11	18	15	135	2.8	13.99

	No ob.	Counts							
		1	2	3	4	5	6	7	D/A
B1 WS source	456	435	17	4	0	0			
B1a metered	456	424	32	0	0	0			
B1b cu m	432								
B2. how pay	456	415	9	21	11	0	0	0	0
B3. payment	456								

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
C1.1 SW overland	456	1.66	1.71	2	2	2	1	0.47
C1.2 SW drains	456	1.73	1.72	2	2	2	1	0.44
C1.3 SW channel	456	1.96	1.96	2	2	2	1	0.19
C1.4 SW sewers	456	1.47	1.41	1	1	2	1	0.50
C1.5 SW other	456	1.99	1.99	2	2	2	1	0.08
C2.1 puddles	456	1.79	1.77	2	1	3	1	0.76
C2.2 flood	456	2.24	2.27	2	3	3	1	0.76
C2.3 garbage	456	1.68	1.68	2	1	3	1	0.73
C2.4 smell	456	1.53	1.51	1	1	3	1	0.69
C2.5 vermin	456	1.45	1.41	1	1	3	1	0.58
C2.6 pollute	456	1.79	1.79	2	2	3	1	0.69

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
C2.7 other	456	1.98	1.95	2	2	3	1	0.66
C3.1. roads	456	5.19	5.13	7	7	7	1	2.42
C3.2. gr floor	456	6.78	6.75	7	7	7	1	0.74
C3.3. higher	456	7.00	7.00	7	7	7	7	0.00

	No ob.	Counts							
		1	2	3	4	5	6	7	D/A
C1.1 SW overland	456	155	301						0
C1.2 SW drains	456	122	334						0
C1.3 SW channel	456	18	438						0
C1.4 SW sewers	456	243	213						0
C1.5 SW other	456	3	453						0
C2.1 puddles	456	191	171	94					0
C2.2 flood	456	90	167	199					0
C2.3 garbage	456	218	168	70					0
C2.4 smell	456	265	140	51					0
C2.5 vermin	456	272	163	21					0
C2.6 pollute	456	168	218	70					0
C2.7 other	456	105	257	94					0
C3.1. roads	456	67	46	23	11	29	11	269	0
C3.2. gr floor	456	1	3	1	4	21	23	403	0
C3.3. higher	456	0	0	0	0	0	0	456	0

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
C4.1.1 clean outside-freq	150	5.23	1.81	7	7	7	1	2.50
C4.2.1 clean clothes-freq	150	5.31	1.82	7	7	7	1	2.64
C4.3.1 clean house-freq	150	5.57	1.91	7	7	7	1	2.41
C4.4.1 spoil food-freq	150	6.65	2.25	7	7	7	2	1.12
C4.4.1 spoil clothes-freq	150	6.63	2.22	7	7	7	1	1.14
C4.6.1 minor repairs-freq	150	6.55	2.20	7	7	7	2	1.08
C4.7.1 major repairs-freq	150	6.93	2.33	7	7	7	2	0.46
C4.8.1 leave house-freq	150	6.98	2.34	7	7	7	5	0.18
C4.9.1 travel-freq	150	3.90	1.27	3	7	7	1	2.63
C4.10.1 work-freq	150	6.01	2.05	7	7	7	1	1.95
C4.11.1 other-freq	150	6.91	2.31	7	7	7	2	0.52
C4.1.2 clean outside-time	150	0.59	0.19	0	0	13	0	1.72
C4.2.2 clean clothes-time	150	0.20	0.05	0	0	10	0	1.04
C4.3.2 clean house-time	150	0.15	0.04	0	0	10	0	0.93
C4.4.2 spoil food-time	150	0.06	0.01	0	0	7	0	0.59
C4.4.2 spoil clothes-time	150	0.06	0.01	0	0	7	0	0.59
C4.6.2 minor repairs-time	150	0.13	0.03	0	0	7	0	0.77
C4.7.2 major repairs-time	150	0.05	0.01	0	0	7	0	0.57
C4.8.2 leave house-time	150	0.05	0.01	0	0	7	0	0.57
C4.9.2 travel-time	150	0.57	0.18	0	0	14	0	1.91
C4.10.2 work-time	150	0.41	0.12	0	0	10	0	1.52
C4.11.2 other-time	150	0.14	0.07	0	0	14	0	1.21
C4.1.3 clean outside-cost	150	27.31	5.03	0	0	1000	0	146.70
C4.2.3 clean clothes-cost	150	1.33	0.36	0	0	100	0	9.29
C4.3.3 clean house-cost	150	0.30	0.05	0	0	20	0	2.03

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
C4.4.3 spoil food-cost	150	0.67	0.09	0	0	100	0	8.16
C4.4.3 spoil clothes-cost	150	7.33	3.39	0	0	1000	0	82.00
C4.6.3 minor repairs-cost	150	4.20	1.40	0	0	200	0	21.81
C4.7.3 major repairs-cost	150	1.67	0.59	0	0	150	0	14.67
C4.8.3 leave house-cost	150	0.00	0.00	0	0	0	0	0.00
C4.9.3 travel-cost	150	1.44	0.41	0	0	100	0	9.35
C4.10.3 work-cost	150	2.67	0.84	0	0	200	0	19.89
C4.11.3 other-cost	150	18.33	8.01	0	0	2000	0	167.93

	No ob.	Counts							
		1	2	3	4	5	6	7	D/A
C4.1.1 clean outside-freq	150	29	11	0	5	9	4	92	0
C4.2.1 clean clothes-freq	150	36	6	1	0	1	1	105	0
C4.3.1 clean house-freq	150	20	17	1	1	1	1	109	0
C4.4.1 spoil food-freq	150	0	5	3	1	6	1	134	0
C4.4.1 spoil clothes-freq	150	2	2	3	2	6	4	131	0
C4.6.1 minor repairs-freq	150	0	3	2	7	6	11	121	0
C4.7.1 major repairs-freq	150	0	1	0	0	1	4	144	0
C4.8.1 leave house-freq	150	0	0	0	0	1	1	148	0
C4.9.1 travel-freq	150	44	28	8	3	8	4	55	0
C4.10.1 work-freq	150	9	11	5	0	6	7	112	0
C4.11.1 other-freq	150	0	1	0	0	4	0	145	0

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
C5. 1 resp-clean	199	2.77	1.18	3	3	4	1	1.00
C5. 2 resp-repair	178	2.98	1.19	4	4	4	1	1.24
C6.1 satis neigh	456	2.73	2.71	2	2	5	1	0.92
C6.2 satis city	456	2.87	2.87	3	2	5	1	0.87
C7. WTP 5	456	1.39	1.31	1	1	2	1	0.49
C7a WTP less	177	2.49	0.74	2	2	6	0	1.37
C7a WTP amount	450	3.55	3.81	5	5	5	0.5	1.87

	No ob.	Counts						
		1	2	3	4	5	6	>6
C5. 1 resp-clean	199	34	25	92	48	0	0	0
C5. 2 resp-repair	178	41	16	27	94	0	0	0
C6.1 satis neigh	456	7	243	79	121	6	0	0
C6.2 satis city	456	3	193	122	135	3	0	0
C7. WTP 5	456	276	180	0	0	0	0	0
C7a WTP less	177	43	69	17	35	3	9	0
C7a WTP amount	450	110	52	12	0	276	0	0

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
D1.1.1 Shisto.-no.	455	0.00	0.00	0	0	1	0	0.05
D1.2.1 Malaria-no.	455	0.02	0.01	0	0	5	0	0.26
D1.3.1 Diarrhea-no.	455	0.09	0.07	0	0	6	0	0.47
D1.4.1 Influenza-no.	455	0.49	0.49	0	0	5	0	0.96
D1.5.1 infections flood-no.	455	0.03	0.03	0	0	3	0	0.23
D1.6.1 infections swim-no.	455	0.04	0.02	0	0	3	0	0.25
D1.7.1 Dysentery-no.	455	0.03	0.03	0	0	2	0	0.18
D1.8.1 Cholera-no.	455	0.00	0.00	0	0	0	0	0.00
D1.9.1 Hep A-no.	455	0.01	0.01	0	0	1	0	0.08
D1.10.1 Typhoid-no.	455	0.00	0.00	0	0	1	0	0.05
D1.10.1 other-no.	455	0.05	0.05	0	0	2	0	0.29

	No ob.	Counts									
		0	1	2	3	4	5	6	7	>7	D/A
D1.1.1 Shisto.-no.	455	454	1	0	0	0	0	0	0	0	0
D1.2.1 Malaria-no.	455	451	2	1	0	0	1	0	0	0	0
D1.3.1 Diarrhea-no.	455	433	11	7	3	0	0	1	0	0	0
D1.4.1 Influenza-no.	455	338	45	43	25	1	3	0	0	0	0
D1.5.1 infections flood-no.	455	445	7	2	1	0	0	0	0	0	0
D1.6.1 infections swim-no.	455	443	8	3	1	0	0	0	0	0	0
D1.7.1 Dysentery-no.	455	443	11	1	0	0	0	0	0	0	0
D1.8.1 Cholera-no.	455	455	0	0	0	0	0	0	0	0	0
D1.9.1 Hep A-no.	455	452	3	0	0	0	0	0	0	0	0
D1.10.1 Typhoid-no.	455	454	1	0	0	0	0	0	0	0	0
D1.10.1 other-no.	455	441	6	8	0	0	0	0	0	0	0

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
D1.1.2 Shisto.-days	455	0.00	0.00	0	0	0	0	0.00
D1.2.2 Malaria-days	455	0.04	0.02	0	0	10	0	0.60
D1.3.2 Diarrhea-days	455	0.65	0.65	0	0	45	0	3.82
D1.4.2 Influenza-days	455	2.28	2.25	0	0	35	0	5.09
D1.5.2 infections flood-days	455	0.54	0.66	0	0	150	0	7.23
D1.6.2 infections swim-days	455	0.28	0.20	0	0	20	0	1.93
D1.7.2 Dysentery-days	455	0.10	0.10	0	0	14	0	0.84
D1.8.2 Cholera-days	455	0.00	0.00	0	0	0	0	0.00
D1.9.2 Hep A-days	455	0.93	1.36	0	0	365	0	17.25
D1.10.2 Typhoid-days	455	0.01	0.01	0	0	3	0	0.14
D1.10.2 other-days	455	3.39	3.58	0	0	180	0	23.27

	No ob.	Counts									
		0	1	2	3	4	5	6	7	>7	D/A
D1.1.2 Shisto.-days	455	455	0	0	0	0	0	0	0	0	0
D1.2.2 Malaria-days	455	453	0	0	0	0	0	0	0	2	0
D1.3.2 Diarrhea-days	455	433	1	0	1	1	0	1	4	10	7
D1.4.2 Influenza-days	455	339	0	2	15	6	11	4	38	27	17
D1.5.2 infections flood-days	455	444	0	0	2	2	1	0	1	2	3
D1.6.2 infections swim-days	455	444	0	0	0	1	0	0	3	6	5
D1.7.2 Dysentery-days	455	442	4	3	1	2	1	0	1	1	0

D1.8.2 Cholera-days	455	455	0	0	0	0	0	0	0	0	0
D1.9.2 Hep A-days	455	452	0	0	0	0	0	0	0	1	2
D1.10.2 Typhoid-days	455	454	0	0	1	0	0	0	0	0	0
D1.10.2 other-days	455	441	0	1	1	1	1	0	0	0	3

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
D1.1.3 Shisto.-hosp.	455	0.00	0.00	0	0	0	0	0.00
D1.2.3 Malaria-hosp.	455	0.00	0.00	0	0	0	0	0.00
D1.3.3 Diarrhea-hosp.	455	0.03	0.02	0	0	15	0	0.70
D1.4.3 Influenza-hosp.	455	0.00	0.00	0	0	2	0	0.09
D1.5.3 infections flood-hosp.	455	0.00	0.00	0	0	0	0	0.00
D1.6.3 infections swim-hosp.	455	0.01	0.00	0	0	2	0	0.10
D1.7.3 Dysentery-hosp.	455	0.01	0.01	0	0	2	0	0.10
D1.8.3 Cholera-hosp.	455	0.00	0.00	0	0	0	0	0.00
D1.9.3 Hep A-hosp.	455	0.06	0.06	0	0	15	0	0.96
D1.10.3 Typhoid-hosp.	455	0.00	0.00	0	0	1	0	0.05
D1.10.3 other-hosp.	455	0.10	0.15	0	0	30	0	1.52

	No ob.	Counts										D/A
		0	1	2	3	4	5	6	7	>7		
D1.1.3 Shisto.-hosp.	455	455	0	0	0	0	0	0	0	0	0	
D1.2.3 Malaria-hosp.	455	455	0	0	0	0	0	0	0	0	0	
D1.3.3 Diarrhea-hosp.	455	453	1	0	0	0	0	0	0	1	1	
D1.4.3 Influenza-hosp.	455	454	0	1	0	0	0	0	0	0	0	
D1.5.3 infections flood-hosp.	455	455	0	0	0	0	0	0	0	0	0	
D1.6.3 infections swim-hosp.	455	453	1	1	0	0	0	0	0	0	0	
D1.7.3 Dysentery-hosp.	455	453	1	1	0	0	0	0	0	0	0	
D1.8.3 Cholera-hosp.	455	455	0	0	0	0	0	0	0	0	0	
D1.9.3 Hep A-hosp.	455	453	0	0	0	0	0	0	0	2	1	
D1.10.3 Typhoid-hosp.	455	454	1	0	0	0	0	0	0	0	0	
D1.10.3 other-hosp.	455	452	0	0	0	0	0	0	1	1	1	

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
D1.1.4 Shisto.-cost	455	0.22	0.31	0	0	100	0	4.69
D1.2.4 Malaria-cost	455	0.88	0.39	0	0	200	0	13.25
D1.3.4 Diarrhea-cost	455	14.22	12.15	0	0	800	0	76.96
D1.4.4 Influenza-cost	455	51.72	59.09	0	0	1500	0	149.14
D1.5.4 infections flood-cost	455	3.94	3.85	0	0	500	0	34.33
D1.6.4 infections swim-cost	455	4.64	2.56	0	0	1000	0	50.85
D1.7.4 Dysentery-cost	455	4.44	3.94	0	0	800	0	42.47
D1.8.4 Cholera-cost	455	0.00	0.00	0	0	0	0	0.00
D1.9.4 Hep A-cost	455	18.02	26.53	0	0	7000	0	331.50
D1.10.4 Typhoid-cost	455	0.33	0.49	0	0	150	0	7.03
D1.10.4 other-cost	455	10.33	11.06	0	0	600	0	67.91

	No ob.	Average	Weighted Average	Median	Mode	Max	Min	St dev
D2. lost work days	149	1.91	0.52	0	0	20	0	3.37
D3. lost school days	149	1.22	0.31	0	0	10	0	2.47
D5. consult	191	2.01	0.75	2	2	3	1	0.64
D5a.1 not serious	39	1.26	0.10	1	1	2	1	0.44
D5a.2 no money	39	1.85	0.15	2	2	2	1	0.37
D5a.3 self-treat	39	1.67	0.13	2	2	2	1	0.48
D5a.4 trust	39	1.97	0.16	2	2	2	1	0.16
D5a.5 loose job	39	1.97	0.15	2	2	2	1	0.16
D5a.6 Other	39	1.92	0.15	2	2	2	1	0.27
D5b.1 Hospital worker	0							
D5b.2 Clinic worker	0							
D5b.3 Pharmacist	0							
D5b.4 acquaintance	0							
D5b.5 Other	0							
D6 swim days	211	2.70	0.82	0	0	32	0	6.20

	No ob.	Counts									D/A
		0	1	2	3	4	5	6	7	>7	
D2. lost work days	149	89	11	7	14	4	4	1	11	7	3
D3. lost school days	149	109	5	8	6	2	4	0	11	4	0
D5. consult	191		39	112	40						0
D5a.1 not serious	39		29	10							0
D5a.2 no money	39		6	33							0
D5a.3 self-treat	39		13	26							0
D5a.4 trust	39		1	38							0
D5a.5 loose job	39		1	38							0
D5a.6 Other	39		3	36							0
D5b.1 Hospital worker	0										
D5b.2 Clinic worker	0										
D5b.3 Pharmacist	0										
D5b.4 acquaintance	0										
D5b.5 Other	0										
D6 swim days	211	156	0	2	6	2	14	3	7	8	17

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
E1.1. Water pollution	456	2.24	1.95	2	2	4	1	6.47
E1.2. Air pollution	456	2.01	1.83	2	2	4	1	4.60
E1.3. Solid waste	456	1.95	1.99	2	2	4	1	4.60
E1.4. Hazardous waste	456	2.89	3.37	2	2	4	1	10.16
E1.5. flooding	456	2.43	2.66	2	2	4	1	6.47
E1.6. Noise	456	3.58	2.99	2	2	4	1	12.79
E1.7. Other	456	83.57	83.67	99	99	4	1	35.39
E2.1. SW WW	456	2.57	2.83	1	1	4	1	10.19
E2.2. WS	456	1.93	2.07	2	1	4	1	4.61
E2.3. Roads	456	1.78	1.78	2	2	4	1	0.74
E2.4. Public transport	456	1.86	1.86	2	2	4	1	0.79
E2.5. Garbage	456	2.41	2.36	1	1	4	1	9.12

E2.6. Electric	456	2.22	2.24	2	2	4	1	6.48
E2.7. Gas	456	4.16	3.42	2	2	4	1	14.23
E2.8. Education	456	4.63	3.81	1	1	4	1	16.83
E2.9. Medical	456	5.18	4.71	1	1	4	1	18.50
E3. SW WW rank	456	4.58	3.86	2	2	4	1	14.88
E4.1. taxes high	456	7.08	7.18	2	2	4	1	20.73
E4.2. services free	456	3.29	2.92	2	2	5	1	9.06
E4.3. wastes money	456	4.80	4.50	4	4	5	1	9.96
E4.4. officials trustworthy	456	6.90	6.28	3	3	5	1	18.71
E4.5. benefit household	456	2.72	2.93	2	2	5	1	9.09
E4.6. business fair share	456	2.93	2.58	2	2	5	1	10.16

	No ob.	Counts					
		1	2	3	4	5	D/A
E1.1. Water pollution	456	148	251	47	8		0
E1.2. Air pollution	456	142	268	39	6		0
E1.3. Solid waste	456	173	231	51	0		0
E1.4. Hazardous waste	456	162	214	66	9		0
E1.5. flooding	456	132	205	99	18		0
E1.6. Noise	456	148	225	58	17		0
E1.7. Other	456	14	21	19	19		0
E2.1. SW WW	456	277	128	41	5		0
E2.2. WS	456	196	194	62	3		0
E2.3. Roads	456	179	207	62	8		0
E2.4. Public transport	456	164	204	75	13		0
E2.5. Garbage	456	260	136	55	1		0
E2.6. Electric	456	174	215	51	14		0
E2.7. Gas	456	90	266	74	16		0
E2.8. Education	456	232	142	63	5		0
E2.9. Medical	456	255	130	53	1		0
E3. SW WW rank	456	78	200	147	20	0	0
E4.1. taxes high	456	46	193	161	34	0	0
E4.2. services free	456	56	204	133	54	5	0
E4.3. wastes money	456	3	15	143	218	72	0
E4.4. officials trustworthy	456	11	82	212	112	21	0
E4.5. benefit household	456	111	293	44	4	0	0
E4.6. business fair share	456	163	209	61	15	3	0

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
F1.1 house type	456	1.72	1.60	1	1	5	1	1.06
F1.2 no rooms	456	3.12	3.15	3	3	13	1	1.20
F1.3 house area	456	88.20	91.94	80	80	500	14	51.87
F1.4 own rent	456	1.05	1.04	1	1	2	1	0.21
F1.5 floor	456	3.04	3.29	2	1	11	1	2.25
F1a rent	21	220	12	100	300	1000	40	259
F2. years	456	2.97	2.93	3	4	4	1	1.02
F3. House value	166	197,849	90,638	160,000	300,000	510,000	20,000	109,317
F5. invalids	452	0.01	0.00	0.00	0.00	1.00	0.00	0.10

Counts	No ob.	1	2	3	4	5	6	7	>7	D/A
F1.1 house type	456	302	10	124	11	9				0
F1.2 no rooms	456	12	119	201	79	31	9	2	3	0
F1.3 house area	456									
F1.4 own rent	456	435	21							0
F1.5 floor	456	178	64	57	34	35	37	36	15	0
F1a rent	21									
F2. years	456	38	128	99	191					0
F3. House value	166									
F5. invalids	452	447	5	0	0	0	0	0	0	0

Note: original data for Question F4 not provided	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
F4.1 HH size – persons	456	2.90	2.95	3.00	3.00	6.00	1.00	0.74
F4 # Female headed HH	456	0.06	0.05	0.00	0.00	1.00	0.00	0.23
F4 Elder only HH	456	0.05	0.03	0.00	0.00	1.00	0.00	0.21
F4 # dependent adults	456	1.11	1.04	1.00	0.00	5.00	0.00	1.01
F4 # income earners	456	1.23	1.37	1.00	2.00	4.00	0.00	0.91
F4 # unemployed	456	0.22	0.17	0.00	0.00	3.00	0.00	0.55
F4 # dependents	456	1.44	1.41	1.00	1.00	6.00	0.00	0.97
F4 # earners / HH size	456	0.37	0.40	0.40	0.60	0.60	0.00	0.24
F4 #dependents / HH size	456	0.49	0.47	0.50	0.33	1.00	0.00	0.32
F4 # children	456	0.33	0.37	0.00	0.00	2.00	0.00	0.48
F4 # elders	456	0.28	0.25	0.00	0.00	2.00	0.00	0.62
F4 # retired	456	0.35	0.34	0.00	0.00	2.00	0.00	0.67
F4 average age adults	456	41.19	40.50	39.17	36.00	78.00	23.50	9.91
F4 Average educ. earners	338	3.96	3.35	4.00	3.00	6.00	1.00	1.36
F4 # who work away	456	0.14	0.16	0.00	0.00	2.00	0.00	0.38

Note: original data for Question F4 not provided	No ob.	Counts								
		0	1	2	3	4	5	6	7	D/A
F4.1 HH size – persons	456	0	9	105	282	47	10	3	0	0
F4 # Female headed HH	456	430	26	0	0	0	0	0	0	0
F4 Elder only HH	456	434	22	0	0	0	0	0	0	0
F4 # dependent adults	456	160	131	125	36	3	1	0	0	0
F4 # income earners	456	118	141	172	22	3	0	0	0	0
F4 # unemployed	456	381	50	23	2	0	0	0	0	0
F4 # dependents	456	75	177	142	55	6	0	1	0	0
F4 # earners / HH size	456	118	338	0	0	0	0	0	0	0
F4 #dependents / HH size	456	75	381	0	0	0	0	0	0	0
F4 # children	456	309	144	3	0	0	0	0	0	0
F4 # elders	456	372	42	42	0	0	0	0	0	0
F4 # retired	456	347	59	50	0	0	0	0	0	0
F4 average age adults	456									
F4 Average educ. earners	338	0	6	48	82	74	72	56	0	0
F4 # who work away	456	395	56	5	0	0	0	0	0	0

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
F6.01 Flush toilet in house	456	1.12	1.08	1.00	1.00	99.00	0.00	4.63
F6.02 Bathroom sink	456	0.41	0.32	0.00	0.00	99.00	0.00	4.65
F6.03 Shower or bath tub with running water	456	1.16	1.11	1.00	1.00	99.00	0.00	4.61
F6.04 Piano or other instrument	456	0.29	0.18	0.00	0.00	99.00	0.00	4.64
F6.05 Electric cooking appliances	456	1.23	1.13	1.00	1.00	99.00	0.00	4.60
F6.06 Gas stove with oven	456	0.45	0.39	0.00	0.00	99.00	0.00	4.64
F6.07 Refrigerator	456	1.14	1.05	1.00	1.00	99.00	0.00	4.60
F6.08 Washing machine	456	0.67	0.47	0.00	0.00	99.00	0.00	4.64
F6.09 Semiautomatic/automatic washing machine	456	0.94	1.04	0.50	0.00	99.00	0.00	6.54
F6.10 dry cleaning machine	456	0.47	0.47	0.00	0.00	99.00	0.00	6.55
F6.11 Color TV set	456	1.43	1.38	1.00	1.00	99.00	0.00	4.61
F6.12 Telephone Video DISC player	456	1.13	1.10	1.00	1.00	99.00	0.00	4.64
F6.13 Mobile phone	456	2.42	2.55	2.00	1.00	99.00	0.00	7.94
F6.14 Air conditioner	456	1.50	1.70	1.00	1.00	99.00	0.00	6.54
F6.15 Computer	456	0.80	0.90	0.00	0.00	99.00	0.00	6.55
F6.16 Motor cycle, scooter	456	0.77	0.86	0.00	0.00	99.00	0.00	8.01
F6.17 Automobile	456	0.91	1.13	0.00	0.00	99.00	0.00	9.24

	No ob.	Counts								
		1	2	3	4	5	6	7	>7	D/A
F6.01 Flush toilet in house	456	95	313	44	3	0	0	0	0	1
F6.02 Bathroom sink	456	374	76	5	0	0	0	0	0	1
F6.03 Shower or bath tub with running water	456	54	371	30	0	0	0	0	0	1
F6.04 Piano or other instrument	456	425	29	1	0	0	0	0	0	1
F6.05 Electric cooking appliances	456	19	410	26	0	0	0	0	0	1

F6.06 Gas stove with oven	456	350	105	0	0	0	0	0	0	1
F6.07 Refrigerator	456	37	414	4	0	0	0	0	0	1
F6.08 Washing machine	456	250	204	1	0	0	0	0	0	1
F6.09 Semiautomatic/automatic washing machine	456	228	222	4	0	0	0	0	0	2
F6.10 dry cleaning machine	456	438	16	0	0	0	0	0	0	2
F6.11 Color TV set	456	2	368	73	10	2	0	0	0	1
F6.12 Telephone Video DISC player	456	96	321	28	5	3	2	0	0	1
F6.13 Mobile phone	456	26	182	149	70	20	2	1	3	3
F6.14 Air conditioner	456	103	265	52	25	6	2	1	0	2
F6.15 Computer	456	300	142	12	0	0	0	0	0	2
F6.16 Motor cycle, scooter	456	397	56	0	0	0	0	0	0	3
F6.17 Automobile	456	434	18	0	0	0	0	0	0	4

	No ob.	Average		Median	Mode	Max	Min	St dev
		Un-weighted	Weighted					
F7.01. Food	456	581.5	653.8	500.0	500.0	3,000.0	100.0	308.4
F7.02. Tobacco alcohol	456	109.7	128.6	100.0	0.0	1,000.0	0.0	120.8
F7.03. Clothing	456	87.1	113.2	50.0	0.0	2,000.0	0.0	150.2
F7.04. Household articles	456	30.7	38.9	0.0	0.0	500.0	0.0	53.6
F7.05. medical	456	59.0	71.4	21.5	0.0	2,000.0	0.0	131.1
F7.06. Transportation	456	73.2	91.7	50.0	50.0	800.0	0.0	92.6
F7.07. Communication	456	107.0	132.4	70.0	50.0	1,200.0	0.0	117.1
F7.08. Recreation	456	43.2	59.1	0.0	0.0	3,000.0	0.0	161.4
F7.09. Education	456	162.2	196.9	100.0	0.0	2,000.0	0.0	241.7
F7.10. Rent or loan	456	34.5	46.1	0.0	0.0	3,000.0	0.0	206.8
F7.11. Utilities	456	148.7	163.9	150.0	100.0	600.0	0.0	80.2
F7.12. Support	455	27.1	32.0	0.0	0.0	1,000.0	0.0	89.9
F7.13. Taxes	456	25.2	34.8	0.0	0.0	3,000.0	0.0	184.0
F7.14. Other	456	16.9	18.4	0.0	0.0	400.0	0.0	44.0
F7.15. Total	456	1,490.1	1,768.6	1,263.5	1,200.0	14,000.0	160.0	1,104.1
F8. income	456	5.06	5.82	5.00	4.00	9.00	2.00	1.88
F9. subsidy	456	1.91	1.95	2.00	2.00	2.00	1.00	0.28

ATTACHMENT: HOUSEHOLD QUESTIONNAIRE

QUESTIONNAIRE PASSEPORT

1. Number of the questionnaire

1	2	3	4	5	6	7
Project #		Interviewer #		Interview #		

2. Subproject/district (circle all that apply)

Dong Xi Hu three drainage gate connections & Chang Qing pump station	1
Dong Xi Hu wastewater collectors	2
Caidian WWTP and collectors	3
Nantiazi Lake WWTP expansion and collectors	4
Nantiazi Lake WWTP & Yangsigang pump station and SW culvert	5
Huangpu Road WWTP upgrade	6
Erlangmiao WWTP upgrade and expansion only	7
Erlangmiao WWTP & Luo Jia Road drainage network	8

3. Neighbourhood Committee

--

4. Correct address

District	Street	No.

5. The date of the interview: day |__|__| month |__|__|

6. Start time of the interview: time |__:__|

7. End time of the interview: time |__:__|

8. ☐ Completed ☐ Not completed

9. Interviewer: name _____ signature _____

10. Supervisor: name _____ signature _____

11. Checking: name _____ signature _____

12. Coding: name _____ signature _____

13. Code check: name _____ signature _____

INTRODUCTION

Hello. My name is _____. I am here to conduct the interview that we telephoned you about a short while ago. Please recall that this survey is being conducted by [NAME OF PMO] and is being done to help us evaluate the Wuhan Wastewater and Stormwater Management Project. The results of the survey will be used to improve the project and get approval for funding.

Wastewater is the dirty water from your kitchen and washroom. Storm water is the rain that collects on the ground and drains away. Now, only 27% of wastewater from Wuhan is treated. The rest of it goes untreated into local drains, rivers and lakes. Several wastewater treatment plants are under construction now and by 2010, 60% will be treated.

The State government requires that Wuhan and other large cities treat 70% of all wastewater by 2010. This project is part of the Wuhan master for achieving this target. The Project will improve wastewater collection and treatment, and storm water drainage in Wuhan through investments in 9 areas of the city. In your area the planned works and benefits are (DESCRIBE IN WORDS BASED ON TABLE).

Subproject	Description of subproject and benefits
Dong Xi Hu tri-gate drainage connection & Chang Qing pump station	The tri-gate connection project and stage-II construction of Changqing Pump Station serves the west area of Hankou. Increased drainage from urban development has far exceeded the capacity of existing drains causing waterlogging and flooding in areas. Improvements to inadequate drains and the Changqing pump station will solve this problem.
Dong Xi Hu wastewater collectors	The Dong Xi Hu area is the City's fastest growing commercial area and also has new residential and recreational developments. Wastewater is discharged into local ditches and is polluting lakes in the area. The new sewers will collect this wastewater and bring it to the Hanxi WWTP, which is now under construction.
Caidian WWTP and collectors	Caidian District, in the southwest of Wuhan, discharges untreated wastewater directly into the Hanjiang River from older combined and newer separated sewers. This causes severe pollution of the river and affects local residents and downstream areas of Wuhan. The project will solve this problem.
Nantiazi Lake WWTP expansion and sewer works	Nantaizihu WWTP serves a rapidly growing area at the confluence of the Yangtse and Hanjiang Rivers. Wastewater flows exceed plant capacity and several local lakes are severely polluted. Some sewers in the area are combined sewers mixing wastewater with storm water causing more pollution. The project will expand Nantaizihu WWTP and separate the sewers to improve the local environmental condition.
Yangsigang pump station and SW culvert	This project will serve the old urban area of Hanyang and the newly built up industrial area of Yingwuzhou. Storm and wastewater, which are now discharged to local water bodies through inadequate drains, will be better managed with the project.
Huangpu Road WWTP	Huangpulu WTP serves the old town along the Yangtze River south of Wuhan Chiangjiang Bridge #2. The WWTP This important commercial

upgrade	and tourist district is adversely affected by severe local pollution of the River and bad odors from the WTP. WTP upgrades will solve these problems.
Erlangmiao WWTP upgrade and expansion	The Erlangmia wastewater sewers cover Xujiapeng, Yangyuan and Liyuan Areas in Wuchang. The existing WWTP can not treat all the wastewater it receives and causes pollution and odor problems. The project addresses these problems.
Luoja Road drainage network	Increased drainage from urban development in the Luoja Road Area has far exceeded the capacity of existing drainage facilities. Storms cause long duration floods to a depth of a meter or more. Improvements to inadequate drains and an obsolete pumping station will solve this problem.

1. Are you knowledgeable about the Wuhan municipal government master plan to improve wastewater and storm water drainage?

1. Very	2. not very	3. Not at all	1.0
1	2	3	

2. Are you knowledgeable about the Wuhan Wastewater and Stormwater Management Project, which is part of the master plan?

1. Very	2. not very	3. Not at all	2.0
1	2	3	

A. WASTEWATER SERVICE

I would like to ask a few questions about your wastewater services.

A9. Where does most of your wastewater go?

CIRCLE ONE.

1. city sewers	1	A 1
2. private septic tank	2	
3. public septic tank	3	
4. directly into open drain or ditch	4	
5. directly into a river or lake	5	
6. directly into own yard	6	
7. Other (describe)	7	
8. Don't know, unsure	99	

A10. I will read you a list of possible problems with wastewater disposal and I want you to tell me for each one whether it is a major or minor problem or not a problem at all for you.

READ EACH PROBLEM AND CIRCLE THE RESPONSE FOR EACH. RECORD ANY OTHERS.

	1. Major problem	2. Minor problem	3. Not a problem	
1. Unsightly water flowing in drains and ditches	1	2	3	A2.1
2. Unsightly water flowing on the road and over the ground	1	2	3	A2.2
3. Wastewater pollutes Wuhan's rivers and lakes	1	2	3	A2.3
4. Bad smells from wastewater	1	2	3	A2.4
5. Wastewater brings flies, mosquitoes and mice	1	2	3	A2.5
6. Describe any other problem and say if it is major or minor.	1	2	3	A2.6

A11. **We want to know if wastewater problems affect your household expenditures and chores.**

a. How much more does your household spend each month for cleaning, odor control, pest control?

/month

A3a

b. How much more time does your household take each month to wash clothes and do cleaning?

/month

A3b

IF THERE ARE NO PROBLEMS AND NO EXTRA EXPENDITURES, SKIP 0.

A12. **Who in the family is mainly responsible for the extra cleaning and other chores caused by problems with wastewater?**

1. Self (respondent)	1
2. Spouse	2
3. Both self and spouse	3
4. Other (describe)	4

A4

A13. **Please tell me how satisfied or unsatisfied you are overall with the management of wastewater here in your neighborhood and for the whole city.**

[READ OUT THE 5 LEVELS AND RECORD RESPONSE]

	1. Very satisfied	2. Satisfied	3. Neither	4. Unsatisfied	5. Very unsatisfied	
neighborhood	1	2	3	4	5	A5.1
whole city	1	2	3	4	5	A5.2

A14. **How does your household pay for wastewater disposal?**

	Yes	No	
1. Pay a charge on a water bill but no separate wastewater bill	1	2	A6.1
2. Pay a separate bill for wastewater	1	2	A6.2
3. Bill paid by employer and deducted from pay slip	1	2	A6.3
4. Pay a private company or person for night soil removal	1	2	A6.4
5. Other (describe)	1	2	A6.5
6. Don't pay at all	1	2	A6.6

IF A14 IS ANSWERED "Don't pay at all" GO TO A16

A15. How much does your household pay each month for wastewater?

Yuan/month A7

A16. The wastewater tariff in this area of the city is 0.8 yuan per tonne. The wastewater tariff will have to increase to pay for the new project. We still don't know how much it will be, but it could be as high as 1.5 yuan per tonne. An average family of 3 people will pay about 22.5 yuan per month at this tariff, but a poor family will pay less because of government subsidies for poor families. Would you be willing to pay a tariff of 1.5 yuan per tonne to finance the project or would you prefer to leave the tariff at 0.8 and not have the project?

Pay higher tariff	Leave tariff at 0.8	
1	2	A8

IF RESPONDENT

SAYS 'YES' GO TO

SECTION B. IF 'NO' ASK THE FOLLOWING 2 QUESTIONS:

- a. Tell me why you will not support a tariff increase [a new tariff] to pay for the project.

[DO **NOT** READ OUT THE LIST. CIRCLE 1 OR 2 FOR EACH ROW].

	Mentioned	Not mentioned	
1. I can't afford the monthly bill	1	2	A8a.1
2. I don't trust the government to spend this money properly	1	2	A8a.2
3. I have other priorities for spending my money	1	2	A8a.3
4. I want to see government money spent on other services	1	2	A8a.4

5. I don't think the project is needed now	1	2	A8a.5
6. Other (describe)	1	2	A8a.6

b. Would you support the higher tariff if it was introduced gradually over 5 years?

IF RESPONDENT SAYS 'YES' GO TO **SECTION B**. IF 'NO' ASK THE FOLLOWING QUESTION:

Yes	No	
1	2	A8b

c. If 1.5 is too high, then what wastewater tariff would you support at a public hearing meeting?

SHOW **CARD 1** AND ASK RESPONDENT TO PICK A TARIFF LEVEL.

	1	2	3	4	5	6	7	D/A	
Yuan/tonne	0.80	0.90	1.00	1.10	1.20	1.30	1.40	99	A8c

ALTERNATIVE FORM OF A8 for Caidian AND DONG XI HU:

Currently, there is no wastewater tariff in this part of the Wuhan. In the urban area it is 0.8 yuan per tonne. A wastewater tariff will have to be introduced here to pay for the new project. We still don't know how much it will be, but it could be as much as 1.5 yuan per tonne. An average family of 3 people will pay about 22.5 yuan per month at this tariff, but a poor family will pay less because of government subsidies for poor families. Would you support a tariff of 1.5 yuan per tonne to have a wastewater service here or would you prefer to pay no new charge and not have a wastewater service?

Pay higher tariff	No tariff	
1	2	A8

IF RESPONDENT SAYS 'YES' GO TO **SECTION B**. IF 'NO' ASK THE FOLLOWING 2 QUESTIONS:

a. Tell me why you will not support a tariff increase [a new tariff] to pay for the project.

[DO **NOT** READ OUT THE LIST. CIRCLE 1 OR 2 FOR EACH ROW].

	Mentioned	Not mentioned	
1. I can't afford the monthly bill	1	2	A8a.1
2. I don't trust the government to spend this money properly	1	2	A8a.3
3. I have other priorities for spending my money	1	2	A8a.4

4. I want to see government money spent on other services	1	2	A8a.5
5. I don't think the project is needed now	1	2	A8a.6
6. Other (describe)	1	2	A8a.7

b. Would you support the higher tariff if it was introduced gradually over 5 years?

IF RESPONDENT SAYS 'YES' GO TO **SECTION**

B. IF 'NO' ASK THE FOLLOWING QUESTION:

Yes	No	A8b
1	2	

c. If 1.5 is too high, then what wastewater tariff would you support at a public hearing meeting?

SHOW CARD 1 AND ASK RESPONDENT TO PICK A TARIFF LEVEL.

	1	2	3	4	5	6	7	D/A	A8c
Yuan/tonne	0.2	0.4	0.6	0.8	1.0	1.2	1.4	99	

B. WATER SUPPLY

Although the project doesn't involve water supply, we have just a few questions on your water supply since the government wastewater service is paid for on the water bill:

B4. Please identify your main water source.

READ OUT THE SOURCES IN THE TABLE BELOW AND CHECK ONLY ONE, THEN ASK:

a. Is this source metered at your household?

b. How much water do you use from this source each month?

Source of Water	Main Source? CIRCLE ONLY ONE	Metered? 1 = YES 2 = NO	How much? TONNES PER MONTH (99 IF DON'T KNOW)
1. Tap water from a water supply company owned by government	1	1 2	Tonnes/month
2. Tap water from a private water supply company not owned by government.	2	1 2	Tonnes/month
3. Tap water from another source such as a neighbor or community well	3	1 2	Tonnes/month
4. Water is purchased in containers from vendors	4	2	Tonnes/month
5. Water is carried in containers from a river, pond or lake	5	2	Tonnes/month

B1

B1a

B1b

B5. How does your household pay for water from the source you identified?

CIRCLE ONE ONLY.

1. Pay a water bill from the government water supply company	1	B2
2. Pay a water bill from an enterprise or private water supply company	2	
3. Bill paid by employer and deducted from pay slip	3	
4. Pay a water bill from the landlord or property manager	4	
5. Pay a neighbor who provides water	5	
6. Pay a water vendor for water	6	

7. Don't pay at all	7
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IF **B5** IS ANSWERED "Don't pay at all" GO TO **SECTION C**

B6. How much does your household pay each month for this water?

Yuan/month	B3
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C. STORM WATER DRAINAGE

Now I would like to ask a few questions about the drains that take rainwater away in your area. These may be ditches, covered and uncovered concrete channels beside the road, or buried pipes.

C8. How is rain water drained away from your property?

READ OUT THE LIST AND CIRCLE ONE ANSWER IN EACH ROW.

	Yes	No	
1. Overland and in natural drainage channels	1	2	C1.1
2. Dug ditches, road gutters and uncovered channels	1	2	C1.2
3. Covered concrete channels	1	2	C1.3
4. Buried pipes	1	2	C1.4
5. Other (DESCRIBE)	1	2	C1.5

C9. I will read you a list of possible problems with storm water drainage and I want you to tell me for each one whether it is a major or minor problem or not a problem at all.

READ EACH STATEMENT AND CIRCLE ONE RESPONSE FOR EACH PROBLEM.

	1. Major problem	2. Minor problem	3. Not a problem	
1. Rainwater collects in deep puddles outside	1	2	3	C2.1
2. Rainwater floods buildings	1	2	3	C2.2
3. Drains are plugged with garbage	1	2	3	C2.3
4. Bad smells come from the storm water drains	1	2	3	C2.4
5. Flies, mosquitoes, or mice come from the drains	1	2	3	C2.5
6. Storm water pollutes Wuhan's rivers and lakes	1	2	3	C2.6
7. Describe any other problem you can think of and tell me if it is major or minor.	1	2	3	C2.7

C10. How frequently do you experience flooding to each of the following levels? SHOW CARD 2. READ EACH STATEMENT AND CIRCLE ONE RESPONSE FOR EACH PROBLEM.

	More than 2 times a year	1 or 2 times a year	Once every 1 to 2 years	Once every 2 to 5 years	Once every 5 to 10 years	Less than once in 10 years	Never	
1. Roads and sidewalks covered in water	1	2	3	4	5	6	7	C3. 1
2. Flood water reaches ground floor of buildings	1	2	3	4	5	6	7	C3. 2
3. Flood goes above the ground floor of buildings	1	2	3	4	5	6	7	C3. 3

IF ALL RESPONSES TO C3 ARE '7 – NEVER', SKIP C4.

C11. We want to know how storm water affects your household and costs you in damages and repairs. I will read several examples of flood damage. Please indicate for each, how often you experience that kind of damage and how much it costs you in direct expenditures and lost work time.

READ EACH STATEMENT AND CIRCLE ONE RESPONSE IN COLUMN 2 FOR EACH PROBLEM. THEN ASK ABOUT LOST WORK TIME AND DIRECT COSTS.

	How often experienced: 1. More than 2 times a year 2. 1 or 2 times a year 3. Once every 1 to 2 years 4. Once every 2 to 5 years 5. Once every 5 to 10 years 6. Less then once every 10 years 7. Never 99. D/A CODE FOR EACH ROW	Lost work time for each flood	Household cost for each flood (yuan)
1. Clean up the outside area around home			

2. Clean clothes, other goods			
3. Heavy cleaning of the house (mud, debris).			
4. Spoiled food supplies			
5. Spoiled clothing, other goods			
6. Minor repairs of home and equipment			
7. Major repairs of home and equipment			
8. Must leave the house during flooding			
9. Interferes with travel around the city			
10. Flood disrupts work or business			
11. Describe other damage you experience			

C4.1.1 to C4.1.11 C4.2.1 to C4.2.11 C4.3.1 to C4.3.11

IF THERE ARE NO PROBLEMS AND NO EXTRA EXPENDITURES, SKIP TO C13.

C12. Who in the family is mainly responsible for cleaning and repairs after a flood?

	Cleaning	Repairs
1. Self (respondent)	1	1
2. Spouse	2	2
3. Both self and spouse	3	3
4. Other (describe)	4	4

C13. How satisfied you are with the storm water control in your neighborhood and for the whole city:

C5.1 C5.2

READ THE 5 LEVELS AND CIRCLE RESPONSE

	1. Very satisfied	2. Satisfied	3. Indifferent	4. Unsatisfied	5. Very unsatisfied	
neighborhood	1	2	3	4	5	C6.1
whole city	1	2	3	4	5	C6.2

C14. The storm water operations are paid for out of government tax revenues. Individuals pay mainly the value added tax, consumption taxes and personal income tax. Together these make up about half of total government revenues. Total taxes may have to increase to pay for the storm water projects. We still don't know by how much, but it could be as much as 5 yuan per household per month. Average and poor families would pay less than this. Would you be willing to pay extra taxes of 5 yuan per month to finance these projects or would you prefer to not change taxes and not have the project?

Would pay	Won't pay	
1	2	C7

IF RESPONDENT SAYS 'YES' GO TO **SECTION D**. IF 'NO' ASK THE FOLLOWING QUESTION:

- a. If 5 yuan is too much, what extra tax would you be willing to pay for the storm water improvements?

SHOW **CARD 3** AND ASK RESPONDENT TO PICK A LEVEL.

	1	2	3	4	5	6	7	8	9	D/A	
Extra tax/month	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	99	C7a

D. HEALTH

Now I would like to ask a few questions about the health of your family. These questions are important because certain diseases are caused by contaminated water.

- D6. I am going to name some diseases that can be caused by polluted water and poor sanitation. For each one, please tell: (a) me how many members of your household were sick over the last 12 months from the disease, (b) the number of days of sickness, (c) days in the hospital and (d) total medical costs.

Sickness	No. of Persons Sick (#)	Total Days of Sickness (all persons)	Total Days in Hospital (#)	Total Medical Costs (Yuan)
1. Shistosomiasis				
2. Malaria				
3. Diarrhea, nausea (Gastroenteritis, or Enteritis)				
4. Influenza, flu				
5. Skin or eye infections from exposure to flood water				
6. Skin or eye infections from swimming in lakes and rivers				
7. Dysentery				
8. Cholera				
9. Hepatitis A				
10. Typhoid/paratyphoid				
11. Other				

D1.1.1-
D1.1.11

D1.2.1-
D1.2.11

D1.3.1-
D1.3.11

D1.4.1-
D1.4.11

- D7. How many days of work were lost by family members due to these illnesses last year?

Number

D2.1

- D8. How many days of school were lost by family members due to these illnesses last year?

Number

D3.1

- D9. Who in the family is mainly responsible for taking care of sick persons?

a. Self (respondent)	1
b. Spouse	2
c. Both self and spouse	3
Other (describe)	4

D4.1

D10. Over the last year did you get medical help during an illness of any of your household members, or did you treat them yourself without consulting anyone?

CIRCLE ONLY ONE ANSWER

1. Treated ourselves without consulting	1
2. Consulted someone	2
3. Nobody was sick over this time	3

D5.1

IF ANSWER IS "1" ASK (a), IF "2" ASK (b), IF "3", GO TO SECTION E

c. Why did not you consult anyone? [DO NOT READ OUT THE LIST. CIRCLE 1 OR 2 FOR EACH ROW].

	Mentioned	Not mentioned	
1. Illness wasn't serious enough	1	2	D5a.1
2. We do not have money to pay for doctors	1	2	D5a.2
3. We prefer self-treatment	1	2	D5a.3
4. We do not trust doctors	1	2	D5a.4
5. Fear of loosing job	1	2	D5a.5
6. Other (SPECIFY):	1	2	D5a.6

d. Who did you consult? CIRCLE 1 OR 2 FOR EACH ROW.

	Yes	No	
1. Hospital worker	1	2	D5b.1
2. Clinic worker	1	2	D5b.2
3. Pharmacist, drug store worker	1	2	D5b.3
4. Experienced acquaintance	1	2	D5b.4
5. Other (SPECIFY):	1	2	D5b.5

D11. How often does your family swim in lakes or rivers in Wuhan each summer?

Number of days	D6.1
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E. GENERAL ATTITUDES

E5. Using the rating: "great concern", "medium concern", "low concern", and "no concern", how do you rate the following environmental issues in Wuhan?

	Great concern	Medium concern	Low concern	No concern	Don't know	
1. Water pollution in rivers and streams	1	2	3	4	99	E1.1
2. Air pollution	1	2	3	4	99	E1.2
3. Solid waste disposal	1	2	3	4	99	E1.3
4. Hazardous and toxic waste	1	2	3	4	99	E1.4
5. Local flooding from rivers and creeks	1	2	3	4	99	E1.5
6. Noise	1	2	3	4	99	E1.6
7. Others (specify)	1	2	3	4	99	E1.7

E6. Using the rating: "high need", "medium need", "low need", and "no need", how do you rate the need for government investments to improve in the following public services in Wuhan?

	High need	Medium need	Low need	No need	Don't know	
1. Storm water & Wastewater	1	2	3	4	99	E2.1
2. Tap water supply	1	2	3	4	99	E2.2
3. Roads	1	2	3	4	99	E2.3
4. Public transportation	1	2	3	4	99	E2.4
5. Garbage collection and street cleaning	1	2	3	4	99	E2.5
6. Electric power	1	2	3	4	99	E2.6
7. Gas services	1	2	3	4	99	E2.7
8. Education	1	2	3	4	99	E2.8
9. Medical services	1	2	3	4	99	E2.9

E7. Comparing these different government services, where do storm water and wastewater rank in priority in your opinion?

1. Highest priority	2. High priority	3. Middle priority	4. Low priority	5. Lowest priority	99. Don't know
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1	2	3	4	5	99	E3
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E8. We want to know what your frank opinion about wastewater and storm water services in general and about the related matters. I will read a number of statements and I want you to indicate how strongly you agree or disagree with each one.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know	
1. Government taxes and charges are too high	1	2	3	4	5	99	E4.1
2. These services should be free to the public	1	2	3	4	5	99	E4.2
3. Government wastes money on construction projects	1	2	3	4	5	99	E4.3
4. Government officials are trustworthy	1	2	3	4	5	99	E4.4
5. The proposed project will benefit my household	1	2	3	4	5	99	E4.5
6. Business pays it's fair share for government services	1	2	3	4	5	99	E4.6

F. HOUSEHOLD INFORMATION

The following questions about your household will help us interpret your answers to the previous questions. The information will be treated as confidential.

F10. Please provide the following information on your house (apartment).

Style of house? CIRCLE ONE ONLY		Number of rooms? (no.)	Total living area? (m ²)	Own or rent? 1=OWN 2=RENT	Floor level? (GROUND FLOOR = 1)
1. Apartment – no elevator	1			1 2	
2. Apartment – with elevator	2			1 2	
3. Separate house	3			1 2	1
4. Rented room or rooms	4			1 2	
5. Other	5			1 2	

F1.1

F1.2

F1.3

F1.4

F1.5

IF APARTMENT OR RENTED ROOMS, ASK (a):

a. How much do you pay for rent and property fees
each month

Yuan

F1a

F11. How long have you lived in this house
(apartment)?

CIRCLE ONE

Less than 2 years	1
2 to 5 years	2
5 to 10 years	3
More than 10 years	4

F2

F12. What is the market value of your house (apartment)?

Yuan

F3

ENTER 99 IF RESPONDENT DOESN'T KNOW

a. What do you think the value will be if local
wastewater and storm water conditions improve?

Yuan

F3a

ENTER 99 IF RESPONDENT DOESN'T KNOW

F13. Please provide the following information for each member of the household—
including people who are considered family members but live away for work or
school. Please begin with yourself.

[FILL OUT THE TABLE BELOW, USING A SEPARATE LINE FOR EACH PERSON].

No	Family position: 1 = respondent respondent's: 2 - spouse 3 - farther/mother 4 - son/daughter 5 - brother/sister 6 -grandchild 7 - grandparents 8 -another relative 9 -another person not related	Sex 1 – M 2 – F	Age (no of years)	Education: 1 – primary or less 2 – Junior high 3 – senior high 4 – technical college 5 – university incomplete 6 – university complete	Type of work (under secondary, ask about #8 house work for each)		Minority group 1 – Han 2 – Hui 3 – Manchurian 4 – Mongolian 5 – Other	Is the person present during the interview 1 –Yes 2 – No, lives here but is out of the house now 3 – No, lives away for work 4 – No, lives away for school
					Main	Secondary		
1.	1							
2.								
3.								
4.								
5.								
6.								
7.								
8.								

9.								
10.								
	F4.1.1 to F4.1.10	F4.2.1 to F4.2.10	F4.3.1 to F4.3.10	F4.4.1 to F4.4.10	F4.5.1 to F4.5.10	F4.6.1 to F4.6.10	F4.7.1 to F4.7.10	F4.8.1 to F4.8.10

F14. How many people in your household are invalids due to their work or for other reasons (e.g. stroke, chronic illness, born with disability)?

Number F5.1

F15. Indicate the number of each of these items in useable condition in your home?

[READ OUT EACH ITEM AND WRITE IN THE RESPONSE, MARK **ZERO** FOR NONE, AND **99** IF THEY WON'T ANSWER]

	No. of items	
1. Flush toilet in house		F6.1
2. Bathroom sink		F6.2
3. Shower or bath tub with running water		F6.3
4. Piano or other instrument		F6.4
5. Electric cooking appliances		F6.5
6. Gas stove with oven		F6.6
7. Refrigerator		F6.7
8. Washing machine		F6.8
9. Semiautomatic/automatic washing machine		F6.9
10. dry cleaning machine		F6.10
11. Color TV set		F6.11
12. Telephone Video DISC player		F6.12
13. Mobile phone		F6.13
14. Air conditioner		F6.14
15. Computer		F6.15
16. Motor cycle, scooter		F6.16
17. Automobile		F6.17

F16. Please say how much, on average, your household spends each month in total for each of the following items?

[READ OUT THE LIST. WRITE THE ANSWERS IN EVERY LINE. WRITE ZERO IF THERE WAS NO EXPENDITURE FOR AN ITEM. IF THE AMOUNT THAT WAS PAID WAS FOR SEVERAL MONTHS, DIVIDE IT BY THE NUMBER OF MONTHS]

Item	Expenditure (yuan/month)	
1. Food		F7.1
2. Tobacco and alcohol		F7.2
3. Clothing		F7.3
4. Household facilities, articles, services		F7.4
5. Medicine and medical services		F7.5
6. Transportation (bus, taxi, car costs)		F7.6
7. Communication (telephone, cell phone, other)		F7.7
8. Recreation (restaurants, movies, ...)		F7.8
9. Education fees and other expenditures		F7.9
10. Rent or loan payments for your house		F7.10
11. Water, electricity, fuel		F7.11
12. Support for parents or other relatives		F7.12
13. Taxes		F7.13
14. Other		F7.14
15. Total monthly expenditure		F7.15

F17. What is your total monthly household income? Include salaries, pensions, scholarships, allowances, remittances from relatives, government subsidies and all other sources.

SHOW INCOME CARD 4

1. Under 300	1
2. 300 to 600	2
3. 600 to 1200	3
4. 1200 to 1600	4
5. 1600 to 2000	5
6. 2000 to 2400	6
7. 2400 to 2800	7
8. 2800 to 3700	8
9. over 3700	9
10. D/A	99

F8.1

F18. Does the local government provide your family with a minimum livelihood income subsidy?

Yes	1
No	2

F9

That is the end of our questions. Many thanks for your patience in answering this long questionnaire. Do you have any comments or questions?

INTERVIEWER, REMEMBER TO COMPLETE QUESTIONNAIRE PASSPORT NOW!

APPENDIX F3 Business Survey

INTRODUCTION

A business survey was implemented to evaluate the impact of the project on businesses and determine their willingness to pay. The survey had a sample of 100 businesses.

F3-1. SURVEY QUESTIONNAIRE

The questionnaire form is provided at the end of this appendix. This questionnaire follows the structure and logic of the household questionnaire quite closely. Key features include:

Grouping of questions by topic, with more sensitive questions about household characteristics kept till the end of the survey.

Use of simple direct questions and separation of multiple part questions into distinct questions.

Avoidance of open-ended questions by means of pre-specified responses (usually with a provision for additional responses under a category called 'other').

There was no opportunity to pre-test this questionnaire due to time constraints. Based on findings of the household survey pre-test, no problems were expected with respect to survey structure or logic.

F3-2. SURVEY IMPLEMENTATION METHODOLOGY

The survey implementation methodology resembles that of the household questionnaire. The principal difference is that a purposive sampling protocol was used to secure 10 respondents in selected economic sectors.

Training

The household interview team was used to implement the business survey. Their training is described in Appendix F2.

Schedule

The survey was undertaken in late September by a local design institute under the guidance of advisors from the Wuhan Statistical Bureau.

Survey Sample

The sample consists of 100 businesses and institutions selected using a purposive sampling protocol. Prospective respondents were selected from business directories and contacted by telephone to secure permission to conduct

the survey. They were selected to achieve a broad representation of the following sectors:

SECTOR	TARGET NUMBER
1. Manufacturing	8
2. Construction services and trades	8
3. Transportation, warehousing	8
4. Information technology, computer services	8
5. Wholesale trade (e.g., chemicals, building materials, office supplies)	8
6. Retail trade	8
7. Health care services	8
8. Other personal services (e.g. barber, massage)	8
9. Culture, sports, recreation	8
10. Accommodation, Hotel	8
11. Restaurant, catering	8
12. Other (specify)	12

Only two Project areas were targeted for the survey, the Tri-gate connection drainage area and the overlapping area of Erlang Miao WWTP sewershed and the Lou Jia Road drainage area. Surveys outside of this area were conducted where businesses in a certain sector could not be found within them.

Questionnaire Numbering

Questionnaires were numbered using 7 digit codes determined as follows:

Digit order	Refers to:
1 – 2	Sub-Project number: Dong Xi Hu tri-gate connection & Chang Qing pump station Dong Xi Hu collectors Caidian WWTP and collectors Nantiazi Lake WWTP expansion and collectors Yangsigang pump station and SW culvert Huangpu Road WWTP upgrade Erlangmiao WWTP upgrade and expansion Erlangmiao WWTP and LuoJia Road drainage network
3 – 4	Interviewer number, 01 to 99
5 - 7	Serial number of questionnaire, 001 to 999.

Questionnaire Mapping

Survey supervisors marked the location of the neighborhood where interviewing took place on a City map, recorded the questionnaire numbers that were completed in that area and the date of the survey work.

Preparation for Interviews

Each interviewer received:

An interviewer number.

An official letter identifying them by name and authorizing them to do the work.

A set of cards to show the respondent as per the instructions given on the questionnaire.

At the beginning of each work day, each interviewer received:

1. An interview schedule with names and addresses.
2. A bundle of questionnaires.
3. A clip board and ballpoint pens to fill in the questionnaire.

Interviewers copied the questionnaire number and the address on to the front page, the 'passport', of the questionnaire and the questionnaire number on every page of the questionnaire.

Filling the Questionnaire Forms

All questionnaires were completed in black ballpoint pen. Supervisors used blue ball point pen to make notes or corrections. This prevented confusion for data coding staff when looking at data alterations.

The supervisor filled in items 1 to 6 and 10 on the passport page before giving questionnaire forms to interviewers. The supervisor filled in item 11 after the quality control check was done. The interviewer filled in items 7, 8, and 9 on the passport page before returning the completed form to the supervisor.

Confidentiality

Respondents were assured that the survey is confidential when they are first called and at the time of the interview.

In order to maintain confidentiality of the respondents the Questionnaire passport with address and name of respondent was permanently detached from the questionnaire after data entry. After the data analysis was completed the passport pages were destroyed by the PPTA team.

Conducting the Interview

Response cards were used:

To encourage respondent to answer very personal questions e.g. income. The respondent can read out an index number instead of saying the actual amount of money that they earn

To help respondent to remember what type of response is required

To avoid interviewer bias. The interviewer's tone of voice can affect which response a respondent may use. Whereas if the respondent reads from a card,

they are not affected by this,

The interview form is the original record of what each respondent has said to the interviewer. Only responses provided by the respondent were marked down on the interview form.

A blank field means that the question was not asked. A field marked '99' means that the question was asked but the respondent refused to answer or answered 'don't know'.

Notes on Individual Questions

The following notes were provided to the interviewers to help guide them in their work:

QUESTION	COMMENT / INSTRUCTION
INTRODUCTION	
1. Are you knowledgeable about the Wuhan municipal government master plan to improve wastewater and storm water drainage? 2. Are you knowledgeable about the Wuhan Wastewater and Storm water Management Project, which is part of the master plan?	The answer to these questions will help us understand the respondent's answers to subsequent questions. It also provides the respondent a chance to ask for more information.
A. WASTEWATER SERVICE	
A1. What type of wastewater does your enterprise produce? Where is each type of wastewater discharged? When was wastewater treatment system built? What is the volume of wastewater treated? What is the annual operating cost of treatment? How much did the wastewater treatment system cost to build?	Enter '1' for YES or '2' for NO in the first column for each row. If the answer is YES, enter the discharge for that type of wastewater. For respondents that discharge treated wastewater (type 3 or 4 in A1) ask questions (b) to (d) about the wastewater treatment? If the respondent doesn't know the answer, ask for his best understanding of what the answer is. If there is no understanding of the answer, enter 99. If the answer is '99' (e.g. 99 tonnes per month), then enter 100 instead of 99.
A2. How many toilets do you have?	Enter the number of toilets.
A3. I will read you a list of possible problems with wastewater and I want you to tell me for each one whether it is a major or minor problem or not a problem at all for you.	Read each response and wait for the answer before proceeding. Circle #3 in row 8 if there are no other problems.
A4. We want to know if wastewater problems affect your costs, production and sales. About how much does it cost each year to overcome wastewater problems? On average, how many days of production are lost each year? On average, how many days of sales are lost each year?	Read each question and record response. Fill in zero for 'no impact'. Do not leave blank.

QUESTION	COMMENT / INSTRUCTION
A5. Please tell me how satisfied or unsatisfied you are overall with the management of wastewater here in your district and for the whole city.	Be sure to distinguish between the district and the whole city. The whole city is important when they are out shopping or working or maybe in a city park by the water. Get a response for each.
A6. How does your enterprise pay for wastewater disposal?	If they don't know, ask to see a recent water and wastewater bill to determine the answer.
A7. How much does your enterprise pay each month?	Make sure that the amount given is for wastewater only and not the total water and wastewater bill. If necessary ask to see a recent bill. Skip this question (leave blank) if A6 response is #5, 'don't pay'.
A8. VERSION 1: Right now, the wastewater tariff in this area of the city is 0.8 yuan per tonne. ... VERSION 2: Right now, there is no wastewater tariff in this part of the Wuhan. ...	There are 2 versions of this question. Use the 2 nd version in the suburban areas where there is no wastewater charge (Chong Qing pump station, Caidian WWTP and collectors). If the respondent is uncertain, stress that the choice is between having the improvements and paying more, or not having the improvements. Be careful to follow the routing commands in for question A8. If the 1 st answer or the answer to A8b is yes, then go to Section B.
A8a VERSION 1: Tell me why you will not support a tariff increase to pay for the project. VERSION 2: Tell me why you will not support a new tariff to pay for the project.	See comment for A9 on the 2 versions of this question. Do not read the statements. Just let respondents answer with their own words and interpret these words in terms of the statements or write in another statement in the last row.
A8b. Would you support the higher tariff if it was introduced gradually over 5 years?	Be careful to follow the routing commands in for question A8. If the answer to A8b is yes, then go to Section B.
A8c. If 1.5 is too high, then what wastewater tariff would you support at a public hearing meeting?	Show the respondent card 1 for this question and circle one response. There are 2 versions of the card for this question. Use the 2 nd version in the suburban areas where there is no wastewater charge (Chong Qing pump station, Caidian WWTP and collectors). The lowest amount in the urban area is the tariff the respondent is already paying. If the respondent will only pay a tariff less than this, explain that they are already paying the lowest on the card.
B. WATER SUPPLY	
B1. Please identify your main water source. a. Is this source metered? b. How much water do you use from this source each month?	Only fill in one row for the main source.
B2. How does your business pay for water from the source you identified?	Circle only one.
B3. How much does your business pay each month for this water?	Skip this question (leave blank) if B2 response is #4. , 'don't pay'.
C. STORM WATER DRAINAGE	

QUESTION	COMMENT / INSTRUCTION
rain water drained away from your property?	Circle 1 or 2 for each row. Do not leave a row unmarked when that method is not used. You may have to explain the difference between wastewater and storm water again.
C2. I will read you a list of possible problems with storm water drainage and I want you to tell me for each one whether it is a major or minor problem or not a problem at all.	Read each response and wait for the answer before proceeding. Circle #3 in row 12 if there are no other problems.
C3. How frequently do you experience flooding to each of the following levels?	Use card 2 showing the frequency categories to help the respondent.
C4. We want to know how storm water affects your business and costs you in damages and repairs. I will read several examples of flood damage. Please indicate for each, how often you experience that kind of damage and how much it costs you in direct expenditures and lost days of production and sales.	Skip C4 if all responses to C3 are '7-NEVER'. This is a complex question so do not rush the respondent. Use card 2 showing the frequency categories to help the respondent.
C5. How satisfied you are with the storm water control in your district and for the whole city:	Be sure to distinguish between the district and the whole city. Get a response for each.
D. GENERAL ATTITUDES	
D1. The storm water operations are paid for out of government tax revenues. ...	Explain that their response should reflect their business priorities for improving the city and should reflect their needs. There is no right answer.
D2. Using the rating: "high need", "medium need", "low need", and "no need", how do you rate the need for government investments to improve in the following public services in Wuhan?	This does not require that the different services be ranked 1 st , 2 nd , 3 rd and so on. For example, more than one service can be rated 'high need' or 'no need'.
D3. Comparing these different government services, where do storm water and wastewater rank in priority in your opinion?	Stress that this question does require the respondent to rank the project based on a comparison of the different services.
D4. We want to know what your frank opinion about wastewater and storm water services in general and about the government. I will read a number of statements and I want you to indicate how strongly you agree or disagree with each one.	Explain that their response should reflect their own opinions and will be confidential. There is no correct answer.
F. ENTERPRISE INFORMATION	
E1. What is your position or title?	Circle one response.
E2. Who owns the enterprise?	Circle one response.
E3. What is the main area of business activity of your enterprise?	A business may be involved in more than one activity. Circle one response representing the main activity.
E4. How long has the enterprise been operating in this district of the City	Circle one response.

QUESTION	COMMENT / INSTRUCTION
E5. How many workers does this enterprise have?	Circle one response. Include owner-operator and family members who work in the business.
E6. How has the level of business activity for your enterprise changed over the last 5 years?	Circle one response. Business activity refers to production or sales.
E7. By how much could the level of business activity be increased in your business now with your existing equipment and location?	Circle one response. This question is about whether they are operating at the full production capacity of the business.
E8. What is the approximate total value of your stocks of raw materials and finished products?	Fill in the response or 99 if respondent refuses to answer or doesn't know. If respondent gives 99 as the response, fill in 100. If the answer is in units of ten thousand write in the actual amount or indicate the units.
E9. What is the approximate total value of your company?	Fill in the response or 99 if respondent refuses to answer or doesn't know. If respondent gives 99 as the response, fill in 100. If the answer is in units of ten thousand write in the actual amount or indicate the units.
E10. Please provide an indication of your production income & operating costs per year?	Fill in the response or 99 if respondent refuses to answer or doesn't know. If respondent gives 99 as the response, fill in 100. If the answer is in units of ten thousand write in the actual amount or indicate the units.
E11. On average, how much do you spend on the following each year?	Ask for operating costs. Do not include investments. Fill in the response or 99 if respondent refuses to answer or doesn't know. If respondent gives 99 as the response, fill in 100. If the answer is in units of ten thousand write in the actual amount or indicate the units.

F3-3. CODING OF QUESTIONNAIRE DATA

Data coding was done in excel using a data entry form. This program has a front page for data entry that provides a space for each data item including the questionnaire number. The second page of the data entry spreadsheet contains the entered data. The third sheet provides documentation of the data entry spreadsheet.

All data entry operations are automated and there are built in checks to prevent certain types of data entry error.

The excel spreadsheet was designed so that individual data items are arranged sequentially in columns and each row represents one completed survey form. Row identifiers are the questionnaire numbers. Column identifiers are the data field codes that are entered in italics after each data item in the survey form.

F3-4. QUALITY CONTROL

Quality control checking of questionnaires of all interviewers was completed by the supervisor. The following items were checked:

1. The questionnaire number was on the front page of the questionnaire and was copied accurately onto every page of the same questionnaire.
2. The questionnaire was complete. No sections, pages or individual questions that should have been asked were missed.
3. Individual questions were properly filled in.
4. Directions regarding the sequence of questions were followed

The checked questionnaire was filed by subproject and in numerical sequence in appropriate boxes in preparation for data coding.

A further check of completed questionnaires was completed by the international SIA consultant in October. A final check of entered data was made following this. All data items in a 5% sample of coded surveys were checked against data in the original survey forms. The coding error rate was determined to be ___% and did not exceed ___% for any single question. This was deemed to be acceptable.

F3-5. SUMMARY OF SURVEY RESULTS

Summary statistics are provided for the total data set below. To understand the following data tables, please refer to the questionnaire form in the attachment. The questionnaire form can be used to understand questions and data formats. Data counts are only provided for categorical data.

SUMMARY STATISTICS	No ob.	Average	Median	Mode	Max	Min	St dev
Intro 1	100	2.3	2.0	2.0	3.0	1.0	0.6
Intro 2	100	2.4	2.0	2.0	3.0	1.0	0.5
A1.1 Domestic	100	1.0	1.0	1.0	2.0	1.0	0.1
A1.2 Contam no treatment	100	1.9	2.0	2.0	2.0	1.0	0.4
A1.3 Contam pre-treatment	100	1.9	2.0	2.0	2.0	1.0	0.2
A1.4 Contam full treatment	100	2.0	2.0	2.0	2.0	1.0	0.1
A1.5 Water cooling	100	1.9	2.0	2.0	2.0	1.0	0.3
A1.6 Overflow septic	100	1.9	2.0	2.0	2.0	1.0	0.3
A1.7 Other	99	2.0	2.0	2.0	2.0	2.0	0.0
A1a.1 Domestic	98	1.2	1.0	1.0	4.0	1.0	0.6
A1a.2 Contam no treatment	15	1.7	1.0	1.0	6.0	1.0	1.6
A1a.3 Contam pre-treatment	6	1.8	1.0	1.0	6.0	1.0	2.0
A1a.4 Contam full treatment	1	5.0	5.0	na	5.0	5.0	na
A1a.5 Water cooling	5	1.0	1.0	1.0	1.0	1.0	0.0
A1a.6 Overflow septic	7	3.0	3.0	3.0	3.0	3.0	0.0
A1a.7 Other	0						
A1a date built?	6	2,000	1,999	1,998	2,003	1,997	3
A1b volume	6	6,167	5,500	10,000	10,000	2,000	3,251
A1c O&M cost	3	101,333	100,000	na	180,000	24,000	78,009
A1d Capital cost	6	128,333	150,000	10,000	250,000	10,000	98,877
A2. toilets	100	16.8	1.0	1.0	405.0	0.0	53.5
A3.1 own system break down	100	1.8	1.0	1.0	3.0	1.0	0.9
A3.2 Septic tanks overflow	100	1.9	2.0	1.0	3.0	1.0	0.8
A3.3 WW bypass	100	1.7	1.0	1.0	3.0	1.0	0.9
A3.4 smells	100	1.8	2.0	2.0	3.0	1.0	0.6

A3.5 vermin	100	1.6	1.5	1.0	3.0	1.0	0.7
A3.6 Staff sick	100	2.0	2.0	2.0	3.0	1.0	0.8
A3.7 contaminates products	100	1.9	2.0	1.0	3.0	1.0	0.9
A3.8 Other	100	3.0	3.0	3.0	3.0	2.0	0.2
A4a problems cost	100	10,176	17	0	500,000	0	56,643
A4b days production	100	1.2	0.0	0.0	36.0	0.0	5.2
A4c days sales	100	1.2	0.0	0.0	36.0	0.0	5.3

FREQ. COUNTS	No ob.	0	1	2	3	4	5	6	>6	D/A
Intro 1	100		6	61	33					0
Intro 2	100		2	57	41					0
A1.1 Domestic	100		98	2						0
A1.2 Contam no treatment	100		15	85						0
A1.3 Contam pre-treatment	100		6	94						0
A1.4 Contam full treatment	100		1	99						0
A1.5 Water cooling	100		7	93						0
A1.6 Overflow septic	100		7	93						0
A1.7 Other	99		0	99						0
A1a.1 Domestic	98		90	0	6	2	0	0		0
A1a.2 Contam no treatment	15		12	0	0	2	0	1		0
A1a.3 Contam pre-treatment	6		5	0	0	0	0	1		0
A1a.4 Contam full treatment	1		0	0	0	0	1	0		0
A1a.5 Water cooling	5		5	0	0	0	0	0		0
A1a.6 Overflow septic	7		0	0	7	0	0	0		0
A1a.7 Other	0		0	0	0	0	0	0		0
A2. toilets	100		48	13	4	4	3	1	24	0
A3.1 own system break down	100		55	14	31					0
A3.2 Septic tanks overflow	100		40	29	31					0
A3.3 WW bypass	100		55	18	27					0
A3.4 smells	100		36	53	11					0
A3.5 vermin	100		50	37	13					0
A3.6 Staff sick	100		34	37	29					0
A3.7 contaminates products	100		39	28	33					0
A3.8 Other	100		0	4	96					
A4b days production	100	87	0	6	2	1	0	0	51	
A4c days sales	100	89	1	2	2	0	0	2	4	

SUMMARY STATISTICS	No ob.	Average	Median	Mode	Max	Min	St dev
A5.1 District	100	2.5	2.0	2.0	5.0	1.0	0.8
A5.2 Whole city	100	3.0	3.0	3.0	4.0	1.0	0.8
A6.1 water bill	100	1.3	1.0	1.0	2.0	1.0	0.5
A6.2 wastewater bill	100	1.9	2.0	2.0	2.0	1.0	0.3
A6.3 private company	100	2.0	2.0	2.0	2.0	1.0	0.1
A6.4 Other	100	2.0	2.0	2.0	2.0	2.0	0.0
A6.5 Don't pay	100	1.8	2.0	2.0	2.0	1.0	0.4
A7. wastewater bill amt	82	1,997	30	10	60,000	2	8,733
A8. WTP 1.5	100	1.2	1.0	1.0	2.0	1.0	0.4
A8a.1 Can't afford	15	1.7	2.0	2.0	2.0	1.0	0.5
A8a.2 Don't trust	15	1.5	2.0	2.0	2.0	1.0	0.5
A8a.3 other priorities	15	1.7	2.0	2.0	2.0	1.0	0.5
A8a.4 other services	15	1.9	2.0	2.0	2.0	1.0	0.3

A8a.5 not needed	15	1.9	2.0	2.0	2.0	1.0	0.4
A8a.6 Other	15	1.9	2.0	2.0	2.0	1.0	0.3
A8b. gradual	15	1.7	2.0	2.0	2.0	1.0	0.5
A8c. WTP <1.5	10	2.1	2.5	3.0	3.0	1.0	1.0
A8 WW WTP	100	1.4	1.5	1.5	1.5	0.8	0.2
B1 source	100	1.0	1.0	1.0	2.0	1.0	0.1
B1a meter	100	1.0	1.0	1.0	2.0	1.0	0.1
B1b amount	100	3,992	80	100	85,000	3	14,242
B2. how pay	100	1.2	1.0	1.0	3.0	1.0	0.4
B3. pay amount	100	7,141	100	12	180,000	5	25,496

FREQ. COUNTS	No ob.	1	2	3	4	5	6	7	D/A
A5.1 District	100	7	47	33	12	1			0
A5.2 Whole city	100	4	21	51	24	0			0
A6.1 water bill	100	72	28						0
A6.2 wastewater bill	100	10	90						0
A6.3 private company	100	1	99						0
A6.4 Other	100	0	100						0
A6.5 Don't pay	100	18	82						0
A8. WTP 1.5	100	85	15						0
A8a.1 Can't afford	15	5	10						0
A8a.2 Don't trust	15	7	8						0
A8a.3 other priorities	15	4	11						0
A8a.4 other services	15	1	14						0
A8a.5 not needed	15	2	13						0
A8a.6 Other	15	1	14						0
A8b. gradual	15	5	10						0
A8c. WTP <1.5	10	4	1	5	0	0	0	0	0
B1 source	100	99	1	0	0				0
B1a meter	100	99	1						0
B2. how pay	100	86	13	1	0				0

SUMMARY STATISTICS	No ob.	Average	Median	Mode	Max	Min	St dev
C1.1 Overland	100	1.6	2.0	2.0	2.0	1.0	0.5
C1.2 ditches	100	1.8	2.0	2.0	2.0	1.0	0.4
C1.3 Covered channels	100	1.8	2.0	2.0	2.0	1.0	0.4
C1.4 Buried pipes	100	1.2	1.0	1.0	2.0	1.0	0.4
C1.5 Other	100	2.0	2.0	2.0	2.0	2.0	0.0
C2.1 puddles	100	1.4	1.0	1.0	3.0	1.0	0.6
C2.2 floods bldg	100	1.9	2.0	1.0	3.0	1.0	0.9
C2.3 garbage	100	1.6	2.0	2.0	3.0	1.0	0.6
C2.4 smells	100	1.7	2.0	2.0	3.0	1.0	0.7
C2.5 vermin	100	1.7	2.0	1.0	3.0	1.0	0.7
C2.6 pollute	100	1.3	1.0	1.0	3.0	1.0	0.5
C2.7 production and sales	100	1.8	2.0	1.0	3.0	1.0	0.8
C2.8 Employees absent	100	2.1	2.0	2.0	3.0	1.0	0.7
C2.9 Staff get sick	100	2.1	2.0	3.0	3.0	1.0	0.8
C2.10 ruins products	100	2.0	2.0	2.0	3.0	1.0	0.8

C2.11 disrupts treatment system	100	1.8	2.0	1.0	3.0	1.0	0.8
C2.12 other	100	3.0	3.0	3.0	3.0	1.0	0.2
C3.1. Roads	100	5.5	7.0	7.0	7.0	1.0	2.4
C3.2. ground floor	100	6.9	7.0	7.0	7.0	2.0	0.8
C3.3. higher	100	7.0	7.0	7.0	7.0	7.0	0.0

FREQ. COUNTS	No ob.	1	2	3	4	5	6	7	D/A
C1.1 Overland	100	37	63						0
C1.2 ditches	100	25	75						0
C1.3 Covered channels	100	22	78						0
C1.4 Buried pipes	100	77	23						0
C1.5 Other	100	0	100						0
C2.1 puddles	100	70	21	9					0
C2.2 floods bldg	100	43	20	37					0
C2.3 garbage	100	48	48	4					0
C2.4 smells	100	40	47	13					0
C2.5 vermin	100	45	43	12					0
C2.6 pollute	100	76	20	4					0
C2.7 production and sales	100	43	35	22					0
C2.8 Employees absent	100	21	45	34					0
C2.9 Staff get sick	100	29	34	37					0
C2.10 ruins products	100	32	36	32					0
C2.11 disrupts treatment system	100	44	32	24					0
C2.12 other	100	1	2	97					0
C3.1. Roads	100	12	12	4	0	0	0	72	0
C3.2. ground floor	100	0	2	0	1	0	1	96	0
C3.3. higher	100	0	0	0	0	0	0	100	0

SUMMARY STATISTICS	No ob.	Average	Median	Mode	Max	Min	St dev
C4.1.1 Cleaning outside	28	4.6	7.0	7.0	7.0	1.0	2.6
C4.2.1 Cleaning buildings	28	6.1	7.0	7.0	7.0	1.0	1.9
C4.3.1 Replace product	28	6.9	7.0	7.0	7.0	3.0	0.8
C4.4.1 Minor repairs	28	6.7	7.0	7.0	7.0	3.0	1.0
C4.5.1 Major repairs	28	6.9	7.0	7.0	7.0	3.0	0.8
C4.6.1 Close business	28	6.3	7.0	7.0	7.0	1.0	1.8
C4.7.1 Delay shipments	28	6.7	7.0	7.0	7.0	2.0	1.1
C4.8.1 Lose sales	28	6.1	7.0	7.0	7.0	1.0	2.0
C4.9.1 other	27	7.0	7.0	7.0	7.0	7.0	0.0
C4.1.2 Cleaning outside	13	2.1	0.0	0.0	15.0	0.0	4.8
C4.2.2 Cleaning buildings	5	0.0	0.0	0.0	0.0	0.0	0.0
C4.3.2 Replace product	1	0.0	0.0	na	0.0	0.0	na
C4.4.2 Minor repairs	2	0.5	0.5	na	1.0	0.0	0.7
C4.5.2 Major repairs	1	0.0	0.0	na	0.0	0.0	na
C4.6.2 Close business	4	7.0	6.0	na	15.0	1.0	6.7
C4.7.2 Delay shipments	2	1.0	1.0	na	2.0	0.0	1.4
C4.8.2 Lose sales	5	2.0	2.0	0.0	5.0	0.0	2.1
C4.9.2 other	0						
C4.1.3 Cleaning outside	13	931	0	0	7,000	0	2,287
C4.2.3 Cleaning buildings	5	500	0	0	1,500	0	707
C4.3.3 Replace product	1	500	500	na	500	500	na
C4.4.3 Minor repairs	2	750	750	na	1,000	500	354

SUMMARY STATISTICS	No ob.	Average	Median	Mode	Max	Min	St dev
C4.5.3 Major repairs	1	500	500	na	500	500	na
C4.6.3 Close business	4	253,300	6,500	na	1,000,000	200	497,810
C4.7.3 Delay shipments	2	251,000	251,000	na	500,000	2,000	352,139
C4.8.3 Lose sales	4	502,700	5,300	na	2,000,000	200	998,210
C4.9.3 other	0						
C4 annual avg damage per employee	26	77,909	0	0	2,000,000	0	392,043
C4 annual avg damage per employee	26	202	0	0	3,333	0	665
C4 annual avg damage per 10^6 sales	26	4,615	0	0	42,857	0	11,583
C5. 1 District	100	2.3	2.0	2.0	4.0	1.0	0.9
C5. 2 Whole city	100	2.7	2.0	2.0	5.0	1.0	0.9

FREQ. COUNTS	No ob.	0	1	2	3	4	5	6	7	>7	D/A
C4.1.1 Cleaning outside	28		2	10	1	0	0	0	15		0
C4.2.1 Cleaning buildings	28		1	2	2	0	0	0	23		0
C4.3.1 Replace product	28		0	0	1	0	0	0	27		0
C4.4.1 Minor repairs	28		0	0	2	0	0	0	26		0
C4.5.1 Major repairs	28		0	0	1	0	0	0	27		0
C4.6.1 Close business	28		1	2	1	0	0	0	24		0
C4.7.1 Delay shipments	28		0	1	0	1	0	0	26		0
C4.8.1 Lose sales	28		2	1	2	0	0	0	23		0
C4.9.1 other	27		0	0	0	0	0	0	27		0
C4.1.2 Cleaning outside	13	9	2	0	0	0	0	0	0	2	0
C4.2.2 Cleaning buildings	5	5	0	0	0	0	0	0	0	0	0
C4.3.2 Replace product	1	1	0	0	0	0	0	0	0	0	0
C4.4.2 Minor repairs	2	1	1	0	0	0	0	0	0	0	0
C4.5.2 Major repairs	1	1	0	0	0	0	0	0	0	0	0
C4.6.2 Close business	4	0	1	1	0	0	0	0	0	2	0
C4.7.2 Delay shipments	2	1	0	1	0	0	0	0	0	0	0
C4.8.2 Lose sales	5	2	0	1	1	0	1	0	0	0	0
C4.9.2 other	0	0	0	0	0	0	0	0	0	0	0
C5. 1 District	100	0	7	72	1	20	0				0
C5. 2 Whole city	100	0	4	50	19	26	1				0

SUMMARY STATISTICS	No ob.	Average	Median	Mode	Max	Min	St dev
D1.1. Water pollution	100	1.6	2.0	1.0	4.0	1.0	0.7
D1.2. Air pollution	100	1.8	2.0	2.0	4.0	1.0	0.8
D1.3. Solid waste	96	2.0	2.0	2.0	4.0	1.0	0.9
D1.4. Hazardous waste	95	1.9	2.0	1.0	4.0	1.0	0.9
D1.5. Local flooding	100	1.7	2.0	1.0	4.0	1.0	0.8
D1.6. Noise	99	1.7	1.0	1.0	4.0	1.0	0.8
D1.7. Others	24	3.2	4.0	4.0	4.0	1.0	1.2
D2.1 SW WW	100	1.5	1.0	1.0	2.0	1.0	0.5
D2.2 WS	100	1.9	2.0	2.0	4.0	1.0	0.8
D2.3 Roads	99	1.8	2.0	2.0	4.0	1.0	0.7
D2.4 transit	100	1.8	2.0	2.0	3.0	1.0	0.6
D2.5 Garbage	99	1.7	2.0	2.0	3.0	1.0	0.5

SUMMARY STATISTICS	No ob.	Average	Median	Mode	Max	Min	St dev
D2.6 Electric power	100	1.9	2.0	1.0	4.0	1.0	0.9
D2.7 Gas services	99	2.4	3.0	3.0	4.0	1.0	0.8
D2.8 Education	100	2.0	2.0	1.0	4.0	1.0	0.9
D2.9 Medical	98	1.8	2.0	1.0	4.0	1.0	0.8
D3. priority	100	2.0	2.0	2.0	3.0	1.0	0.7
D4.1 taxes too high	92	2.4	2.0	2.0	5.0	1.0	0.8
D4.2 services free	96	2.4	2.0	2.0	4.0	1.0	0.7
D4.3 wastes money	93	3.3	3.0	3.0	5.0	1.0	1.1
D4.4 trustworthy	88	3.0	3.0	3.0	5.0	1.0	0.7
D4.5 benefit enterprise	95	2.0	2.0	2.0	4.0	1.0	0.7
D4.6 Business fair share	90	2.4	2.0	2.0	4.0	1.0	0.7
D4.7 polluter pay	100	1.5	1.0	1.0	3.0	1.0	0.6
D4.8 pre treat	100	1.5	1.0	1.0	3.0	1.0	0.6
D5.1 Economic growth	96	1.8	2.0	2.0	4.0	1.0	0.7
D5.2 Inflation	91	2.3	2.0	2.0	4.0	1.0	0.8
D5.3 Foreign competition	98	2.7	3.0	3.0	4.0	1.0	0.9
D5.4 Transportation	98	2.0	2.0	2.0	4.0	1.0	0.8
D5.5 skilled workers	100	1.9	2.0	1.0	4.0	1.0	1.0
D5.6 Housing for workers	96	2.5	2.0	2.0	4.0	1.0	1.0
D5.7 Local environment	99	1.9	2.0	1.0	4.0	1.0	0.9
D5.8 other	23	2.8	4.0	4.0	4.0	1.0	1.4

FREQ. COUNTS	No ob.	1	2	3	4	5	D/A
D1.1. Water pollution	100	47	44	7	2		0
D1.2. Air pollution	100	39	49	8	4		0
D1.3. Solid waste	96	32	36	23	5		0
D1.4. Hazardous waste	95	41	32	16	6		0
D1.5. Local flooding	100	48	37	13	2		0
D1.6. Noise	99	52	30	15	2		0
D1.7. Others	24	4	3	1	16		0
D2.1 SW WW	100	51	49	0	0		0
D2.2 WS	100	33	43	23	1		0
D2.3 Roads	99	35	48	14	2		0
D2.4 transit	100	31	57	12	0		0
D2.5 Garbage	99	31	63	5	0		0
D2.6 Electric power	100	46	25	26	3		0
D2.7 Gas services	99	14	34	45	6		0
D2.8 Education	100	40	27	29	4		0
D2.9 Medical	98	42	35	19	2		0
D3. priority	100	25	53	22	0	0	0
D4.1 taxes too high	92	10	41	35	4	2	0
D4.2 services free	96	5	52	32	7	0	0
D4.3 wastes money	93	7	10	39	26	11	0
D4.4 trustworthy	88	2	14	56	14	2	0
D4.5 benefit enterprise	95	23	49	22	1	0	0
D4.6 Business fair share	90	9	42	37	2	0	0
D4.7 polluter pay	100	52	44	4	0	0	0
D4.8 pre treat	100	59	37	4	0	0	0
D5.1 Economic growth	96	36	43	16	1		0
D5.2 Inflation	91	13	38	37	3		0
D5.3 Foreign competition	98	12	29	38	19		0

D5.4 Transportation	98	27	47	19	5		0
D5.5 skilled workers	100	44	30	14	12		0
D5.6 Housing for workers	96	16	35	30	15		0
D5.7 Local environment	99	41	39	11	8		0
D5.8 other	23	8	1	1	13		0

SUMMARY STATISTICS	No ob.	Average	Median	Mode	Max	Min	St dev
E1. position	100	2.1	2.0	2.0	5.0	1.0	1.0
E2. owns	100	2.3	2.0	2.0	5.0	1.0	1.1
E3. business activity	100	6.8	6.0	12.0	12.0	1.0	3.9
E4. How long	100	2.4	2.0	2.0	4.0	1.0	1.0
E5.1 Full-time	100	91.7	10	5	1,000	2	209.4
E5.2 Part-time	100	2.1	0	0	50	0	7.7
E5.3 Laid off	100	1.0	0	0	100	0	10.0
E5.4 Retired	100	21.6	0	0	900	0	120.0
E6. 5 yr change	100	2.1	2	2	5	1	0.9
E7. activity increase	100	2.1	2	1	5	1	1.3
E8. inventory value	56	13,925,938	77,500	0	400,000,000	0	56,132,307
E9 co. value	69	12,705,652	200,000	100,000	300,000,000	50,000	52,851,553
E10.1 operating income	89	27,985,056	260,000	100,000	1,000,000,000	40,000	124,827,573
E10.2 operating costs	86	23,052,035	105,000	100,000	980,000,000	20,000	118,229,339
E10.3 profit	91	3,293,022	60,000	30,000	100,000,000	5,000	12,921,672
E11.1 WS	100	61,705	1,350	3,000	2,000,000	80	229,265
E11.2 own WS	100	1	0	0	80	0	8
E11.3 WW	100	10,068	190	0	500,000	0	51,736
E11.4 own WW	100	49,773	0	0	3,000,000	0	322,874
E11.5 Private WW	100	110	0	0	10,000	0	1,001
E11.6 Electricity	100	768,829	5,500	1,000	20,000,000	240	2,919,453
E11.7 Gas	100	51,270	500	0	2,000,000	0	235,929
E11.8 Rent	100	30,550	11,000	0	1,000,000	0	104,403

FREQ. COUNTS	No ob.	1	2	3	4	5	6	7	8	9	10	11	12	D/A
ID	No ob.	1	2	3	4	5	6	7	8	9	10	11	12	99
E1. position	100	23	57	12	0	8								0
E2. owns	100	15	59	13	3	10	0							0
E3. business activity	100	10	10	10	2	10	10	3	7	0	10	10	18	0
E4. How long	100	22	34	28	16									0
E6. 5 yr change	100	27	39	30	3	1								0
E7. activity increase	100	38	35	11	7	9								0

ATTACHMENT:

BUSINESS QUESTIONNAIRE

Table of Contents

QUESTIONNAIRE PASSEPORT – Identifies interviewer, supervisor, coding and checking staff. Assigns a questionnaire number. Identifies business and location of respondent.

INTRODUCTION – Introduce and describe the project and queries the respondents familiarity with the project.

A. WASTEWATER SERVICE – Eight questions on various aspects of wastewater services including type of service, satisfaction and willingness to pay.

B. WATER SUPPLY – Three question on water supply covering type of service, and payments.

C. STORM WATER DRAINAGE - Five questions on various aspects of storm water flooding and drainage services including nature of flooding, type of drainage, damages, satisfaction and willingness to pay.

D. GENERAL ATTITUDES – Five questions soliciting attitudes and opinions on existing public services, the proposed project, the government, pollution and business conditions.

F. BUSINESS INFORMATION – Eleven questions soliciting information on the respondent's business activities.

BUSINESS QUESTIONNAIRE
QUESTIONNAIRE PASSEPORT

Number of the questionnaire

1	2	3	4	5	6	7
Project #		Interviewer #		Interview #		

Subproject/district (circle all that apply)

Dong Xi Hu three drainage gate connections & Chang Qing pump station	1
Dong Xi Hu wastewater collectors	2
Caidian WWTP and collectors	3
Nantiazi Lake WWTP expansion and collectors	4
Nantiazi Lake WWTP & Yangsigang pump station and SW culvert	5
Huangpu Road WWTP upgrade	6
Erlangmiao WWTP upgrade and expansion only	7
Erlangmiao WWTP & Luo Jia Road drainage network	8

Name of enterprise

--

Correct address

District	Street	No.

The date of the interview: day |__|__| month |__|__|

Start time of the interview: time |__:__|

End time of the interview: time |__:__|

☐ Completed ☐ Not completed

Interviewer: name _____ signature _____

Supervisor: name _____ signature _____

Checking: name _____ signature _____

Coding: name _____ signature _____

Code check: name _____ signature _____

Introduction

Hello. My name is _____. I am here to conduct the interview that we telephoned you about a short while ago. Please recall that this survey is being conducted by [NAME OF PMO] and is being done to help evaluate the Wuhan Wastewater and Stormwater Management Project. The results of the survey will be used to improve the project and get approval for funding.

Wastewater is the dirty water from kitchens, washrooms and production. Storm water is the rain that collects on the ground and drains away. Now, only 27% of wastewater from Wuhan is treated. The rest of it goes untreated into local drains, rivers and lakes. Several wastewater treatment plants are under construction now and by 2010, 60% will be treated.

The State government requires that Wuhan and other large cities treat 70% of all wastewater by 2010. This project is part of the Wuhan master for achieving this target. The Project will improve wastewater collection and treatment, and storm water drainage in Wuhan through investments in 8 areas of the city. In your area the planned works and benefits are (DESCRIBE IN WORDS BASED ON TABLE).

Subproject	Description of subproject and benefits
Dong Xi Hu tri-gate connection project & Chang Qing pump station	The tri-gate connection project and stage-II construction of Changqing Pump Station serves the west area of Hankou. Increased drainage from urban development has far exceeded the capacity of existing drains causing waterlogging and flooding in areas. Improvements to inadequate drains and the pumping Changqing pump station will solve this problem.
Dong Xi Hu wastewater collectors	The Dong Xi Hu area is the City's fastest growing commercial area and also has new residential and recreational developments. Wastewater is discharged into local ditches and is polluting lakes in the area. The new sewers will collect wastewater and bring it to the Hanxi WWTP, which is now under construction.
Caidian WWTP and collectors	Caidian District, in the southwest of Wuhan, discharges untreated wastewater directly into the Hanjiang River from older combined and newer separated sewers. This causes severe pollution of the river and affects local residents and downstream areas of Wuhan. The project will solve this problem.
Nantaizi Lake WWTP expansion and sewer works	Nantaizihu WWTP serves a rapidly growing area at the confluence of the Yangtse and Hanjiang Rivers. Wastewater flows exceed plant capacity and several local lakes are severely polluted. Some sewers in the area are combined sewers mixing wastewater with storm water causing more pollution. The project will expand Nantaizihu WWTP and separate the sewers to improve the local environmental condition.
Yangsigang pump station and SW culvert	This project will serve the old urban area of Hanyang and the newly built up industrial area of Yingwuzhou. Storm and wastewater, which are now discharged to local water bodies through inadequate drains, will be better managed with the project.

Huangpu Road WWTP upgrade	Huangpulu WTP serves the old town along the Yangtze River south of Wuhan Chiangjiang Bridge #2. The WWTP This important commercial and tourist district is adversely affected by severe local pollution of the River and bad odors from the WTP. WTP upgrades will solve these problems.
Erlangmiao WWTP upgrade and expansion	The Erlangmia wastewater treatment system covers Xujiapeng, Yangyuan and Liyuan Areas in Wuchang. The existing WWTP can not treat all the wastewater it receives and causes pollution and local odor problems. The project will solve these problems.
Luoja Road drainage network	Increased drainage form urban development in the Luoja Road Area has far exceeded the capacity of existing drainage facilities. Storms cause long duration floods to a depth of a meter or more. Improvements to inadequate drains and an obsolete pumping station will solve this problem.

Are you knowledgeable about the Wuhan municipal government master plan to improve wastewater and storm water drainage?

1. Very	2. not very	3. Not at all	1.0
1	2	3	
1. Very	2. not very	3. Not at all	2.0
1	2	3	

Are you knowledgeable about the Wuhan Wastewater and Stormwater Management Project, which is part of the master plan?

A. WASTEWATER SERVICE

First, I would like to ask a few questions about your wastewater services.

A1. What type of wastewater does your enterprise produce?

a. Where is each type of wastewater discharged?

	Yes=1 No=2	a.Where is it discharged 1. city sewers 2. private septic tank 3. public septic tank 4. directly into open drain or ditch 5. directly into a river or lake 6. Other 99. Don't know, unsure
Kitchen and toilet wastewater only		
Contaminated water from manufacturing with no treatment		
Contaminated water from manufacturing with pre-treatment		
Contaminated water from manufacturing with full treatment		
Water used only for cooling		
Overflow from a septic tank		
Other (specify)		

A1.1 to

A1a.1 to A1a.

A1.7

FOR RESPONDENTS THAT DISCHARGE TREATED WASTEWATER (TYPE 3 OR 4 IN A1) ASK QUESTIONS (a) TO (d) ABOUT THE WASTEWATER TREATMENT?

When was wastewater treatment system built?	year	A.1a
What is the volume of wastewater treated?	tonnes per month	A.1b
What is the annual operating cost of treatment?	Yuan per year	A.1c
How much did the wastewater treatment system cost to build?	Yuan	A.1d

A2. How many toilets do you have?

--

 number A2

A3. I will read you a list of possible problems with wastewater and I want you to tell me for each one whether it is a major or minor problem or not a problem at all for you.

READ EACH PROBLEM AND CIRCLE THE RESPONSE FOR EACH. RECORD ANY OTHERS.

	1. Major problem	2. Minor problem	3. Not a problem	
Treatment system breaks down	1	2	3	A3.1
Overflow of septic tanks	1	2	3	A3.2
Excess wastewater bypasses the treatment system	1	2	3	A3.3
Bad smells from wastewater	1	2	3	A3.4
Wastewater brings flies, mosquitoes and mice	1	2	3	A3.5
Staff exposed to wastewater get sick	1	2	3	A3.6
Wastewater contaminates raw materials or products	1	2	3	A3.7
Describe other problem and say if it is major or minor.	1	2	3	A3.8

A4. We want to know if wastewater problems affect your costs, production and sales:

a.About how much does it cost each year to overcome wastewater problems?

b.On average, how many days of production are lost each year?

c.On average, how many days of sales are lost each year?

Yuan	A4a
number	A4b
number	A4c

A5. Please tell me how satisfied or unsatisfied you are overall with the management of wastewater here in your district and for the whole city.

[READ OUT THE 5 LEVELS AND RECORD RESPONSE]

	1. Very satisfied	2. Satisfied	3. Neither	4. Unsatisfied	5. Very unsatisfied	
District	1	2	3	4	5	A5.1
Whole city	1	2	3	4	5	A5.2

A6. How does your enterprise pay for wastewater disposal?

	Yes	No	
Pay a charge on a water bill but no separate wastewater bill	1	2	A6.1
Pay a separate bill for wastewater	1	2	A6.2
Pay a private company or person for night soil removal	1	2	A6.3
Other (describe)	1	2	A6.4
Don't pay at all	1	2	A6.5

IF A6 IS ANSWERED "Don't pay at all" GO TO A8

A7. How much does your enterprise pay each month?

Yuan/month

 A7

A8. Right now, the wastewater tariff in this area of the city is 0.8 yuan per tonne. The wastewater tariff will have to increase to pay for the new project. We still don't know how much it will be, but it could be as much as 1.5 yuan per tonne. Would you be willing to pay a tariff of 1.5 yuan per tonne to finance the project or would you prefer to leave the tariff at 0.8 and not have the project?

IF RESPONSE IS '1' GO TO SECTION B. IF '2'
ASK THE FOLLOWING 2 QUESTIONS:

Pay higher tariff, get project	Leave tariff at 0.8, no project	
1	2	A8

Tell me why you will not support a tariff increase to pay for the project.

[DO **NOT** READ OUT THE LIST. CIRCLE 1 OR 2 FOR EACH ROW].

	Mentioned	Not mentioned	
1. Can't afford the additional cost	1	2	A8a.1
2. Don't trust the government to spend this money properly	1	2	A8a.2
3. Have other priorities for expenditures	1	2	A8a.3
4. Prefer to see government money spent on other services	1	2	A8a.4
5. Don't think the project is needed now	1	2	A8a.5
6. Other (describe)	1	2	A8a.6

Would you support the higher tariff if it was introduced gradually over 5 years?

IF RESPONDENT SAYS 'YES' GO TO SECTION B. IF 'NO' ASK THE FOLLOWING QUESTION:

Yes	No	
1	2	b

If 1.5 is too high, then what wastewater tariff would you support at a public hearing meeting?

SHOW CARD 1 AND ASK RESPONDENT TO PICK A TARIFF LEVEL.

	1	2	3	4	5	6	7	D/A
Yuan/tonne	0.80	0.90	1.00	1.10	1.20	1.30	1.40	99

c

ALTERNATIVE FORM OF A8 for CAIDIAN WWTP AND DONG XI HU WW COLLECTORS:

Right now, there is no wastewater tariff in this part of the Wuhan. In the urban area it is 0.8 yuan per tonne. A wastewater tariff will have to be introduced here to pay for the new project. We still don't know how much it will be, but it could be as much as 1.5 yuan per tonne. Would you support a tariff of 1.5 yuan per tonne to have a wastewater service here or would you prefer to pay no new charge and not have a wastewater service?

IF RESPONSE IS '1' GO TO SECTION B. IF '2' ASK THE FOLLOWING 2 QUESTIONS:

Pay new tariff, get service	Don't pay, no service
1	2

A8

a. Tell me why you will not support a new tariff to pay for the project.

[DO NOT READ OUT THE LIST. CIRCLE 1 OR 2 FOR EACH ROW].

	Mentioned	Not mentioned	
1. Can't afford the additional cost	1	2	A8a.1
2. Don't trust the government to spend this money properly	1	2	A8a.2
3. Have other priorities for expenditures	1	2	A8a.3
4. Want to see government money spent on other services	1	2	A8a.4
5. Don't think the project is needed now	1	2	A8a.5
6. Other (describe)	1	2	A8a.6

- b. Would you support the higher tariff if it was introduced gradually over 5 years?

IF RESPONDENT SAYS 'YES' GO TO **SECTION B**. IF 'NO' ASK THE FOLLOWING QUESTION:

Yes	No
1	2

A8b

- c. If 1.5 is too high, then what wastewater tariff would you support at a public hearing meeting?

SHOW **CARD 1** AND ASK RESPONDENT TO PICK A TARIFF LEVEL.

	1	2	3	4	5	6	7	D/A
Yuan/tonne	0.2	0.4	0.6	0.8	1.0	1.2	1.4	99

A8c

B. WATER SUPPLY

Although the project doesn't involve water supply, we have just a few questions on your water supply since the government wastewater service is paid for on the water bill:

Please identify your main water source.

READ OUT THE SOURCES IN THE TABLE BELOW AND CHECK ONLY ONE, THEN ASK:

- a. Is this source metered?
- b. How much water do you use from this source each month?

Source of Water	Main Source? CIRCLE ONLY ONE	Metered? 1 = YES 2 = NO	How much? TONNES PER MONTH (99 IF DON'T KNOW)
1. Tap water from a water supply company owned by government	1	1 2	Tonnes/month
2. Tap water from a private water supply company not owned by government.	2	1 2	Tonnes/month
3. Water from your own water	3	1 2	Tonnes/month

supply system			
4. Other (describe)	4	1 2	Tonnes/month
	<i>B1</i>	<i>B1a</i>	<i>B1b</i>

B1. How does your business pay for water from the source you identified?

CIRCLE ONE ONLY.

1. Pay a water bill from the government water supply company	1
2. Pay a water bill from an enterprise or private water supply company	2
3. Other (describe)	3
4. Don't pay at all	4

*B2*IF **B2** IS ANSWERED "Don't pay at all" GO TO **SECTION C****B2. How much does your business pay each month for water?**

Yuan/month	<i>B3</i>
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C. STORM WATER DRAINAGE

Now I would like to ask a few questions about the drains that take rainwater away in your area. These may be ditches, covered and uncovered concrete channels beside the road, or buried pipes.

C1. How is rain water drained away from your property?

READ OUT THE LIST AND CIRCLE ONE ANSWER IN EACH ROW.

	Yes	No	
1. Overland and in natural drainage channels	1	2	<i>C1.1</i>
2. Dug ditches, road gutters and uncovered channels	1	2	<i>C1.2</i>
3. Covered concrete channels	1	2	<i>C1.3</i>
4. Buried pipes	1	2	<i>C1.4</i>
5. Other (DESCRIBE)	1	2	<i>C1.5</i>

C2. I will read you a list of possible problems with storm water drainage and I want you to tell me for each one whether it is a major or minor problem or not a problem at all.

READ EACH STATEMENT AND CIRCLE ONE RESPONSE FOR EACH PROBLEM.

	1. Major problem	2. Minor problem	3. Not a problem	
1. Rainwater collects in deep puddles outside	1	2	3	C2.1
2. Rainwater floods buildings	1	2	3	C2.2
3. Drains are plugged with garbage	1	2	3	C2.3
4. Bad smells come from the storm water drains	1	2	3	C2.4
5. Flies, mosquitoes, or mice come from the drains	1	2	3	C2.5
6. Storm water pollutes Wuhan's rivers and lakes	1	2	3	C2.6
7. Storm water flooding hurts production and sales	1	2	3	C2.7
8. Employees can't get to work during flooding	1	2	3	C2.8
9. Staff exposed to storm water get sick	1	2	3	C2.9
10. Storm water ruins raw materials or products	1	2	3	C2.10
11. Storm water disrupts wastewater treatment system	1	2	3	C2.11
12. Describe any other problem you can think of and tell me if it is major or minor.	1	2	3	C2.12

C3. How frequently do you experience flooding to each of the following levels?

SHOW CARD 2. READ EACH STATEMENT AND CIRCLE ONE RESPONSE FOR EACH PROBLEM.

	More than 2 times a year	1 or 2 times a year	Once every 1 to 2 years	Once every 2 to 5 years	Once every 5 to 10 years	Less than once in 10 years	Never	
1. Roads and sidewalks covered in water	1	2	3	4	5	6	7	C
2. Flood water reaches ground floor of buildings	1	2	3	4	5	6	7	3.
3. Flood goes above the ground floor of buildings	1	2	3	4	5	6	7	1

IF ALL RESPONSES TO C3 ARE '7 – NEVER', SKIP C4.

C4. We want to know how storm water affects your business and costs you in damages and repairs. I will read several examples of flood damage. Please indicate for each, how often you experience that kind of damage and how much it costs you in direct expenditures and lost days of production and sales.

READ EACH STATEMENT AND CIRCLE ONE RESPONSE IN COLUMN 2 FOR EACH PROBLEM. THEN ASK ABOUT LOST WORK TIME AND DIRECT COSTS.

	How often experienced: 1. More than 4 times a year 2. 1 to 4 times a year 3. Once every 1 to 2 years 4. Once every 2 to 5 years 5. Once every 5 to 10 years 6. Once every 10 to 50 years 7. Never 99. D/A CODE FOR EACH ROW	Lost days of production or sales for each flood (number)	Direct expense for each flood (yuan)
1. Cleaning outside areas			
2. Cleaning buildings and equipment			
3. Spoiled inventory and product			
4. Minor repairs to buildings and equipment			
5. Major repairs to buildings and equipment			
6. Close business during flooding			
7. Delay shipments			
8. Lose sales during flood			
9. Describe other damage you experience			

C4.1.1 to C4.1.9

C4.2.1 to C4.2.9
C4.3.1 to C4.3.9

C5. How satisfied you are with the storm water control in your district and for the whole city:

READ THE 5 LEVELS AND CIRCLE RESPONSE

	1. Very satisfied	2. Satisfied	3. Indifferent	4. Unsatisfied	5. Very unsatisfied	
1. District	1	2	3	4	5	C5.1
2. Whole city	1	2	3	4	5	C5.2

D. GENERAL OPINIONS

D1. Using the rating: "great concern," "medium concern," "low concern," and "no concern," how do you rate the following environmental issues in Wuhan?

	Great concern	Medium concern	Low concern	No concern	Don't know	
1. Water pollution in rivers and streams	1	2	3	4	99	D1.1
2. Air pollution	1	2	3	4	99	D1.2
3. Solid waste disposal	1	2	3	4	99	D1.3
4. Hazardous and toxic waste	1	2	3	4	99	D1.4
5. Local flooding from rivers and creeks	1	2	3	4	99	D1.5
6. Noise	1	2	3	4	99	D1.6
7. Others (specify)	1	2	3	4	99	D1.7

D2. Using the rating: "high need," "medium need," "low need," and "no need," how do you rate the need for government investments to improve in the following public services in Wuhan?

	High need	Medium need	Low need	No need	Don't know	
1. Storm water & Wastewater	1	2	3	4	99	D2.1
2. Tap water supply	1	2	3	4	99	D2.2
3. Roads	1	2	3	4	99	D2.3
4. Public transportation	1	2	3	4	99	D2.4
5. Garbage collection and street cleaning	1	2	3	4	99	D2.5
6. Electric power	1	2	3	4	99	D2.6
7. Gas services	1	2	3	4	99	D2.7
8. Education	1	2	3	4	99	D2.8
9. Medical services	1	2	3	4	99	D2.9

D3. Comparing these different government services, where do storm water and wastewater rank in priority?

1. Highest priority	2. High priority	3. Middle priority	4. Low priority	5. Lowest priority	99. Don't know
1	2	3	4	5	99

D3

D4. We want to know what your frank opinion about wastewater and storm water services in general and about the government. I will read a number of statements and I want you to indicate how strongly you agree or disagree with each one.

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know	
1. Government taxes and charges are too high	1	2	3	4	5	99	D4.1
2. These services should be free to the public	1	2	3	4	5	99	D4.2
3. Government wastes money on construction projects	1	2	3	4	5	99	D4.3
4. Government officials are trustworthy	1	2	3	4	5	99	D4.4
5. The project will benefit my enterprise	1	2	3	4	5	99	D4.5
6. Business pays it's fair share for government services	1	2	3	4	5	99	D4.6
7. Those who pollute should pay for the pollution clean up	1	2	3	4	5	99	D4.7
8. Manufacturers should treat their own industrial wastewater	1	2	3	4	5	99	D4.8

D5. I will identify a number of factors that can affect business success. For each, please indicate whether it is a "great concern," "medium concern," "low concern," and "no concern," from the perspective of your own business?

	Great concern	Medium concern	Low concern	No concern	Don't know	
1. Economic growth	1	2	3	4	99	D5.1
2. Inflation	1	2	3	4	99	D5.2
3. Foreign competition	1	2	3	4	99	D5.3
4. Transportation	1	2	3	4	99	D5.4
5. Finding skilled workers	1	2	3	4	99	D5.5
6. Housing for workers	1	2	3	4	99	D5.6
7. Local environmental conditions	1	2	3	4	99	D5.7
8. Others (specify)	1	2	3	4	99	D5.8

E. ENTERPRISE INFORMATION

Information about your enterprise will allow us to interpret the answers you have given us and estimate the benefits of the project. The information we all be treated confidentially and no information will be used in a way that will allows others to identify your business.

IN THE FOLLOWING QUESTIONS, ENTER 99 IF THE RESPONDENT REFUSES TO ANSWER. IF THE ANSWER IS 99, ENTER 100.

E1. What is your position or title?

1. Owner	1	E1
2. Management staff	2	
3. Engineering, professional	3	
4. Production supervision	4	
5. Other	5	

E2. Who owns the enterprise?

1. Owner-operator, sole proprietor	1
2. Private corporation – Chinese	2
3. Private corporation – Joint venture	3
4. Collective	4
5. Government / State-owned enterprise	5
6. Other (specify)	6

E2

E3. What is the main area of business activity of your enterprise?

1. Manufacturing	1
2. Construction services and trades	2
3. Transportation, warehousing	3
4. Information technology, computer services	4
5. Wholesale trade (e.g., chemicals, building materials, office supplies)	5
6. Retail trade	6
7. Health care services	7
8. Other personal services (e.g. barber, massage)	8
9. Culture, sports, recreation	9
10. Accommodation, Hotel	10
11. Restaurant, catering	11
12. Other (specify)	12

E3

E4. How long has the enterprise been operating in this district of the City?

CIRCLE ONE

Less than 2 years	1
2 to 5 years	2
5 to 10 years	3
More than 10 years	4

E4

E5. How many workers does this enterprise have?

INCLUDE OWNER-OPERATOR AND FAMILY MEMBERS WHO WORK IN THE BUSINESS.

Full-time		E5.1
Part-time		E5.2
Laid off		E5.3
Retired		E5.4

E6. How has the level of business activity for your enterprise changed over the last 5 years?

CIRCLE ONE BUSINESS ACTIVITY REFERS TO PRODUCTION OR SALES.

1. Increased more than 50%	1	E6
2. Increased 50% or less	2	
3. No change	3	
4. Decreased 50% or less	4	
5. Decreased more than 50%	5	

E7. By how much could the level of business activity be increased in your business now with your existing equipment and location? CIRCLE ONE

1. Could not be increased now	1	E7
2. Could increase up to 25%	2	
3. Could increase 25% to 50%	3	
4. Could increase 50% to 100%	4	
5. Could increase more than 100%	5	

E8. What is the approximate total value of your stocks of raw materials and finished products?

yuan E8

E9. What is the approximate total value of your company?

	yuan	E9
--	------	----

E10. Please provide an indication of your production income & operating costs per year?

1. Total operating income	yuan	E10. 1
2. Total operating costs	yuan	E10. 2
3. Profit or Loss	yuan	E10. 3

E11. On average, how much do you spend on the following each year?

1. Municipal tap water supply	yuan	E11.1
2. Own water supply	yuan	E11.2
3. Municipal Wastewater service	yuan	E11.3
4. Own sewage treatment	yuan	E11.4
5. Private night soil disposal service	yuan	E11.5
6. Electricity	yuan	E11.6
7. Gas	yuan	E11.7
8. Rent	yuan	E11.8

That is the end of our questions. Many thanks for your patience in answering this long questionnaire. Do you have any comments or questions?

--

INTERVIEWER, REMEMBER TO COMPLETE QUESTIONNAIRE PASSPORT NOW!

APPENDIX F4 HEALTH IMPACT

F4-1. INTRODUCTION

The analysis documented here was completed to develop an indicative estimate of the health benefits associated with wastewater (WW) and storm water (SW) service improvements.

The analysis of health impacts is a desk-top exercise based on secondary sources of information. The measure of impact is the change in total occurrences of illness in the affected population.¹

F4-2. CURRENT HEALTH STATUS

Housing conditions of Wuhan urban residents reported in the Wuhan Statistical Yearbook, 2004 indicate a relatively advanced condition from the perspective of public health. No residents rely on untreated well or river water for their drinking water or their general water supply. Only 3.7% of households report having no sanitary facilities and 4.5% report using a public washroom and lavatory.² The use of coal for cooking is less than 1% and one quarter of households report having air conditioners.³

Based on focus group discussions, there also appears to be a high level of training in personal hygiene (Appendix F-1). All of these factors suggest significant progress in establishing the requirements for prevention of infectious disease. This is confirmed by the fact that infectious disease, with a combined death rate of 6.96 per 100,000 persons, ranked last in a list of the ten main categories of disease causing deaths in the City in 2003. Progress since 1980 in the control of infectious disease is evident in the data in Table 1.

Table 1: Water related infectious disease in Wuhan, 1981 to 1998

	1981 to 1985	1986 to 1990	1991 to 1995	1996 to 1998
Average annual incidence (no.per100,000 persons)				
Cholera	1.07	1.13	0.19	0.05
Dysentery (Shigellosis)	823.60	541.63	215.19	100.60
Typhoid and Paratyphoid	14.44	9.44	6.46	4.85
Viral Hepatitis	150.20	204.78	197.25	169.80
Malaria	114.95	5.96	1.21	1.89
Average annual deaths (no.per100,000 persons)				
Cholera	0.01	0.00	0.00	0.00
Dysentery (Shigellosis)	0.74	0.39	0.11	0.06
Typhoid and Paratyphoid	0.02	0.05	0.00	0.01

¹ This includes both mild and severe episodes of illness. Information was not available to allow use of a more meaningful measure such as quality-adjusted or disability-adjusted life years.

² Table 9-12, Wuhan Statistical Yearbook, 2004. The presence of flush toilets in the home reported in the household survey, at 79%, suggests a much higher degree of reliance on public washrooms.

³ Table 9-12, Wuhan Statistical Yearbook, 2004. The use of air conditioners reported in this table does not appear to be consistent with ownership data for air conditioners (see table 6)

Viral Hepatitis	3.72	2.36	1.19	1.37
Malaria	0.02	0.00	0.00	0.00

Source: 'Wuhan, the Past 50 Years'

Available statistics on water related diseases for 2000 are provided in Table 6-9. These are for Wuhan City in total and not the urban population. Assuming an urban population of 4.86 million, the data in Table 2 imply an annual health care cost of RMB 0.6 million and a 35,500 days of lost work time each year in association with the water related diseases.

Table 2: Water related infectious disease in Wuhan, 2000

Disease	Incidence rate*	Death rate*	Direct health care costs per case	Lost work time per case
	(no. per 100,000)		(RMB)	(days)
Hepatitis A	23.26	2.58	480	30
Dysentery (Shigellosis)	1.29	0.36	257	7
Cholera	0.023	0.00	642	28
Typhoid	0.32	0.065	623	22
Giardia	0.41	0.052	467	18
Bilharzias (Shistosomiasis)	0.22	0.039	516	25
Others	0.74	0.079	60	4
Total	26.27	3.19	459**	28**

Source: Wuhan City Health Bureau

* Original data was number of cases. Rates calculated assuming a population of 7.582 million for 2000 (Wuhan Statistical Yearbook, 2004)

** Estimated as a weighted average.

The incidence of disease reported in official statistics is often under reported since many sick people may not seek medical assistance.⁴ This appears to be the case in Wuhan based on household survey data. Estimates of incidence based on survey data are compared to incidence data from Table 2 in Table 3. In all cases, the estimated incidence rates are significantly higher than the published rates, implying under reporting by an order of magnitude or more.

The very high incidence rates implied by survey data will however be subject to error since respondents may not understand the diseases about which they were asked or they may mis-interpret their own experience of illness.

Table 3: Comparison of Published and survey disease incidence data

	Published data*		Survey data** (cases per person)	T-score	Under reporting factor
	cases/100,000 persons	Cases per person			
Hepatitis A	23.26	2.33E-04	2.56E-03	-18087	11
Dysentery (Shigellosis)	1.29	1.29E-05	9.74E-03	-449	755
Cholera	0.023	2.30E-07	0.00E+00		

⁴ Under-reporting factors of 10 to 38 are used in: P. S. Mead, L. Slutsker, V. Dietz, L. F. McCaig, J. S. Bressee, C. Shapiro, P. M. Griffin, and R. V. Tauxe, "Food-Related Illness and Death in the United States" *Emerging Infectious Diseases*, Vol. 5, No. 5, September-October 1999, pp 607-25. [<http://www.cdc.gov/ncidod/eid/vol5no5/pdf/mead.pdf>]

Typhoid	0.32	3.20E-06	1.11E-03	-429	348
Bilharzias (Shistosomiasis)	0.22	2.20E-06	1.06E-03	-294	483
Others	0.74	7.40E-06	1.81E-02	-159	2,451
Total	26.27	2.63E-04	2.44E-01	-1090	929

* Wuhan City Health Bureau

** Household survey, Appendix F2.

Direct medical cost and lost work days per case were also estimated from survey data as follows:

Lost work days/person	0.18
Total cases/person	0.24
Lost work days/case	0.72
Cost/person	40.76
Total cases/person	0.24
Cost/case	166.97

These values are considerably lower than published data (Table 2). This suggests that cases of disease reported by survey respondents may be less serious on average than cases upon which the official statistics are based.

F4-3. PROJECT IMPACTS ON HEALTH

F4-3.1. NATURE OF THE BENEFITS

Since Project components involve storm water and wastewater management, health related impacts of the Project will be associated with: (1) reduced exposure of the population to pathogens during local storm water flood events and while swimming in local lakes and rivers, and (2) reduced risk of contamination of drinking water supplies through protection of sources of supply. These benefits are brought about by:

- Treatment of a greater proportion of wastewater and a reduction in the discharge of raw sewage into local water bodies.
- Sewer separation leading to a reduction in the discharge of storm water contaminated with untreated WW.
- A reduction in over ground flows caused by surcharging of inadequate storm water systems.

Water related diseases of primary concern are both waterborne and water washed diseases⁵, including diarrhoeal disease (*Shigella* spp., nontyphoidal *Salmonella*, *Vibrio cholerae*, Rotavirus, *Cryptosporidium*, *Giardia lamblia*, *Escherichia coli*), hepatitis (Hepatitis A), typhoid and paratyphoid, skin, ear and eye infections (*Pseudomonas aeruginosa*, Adenovirus) and bilharzias

⁵ Water washed diseases are diseases prevented by hand washing and other good hygiene practices.

(shistosomiasis).⁶ Malaria involves a vector, mosquitoes, which depends on water, but is unlikely to be affected by a project related to water, sanitation, and hygiene.⁷

F4-3.2. APPROACH

A rapid web-based review of literature on health impacts was completed to support the assessment of Project health impacts (see Attachment). The review provides strong support for the position that wastewater and storm water are linked to human health status through direct contact and through their impact on drinking water sources.

The relationship between the quality of WS and WW services and human health is well documented with respect to certain types of disease. The World Health Organization (WHO) reports estimates of reductions in the diarrhea morbidity rate from service improvements ranging from 16% to 37%.⁸ Such estimates are not entirely applicable for the current Project since they apply to Projects that replace inadequate WS and WW systems such as unprotected wells, untreated surface water and open latrines with improved systems. In the current case, improved WS systems already exist in Wuhan although it is common for WS systems in developing countries to pose a health risk due to functional impairment caused by poor operation and maintenance practices. The project will expand existing WW treatment systems and in certain cases, establish them where none currently exist.

The approach to evaluation of health effects for the Project had to account for upgrades in existing WW services and improvements to SW services. No estimates of the impact of such projects on health were found in an internet based search. An ad hoc approach was therefore developed using the following assumptions based on the HH survey:

- There are 73 episodes of disease for every thousand persons exposed to risk from water related disease (excludes malaria and influenza).
- There is a loss of 0.72 work days for every disease episode and average daily earnings are 60 yuan.
- The direct health care costs are 167 yuan per disease episode.

Estimates of disease incidence with and without the project are based on a conservative assumption that the disease incidence is reduced by 10% or 7.3 cases per thousand persons. A small reduction is assumed because cases reported by survey respondents may be related to sources other than water (e.g. food, inter-personal contact) and also because the proposed project will not remediate all of the sources of surface water contamination associated with

⁶ The Cadmus Group, Health Effects of Waterborne Pathogens Identified in the Distribution System, [internet access, 2004 12 05, <http://www.eesi.org/publications/Briefing%20Summaries/06.03.98flooding.pdf>]

⁷ A. Prüss et al., 2002. "Estimating the Burden of Disease from Water, Sanitation, and Hygiene at a Global Level", *Environmental Health Perspectives* V 110(5)

⁸ *Water and Public Health*, Who Seminar Pack for Drinking-Water Quality, [internet access, 2004 12 04, http://www.who.int/water_sanitation_health/dwq/en/S01.pdf]

disease causing organisms. The impacted population is assumed to be the entire urban and suburban population in the Project area. This is realistic since health risks of contaminated water affect the entire population and not just those persons resident in Project service areas.

F4-3.3. RESULTS AND DISCUSSION

Annual estimates of disease incidence are provided in Table 4. The average annual impact of the project from commissioning in 2010 to 2020 is to reduce disease episodes by 39,800 cases per year. The cumulative impact amounts to 438 thousand episodes of disease. This benefit is associated with annual health care cost savings of about 7 million yuan and a reduction in work days lost due to illness of about 29,000 per year equivalent to earnings of 1.7 million yuan (Table 4). A minority of the cases of avoided illness will be serious enough to result in a medical consultation. These estimates are indicative only and are best understood as order of magnitude estimates.

Table 4: Estimated Project Impact on Health

	2005*	2010	2015	2020	AVG	SUM
Population (1,000's)**						
Suburban (Caidian and Dongxihu)	483.7	524.0	572.4	648.1		
Wuhan urban	4,260.0	4,580.0	4,880.0	5,050.0		
Total	4,744.0	5,104.0	5,452.0	5,698.0		
Disease incidence (1,000 episodes/year)						
- without project	348.2	374.6	400.2	418.2	398.1	4,379.3
- with project	348.2	337.2	360.2	376.4	358.3	3,941.5
- reduction	0.0	37.4	40.0	41.8	39.8	437.8
Reduction in lost work days (1,000 days/year)	0.0	27.0	28.9	30.2	28.8	316.3
Reduction in lost earnings (1,000 yuan/year)	0.0	1,607.0	1,720.0	1,798.0	1,712.0	18,828.0
Direct health care cost savings (1,000 yuan/year)	0.0	6,245.0	6,679.0	6,979.0	6,645.3	73,098.0

* Assumes project commissioning in 2009.

** Wuhan urban population from the urban master plan, Suburban from FSRs

ATTACHMENT: Review of Literature on Health Effects

SOURCE WATER PROTECTION

Stephen JG et al, 2003. **"Public Health Effects of Inadequately Managed Storm Water Runoff"**. September 2003, Vol 93, No. 9, American Journal of Public Health 1527-1533

The estimated annual cost of waterborne illness is comparable to the long-term capital investment needed for improved drinking water treatment and storm water management. Although additional data on cost and effectiveness are needed, storm water measures to minimize runoff and pollution appear to make sense for protecting public health at the least cost.

Krewski D et al, 2002. **Managing Health Risks from Drinking Water**, Commissioned Paper 7, The Walkerton Inquiry, Toronto

This report is a wide ranging review of literature on the safety of drinking water. The authors observe that: "Application of multiple barriers is universally recognized as a fundamental tenet for effective drinking water quality management and for ensuring the supply of safe drinking water. The multiple barrier approach involves the use of a series of barriers from catchment to consumer to prevent contaminants from entering the water supply system, and where they occur, control their transmission through the system. Barriers should be effective and capable at all times; however, the basic principle is that if multiple barriers are provided, any contaminant passing through one process can be removed in the next thereby minimizing the likelihood of contaminants passing through the entire treatment system and being present in sufficient amounts to cause harm to consumers."

Prüss A et al, 2002. **"Estimating the Burden of Disease from Water, Sanitation, and Hygiene at a Global Level"**. Environmental Health Perspectives • Volume 110, no. 5, may 2002.

This study makes estimates of the disease burden from water, sanitation, and hygiene at a global level measured as disability-adjusted life years (DALYs). The estimates account for diarrheal diseases, schistosomiasis, trachoma, ascariasis, trichuriasis, and hookworm disease. Typical exposure scenarios were postulated for 14 geographical regions. These scenarios were matched with relative risk information to estimate disease burden. Diseases associated with water, sanitation, and hygiene were estimated to account for 4.0% of all deaths and 5.7% of the total disease burden (in DALYs) occurring worldwide.

Working Group on Water and Health, 2002. **The Protocol on Water and Health: making a difference**, WHO (World Health Organization) European Region, UN (United Nation) Economic and Social Council, Economic Commission for Europe.

This report summarizes is the Protocol on Water and Health⁹, the world's first legal treaty designed to reduce water-related deaths and diseases. It supports a holistic approach to water resources management, in recognition that: "Formulating national plans for integrated water resources management and for water use efficiency is crucial to ensure sustainability of water resources. The development of such plans, contributing to the achievement of MDG 7,¹⁰ should take into account health considerations. This means that decision-making on water resources should consider all elements of the environmental system, as well as the possible adverse effects on health, including the location of potential sources of pollution and collection points, treatment methods and resources' natural capacity for regeneration."

DRINKING WATER AND WASTEWATER

P. Payment et al, 1991. **"A randomized trial to evaluate the risk of gastrointestinal disease due to consumption of drinking water meeting current microbiological standards"** American Journal of Public Health, Vol 81, Issue 6 703-708

A randomized trial to measure the level of gastrointestinal illness related to the consumption of treated tap water drawn from sewage-contaminated surface waters. 35% of the illnesses among the tap water drinkers were water-related and preventable.

Egorov Al et al, 2003. **"Daily variations in effluent water turbidity and diarrhoeal illness in a Russian city."** Int J Environ Health Res. 2003 Mar;13(1):81-94.

This study was a randomized trial to look at the relationship between gastrointestinal diseases and turbidity levels in treated tap water. The incidence rate of self-reported gastrointestinal diseases, 1.7 per person year, was almost two orders of magnitude higher than published statistics. Overall, an increase in treated water turbidity of 0.8 NTU was associated with a relative risk of illness of 1.47, but an association between turbidity and GI illness was not found for participants who always boiled drinking water.

Semenza JC et al. 1998. **"Water distribution system and diarrheal disease transmission: a case study in Uzbekistan"**. Am. J. Trop. Med. Hyg., 59(6), 1998, pp. 941–946.

⁹ Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes, Adopted on 17 June 1999 at the Third Ministerial Conference on Environment and Health

¹⁰ MDG 7. Ensure environmental sustainability

Target 10. Halve the proportion of people without sustainable access to safe drinking-water and basic sanitation

Target 11. Achieve a significant improvement in the lives of at least 100 million slum dwellers by 2020

This randomized trial evaluated the impact of declining chlorine residuals in treated tap water on the incidence of diarrhea. A home-chlorination intervention group had a monthly incidence of 28.8 per 1000 persons compared to 75.5 cases per 1000 persons with piped water but no supplementary chlorination. This implicates the distribution system as a source of disease transmission as a result of cross-contamination between the municipal water supply and the sewers, due to leaky pipes and lack of water pressure.

WATER CONTAMINATION AT BATHING SITES

Fleisher JM et al, 1993. **"Water and non-water-related risk factors for gastroenteritis among bathers exposed to sewage-contaminated marine waters."** Int J Epidemiol. 1993 Aug;22(4):698-708.

Faecal streptococci was found to be the only indicator organism to predict the occurrence of gastroenteritis among bathers. Other non-water-related risk factors including the consumption of foods involved in the transmission of gastroenteritis, significantly increased the risk of gastroenteritis among bathers.

Pruss A, 1998. **"Review of epidemiological studies on health effects from exposure to recreational water."** Int J Epidemiol. 1998 Feb;27(1):1-9.

This is a review of research on the health risks of microbiological contamination of recreational waters. Most studies reported higher health risk in swimmers with increased indicator-bacteria counts in recreational waters. Relative risk values for swimming in polluted water versus clean water usually ranged between 1.0 and 3.0. Indicator organisms most closely correlated with disease were enterococci and faecal streptococci for both marine and freshwater and *Escherichia coli* for freshwater. Increased risk of gastro-intestinal symptoms was reported for indicator counts ranging from only a few to about 30 organisms/100 ml. The review strongly suggests a causal dose-related relationship between gastrointestinal symptoms and recreational water quality measured by bacterial indicator counts.

Fleisher JM, et al, 1996. **"Marine waters contaminated with domestic sewage: nonenteric illnesses associated with bather exposure in the United Kingdom."** Am J Public Health. 1996 Sep;86(9):1228-34.

This study identified dose-response relationships for nonenteric illness (acute febrile respiratory illness, and eye, ear, and skin ailments) in bathers using marine waters contaminated with domestic sewage. Faecal streptococci counts predicted acute febrile respiratory illness, while faecal coliform counts predicted ear ailments. Thresholds of effect occurred at 60 faecal streptococci and 100 faecal coliform per 100 ml respectively. Compared to non-bathers, bathers were also at higher risk for eye ailments.

Seyfried PL, Tobin RS, Brown NE, Ness PF, 1985. **"A prospective study of swimming-related illness. I. Swimming-associated health risk."** Am J Public Health. 1985 Sep;75(9):1068-70.

Swimmers and non-swimmers were enlisted in a study to determine the relationship between swimming, water quality, and disease incidence. Results showed that crude morbidity rates were 69.6 per 1,000 swimmers versus 29.5 per 1,000 non-swimmers. Swimmers experienced respiratory ailments most frequently, followed by gastrointestinal, eye, ear, skin, and allergenic symptoms.

Zmirou D, Pena L, Ledrans M, Letertre A, 2003. **"Risks associated with the microbiological quality of bodies of fresh and marine water used for recreational purposes: summary estimates based on published epidemiological studies."** Arch Environ Health. 2003 Nov;58(11):703-11.

A meta-analysis of 18 published epidemiological studies was implemented to characterize the relationship(s) between bacterial indicators and rates of acute gastrointestinal diseases among bathers. For fresh-water, a level of 10 fecal coliforms/100 ml water yielded an attributable risk of 0.2 cases/1,000 person-years of gastrointestinal illnesses; a risk of 2 cases/1,000 person-years was found for fecal streptococci. The risks were 1 and 13 cases/1,000 person-years, respectively, for 100 bacteria/100 ml fresh water. Total coliforms were related only weakly with acute digestive morbidity.

Ferley JP et al, 1989. **"Epidemiological significance of microbiological pollution criteria for river recreational waters."** Int J Epidemiol. 1989 Mar;18(1):198-205.

A retrospective follow-up study was conducted to assess the relationship between swimming-related morbidity and the bacteriological quality of the recreational water. The swimmers to non-swimmer rate-ratio for total morbidity is 2.1 and for 'objective' gastrointestinal cases 2.3. The concentration of faecal streptococci above which the gastrointestinal morbidity is significantly greater for bathers than non-bathers is 20 organisms per 100 ml. Swimmers suffer skin ailments much more frequently than non-swimmers (rate ratio of 3.7). This type of morbidity is well correlated with the concentration of faecal coliforms, aeromonas and pseudomonas.

APPENDIX F5 POVERTY ASSESSMENT

F5-1. INTRODUCTION

This appendix provides background information and data relating to the assessment of poverty. Topics covered are the poverty threshold, project beneficiaries and affordability.

F5-2. POVERTY INCOME THRESHOLDS

The analysis of poverty is based on estimates of income thresholds representing absolute and relative poverty for households. An absolute poverty line reflects requirements for basic food and non-food expenditures, while measures of relative poverty include the additional income needed to pay for social obligations such as funerals and weddings. Published poverty lines that are assumed to correspond to absolute and relative poverty are provided in Table 1. The currently Wuhan city urban poverty threshold, at RMB 210 per capita per month, is close to the average urban poverty line in this table. The sub-urban poverty threshold is RMB 125 per capita per month. This is assumed to represent poverty conditions for the farm population, so the Wuhan figure is used for purposes of analysis here.

Table 1 Urban poverty lines for China*

	Per capita per year (2004 RMB)	Per capita per month (2004 RMB)
POVERTY LINES ASSUMED TO REPRESENT ABSOLUTE POVERTY		
National Bureau of Statistics, 2000**	1,948	162
May 2000 Poverty Conference**		
inland cities	1,351	112
coastal cities	2,026	169
POVERTY LINES ASSUMED TO REPRESENT RELATIVE POVERTY		
Official Municipal poverty lines, 35 major cities, 1998***		
Average	2,445	204
Minimum (Nanchang)	1,778	148
Maximum (Shenzhen)	3,957	330

* Source: ADB, May 2004. Poverty Profile of the People's Republic of China.

Values adjusted for inflation using the urban consumer price index for China.

** These values are used for purposes of evaluating poverty and are not policy tools.

*** These values are guidelines for distribution of poverty relief entitlements under the Minimum Living Standard Scheme administered by municipal governments.

The following table provides household income data. The income classes are percentiles of a survey of 500 households.

Table 2 Monthly HH income by income class, Wuhan 2004

CLASS	Total	Disposable income	PERCENTILE
-------	-------	-------------------	------------

	Income		
Average	2,274	2,152	
Lowest	968	852	1 st decile (lowest 10%)
Low	1,428	1,321	2nd decile (2nd lowest 10%)
Medium Low	1,773	1,670	2nd quintile (2nd lowest 20%)
Medium	2,166	2,057	3rd quintile (3rd lowest 20%)
Medium High	2,565	2,447	4th quintile (2nd highest 20%)
High	3,074	2,918	9th decile (2nd highest 10%)
Highest	4,279	4,105	10th decile (highest 10%)

Source: Wuhan Statistical Yearbook, 2004.

The income data in Table 2 were used to develop income classes for the income question in the household survey. Income class thresholds were set at the mid-range values of the income classes in Table 2. These are shown in Table 3. The lowest income class was split into three classes, with the two lower class representing households that fall below the poverty line.

Table 3 Income classes for the survey (monthly household income)

Income classes in the Published Data	Total HH Income	Mid-range income*	Household Survey Income Class	
Lowest	968	1,200	1	Under 300
			2	300 to 600
			3	600 to 1200
Low	1,428	1,600	4	1200 to 1600
Medium Low	1,773	1,970	5	1600 to 2000
Medium	2,166	2,370	6	2000 to 2400
Medium High	2,565	2,820	7	2400 to 2800
High	3,074	3,680	8	2800 to 3700
Highest	4,279	Not applicable	9	over 3700

* Approximate mid-range between class and next higher class.

The official poverty line of RMB 210 per capita per month is assumed to represent the upper income threshold for relative poverty. This corresponds to a monthly household income of RMB 600 for an average size family.¹ The 2nd income class for the household survey therefore includes households experiencing relative poverty. The first income class, 'under 300', implies a monthly per capita income of RMB 105, close to the lowest income level for absolute poverty in Table 1. This class is assumed to represent absolute poverty.

The distribution of household survey respondents by income class is provided in Table 4. It is notable that no respondents fell into class 1 the absolute poverty group. This outcome suggests that there are relatively few such households among registered residents. It says nothing about their occurrence in the floating population.

Respondents in classes 1 to 3 of the household survey represent households in the first decile of the published statistics (Table 2). Their share of the total sample exceeds 10% because a block sampling frame was used to increase the

¹ Average household size in 2004 was 2.86.

representation of this group to at least 20%. The division between classes 2 and 3 in the sample implies that 1.8% of the resident urban population falls into class 2 and experiences poverty. In light of the economic disadvantages faced by the non-resident or floating population, 50% of that group is assumed to live in poverty (i.e. in Class 1 or 2).²

For purposes of analysis, the household survey income class data were aggregated as follows:

Final income class	Income range	Original survey classes	% of population
Lowest	< 600	1 and 2	1.8%
Low	600 to 1,200	3	8.2%
Low-middle	1,200 to 1,600	4	10%
Middle	1,600 to 2,800	5, 6, and 7	60%
High	>2,800	8 and 9	20%

² Chen X, Sun L, 1997. "Analyses and thought on countermeasures for the family formation trend among floating population in Wuhan city", *Chin J Popul Sci* V9(1) pg 67-74.

Table 4 Household survey income class frequencies (number of households)

		Income Class									Total	Percent of total
		1	2	3	4	5	6	7	8	9		
Project Component												
1	Dong Xi Hu tri-gate drainage	0	2	9	14	18	10	1	2	10	66	14%
2	Dong Xi Hu wastewater collectors	0	0	5	13	9	14	1	0	0	42	9%
3	Caidian WWTP and collectors	0	4	31	10	1	1	1	0	0	48	11%
4	Nantiazi Lake WWTP expansion & sewerage	0	1	7	19	8	5	5	2	0	47	10%
5	Yangsigang pump station and SW culvert	0	3	9	8	8	4	2	6	6	46	10%
6	Huangpu Road WWTP upgrade	0	0	7	13	11	5	2	3	5	46	10%
7	Erlangmiao WWTP upgrade and expansion	0	4	8	14	8	12	7	1	2	56	12%
8	Luojia Road drainage network	0	3	7	19	21	17	12	13	13	105	23%
	Total	0	17	83	110	84	68	31	27	36	456	100%
	Percent of total	0%	4%	18%	24%	18%	15%	7%	6%	8%	100%	
Urban/Sub-urban												
	Sub-urban	0	4	36	23	10	15	2	0	0	90	20%
	Urban	0	13	47	87	74	53	29	27	36	366	80%
	Total	0	17	83	110	84	68	31	27	36	456	100%
	Percent of total	0%	4%	18%	24%	18%	15%	7%	6%	8%	100%	

F5-3. ACCESS OF POOR HOUSEHOLDS TO PROJECT BENEFITS

The Project will benefit persons who access project services and persons who are gain employment because of project construction and operation activities. An analysis of both groups of benefiting persons is documented in this section.

F5-4. ESTIMATED PROJECT BENEFICIARIES

Project beneficiaries include primary and secondary beneficiaries. Primary beneficiaries are persons who, in the case of WW service improvements, are persons within the service catchments who are connected to the service. In the case of the SW improvements, primary beneficiaries are persons residing in the impact area of the works.

Secondary beneficiaries live outside of these Project areas, but are nevertheless likely to experience some improvement in their living condition as a result of the project. For the flood control benefits of SW components, this will include people who do business or have friends and relatives within the impact area or who use amenities in the impact area such as shopping venues, roads, and schools. Secondary beneficiaries of the water quality improvements in area rivers and lakes resulting from both SW and WW components will be anyone using those waters for recreation plus those who derive satisfaction from the fact that environmental improvements are being made.

Populations for 2003 in the benefiting urban areas are as follows:

	Registered Population	Floating Population	Total
Wuhan	3,937,500	590,600	4,528,100
Caidian	120,100	18,000	138,100
Dongxihu	66,900	10,000	76,900
Total	4,124,500	618,600	4,743,100

The floating population is estimated as 15% of the registered urban population.³

Direct project beneficiaries are enumerated in Table 5. All urban and sub-urban residents living outside of the service catchments of the project components are assumed to be indirect project beneficiaries. Indirect beneficiaries number as follows:

	Registered Population	Floating Population	Total
Wuhan city - WW	2,843,100	410,100	3,253,200
Wuhan city - SW	3,016,100	418,300	3,434,400
Caidian - WW	20,100	18,000	38,100
Dongxihu - WW	0	0	0
Total – WW	2,863,100	423,500	3,286,600
Total – SW	3,016,100	418,300	3,434,400

³ Based on assumptions in the project FSRs.

The counts of primary beneficiaries in Table 5 are estimates of people living within the project service areas in 2003 who will realize project benefits at the time of works commissioning. Estimates of actual beneficiaries at the time of commissioning must account for population growth.

A reduction in the exposure to disease causing agents and in the risk of morbidity and mortality is a specific type of beneficial impact experienced by the benefiting population. This impact is evaluated in Appendix F4.

Table 5: Direct Project Beneficiaries, 2003

Project Component	Registered Population	Floating Population	Total	Poor*
Benefiting persons				
Dong Xi Hu three gate drainage**	640,400	128,100	768,500	75,600
Yangsigang pump station and SW culvert**	41,100	8,200	49,300	4,800
Luoja Road drainage network**	239,900	36,000	275,900	22,300
Dong Xi Hu wastewater collectors	92,800	18,600	111,400	11,000
Caidian WWTP and collectors	100,000	0	100,000	1,800
Nantiazi Lake WWTP expansion & sewers	327,200	65,400	392,600	38,600
Huangpu Road WWTP upgrade	303,600	45,500	349,100	28,200
Erlangmiao WWTP upgrade and expansion	463,600	69,500	533,100	43,100
Total direct beneficiaries***	2,039,200	343,900	2,383,100	225,400
Storm water beneficiaries***	921,400	172,300	1,093,700	102,700
Wastewater beneficiaries***	1,287,200	199,000	1,486,200	122,700
Benefiting households****				
Dong Xi Hu three gate drainage	220,800	44,200	265,000	26,100
Yangsigang pump station and SW culvert	14,200	2,800	17,000	1,700
Luoja Road drainage network	82,700	12,400	95,100	7,700
Dong Xi Hu wastewater collectors	32,000	6,400	38,400	3,800
Caidian WWTP and collectors	34,500	0	34,500	600
Nantiazi Lake WWTP expansion & sewers	112,800	22,600	135,400	13,300
Huangpu Road WWTP upgrade	104,700	15,700	120,400	9,700
Erlangmiao WWTP upgrade and expansion	159,900	24,000	183,800	14,900
Total direct beneficiaries***	703,200	118,600	821,800	77,700
Storm water beneficiaries	317,700	59,400	377,100	35,500
Wastewater beneficiaries	443,900	68,700	512,500	42,300

* 1.8% of the registered population (based on HH survey) plus 50% of the floating population (assumed).

** Estimated based on total district population and the ratio of the project service area to the district urban area.

*** Due to overlap of service areas, the total is less than the simple sum of beneficiaries for each project.

**** Population divided by average household size.

F5-5. EMPLOYMENT IMPACT

Employment impacts are measured in terms of full time equivalent jobs per year. A two-part analysis was completed addressing Project construction and Project operations. Two types of employment benefit are considered. The first type, direct employment, includes jobs directly created by the project. For construction, these are: managerial, engineering and other professional positions for Project design, contract management, contractor supervision, etc.; various skilled construction trades (equipment operators, electricians, mill writes, welders, etc); and unskilled workers (manual laborers for excavation, material handling, etc.). Direct employment benefits for operations include all of the jobs that are created to administer, operate and maintain Project facilities. New operational employees will be the administrative staffs; the engineers and scientists involved in monitoring, supervision and control of operations; the various trades (electricians, plumbers, mechanics ...) used to maintain Project facilities; the trained operators who work in the WW treatment plants and networks; and various unskilled workers (manual labourers, grounds keepers, cleaners,...).

The second type of employment benefit arises because of the follow-on economic activity in response to the stimulus of the Project expenditures. This follow on activity comprises the so called 'indirect' and 'induced' employment effects. Indirect employment benefits occur when enterprises expand their operations to meet the Project demand for goods and services such as cement, equipment, vehicles, surveying, etc. Induced employment benefits account for the employment opportunities created when a Project creates new household income due to the direct and indirect employment effects and this new income in turn causes an increase in demand for consumer goods.

Indirect and induced employment effects are estimated using a 'multiplier' which is a measure of the ratio of the total employment created by a project and the direct employment. For the current Project, the construction and operational multipliers are assumed to be 2.6 and 1.6 respectively.⁴ The multiplier of 2.6 for construction activity means that for every job created directly, there are 1.6 indirect and induced jobs. Judging from the size of the multipliers, the construction benefit is larger than the operational benefit but it is temporary, lasting only as long as the Project construction schedule which is 5 years. Employment benefits from operations are ongoing.

There is a very high certainty that direct employment benefits will occur. This is not the case for the indirect and induced employment benefits. These are most likely to be realised when enterprises have excess or unused production capacity and unemployed workers are available to fill new positions.

The Project will provide 5,040 person years of work or an average of about 1,000 full-time equivalent jobs over the 5-year construction period (Table 6). Follow-on

⁴ Yang Cuihong, "Study on Multiplier Effects of China Township and Village Enterprises on National Economy", Paper for the 13th International Conference on Input-Output Technique, August 21-25, 2000, Macerata, Italy

multiplier effects are expected to create an additional 8,070 full-time jobs. One third of the construction jobs are assumed to be unskilled jobs and are likely to be filled by currently unemployed persons. Since unemployment is a major cause of poverty in the Project area the poor will benefit disproportionately from this job creation. Those temporarily employed in construction will benefit from additional training and experience that will provide them with opportunities in future planned infrastructure projects.

Project operations will create 220 full-time permanent jobs directly and another 132 jobs through multiplier effects (Table 7). While the directly created jobs are primarily skilled jobs in storm water and wastewater services, they will require on-the-job training and will therefore be available to unemployed workers who have basic technical training and experience from their previous work history.

Table 6 Construction employment (total person years)

	Direct*			Indirect and Induced**	Total
	Skilled	Unskilled	Total		
Dong Xi Hu three gate	637	314	950	1,520	3,420
Chang Qing pump station	321	158	479	767	1,725
Yangsigang pump station and SW culvert	169	83	253	404	910
Luo Jia Road drainage network	746	368	1,114	1,782	4,010
Dongxihu WW collectors	325	160	485	776	1,745
Caidian Sub-Project	194	95	289	462	1,040
Nantiazi Lake WWTP expansion, collectors	372	183	555	888	1,999
Huangpu Road Sub-Project	244	120	364	583	1,312
Erlangmiao Sub-Project	372	183	555	888	1,997
Total	3,379	1,664	5,044	8,070	18,158

* Assumes labor represents 5% of base costs at an average annual cost per worker of RMB 18,000. Skilled jobs are assumed to be 67% of the total. These jobs end after the 5 year construction period. Actual employment levels will vary according to construction schedules.

** Construction employment multiplier = 2.6

Table 7 Operations employment (permanent jobs)

	Direct			Indirect and Induced*	Total
	Skilled	Unskilled	Total		
Dong Xi Hu three gate	0	0	0	0	0
Chang Qing pump station	27	7	34	20	88
Yangsigang pump station, SW culvert	29	7	36	22	94
Luo Jia Road drainage network	25	6	31	19	81
Dongxihu WW collectors	12	3	15	9	39
Caidian Sub-Project	30	8	38	23	99
Nantiazi Lake WWTP expansion, collectors	12	3	15	9	39
Huangpu Road Sub-Project	16	4	20	12	52

Erlangmiao Sub-Project	25	6	31	19	81
Total	176	44	220	132	572

* Operational employment multiplier = 1.6

F5-6. AFFORDABILITY

F5-7. EXPENDITURE PROFILES OF POOR HOUSEHOLDS

Expenditure data for low income and average households are provided in Table 8. These data are expressed in terms of percentages of total expenditures in Table 9. These data show that low income households spend proportionately more on food and utilities and less on more discretionary expenditure categories like recreation. Basic expenditures represent about 70% of total expenditures for poor households.

Table 8 Monthly household income and expenditures by income class

Item	Average	Lowest	Low
Total Income	2,274	968	1,428
Disposable income	2,152	852	1,321
Total expenditures	2,181	1,288	1,527
Living expenditures	1,831	979	1,296
Food	744	455	605
Clothing	191	69	119
household facilities, articles, services	97	34	63
Medical, health	139	67	85
Transportation, communication	183	66	109
Education, recreation, cultural	223	104	132
Housing, utilities	209	173	162
Other	43	11	20
Food, clothing, housing	1,144	697	886
Taxes*	121	116	107
household size (persons)	3.03	3.18	3.18

Source: Wuhan Statistical Yearbook, 2004, Table 9-9.

* Estimated as total income less disposable income.

Table 9 Allocation of household expenditures by income class

Item	Average	Lowest	Low
Total expenditures	119%	131%	118%
Living expenditures	100%	100%	100%
Food	41%	46%	47%
Clothing	10%	7%	9%
household facilities, articles, services	5%	3%	5%
Medical, health	8%	7%	7%
Transportation, communication	10%	7%	8%
Education, recreation, cultural	12%	11%	10%
Housing, utilities	11%	18%	12%
Other	2%	1%	2%
Food, clothing, housing, utilities	63%	71%	68%

Source: Based on data in Table 8 above.

F5-8. LOCAL POVERTY ALLEVIATION POLICIES

In the past, the government of Wuhan municipality has been a leader in the introduction of policies that have benefited the poor. It was first in China to introduce the Temporary Residence Certificate in 1993. This certificate allows temporary workers to stay in urban areas outside their official residence.⁵ Wuhan is also one of only a handful of cities that has granted legal status to private schools for the children of non-resident households, thus helping this group gain access to education for their children.⁶ The children of the floating population now have equal rights to education and can receive financial support for tuition.

The primary program supporting registered poor families is a basic subsidy program designed to maintain a minimum level of income. It is called the Lowest Living Security program. Families with income below the official poverty line receive help under this program. Subsidies are meant to cover all expenses including the wastewater bill. The size of this security payment makes up the difference between the official poverty line, RMB 210 per capita per month, and the household income.

In addition, a monthly subsidy of RMB 5 per household plus RMB 2 per capita is provided to poverty households to offset the cost of wastewater services. This subsidy, financed by the Wuhan Urban Drainage Development Co. probably covers the entire bill for the majority of eligible households.

The Women's League works closely with various government departments to deliver poverty alleviation and other programs including: health promotion and education, legal advisory services, telephone help lines for women and children, job training, stay-in-school programs for drop outs, and family violence programs. The Women's League is involved with the floating population through a special unit that delivers the 'Three hearts Action' program. This program is offered to women from outside the city and provides a variety of support services including orientation to urban living, assistance with housing, liaison with employers, job training, and a legal advisory service.

Job training is provided by the Women's League to urban and rural women. With urban women the focus is on improving job skills. With rural women, the focus is on basic job training to alleviate poverty alleviation, for example, poor women may be trained in providing child care services or home care services. Poor women can also be trained for work in other sectors including construction trades if jobs are available, for instance, with the ADB project. Through these efforts, the Women's League finds employment for 3,000 to 4,000 women each year.

The Women's League offers help to people who are displaced by construction projects and assists in resolving complaints over resettlement compensation.

⁵ Country Information & Policy Unit, 2003. China Country Report. European Country Of Origin Information Network. [Http://www.ecoi.net/pub/Panjal_chi0006.htm](http://www.ecoi.net/pub/Panjal_chi0006.htm)

⁶ James Irwin, 2000. China's migrant children fall through the cracks. UNESCO Courier. [Http://www.unesco.org/courier/2000_09/uk/apprend.htm](http://www.unesco.org/courier/2000_09/uk/apprend.htm)

F5-9. TARIFF IMPACTS ON POOR HOUSEHOLDS

Tariff increases assumed for this analysis are presented in Table 10.⁷

Table 10 Project impact on domestic tariffs (RMB/m³)*

Project component	Existing tariff		WW Tariff increase**	Project tariff	% increase	
	Water supply	Wastewater			WW	Total
Urban	0.71	0.80	0.80	2.31	100%	53%
Dongxihu	0.71	0.00	0.90	1.61	n.a.	126%
Caidian	0.71	0.00	0.90	1.61	n.a.	126%

* Tariffs shown here are total domestic tariffs and include WW and water supply charges.

** Tariff increases are phased between 2006 and 2010. The Project tariff is the final 2010 tariff expressed in constant 2005 prices.

Results of the analysis are reported in Table 11. The analysis considers the impact of the tariff and the wastewater bill discount for poor households. In suburban areas water demand is assumed to increase by 5% to account for the improved access to city sewers provided to residents and the resulting increase in the use of flush toilets.⁸

Under existing conditions, the water bill represents less than 1% of household income for the lowest income class corresponding to households below the official poverty line (Table 11). After Project implementation and the corresponding tariff increases the share of household income for this class is 1.8% for urban households and 1.1% for sub-urban households. The water and wastewater bill exceeds 2% of income only for urban households in the low income class.

Table 11 Affordability of project tariffs to lowest income households

	HOUSEHOLD INCOME CLASS (RMB per month)				
	Lowest (< RMB 600)	Low (600 to 1,200)	Low-middle (1,200 to 1,600)	Middle (1,600 to 2,800)	High (>2,800)
Urban					
Household size*	2.90	2.90	2.90	2.90	2.90
Income (RMB per month)					
Per capita	188.2	323.5	491.2	725.3	1,403.8
Household*	545.9	938.1	1424.5	2103.3	4071.1
Water use (tonnes/mo)					
Existing*	9.3	12.6	14.2	15.0	22.9
Project**	9.2	11.5	12.9	13.6	20.8
Tariff (water + sewer)***					
Existing	1.51	1.51	1.51	1.51	1.51
Project	2.31	2.31	2.31	2.31	2.31

⁷ Final forecasts of full cost tariffs were not available when this appendix was prepared. The assumed levels are high and are very conservative. This analysis will be revised for the final report.

⁸ Based on responses to the household survey, 21% of respondents do not currently have flush toilets. This figure exceeds 30% in the Dongxihu and Nantaizi Lake Project service areas.

	HOUSEHOLD INCOME CLASS (RMB per month)				
	Lowest (< RMB 600)	Low (600 to 1,200)	Low-middle (1,200 to 1,600)	Middle (1,600 to 2,800)	High (>2,800)
Water bill Discount	10.8	0.0	0.0	0.0	0.0
Water bill (RMB/mo)					
Existing	3.3	19.0	21.5	22.6	34.6
Project	10.0	25.4	28.7	30.2	46.2
Increase in the water bill	6.7	6.4	7.2	7.6	11.7
Income share					
Existing	0.61%	2.03%	1.51%	1.07%	0.85%
Project	1.83%	2.71%	2.01%	1.44%	1.14%
Sub-urban					
Household size*	2.90	2.90	2.90	2.90	2.90
Income (RMB per month)					
Per capita	181.9	304.6	482.8	717.8	n.a
Household*	527.5	883.3	1,400.0	2,081.5	n.a
Water use (tonnes/mo)					
Existing*	11.1	11.1	11.4	12.6	n.a
Project**	10.3	8.1	8.3	9.1	n.a
Tariff (water + sewer)***					
Existing	0.71	0.71	0.71	0.71	0.71
Project	1.61	1.61	1.61	1.61	1.61
Water bill Discount	10.8	0.0	0.0	0.0	0.0
Water bill (RMB/mo)					
Existing	0.0	7.9	8.1	9.0	n.a
Project	5.7	13.0	13.3	14.7	n.a
Increase in the water bill	5.7	5.1	5.2	5.8	n.a
Income share					
Existing	0.00%	0.90%	0.58%	0.43%	n.a
Project	1.08%	1.47%	0.95%	0.71%	n.a

* Based on household survey data.

** Assumes a price elasticity of -0.4 and accounts for the lump sum discount.

*** Tariffs shown here are total domestic tariffs and include WW and water supply charges. The project tariff is the tariff required to achieve full cost recovery following a period of gradual phase in.

The implication of an increase in the water bill will depend on the response of the household to the change. This will include an adjustment in expenditures in response to the increased water bill as well as possible changes due to the improved wastewater service. Data in Table 8 above indicate that low income households report proportionately lower expenditures on items such as household facilities. They therefore have less opportunity to reduce discretionary expenditures in response to the higher water bill. On the other hand, the anticipated increase is very small because of the existing poverty alleviation program.

F5-10. MITIGATION OF TARIFF IMPACTS

The Project will improve standards of wastewater service for poor households and increase the wastewater tariff that they pay. The proportion of poor household expenditures going to tap water and wastewater is currently less than 1%. With the Project, this proportion might rise to 1.4%. Poor households have little scope for absorbing even a small increase given their current allocation of expenditures. The households most likely to be adversely affected by the tariff increase are those within the classes of low-income households experiencing the most extreme poverty. Factors contributing to extreme poverty include elevated health care costs due to poor health of a household member and single person households where there is no opportunity to share common costs within a family group. Such households may require additional support in the face of an increase in their wastewater bill.

The main policies used to support poor households are lifeline tariffs, and proportional or lump sum water bill discounts. The lifeline tariff is a poorly targeted policy since it benefits all households, not just those needing support. The water bill discount is a much better poverty alleviation measure primarily because it can be properly targeted to poor households. It is now being used in Wuhan. The proportional water bill discount (i.e. a percentage decrease) creates an opportunity for a recipient of the discount to sell water to neighbours at a profit. The existing lump sum subsidy is therefore the preferred poverty alleviation measure.

If tariff increases prove to be greater than forecast for the Project, the official poverty line should be reviewed and adjusted by a small amount representing a portion of the expected increase in the typical water and wastewater bill of a poor household. This adjustment should take into account the size of the water and wastewater bill.

APPENDIX F6

WILLINGNESS TO PAY AND PROJECT BENEFITS

F6-1. INTRODUCTION

This appendix provides background information and data relating to calculation of willingness to pay (WTP) amounts for households and business enterprises. Calculations were made for both wastewater and storm water services.

The main approach is based on stated WTP and draws upon WTP questions in the household and business surveys. A common 2 part format was used for all of these questions. The first part was a dichotomous choice question illustrated here with the household question for wastewater in urban areas:

The wastewater tariff in this area of the city is 0.8 yuan per tonne. The wastewater tariff will have to increase to pay for the new project. We still don't know how much it will be, but it could be as high as 1.5 yuan per tonne. An average family of 3 people will pay about 22.5 yuan per month at this tariff, but a poor family will pay less because of government subsidies for poor families. Would you be willing to pay a tariff of 1.5 yuan per tonne to finance the project or would you prefer to leave the tariff at 0.8 and not have the project?

<i>Pay higher tariff</i>	<i>Leave tariff at 0.8</i>
1	2

This was followed for respondents refusing to pay the stated amount by a second question using a payment card format as follows:

If 1.5 is too high, then what wastewater tariff would you support at a public hearing meeting?

	1	2	3	4	5	6	7	D/A
<i>Yuan/tonne</i>	0.80	0.90	1.00	1.10	1.20	1.30	1.40	99

This question structure is commonly used in WTP work but the application here departs from conventional practice in that the offer amount in the initial question is not varied randomly across respondents. The approach was simplified in this manner due to logistical constraints and resource limitations for the survey field work. The consequence of this simplification is that it is not possible to estimate a compensated demand curve or determine marginal effects with the resulting survey data. The average WTP determined with the survey is therefore based on data that is truncated at the offer amount provided in the initial question. No observations above the offer are available even though some respondents will be willing to pay an amount that exceeds the offer. The estimated average WTP will therefore have a downward bias and estimates of project benefits based on these estimates will therefore also have a negative bias.

F6-2. HOUSEHOLD WTP

F6-3. WASTEWATER

All household survey respondents were asked if they were willing to pay a wastewater tariff of RMB 1.5 per tonne. A follow up question for respondents who would not pay the offer amount allowed them to select a tariff they would be willing to pay that ranged between the existing tariff level and RMB 1.4 per tonne. The existing tariff is RMB 0.8 per tonne in the urban area and RMB 0.0 in the sub-urban area.

Results of the household WTP questions are provided in Tables 1 to 3. A majority of all respondents are willing to pay the offered tariff of RMB 1.5 per tonne. Affordability and personal spending priorities were the principle reasons cited for not being willing to pay the initial offer amount. The average WTP, accounting for all respondents, is RMB 1.38 per tonne. Note that this WTP amount represents all respondents including both direct beneficiaries within wastewater project service areas and indirect beneficiaries outside of the service areas.

Table 1 Number of Respondents Willing to Pay for Wastewater

	WTP a tariff of RMB 1.5/tonne	WTP if the high tariff is introduced gradually
All respondents		
No ob.	456	188
Yes	267	80
No	189	107
Urban respondents		
No ob.	366	160
Yes	205	63
No	161	96
Sub-urban respondents		
No ob.	90	28
Yes	62	17
No	28	11

* Source: household survey data.

Table 2 Reasons for not being Willing to Pay

	Can't afford the bill	Don't trust government to spend money properly	Other personal spending priorities	Spend money on other services	Project not needed now	Other
All respondents						
No ob.	189	188	187	187	187	187
Mentioned						
Yes	82	39	70	25	21	30

No	107	149	117	162	166	157
Urban respondents						
No ob.	161	160	160	160	160	160
Mentioned						
Yes	74	32	61	15	14	24
No	87	128	99	145	146	136
Sub-urban respondents						
No ob.	28	28	27	27	27	27
Mentioned						
Yes	8	7	9	10	7	6
No	20	21	18	17	20	21

* Source: household survey data.

Table 3 Average willingness to pay for wastewater (RMB per tonne)

	All respondents	Urban	Sub-urban
No observations	453	363	90
Average	1.36	1.35	1.38
Weighted Average**	1.38	1.38	1.37
St dev	0.27	0.25	0.34

* Source: household survey data.

** Weighting by income class to overcome bias created by the block randomized sampling frame (see Appendix F2).

F6-4. STORM WATER

All household survey respondents were asked if they were willing to pay an additional RMB 5 per month through government taxes and charges to help finance project storm water investments. A follow up question for respondents who would not pay the offer amount allowed them to select an amount that they would be willing to pay that ranged between RMB 0.5 and RMB 4.5.

Results of the questions are provided in Tables 4 and 5.¹ A majority of all respondents are willing to pay the offered monthly charge. The average WTP, accounting for all urban respondents, is RMB 3.57 per month. Note that this WTP amount represents all respondents including both direct beneficiaries within storm water project service areas and indirect beneficiaries outside of those service areas.

Table 4 Respondent willingness to pay RMB 5 per month for storm water

	All urban respondents	Urban	
		in a SW area	not in a SW area
No observations	366	215	146
% Yes	60.7%	61.3%	59.7%
% No	39.3%	38.7%	40.3%

* Source: household survey data.

¹ Results are only provided for urban respondents since all SW projects are located within the urban area.

Table 5 Average willingness to pay for storm water (RMB per month)

	All urban respondents	Urban	
		in a SW area	not in a SW area
No observations	361	215	146
Average	3.57	3.67	3.43
St dev	1.86	1.77	1.99

* Source: analysis of household survey data.

Direct beneficiaries within storm water project service areas will likely be willing to pay an amount exceeding the offer amount in the WTP question if they experience flood damages in excess of that amount. Respondents were asked to indicate the frequency of occurrence of flooding to different depths relative to their home and were also asked to indicate the cost they incurred both in terms of direct cash expenditures and time to repair flood damages. The damage question itemized damage categories as follows to help the respondent:

1. Clean up the outside area around home
2. Clean clothes, other goods
3. Heavy cleaning of the house (mud, debris).
4. Spoiled food supplies
5. Spoiled clothing, other goods
6. Minor repairs of home and equipment
7. Major repairs of home and equipment
8. Must leave the house during flooding
9. Interferes with travel around the city
10. Flood disrupts work or business
11. Other damages

Seven levels of frequency were used:²

1. More than 2 times a year
2. 1 or 2 times a year
3. Once every 1 to 2 years
4. Once every 2 to 5 years
5. Once every 5 to 10 years
6. Less than once every 10 years
7. Never

Estimates of annual average household damage in the urban area are provided in Table 6. These estimates account for direct cash expenditures and lost time valued at the average daily earnings of employed household members, and for the frequency of occurrence of damages. The average annual damage per household of RMB 55 is an average over all households in the urban area. This amount implies a monthly WTP of RMB 4.6, somewhat higher than the WTP figure reported in Table 5 above. Damages for respondents within the Project storm water service areas are more than double at RMB 62. In this group, 59%

² The approach implicitly assumes that each specific type of damage only occurs at a specific return frequency. This simplified characterization of the actual flood damage process is unavoidable given resource and time constraints.

report no damages perhaps because they use coping mechanisms to avoid damage or because they discount costs that are incurred because these are relatively small. Annual average damages for the 41% of respondents reporting damage are RMB 153.

Table 6 Average annual damages from storm water flooding (RMB per household)

	All urban respondents	Urban, not in a SW area	Urban, in a SW area	
			Total	Damages>0
Number observations	134	28	106	43
Average annual damage per HH	54.8	26.64	62.24	153.42
St dev	317.7	83.49	354.68	547.89

Source: household survey data.

F6-5. BUSINESS ENTERPRISE WTP

F6-6. WASTEWATER

Business survey respondents were asked the same WTP questions for improved wastewater services that were used in the household survey. Respondents were first asked if they would willingly pay a tariff of RMB 1.5 per tonne to help finance project storm water investments, and, if they said no, a follow up question allowed them to select an amount that they would willingly pay that ranged between the existing tariff and RMB 1.5.

Results of the questions are provided in Tables 7 and 8. A majority of all respondents are willing to pay the offered monthly charge. The average WTP, accounting for all respondents, is RMB 1.44 per tonne. Note that this WTP amount represents all respondents including both direct beneficiaries within storm water project service areas and indirect beneficiaries outside of those service areas.

Table 7 Respondent willingness to pay for storm water

	WTP a charge of RMB 5 per month
All respondents	
Number responding	100
Yes	85
No	15
Urban respondents	
Number responding	60
Yes	50
No	10
Sub-urban respondents	
Number responding	40
Yes	35
No	5

* Source: household survey data.

Table 8 Average willingness to pay for storm water (RMB per month)

	All respondents	Urban respondents	Sub-urban respondents
Number observations	100	60	40
Average	1.44	1.42	1.48
St dev	0.18	0.21	0.11

* Source: business survey data.

F6-7. STORM WATER

Business survey respondents were not asked a WTP question concerning storm water management improvements but they were asked to report on their experience with flood damages using the same question format as was used in the household survey. Return frequency levels were the same as those used in the household survey. Damage categories in the business survey were as follows:

1. Cleaning outside areas
2. Cleaning buildings and equipment
3. Spoiled inventory and product
4. Minor repairs to buildings and equipment
5. Major repairs to buildings and equipment
6. Close business during flooding
7. Delay shipments
8. Lose sales during flood
9. Other damages

Out of the 100 survey respondents 26 report experiencing flooding and of these, 7 report damages from the flooding. Estimates of annual average enterprise damage are provided in Table 9. These estimates account for direct cash expenditures and lost days of production valued at the each enterprise's reported net daily operating income. As with the household damages, estimates here also account for return frequencies. The average annual damage per enterprise of RMB 77,900 is an average over those enterprises reporting flooding including those reporting no damages.

Table 9 Average annual damages for enterprises experiencing flooding

	Annual average damage		
	RMB per enterprise	RMB per employee	RMB per RMB 10⁶ in sales
Average annual damage*	77,909	202	4,615
St dev	392,043	665	11,583

Source: business survey data.

* Averages based on all enterprises reporting flooding including those reporting no damages.

Alternative estimates of average annual flood damages for enterprises in the services areas of Project SW components were estimated using the averages in Table 9 and the enterprise activity provided in Table 10. These estimates are as follows:

Based on no. employees RMB 3.5 million
 Based on no. enterprises RMB 8.7 million
 Based on Sales, RMB 10⁶ RMB 14.2 million

Table 10 Enterprise activity in project service areas

	Dong Xi Hu tri-gate		Yangsigang	Luoja Road		Totals
District	Qiao Kou	Jiang Han	Han Yang	Wu Chang	Qing Shan	
Total district						
No. Enterprises	71	48	61	33	75	288
No. Employees	8,950	9,005	6,547	6,208	18,965	49,675
Sales, RMB 10 ⁶	1.930	1.994	1.371	0.561	1.827	7.684
In Flood Area*						
No. Enterprises	71	12	6	5	18	112
No. Employees	8,950	2228	647	863	4673	17,361
Sales, RMB 10 ⁶	1.930	0.493	0.136	0.078	0.450	3.087

Source: Wuhan Statistical Yearbook, 2004

* The proportion of District enterprise activity within the project service areas was estimated by pro-rating using the District and project service areas.

TA 4436-PRC

Project Preparatory Technical Assistance

Wuhan Wastewater and Storm Water Management Project

FINAL REPORT

APPENDIX H1 Project Cost Summary

Appendix H1 - Financial Cost.xls

People's Republic of China
Wuhan Wastewater and Storm Water Management Project
Components Project Cost Summary

	(yuan)			(US\$)			% Foreign Exchange
	Local	Foreign	Total	Local	Foreign	Total	
A. Develop Wastewater Treatment Facilities in Central Urban Areas							
Erlangmiao WWTP	74,898,893	107,059,457	181,958,350	9,235,375	13,200,919	22,436,295	59
Nantaizi Lake WWTP	102,037,564	80,375,116	182,412,680	12,581,697	9,910,619	22,492,316	44
Huangpu Road WWTP	48,496,499	71,030,018	119,526,517	5,979,840	8,758,325	14,738,165	59
Subtotal Develop Wastewater Treatment Facilities in Central Urban Areas	225,432,956	258,464,591	483,897,547	27,796,912	31,869,863	59,666,775	53
B. Develop Wastewater Treatment Facilities in Suburban Areas							
Dongxihu Sewer System	79,941,341	79,170,949	159,112,290	9,857,132	9,762,139	19,619,271	50
Caidian WWTP	51,666,264	43,198,326	94,864,590	6,370,686	5,326,551	11,697,237	46
Subtotal Develop Wastewater Treatment Facilities in Suburban Areas	131,607,605	122,369,275	253,976,880	16,227,818	15,088,690	31,316,508	48
C. Develop Storm Water System in Wuhan							
Drainage Works in LuoJia Road Area of Wuchang	240,475,468	125,946,792	366,422,260	29,651,722	15,529,814	45,181,536	34
Yangsigang Pump Stations and Pipes Works in Hanyang	49,952,914	33,460,976	83,413,890	6,159,422	4,125,891	10,285,313	40
Tri-gate Connection Works in Dongxihu	181,007,684	131,227,036	312,234,720	22,319,073	16,180,892	38,499,965	42
Changqing Pump Station Expansion	68,564,370	88,614,652	157,179,022	8,454,300	10,926,591	19,380,891	56
Subtotal Develop Storm Water System in Wuhan	540,000,437	379,249,455	919,249,892	66,584,517	46,763,188	113,347,706	41
D. Project Management	-	8,110,000	8,110,000	-	1,000,000	1,000,000	100
Total BASELINE COSTS	897,040,997	768,193,322	1,665,234,319	110,609,248	94,721,741	205,330,989	46
Physical Contingencies	89,704,100	76,819,332	166,523,432	11,060,925	9,472,174	20,533,099	46
Price Contingencies	64,247,213	45,438,313	109,685,526	7,921,974	5,602,751	13,524,726	41
Total PROJECT COSTS	1,050,992,310	890,450,967	1,941,443,277	129,592,147	109,796,667	239,388,813	46
Interest During Implementation	135,451,347	106,730,863	242,182,210	16,701,769	13,160,402	29,862,171	44
Commitment Charges	-	7,764,591	7,764,591	-	957,410	957,410	100
Total Costs to be Financed	1,186,443,657	1,004,946,422	2,191,390,079	146,293,916	123,914,479	270,208,394	46

Appendix H1 – Financial Cost.xls

People's Republic of China Wuhan Wastewater and Storm Water Management Project Expenditure Accounts Project Cost Summary

	(yuan)			(US\$)			% Foreign Exchange	% Total Base Costs
	Local	Foreign	Total	Local	Foreign	Total		
I. Investment Costs								
A. Civil Works								
Wastewater treatment plant	97,265,186	128,932,921	226,198,107	11,993,241	15,898,017	27,891,259	57	14
Wastewater pipe network	67,209,013	89,091,017	156,300,030	8,287,178	10,985,329	19,272,507	57	9
Storm water pipe network	213,448,729	282,943,663	496,392,392	26,319,202	34,888,245	61,207,447	57	30
Subtotal Civil Works	377,922,927	500,967,602	878,890,529	46,599,621	61,771,591	108,371,212	57	53
B. Equipment and Materials								
Wastewater equipment and materials	40,702,482	162,809,928	203,512,410	5,018,802	20,075,207	25,094,009	80	12
Storm-water equipment and materials	24,076,448	96,305,792	120,382,240	2,968,736	11,874,944	14,843,679	80	7
Installation	47,260,320	-	47,260,320	5,827,413	-	5,827,413	-	3
Subtotal Equipment and Materials	112,039,250	259,115,720	371,154,970	13,814,951	31,950,150	45,765,101	70	22
C. Land Acquisition and Resettlement Compensation	286,753,320	-	286,753,320	35,357,993	-	35,357,993	-	17
D. Environment Protection	1,134,040	-	1,134,040	139,832	-	139,832	-	-
E. Implementation Supervision and Training								
Implementation supervision - local	11,575,750	973,200	12,548,950	1,427,343	120,000	1,547,343	8	1
Implementation supervision - international	-	7,136,800	7,136,800	-	880,000	880,000	100	-
Training	1,474,200	-	1,474,200	181,776	-	181,776	-	-
Subtotal Implementation Supervision and Training	13,049,950	8,110,000	21,159,950	1,609,118	1,000,000	2,609,118	38	1
F. Survey, Research, Design, Consulting Services	56,218,880	-	56,218,880	6,932,044	-	6,932,044	-	3
G. Bidding Documents and Expenses	1,596,540	-	1,596,540	196,861	-	196,861	-	-
H. Auditing	4,281,560	-	4,281,560	527,936	-	527,936	-	-
I. Production Preparation and Trial Production	3,461,940	-	3,461,940	426,873	-	426,873	-	-
J. EAIAs Project Management and Others	40,582,590	-	40,582,590	5,004,018	-	5,004,018	-	2
Total BASELINE COSTS	897,040,997	768,193,322	1,665,234,319	110,609,248	94,721,741	205,330,989	46	100
Physical Contingencies	89,704,100	76,819,332	166,523,432	11,060,925	9,472,174	20,533,099	46	10
Price Contingencies	64,247,213	45,438,313	109,685,526	7,921,974	5,602,751	13,524,726	41	7
Total PROJECT COSTS	1,050,992,310	890,450,967	1,941,443,277	129,592,147	109,796,667	239,388,813	46	117
Interest During Implementation	135,451,347	106,730,863	242,182,210	16,701,769	13,160,402	29,862,171	44	17
Commitment Charges	-	7,764,591	7,764,591	-	957,410	957,410	100	1
Total Costs to be Financed	1,186,443,657	1,004,946,422	2,191,390,079	146,293,916	123,914,479	270,208,394	46	134

Appendix H1 - Financial Cost.xls

People's Republic of China
Wuhan Wastewater and Storm Water Management Project
Expenditure Accounts by Components - Base Costs
(US\$)

	Develop Storm Water System in Wuhan												Physical Contingencies	
	Develop Wastewater Treatment Facilities in Central Urban Areas			Develop Wastewater Treatment Facilities in Suburban Areas		Drainage Works in Luojia Road Area of Wuchang	Yangsigang Pump Stations and Pipes Works in Hanyang	Tri-gate Connection Works in Dongxihu	Changqing Pump Station Expansion	Project Management	Total			
	Erlangmiao WWTP	Nantaizi Lake WWTP	Huangpu Road WWTP	Dongxihu Sewer System	Caidian WWTP									
											%	Amount		
I. Investment Costs														
A. Civil Works														
Wastewater treatment plant	10,440,761	8,669,716	4,793,779	-	3,987,002	-	-	-	-	-	27,891,259	10.0	2,789,126	
Wastewater pipe network	-	2,690,298	-	14,937,571	1,644,637	-	-	-	-	-	19,272,507	10.0	1,927,251	
Storm water pipe network	-	-	-	-	-	20,277,691	4,484,761	28,387,530	8,057,465	-	61,207,447	10.0	6,120,745	
Subtotal Civil Works	10,440,761	11,360,015	4,793,779	14,937,571	5,631,640	20,277,691	4,484,761	28,387,530	8,057,465	-	108,371,212	10.0	10,837,121	
B. Equipment and Materials														
Wastewater equipment and materials	9,062,107	4,294,263	7,532,339	1,559,655	2,645,645	-	-	-	-	-	25,094,009	10.0	2,509,401	
Storm-water equipment and materials	-	-	-	-	-	4,964,413	1,961,972	-	7,917,295	-	14,843,679	10.0	1,484,368	
Installation	896,030	955,302	1,060,942	420,481	395,645	619,852	307,768	-	1,171,393	-	5,827,413	10.0	582,741	
Subtotal Equipment and Materials	9,958,137	5,249,565	8,593,281	1,980,136	3,041,290	5,584,265	2,269,740	-	9,088,688	-	45,765,101	10.0	4,576,510	
C. Land Acquisition and Resettlement Compensation	-	4,295,287	-	917,795	1,923,423	17,008,621	2,906,439	7,675,001	631,425	-	35,357,993	10.0	3,535,799	
D. Environment Protection	16,681	13,582	10,947	24,057	17,731	18,808	4,912	20,645	12,470	-	139,832	10.0	13,983	
E. Implementation Supervision and Training														
Implementation supervision - local	193,789	157,789	127,175	209,779	121,420	204,309	53,361	224,261	135,457	120,000	1,547,343	10.0	154,734	
Implementation supervision - international	-	-	-	-	-	-	-	-	-	880,000	880,000	10.0	88,000	
Training	47,941	9,988	29,963	9,988	25,302	20,641	15,314	-	22,639	-	181,776	10.0	18,178	
Subtotal Implementation Supervision and Training	241,730	167,777	157,138	219,767	146,723	224,951	68,676	224,261	158,096	1,000,000	2,609,118	10.0	260,912	
F. Survey, Research, Design, Consulting Services	920,719	749,683	604,232	842,503	462,376	1,109,444	289,755	1,217,776	735,557	-	6,932,044	10.0	693,204	
G. Bidding Documents and Expenses	22,951	16,687	15,062	39,963	29,619	23,356	6,100	25,637	15,486	-	196,861	10.0	19,686	
H. Auditing	78,131	63,617	51,274	62,916	37,546	77,586	20,264	85,163	51,440	-	527,936	10.0	52,794	
I. Production Preparation and Trial Production	99,499	44,792	74,707	17,446	31,142	53,466	22,456	-	83,365	-	426,873	10.0	42,687	
J. EA/IAs Project Management and Others	657,687	529,312	437,746	577,117	375,747	803,349	212,211	863,952	546,898	-	5,004,018	10.0	500,402	
Total BASELINE COSTS	22,436,295	22,492,316	14,738,165	19,619,271	11,697,237	45,181,536	10,285,313	38,499,965	19,380,891	1,000,000	205,330,989	10.0	20,533,099	
Physical Contingencies	2,243,629	2,249,232	1,473,816	1,961,927	1,169,724	4,518,154	1,028,531	3,849,997	1,938,089	100,000	20,533,099	-	-	
Price Contingencies	1,477,490	1,427,581	815,449	1,893,950	899,797	3,314,217	775,996	1,676,358	1,228,488	15,400	13,524,726	9.1	1,229,521	
Total PROJECT COSTS	26,157,415	26,169,128	17,027,430	23,475,148	13,766,757	53,013,907	12,089,841	44,026,320	22,547,468	1,115,400	239,388,813	9.1	21,762,619	
Taxes	1,959,398	1,185,340	1,480,274	859,067	677,562	1,635,356	515,467	1,041,552	1,680,883	-	11,034,897	9.1	1,003,172	
Foreign Exchange	15,297,010	11,464,631	10,077,734	11,540,193	6,220,263	18,143,315	4,821,350	18,463,972	12,652,800	1,115,400	109,796,667	9.1	9,981,515	

Appendix H1 - Financial Cost.xls

People's Republic of China
Wuhan Wastewater and Storm Water Management Project
Expenditure Accounts by Components - Totals Including Contingencies
(US\$)

	Develop Storm Water System in Wuhan										
	Develop Wastewater Treatment Facilities in Central Urban Areas			Develop Wastewater Treatment Facilities in Suburban Areas		Drainage Works in Luojia Road Area of Wuchang	Yangsigang Pump Stations and Pipes Works in Hanyang	Tri-gate Connection Works in Dongxihu	Changqing Pump Station Expension	Project Management	Total
	Erlangmiao WWTP	Nantaizi Lake WWTP	Huangpu Road WWTP	Dongxihu Sewer System	Caidian WWTP						
I. Investment Costs											
A. Civil Works											
Wastewater treatment plant	12,098,064	10,002,447	5,529,223	-	4,682,360	-	-	-	-	-	32,312,094
Wastewater pipe network	-	3,219,306	-	17,874,824	1,966,673	-	-	-	-	-	23,060,804
Storm water pipe network	-	-	-	-	-	23,926,127	5,291,675	32,548,489	9,395,790	-	71,162,081
Subtotal Civil Works	12,098,064	13,221,753	5,529,223	17,874,824	6,649,034	23,926,127	5,291,675	32,548,489	9,395,790	-	126,534,979
B. Equipment and Materials											
Wastewater equipment and materials	10,577,898	4,991,549	8,690,074	1,860,212	3,092,329	-	-	-	-	-	29,212,062
Storm-water equipment and materials	-	-	-	-	-	5,817,734	2,299,210	-	9,187,549	-	17,304,493
Installation	1,069,796	1,139,768	1,243,806	518,675	474,008	744,416	369,617	-	1,385,872	-	6,945,958
Subtotal Equipment and Materials	11,647,695	6,131,317	9,933,880	2,378,888	3,566,336	6,562,150	2,668,827	-	10,573,421	-	53,462,512
C. Land Acquisition and Resettlement Compensation	-	4,942,500	-	1,102,239	2,248,076	19,818,650	3,397,014	8,693,338	722,086	-	40,923,903
D. Environment Protection	19,554	15,922	12,596	28,460	20,786	21,843	5,652	23,607	14,349	-	162,770
E. Implementation Supervision and Training											
Implementation supervision - local	231,365	187,819	147,717	256,874	146,719	244,636	63,894	258,880	158,806	133,848	1,830,557
Implementation supervision - international	-	-	-	-	-	-	-	-	-	981,552	981,552
Training	60,537	12,612	35,664	12,244	31,019	25,305	18,775	-	26,946	-	223,102
Subtotal Implementation Supervision and Training	291,901	200,431	183,380	269,118	177,739	269,941	82,669	258,880	185,752	1,115,400	3,035,211
F. Survey, Research, Design, Consulting Services	1,072,708	873,438	692,001	987,602	542,032	1,288,506	336,521	1,383,709	846,391	-	8,022,907
G. Bidding Documents and Expenses	25,996	21,436	17,060	47,994	34,191	26,964	7,042	28,946	17,878	-	227,508
H. Auditing	93,000	75,724	59,278	77,041	41,982	92,484	24,155	98,309	60,307	-	622,279
I. Production Preparation and Trial Production	125,642	56,560	91,587	22,030	39,324	65,547	27,530	-	99,225	-	527,446
J. EA/IAs Project Management and Others	782,855	630,048	508,425	686,952	447,258	941,694	248,756	991,042	632,269	-	5,869,298
Total PROJECT COSTS	26,157,415	26,169,128	17,027,430	23,475,148	13,766,757	53,013,907	12,089,841	44,026,320	22,547,468	1,115,400	239,388,813
Taxes	1,959,398	1,185,340	1,480,274	859,067	677,562	1,635,356	515,467	1,041,552	1,680,883	-	11,034,897
Foreign Exchange	15,297,010	11,464,631	10,077,734	11,540,193	6,220,263	18,143,315	4,821,350	18,463,972	12,652,800	1,115,400	109,796,667

Appendix H1 – Financial Cost.xls

People's Republic of China
Wuhan Wastewater and Storm Water Management Project
Project Components by Year – Base Costs
(US\$)

	Base Cost					Total
	2006	2007	2008	2009	2010	
A. Develop Wastewater Treatment Facilities in Central Urban Areas						
Erlangmiao WWTP	2,331,163	7,613,659	7,312,095	3,267,411	1,911,967	22,436,295
Nantaizi Lake WWTP	4,050,180	6,875,612	7,498,582	2,924,159	1,143,783	22,492,316
Huangpu Road WWTP	487,673	9,166,884	4,105,799	977,809	-	14,738,165
Subtotal Develop Wastewater Treatment Facilities in Central Urban Areas	6,869,015	23,656,155	18,916,476	7,169,379	3,055,749	59,666,775
B. Develop Wastewater Treatment Facilities in Suburban Areas						
Dongxihu Sewer System	462,047	199,674	7,425,665	7,448,577	4,083,309	19,619,271
Caidian WWTP	310,662	3,199,090	4,466,340	3,181,110	540,034	11,697,237
Subtotal Develop Wastewater Treatment Facilities in Suburban Areas	772,710	3,398,764	11,892,005	10,629,687	4,623,342	31,316,508
C. Develop Storm Water System in Wuhan						
Drainage Works in LuoJia Road Area of Wuchang	652,138	17,033,981	16,541,162	10,954,256	-	45,181,536
Yangsigang Pump Stations and Pipes Works in Hanyang	171,656	3,002,381	4,231,527	2,879,748	-	10,285,313
Tri-gate Connection Works in Dongxihu	8,610,153	26,690,477	3,199,335	-	-	38,499,965
Changqing Pump Station Expension	652,708	5,201,732	13,526,451	-	-	19,380,891
Subtotal Develop Storm Water System in Wuhan	10,086,655	51,928,572	37,498,474	13,834,004	-	113,347,706
D. Project Management	1,000,000	-	-	-	-	1,000,000
Total BASELINE COSTS	18,728,381	78,983,491	68,306,955	31,633,070	7,679,092	205,330,989
Physical Contingencies	1,872,838	7,898,349	6,830,696	3,163,307	767,909	20,533,099
Price Contingencies	326,192	3,838,199	5,145,821	3,204,799	1,009,715	13,524,726
Total PROJECT COSTS	20,927,411	90,720,040	80,283,471	38,001,176	9,456,715	239,388,813
Taxes	310,778	3,522,120	4,492,933	2,144,737	564,329	11,034,897
Foreign Exchange	5,351,374	38,325,442	40,229,320	21,068,477	4,822,054	109,796,667

Appendix H1 – Financial Cost.xls

People's Republic of China
Wuhan Wastewater and Storm Water Management Project
Project Components by Year – Totals Including Contingencies
(US\$)

	Totals Including Contingencies					Total
	2006	2007	2008	2009	2010	
A. Develop Wastewater Treatment Facilities in Central Urban Areas						
Erlangmiao WWTP	2,603,354	8,724,633	8,571,744	3,913,208	2,344,475	26,157,415
Nantaizi Lake WWTP	4,525,564	7,893,109	8,821,130	3,515,620	1,413,705	26,169,128
Huangpu Road WWTP	545,291	10,500,443	4,811,587	1,170,108	-	17,027,430
Subtotal Develop Wastewater Treatment Facilities in Central Urban Areas	7,674,209	27,118,186	22,204,461	8,598,936	3,758,181	69,353,973
B. Develop Wastewater Treatment Facilities in Suburban Areas						
Dongxihu Sewer System	516,638	230,519	8,735,455	8,964,989	5,027,547	23,475,148
Caidian WWTP	347,367	3,677,527	5,251,233	3,819,642	670,988	13,766,757
Subtotal Develop Wastewater Treatment Facilities in Suburban Areas	864,005	3,908,047	13,986,688	12,784,630	5,698,535	37,241,905
C. Develop Storm Water System in Wuhan						
Drainage Works in LuoJia Road Area of Wuchang	729,188	19,628,494	19,496,310	13,159,916	-	53,013,907
Yangsigang Pump Stations and Pipes Works in Hanyang	191,938	3,456,982	4,983,228	3,457,694	-	12,089,841
Tri-gate Connection Works in Dongxihu	9,622,846	30,640,626	3,762,848	-	-	44,026,320
Changqing Pump Station Expension	729,825	5,967,705	15,849,937	-	-	22,547,468
Subtotal Develop Storm Water System in Wuhan	11,273,797	59,693,807	44,092,322	16,617,609	-	131,677,536
D. Project Management	1,115,400	-	-	-	-	1,115,400
Total PROJECT COSTS	20,927,411	90,720,040	80,283,471	38,001,176	9,456,715	239,388,813

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Project Preparatory Technical Assistance

Wuhan Wastewater and Storm Water Management Project

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APPENDIX H2 Financing Plan

Appendix H2 – Financial Plan.xls

People's Republic of China
Wuhan Wastewater and Storm Water Management Project
Disbursement Accounts by Financiers
(US\$)

	Asian Development Bank		Wuhan Municipal Government		Domestic Commercial Bank		Total
	Amount	%	Amount	%	Amount	%	Amount
A. Civil Works	59,039,137	57.0	-	-	44,538,296	43.0	103,577,433
B. Installation	-	-	-	-	4,766,471	100.0	4,766,471
C. Equipment and Materials	25,924,279	80.0	-	-	6,481,070	20.0	32,405,349
D. Huangpulu WWTP turnkey contract	8,758,325	65.4	2,314,367	17.3	2,314,367	17.3	13,387,060
E. Land Acquisition and Resettlement Compensation	-	-	-	-	35,357,993	100.0	35,357,993
F. Environment Protection	-	-	139,832	100.0	-	-	139,832
G. Implementation Supervision and Training							
Implementation supervision - local	-	-	1,427,343	100.0	-	-	1,427,343
Implementation supervision - international	1,000,000	100.0	-	-	-	-	1,000,000
Training	-	-	181,776	100.0	-	-	181,776
Subtotal Implementation Supervision and Training	1,000,000	38.3	1,609,118	61.7	-	-	2,609,118
H. Survey, Research, Design, Consulting Services	-	-	6,932,044	100.0	-	-	6,932,044
I. Bidding Documents	-	-	196,861	100.0	-	-	196,861
J. Auditing	-	-	527,936	100.0	-	-	527,936
K. Production Preparation and Trial Production	-	-	426,873	100.0	-	-	426,873
L. EA/IAs Project Management and Others	-	-	5,004,018	100.0	-	-	5,004,018
Total PROJECT BASE COSTS	94,721,741	46.1	17,151,051	8.4	93,458,197	45.5	205,330,989
Contingencies - local currency			18,982,899				18,982,899
Contingencies - foreign exchange			15,074,925				15,074,925
Total PROJECT COSTS	94,721,741	39.6	51,208,875	21.4	93,458,197	39.0	239,388,813
Interest During Implementation	13,160,402	44.1	-	-	16,701,769	55.9	29,862,171
Commitment Charges	957,410	100.0	-	-	-	-	957,410
Total Disbursement	108,839,553	40.3	51,208,875	19.0	110,159,966	40.8	270,208,394

Appendix H2 - Financial Plan.xls

People's Republic of China
Wuhan Wastewater and Storm Water Management Project
Components by Financiers
(US\$)

	Asian Development Bank		Wuhan Municipal Government		Domestic Commercial Bank		Total
	Amount	%	Amount	%	Amount	%	Amount
A. Develop Wastewater Treatment Facilities in Central Urban Areas							
Erlangmiao WWTP	13,200,919	58.8	2,037,397	9.1	7,197,978	32.1	22,436,295
Nantaizi Lake WWTP	9,910,619	44.1	1,587,449	7.1	10,994,248	48.9	22,492,316
Huangpu Road WWTP	8,758,325	59.4	3,665,472	24.9	2,314,367	15.7	14,738,165
Subtotal Develop Wastewater Treatment Facilities in Central Urban Areas	31,869,863	53.4	7,290,318	12.2	20,506,594	34.4	59,666,775
B. Develop Wastewater Treatment Facilities in Suburban Areas							
Dongxihu Sewer System	9,762,139	49.8	1,783,769	9.1	8,073,363	41.2	19,619,271
Caidian WWTP	5,326,551	45.5	1,100,884	9.4	5,269,802	45.1	11,697,237
Subtotal Develop Wastewater Treatment Facilities in Suburban Areas	15,088,690	48.2	2,884,654	9.2	13,343,165	42.6	31,316,508
C. Develop Storm Water System in Wuhan							
Drainage Works in Luoja Road Area of Wuchang	15,529,814	34.4	2,310,959	5.1	27,340,763	60.5	45,181,536
Yangsigang Pump Stations and Pipes Works in Hanyang	4,125,891	40.1	624,374	6.1	5,535,049	53.8	10,285,313
Tri-gate Connection Works in Dongxihu	16,180,892	42.0	2,437,434	6.3	19,881,639	51.6	38,499,965
Changqing Pump Station Expansion	10,926,591	56.4	1,603,312	8.3	6,850,988	35.3	19,380,891
Subtotal Develop Storm Water System in Wuhan	46,763,188	41.3	6,976,079	6.2	59,608,439	52.6	113,347,706
D. Project Management	1,000,000	100.0	-	-	-	-	1,000,000
Total PROJECT BASE COSTS	94,721,741	46.1	17,151,051	8.4	93,458,197	45.5	205,330,989
Contingencies - local currency			18,982,899				18,982,899
Contingencies - foreign exchange			15,074,925				15,074,925
Total PROJECT COSTS	94,721,741	39.6	51,208,875	21.4	93,458,197	39.0	239,388,813
Interest During Implementation	13,160,402	44.1	-	-	16,701,769	55.9	29,862,171
Commitment Charges	957,410	100.0	-	-	-	-	957,410
Total Disbursement	108,839,553	40.3	51,208,875	19.0	110,159,966	40.8	270,208,394

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Project Preparatory Technical Assistance

Wuhan Wastewater and Storm Water Management Project

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APPENDIX H3 FIRR Calculation

Caidian WWTP

		Waste Water Tariff yuan/m ³ A	Annual water sold 000 m ³ /a	WW tariff collection rate % B	Waste Water treated 000 m ³ /a C	Financial revenues 000 yuan	Capital costs 000 yuan D	O&M costs 000 yuan E	Depreciation Amortization 000 yuan F	Total costs 000 yuan G=D+E+F	Total excluding depreciation 000 yuan H=G-F	Net Cash Flow 000 yuan I=C-H	
1	2006	0.00	0	0.00	0	0	3,090	0	0	3,090	3,090	-3,090	
2	2007	0.40	0	0.00	0	0	27,811	0	0	27,811	27,811	-27,811	
3	2008	0.40	0	0.00	0	0	39,141	0	0	39,141	39,141	-39,141	
4	2009	0.40	0	0.00	0	0	27,811	0	0	27,811	27,811	-27,811	
5	2010	0.80	17,242	0.80	10,950	11,035	5,150	4,381	5,331	14,862	9,531	1,503	
6	2011	0.80	18,487	0.85	14,600	12,571		5,901	5,331	11,231	5,901	6,671	
7	2012	0.95	19,830	0.85	18,250	16,013		7,507	5,331	12,838	7,507	8,506	
8	2013	0.95	21,280	0.90	18,250	18,194		7,834	5,331	13,165	7,834	10,360	
9	2014	0.95	22,845	0.90	18,250	19,532		8,035	5,331	13,366	8,035	11,497	
10	2015	0.95	24,534	0.95	18,250	22,142		8,427	5,331	13,757	8,427	13,716	
11	2016	0.95	26,502	0.95	18,250	23,918		10,788	5,331	16,119	10,788	13,130	
12	2017	0.95	28,640	0.95	18,250	25,848		11,425	5,331	16,756	11,425	14,423	
13	2018	0.95	30,965	0.95	18,250	27,946		12,118	5,331	17,448	12,118	15,829	
14	2019	0.95	33,495	0.95	18,250	30,229		12,871	5,331	18,202	12,871	17,358	
15	2020	0.95	36,247	0.95	18,250	32,713		13,691	5,331	19,021	13,691	19,023	
16	2021	0.95	36,763	0.95	18,250	33,179		13,844	5,331	19,175	13,844	19,334	
17	2022	0.95	37,292	0.95	18,250	33,656		14,286	4,249	18,535	14,286	19,370	
18	2023	0.95	37,833	0.95	18,250	34,144		14,732	3,168	17,900	14,732	19,413	
19	2024	0.95	38,388	0.95	18,250	34,646		14,897	3,168	18,065	14,897	19,748	
20	2025	0.95	38,957	0.95	18,250	35,159		15,067	3,168	18,234	15,067	20,092	
21	2026	0.95	39,541	0.95	18,250	35,686		15,240	3,168	18,408	15,240	20,445	
22	2027	0.95	40,139	0.95	18,250	36,225		15,418	3,168	18,586	15,418	20,807	
23	2028	0.95	40,752	0.95	18,250	36,778		15,601	3,168	18,769	15,601	21,177	
24	2029	0.95	41,380	0.95	18,250	37,345		15,788	3,168	18,956	15,788	21,557	
25	2030	0.95	42,024	0.95	18,250	37,926		15,980	3,168	19,148	15,980	21,946	
26	2031	0.95	42,684	0.95	18,250	38,522		16,176	3,168	19,344	16,176	22,346	
27	2032	0.95	43,360	0.95	18,250	39,132		16,378	3,168	19,546	16,378	22,755	
28	2033	0.95	44,053	0.95	18,250	39,758		16,600	3,107	19,707	16,600	23,158	
NPV@ 4.00%		406,498		228,971		356,961	91,486	152,160	59,173	302,819	243,646	113,315	
Per m3 WW treated						1.56	0.40	0.66	0.26	1.32	1.06	0.49	
											AIFC	AIFC	
IRR													10.91%

		Waste Water Tariff yuan/m3 A	Annual water sold 000 m3/a	WW tariff collection rate %	Waste Water collected 000 m3/a B	Financial revenues 000 yuan C	Capital costs 000 yuan D	O&M costs 000 yuan E	Depreciation Amortization 000 yuan F	Total costs 000 yuan G=D+E+F	Total excluding depreciation 000 yuan H=G-F	Net Cash Flow 000 yuan I=C-H
1	2006	0.40	0	0%	0	0	4,321	0	0	4,321	4,321	-4,321
2	2007	0.40	0	70%	0	0	1,729	0	0	1,729	1,729	-1,729
3	2008	0.40	0	80%	0	0	65,686	0	0	65,686	65,686	-65,686
4	2009	0.40	44,232	80%	21,900	14,154	65,686	1,302	0	66,988	66,988	-52,834
5	2010	0.40	47,431	80%	32,850	15,178	35,436	2,447	0	37,883	37,883	-22,705
6	2011	0.40	50,859	85%	43,800	17,292		4,417	8,153	12,571	4,417	12,875
7	2012	0.40	54,534	85%	54,750	18,542		5,835	8,153	13,988	5,835	12,707
8	2013	0.40	58,475	90%	65,700	21,051		6,780	8,153	14,934	6,780	14,271
9	2014	0.40	62,701	90%	71,175	22,572		7,429	8,153	15,583	7,429	15,143
10	2015	0.40	67,232	95%	76,650	25,548		8,395	8,153	16,548	8,395	17,153
11	2016	0.40	72,055	95%	87,600	27,381		13,363	8,153	21,516	13,363	14,018
12	2017	0.40	77,224	95%	93,075	29,345		14,532	8,153	22,685	14,532	14,813
13	2018	0.40	82,764	95%	98,550	31,450		15,799	8,153	23,952	15,799	15,652
14	2019	0.40	88,702	95%	104,025	33,707		17,172	8,153	25,326	17,172	16,534
15	2020	0.40	95,065	95%	109,500	36,125		20,578	8,153	28,732	20,578	15,546
16	2021	0.40	96,491	95%	109,500	36,667		20,844	8,153	28,997	20,844	15,823
17	2022	0.40	97,939	95%	109,500	37,217		21,113	8,153	29,266	21,113	16,104
18	2023	0.40	99,408	95%	109,500	37,775		21,646	7,166	28,812	21,646	16,129
19	2024	0.40	100,899	95%	109,500	38,342		22,183	6,179	28,362	22,183	16,159
20	2025	0.40	102,412	95%	109,500	38,917		23,584	6,179	29,763	23,584	15,332
21	2026	0.40	103,949	95%	109,500	39,500		23,887	6,179	30,066	23,887	15,614
22	2027	0.40	105,508	95%	109,500	40,093		24,194	6,179	30,373	24,194	15,899
23	2028	0.40	107,090	95%	109,500	40,694		24,506	6,179	30,685	24,506	16,189
24	2029	0.40	108,697	95%	109,500	41,305		24,822	6,179	31,001	24,822	16,483
25	2030	0.40	110,327	95%	109,500	41,924		25,143	6,179	31,322	25,143	16,781
26	2031	0.40	111,982	95%	109,500	42,553		25,469	6,179	31,648	25,469	17,084
27	2032	0.40	113,662	95%	109,500	43,191		25,800	6,179	31,979	25,800	17,392
28	2033	0.40	115,367	95%	109,500	43,839		26,135	6,179	32,314	26,135	17,704
NPV@ 4.00%		1,120,540			1,173,976	416,197	149,423	206,026	91,171	446,620	355,449	60,748
Per m3 WW						0.35	0.13	0.18	0.08	0.38	0.30	0.05

		Waste Water Tariff yuan/m3 A	Annual water sold 000 m3/a	WW tariff collection rate %	Waste Water treated 000 m3/a B	Financial revenues 000 yuan C	Capital costs 000 yuan D	O&M costs 000 yuan E	Depreciation Amortization 000 yuan F	Total costs 000 yuan G=D+E+F	Total excluding depreciation 000 yuan H=G-F	Net Cash Flow 000 yuan K=C-H	
1	2006	0.15	0		0	0	60,476	0	0	60,476	60,476	-60,476	
2	2007	0.15	0		0	0	210,352	0	0	210,352	210,352	-210,352	
3	2008	0.15	0		0	0	165,652	0	0	165,652	165,652	-165,652	
4	2009	0.20	901,809	0.60	32,120	108,217	63,105	14,071	0	77,176	77,176	31,041	
5	2010	0.20	908,587	0.65	120,450	118,116	26,294	40,594	25,165	92,053	66,888	51,228	
6	2011	0.20	917,069	0.65	160,600	119,219		55,637	25,165	80,802	55,637	63,582	
7	2012	0.20	925,656	0.65	160,600	120,335		55,805	25,165	80,969	55,805	64,531	
8	2013	0.20	934,352	0.70	160,600	130,809		57,376	25,165	82,541	57,376	73,433	
9	2014	0.20	943,157	0.70	160,600	132,042		57,561	25,165	82,725	57,561	74,481	
10	2015	0.20	952,074	0.70	160,600	133,290		57,748	25,165	82,913	57,748	75,542	
11	2016	0.20	961,415	0.70	160,600	134,598		68,848	25,165	94,012	68,848	65,750	
12	2017	0.20	970,887	0.70	160,600	135,924		69,285	25,165	94,450	69,285	66,639	
13	2018	0.20	980,490	0.70	160,600	137,269		69,729	25,165	94,894	69,729	67,540	
14	2019	0.20	990,227	0.70	160,600	138,632		70,179	25,165	95,344	70,179	68,453	
15	2020	0.20	1,000,100	0.70	160,600	140,014		70,635	25,165	95,800	70,635	69,379	
16	2021	0.20	1,001,536	0.70	160,600	140,215		70,701	25,165	95,866	70,701	69,514	
17	2022	0.20	1,002,976	0.70	160,600	140,417		71,657	21,786	93,442	71,657	68,760	
18	2023	0.20	1,004,420	0.70	160,600	140,619		72,612	18,406	91,018	72,612	68,007	
19	2024	0.20	1,005,869	0.70	160,600	140,822		72,679	18,406	91,085	72,679	68,143	
20	2025	0.20	1,007,322	0.70	160,600	141,025		72,746	18,406	91,153	72,746	68,279	
21	2026	0.20	1,008,779	0.70	160,600	141,229		72,813	18,406	91,220	72,813	68,416	
22	2027	0.20	1,010,240	0.70	160,600	141,434		72,881	18,406	91,287	72,881	68,553	
23	2028	0.20	1,011,706	0.70	160,600	141,639		72,949	18,406	91,355	72,949	68,690	
24	2029	0.20	1,013,175	0.70	160,600	141,845		73,017	18,406	91,423	73,017	68,828	
25	2030	0.20	1,014,649	0.70	160,600	142,051		73,085	18,406	91,491	73,085	68,966	
26	2031	0.20	1,016,128	0.70	160,600	142,258		73,153	18,406	91,559	73,153	69,105	
27	2032	0.20	1,017,611	0.70	160,600	142,465		73,221	18,406	91,628	73,221	69,244	
28	2033	0.20	1,019,098	0.70	160,600	142,674		73,383	18,053	91,436	73,383	69,291	
NPV@ 4.00%		13,478,539			2,087,583	1,849,828	475,450	865,302	295,728	1,636,480	1,340,752	509,076	
Per m3 WW treated						0.89	0.23	0.41	0.14	0.78	0.64	0.24	
Per m3 sold						0.14	0.04	0.06	0.02	0.12	0.10	0.04	
											AIFC	AIFC	
IRR													12.36%

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Wuhan Wastewater and Storm Water Management Project

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APPENDIX H4 FMA Questionnaire

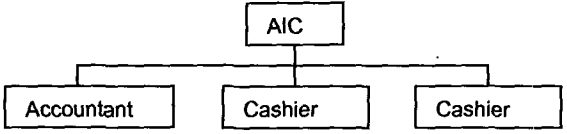
Appendix H4 Completed FMA Questionnaire on WDC

FINANCIAL MANAGEMENT ASSESSMENT QUESTIONNAIRE

WUHAN WASTEWATER AND STORM - WATER MANAGEMENT PROJECT

JULY 2005

QUESTION	ANSWER
0 Background Information	
0.1 Name of agency	Wuhan Sewerage Company Limited
0.2 Subproject that the agency is responsible for	Wuhan Wastewater Management Project
0.3 Name of person responsible for filling this form	Liu Chang, Accountant-in-charge of Finance Department
1 Implementing agency	
1.1 What is your agency's legal status and registration?	Legal status : Solely state owned enterprise ; limited company Registration :Registered at Wuhan Business Administration Bureau in September 1995 with registered capital of RMB 48.46 million.
1.2 What is your agency's governing body? What is the governing body's relationship to government?	Governing Body : Wuhan Water Affairs Group Co. Ltd (WWAG), a solely state owned enterprise.
1.3 What are the legal reporting requirements for your agency with respect to finance?	Balance Sheet, Income Statement, Cash Flow Statement and Notes to Financial Statments
1.4 Has your agency implemented a foreign-financed project in the past? If yes, please provide detailed project(s) name?	Yes. - World Bank Financed Wuhan Wastewater Management Project; - ADB Financed Wuhan Wastewater Management Project Phase I - Poland Government Financed Nantaizihu WWTP Project.
2 Funds flow arrangements	
2.1 Describe how ADB funds will be disbursed to your agency.	ADB --> Ministry of Finance --> Finance Bureau --> IA
2.2 Are arrangements to transfer the proceeds of the loan to your agency satisfactory?	Yes.

QUESTION	ANSWER		
2.3 What have been the major problems in the past in receipt of funds by the entity?	It took too long to receive the fund.		
2.4 Does the (proposed) project implementing unit (PIU) have experience in the management of disbursements from ADB?	Depends on answer to 1.4 Yes.		
2.5 Does your agency have experience managing foreign exchange risks?	<input type="checkbox"/> If Yes, please describe briefly <input checked="" type="checkbox"/> No		
2.6 Is your agency responsible for providing counterpart funds?	Yes.		
2.7 How will you provide counterpart funds for the subproject construction? What is their source?	Wastewater tariff revenue will be the main source of counterpart funds. The rest will be financed by either State Bond or domestic loans.		
2.8 How will tariffs (wastewater tariff, solid waste tariff, flood control fee, etc) be used to help fund the project? Are the beneficiaries required to contribute to project costs? (for example by a special levy) If beneficiaries have an option to contribute in kind (in the form of labor), are proper guidelines formulated to record and value the labor contribution?	Wastewater tariff revenue is the company's operating revenue, which will be used for construction of the new project, after covering the operation and maintenance cost of the existing WWTPs and subsidizing urban poor households for their wastewater charges. Beneficiaries have the obligation to pay wastewater tariff.		
3 Staffing			
3.1 What is your agency's organizational structure for accounting and finance? Please attach an organization chart.	One Accountant-in-charge (AIC), one accountant and two cashiers.  <pre> graph TD AIC[AIC] --- Accountant[Accountant] AIC --- Cashier1[Cashier] AIC --- Cashier2[Cashier] </pre>		
3.2 Identify key finance and accounting staffs including job title, responsibilities, educational background and professional certification.			
Staff	Job title	Main responsibilities	Training and Certification
Liu Chang	Accountant-in-charge	Coordinate, monitor and supervise accounting activities	Accountant

QUESTION		ANSWER	
Zhang Wenjuan		Accountant	Record accounting transactions and perform reconciliation Assistant Accountant
Li Bin		Cashier	Record cash receipts and payments and perform bank reconciliation Assistant Accountant
Zhou Gang		Cashier	Record cash receipts and payments and perform bank reconciliation Assistant Accountant
3.3	If the ADB loan is approved, what staffing changes will you make to assist with project finance and accounting?	A suitable accountant will be recruited for this project in particular.	
3.4	Are accounts and finance staffs trained in ADB procedures?	Yes.	
3.5	Does the sub-project have written position descriptions that clearly define duties, responsibilities, lines of supervision, and limits of authority for all of the officers, managers, and staff?	Yes.	
3.6	What is the existing training policy for the finance and accounting staff?	Internal: organize periodical project accountant training course External: participate national accounting qualification training course	
4 Accounting policies and procedures			
4.1 General policies			
4.1.1	Does the entity have an accounting system that allows for the proper recording of project financial transactions, including the allocation of expenditures in accordance with the respective components, disbursement categories, and sources of funds?	Yes.	
4.1.2	Are controls in place concerning the preparation and approval of transactions, ensuring that all transactions are correctly made and adequately explained?	Yes.	

QUESTION	ANSWER
4.1.3 Is the chart of accounts adequate to properly account for and report on project activities and disbursement categories?	Yes.
4.1.4 Are the General Ledger and subsidiary ledgers reconciled and in balance?	Yes.
4.1.5 Are all accounting and supporting documents retained on a permanent basis in a defined system that allows authorized users easy access?	Yes.
4.2 Segregation of duties	
4.2.1 Who is responsible for the following (give name and title):	
(i) Authorize transactions;	Zhai Zhaochun, Chairman of the Board; Pan Heping, General Manager.
(ii) record transactions;	Zhang Wenjuan, accountant; Li Bin, cashier; Zhou Gang, cashier.
(iii) maintain custody of assets involved in transaction	The department where the assets belong to.
4.2.2 Are responsibilities for ordering, receiving, accounting for, and paying for goods and services separated?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> briefly describe how they are not separated
4.2.3 Are bank reconciliations prepared by someone other than those who make or approve payments?	Yes.
4.3 Budgeting system	
4.3.1 Are annual budgets based on physical and financial targets?	<input type="checkbox"/> Yes – with financial targets only <input checked="" type="checkbox"/> Yes – with physical and financial targets <input type="checkbox"/> No
4.3.2 Are budgets prepared for all significant activities in sufficient detail to provide a meaningful tool with which to monitor subsequent performance?	Detailed budget is prepared for significant activities. Related auditing department will compare the actual expenditures with budgets.
4.3.3 Are actual expenditures compared with the budget with reasonable frequency, and explanations required for significant variations from the budget?	If yes, provide frequency Yes, according to related required procedures.

QUESTION	ANSWER
4.3.4 Are approvals for variations from the budget required in advance?	If the actual expenses are lower than budgets, no additional approval is required.
4.3.5 How are budgets prepared and approved?	According to design budgetary estimate and project implementation schedule.
4.3.6 Who is involved and what is the basis for setting budgets?	Managers from Engineering Department, Finance Department and Planning Department are involved in setting budgets. Budgets are set based on annual implementation plan and last year actual expenditures.
4.4 Payments	
4.4.1 During invoice-processing procedures are:	
(i) Copies of purchase orders and receiving reports obtained directly from issuing departments?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
(ii) Comparison made of invoice quantities, prices and terms, with those indicated on the purchase order and with records of goods actually received?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
(iii) Comparison of invoice quantities with those indicated on the receiving reports?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
(iv) Is the accuracy of calculations checked?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4.4.2 Are all invoices:	
(i) dated, reviewed and approved,	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
(ii) stamped PAID upon payment,	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
(iii) marked for account code assignment?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4.4.3 What controls exist for the preparation of the payroll?	A specific staff is assigned for recording, checking payroll records. General Manager approves payroll records and payments.
4.4.4 How are changes to the payroll authorized?	A document indicating any payroll changes with reasons is prepared by General Administration Department, which is subject to approval by General Manager.
4.5 Specific Accounting Policies and procedures	
4.5.1 What accounting standards are followed? What is the basis of accounting (e.g., cash, accrual)?	Accounting System for Construction Enterprises, and Accounting Systems for Business Enterprise Basis of accounting: accrual basis

QUESTION		ANSWER	
4.5.2	Does the agency have a policies and procedures manual for accounting?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No, but will prepare a manual in future <input type="checkbox"/> No	
4.5.3	Is the accounting policy and procedure manual updated for the project activities?	Yes.	
4.5.4	Are there written policies and procedures covering routine financial management and related administrative activities?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
4.5.5	Do procedures exist to ensure that only authorized persons can alter or establish a new accounting principle, policy or procedure to be used by the entity?	Yes.	
4.5.6	Do policies and procedures clearly define conflict of interest and related party transactions (real and apparent) and provide safeguards to protect the organization from them?	Never had any related party transactions, therefore no policy and procedure were defined.	
4.5.7	Are manuals distributed to appropriate personnel?	Yes.	
4.6 Cash and bank			
4.6.1	Indicate names and positions of authorized signatories in the bank accounts.	Name	Position
		Zhang Yong Juan	Accountant
		Li Bin	Cashier
4.6.2	Does the organization maintain an up-to-date cashbook, recording receipts and payments?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
4.6.3	What are the controls for the following activities:		
(i)	collection of revenues	All revenue receipts are deposited into company bank account, and booked as sales revenues	
(ii)	timely deposit of receipts	Cash receipts are deposited into bank account on a daily basis.	
(iii)	recording of receipts	Cash is recorded in cash receipt book on a timely basis.	
4.6.4	Are bank and cash reconciled on a monthly basis?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
4.6.5	Are unusual items on the bank reconciliation reviewed and approved by a responsible official?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	

QUESTION	ANSWER
4.6.6 How quickly are receipts deposited?	The same day as receiving date.
4.7 Safeguard over assets	
4.7.1 Describe the system to record assets and protect them from fraud, waste and abuse?	A fixed assets register, general ledger and subsidiary ledger are maintained by Finance Department. Any changes in fixed asset are recorded in a timely manner. A physical record of all the fixed assets is maintained by General Administration Department. Every half a year a fixed assets checking is carried out. Physical records are reconciled with control accounts.
4.7.2 Are subsidiary records of fixed assets and stocks kept up to date?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4.7.3 Are subsidiary records of fixed assets and stocks reconciled with control accounts?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
4.7.4 How frequent are physical inventories of fixed assets and stocks?	Every half a year.
4.7.5 Are assets covered by insurance policies? To what level?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
4.8 Other offices and implementing entities	
4.8.1 Identify agencies under your supervision or control that are responsible for project implementation or finance?	None.
4.8.2 In relation to these other agencies, has the project established controls and procedures for:	
(i) flow of funds	<input type="checkbox"/> Yes <input type="checkbox"/> No
(ii) financial information	<input type="checkbox"/> Yes <input type="checkbox"/> No
(iii) accountability	<input type="checkbox"/> Yes <input type="checkbox"/> No
(iv) audits	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.8.3 Are periodic reconciliations performed among the different offices/implementing agencies?	<input type="checkbox"/> Yes <input type="checkbox"/> No
4.9 Other	

QUESTION	ANSWER
4.9.1 Describe the options available to employees, beneficiaries and others for reporting suspected fraud, waste or misuse of project resources or property?	According to related laws and procedures, and report to related departments.
5 Reporting and monitoring	
5.1 Are financial statements prepared for your agency?	Yes.
5.2 How often are financial statements prepared?	Every month.
5.3 How quickly are the financial statements prepared at year end?	About a month.
5.4 Will the financial reporting system need to be adapted to report on the sub-project components?	No.
5.5 Does the reporting system have the capacity to link financial information with information on the physical progress of engineering project's?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
5.6 Describe procedures and controls used to insure that the physical project data can be compared and coordinated with the financial data?	Timely and periodically reconciliation and update of financial data and physical implementation data.
5.7 Are there financial management reporting requirements for existing engineering projects that specify:	
(i) what reports are to be prepared	Balance Sheet of Project, Summary of Sources and Uses of Funds by Project Component, Statement of Implementation of Loan Agreement
(ii) what the reports are to contain	The project expenditure, project implementation progress, and the use of loan
(iii) how the reports are to be used	Reports will be submitted to company chairman of the board and general manager, and financial institutions where loans are borrowed.
5.8 What information do the financial management reports for engineering projects contain? (check all that apply)	<input checked="" type="checkbox"/> Total project expenditures to date <input checked="" type="checkbox"/> Comparison of actual expenditures with budgets <input checked="" type="checkbox"/> Comparison of actual expenditures with work completed <input checked="" type="checkbox"/> Expenditures by project component <input checked="" type="checkbox"/> Explanations of significant variances of expenditures from budgets <input type="checkbox"/> Others– please describe

QUESTION	ANSWER
5.9 Describe a recent action taken by management in response to information provided in a financial management report?	
5.10 Are financial statements and reports prepared directly by an automated accounting system or are they prepared manually?	<input type="checkbox"/> prepared by an automated accounting system <input type="checkbox"/> prepared manually <input checked="" type="checkbox"/> both ways used
6 Internal audit	
6.1 Is there an internal auditor or audit department in your agency?	Yes. There is an internal audit department within the Wuhan Water Affairs Group Co. Ltd.(WWAG)
6.2 What are the qualifications and experience of audit department staff?	They have experiences in auditing the subsidiaries and branches of WWAG.
6.3 To whom does the internal auditor report?	WWAG board of directors
6.4 Will the internal audit department audit the sub-project?	Yes.
6.5 Are actions taken on the internal audit findings?	Yes.
7 External audit	
7.1 Is your agency financial statement audited each year by an independent non-government auditor?	<input checked="" type="checkbox"/> Yes - Who is the auditor? Daxin Accounting Firm <input type="checkbox"/> No
7.2 How soon following the financial year end are audit reports issued?	Before March of the following year.
7.3 Is the audit of the entity conducted according to the International Standards on Auditing?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No.—Please describe the standards your entity is adopting.
7.4 Please provide the audit reports for the previous three years.	<input checked="" type="checkbox"/> Provided all <input type="checkbox"/> Not provided or not all provided— please give reason

QUESTION	ANSWER
7.5 Will your agency auditor audit the sub-project accounts or will another auditor be appointed to audit the sub-project financial statements?	Another auditor is to be appointed.
7.6 Describe recommendations made in the most recent audit reports or management letters.	1. Wastewater tariff revenue figure does not reflect the real situation. Suggest real situation be reflected. 2. Some small amount of local funds for ADB financed project were temporarily used for other projects and booked in corresponding ADB project accounts due to temporarily short of fund for the other project. Adjustment is requested (according to explanation by PMO). 3. Land acquisition and resettlement compensation approval documents have not been fully obtained. Suggest getting the approval procedures and documentation completed as soon as possible.
7.7 Which of the recommendations identified in question 7.6 have you implemented?	All the above points were accepted and implemented.
7.8 Is the project subject to any kind of audit from an independent government entity in addition to the external audit?	<input checked="" type="checkbox"/> Yes - Who is the auditor? Wuhan Municipal Audit Bureau. <input type="checkbox"/> No
8 Information systems	
8.1 Is the financial management system computerized?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
8.2 Can the system produce the necessary project financial reports?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
8.3 What training has the staff received to operate the system?	The training course on the operation and maintenance of the system.
8.4 What controls are there to safeguard the confidentiality, integrity and availability of data in the information system?	1. use pass codes 2. use operation limit 3. recheck all the transactions and data by different people
9 Documents	
9.1 Please provide copies of the following documents:	
1. Document establishing the legal status of the entity	<input checked="" type="checkbox"/> Provided <input type="checkbox"/> Not provided
2. Chart of Accounts	<input checked="" type="checkbox"/> Provided <input type="checkbox"/> Not provided

QUESTION	ANSWER
3. The last 3 – 5 years financial statements produced for the agency	<input checked="" type="checkbox"/> Provided <input type="checkbox"/> Not provided
4. Sample financial statement produced for an engineering project	<input checked="" type="checkbox"/> Provided <input type="checkbox"/> Not provided
5. The last 3 – 5 years external audit reports	<input checked="" type="checkbox"/> Provided <input type="checkbox"/> Not provided
6. Legal documents, agreements, and minutes concerning counterpart funding	<input type="checkbox"/> Provided <input type="checkbox"/> Not provided

Signature of person responsible for filling this form	
Date	

TA 4436-PRC

Project Preparatory Technical Assistance

Wuhan Wastewater and Storm Water Management Project

FINAL REPORT

APPENDIX I1 General Economic Indicator

Table 1 Wuhan Wastewater and Storm Water Mngment Project - SUMMARY ECONOMIC INDICATORS 2004

Municipality/District	Population (000)		GDP			GDP Per Capita (RMB)	Average Wage		Average Disposable Income			GDP Total (US\$ million)	GDP per capita (US\$)	Average Wage		Av. Urban Disposable Income			
	Total	Sub Project	Total (RMB million)	Distribution (%)			(RMB/year)	(RMB/month)	Per Capita (RMB/year)	Av. HH (persons)	Av. HH Income (RMB/month)			(US\$/year)	(US\$/month)	Per Capita (US\$/year)	Av. HH Income (US\$/month)		
				Primary	Secondary	Tertiary													
Hubei Province	60,161		632,048	16%	47%	36%	10,506	8,522	710	8,023	3.03	2,028	76,334	1,269	1,029	88	989	245	
Wuhan Municipality	7,859		195,600	5%	46%	49%	24,963	13,818	1,152	9,564	2.99	2,363	23,623	3,015	1,569	139	1,155	288	
Urban District																			
Jiangnan District	635	8%	9,909				15,593	10,667	889	9,343	2.88	2,244	5%	1,197	1,883	1,288	107	1,128	271
Qiaokou District	537	7%	8,007				14,905	11,390	949	9,210	2.93	2,252	4%	967	1,800	1,378	115	1,112	272
Hanyang District	483	6%	6,616				13,698	10,792	899	9,488	2.91	2,303	3%	799	1,654	1,303	109	1,146	278
Wuchang District	977	12%	10,658				10,919	11,154	930	9,512	3.41	2,706	5%	1,288	1,319	1,347	112	1,149	327
Qingshan District	458	6%	9,067				19,889	13,444	1,120	9,656	3.41	2,747	5%	1,095	2,402	1,624	135	1,166	332
Hongshan District	791	10%	8,746				11,062	15,898	1,325	9,837	4.88	3,999	4%	1,056	1,336	1,920	160	1,188	483
Other District	460	6%	10,144				22,047	10,487	874	9,821	2.88	2,356	5%	1,225	2,663	1,267	106	1,186	285
Suburban District																			
Dongshu District	248	3%	5,053				20,564	9,316	776	4,167	2.83	984	3%	610	2,484	1,125	94	503	119
Caidian District	463	6%	4,518				9,786	9,683	807	3,946	3.17	1,044	2%	548	1,179	1,169	97	477	126
Other Districts	2,810	36%	27,028				9,617	8,231	686	3,828	3.09	987	14%	3,264	1,162	994	83	462	119
Rural (Net Income)																			
Total	4,339	55%	53,013				12,217	12,106	1,009	9,554			6,403	1,475	1,462	122	1,154		
Urban	3,519	45%	36,599	0.0%	0.0%	0.0%	10,401	8,498	708	3,867			4,420	1,256	1,026	86	467		

Source: Tables 2 to 4. Hubei Statistical Yearbooks 2001 to 2003 and 2005, Hubei Provincial Statistics Bureau, China Statistics Press.
Hubei Yearbook 2004, Hubei Provincial Government, Hubei Yearbook Edit Commission
Wuhan Yearbook 2002 to 2005, Wuhan Almanac Press
Wuhan Statistical Yearbook 2002 to 2004, China Statistical Press
Statistical Communique of Wuhan Municipality Statistical Bureau on 2000 to 2004 National Economic and Social Development, Wuhan Statistical Bureau
Statistical Communique of Hubei Province Statistical Bureau on 2001 to 2004 National Economic and Social Development, Hubei Statistical Bureau
China Statistical Yearbook 2003, National Bureau of Statistics of China.
Wuhan Basic Facts 2005, Wuhan Statistic Bureau & Wuhan NRC, 2005

TABLE 2 (n)

TABLE 2 (b)		HUBEI PROVINCE - GENERAL ECONOMIC INDICATORS															
Component	Unit	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	
AVERAGE WAGE (staff and workers)																	
Average Wage	RMB	1903	2081	2370	2933	4050	4685	5099	5401	6436	6991	7565	8619	9611	10682		
PRICE INDEX																	
General Consumer Price Index	% p.a.	4.7%	6.5%	5.5%	13.3%	11.8%	13.9%	5.4%	11.6%	3.8%	6.3%	11.3%		-0.4%	2.2%	4.9%	
Urban Areas	% p.a.													-0.8%	2.6%	4.5%	
Rent	% p.a.													n/a	3.5%	6.1%	
Water, Electricity and Fuel	% p.a.													-2.3%	8.2%	13.1%	
Industrial Products (ex-factory)	% p.a.													-1.8%	3.5%	5.7%	
Raw Materials (fuel, power, steel, chemicals, etc.)	% p.a.													-2.3%	8.2%	13.1%	
PER CAPITA INCOME AND EXPENDITURE																	
Average Disposable Income																	
Rural (Net Income)	RMB	671	627	678	783	1170	1511	1864	2102	2172	2217	2269	2352	2444	2557	2697	
Urban	RMB	1427	1593	1874	2439	3346	4017	4350	4673	4826	5213	5525	5856	6788	7322	8023	
Average Living Expenditure																	
Rural	RMB	608	615	612	722	1013	1245	1630	1660	1699	1573	1556	1649	1746			
Urban	RMB	1220	1380	1578	2098	2733	3434	3714	3856	4074	4341	4645	4805	5609			
of which: Expenditure on Water, Electricity and Fuel																	
Rural Expenditure on Electricity and Fuel	RMB									174	85	66	81	82			
Urban	RMB												324	352			
% on Water, Electricity and Fuel	%																
Rural	%	0.0%					0.0%			10.3%	5.4%	4.2%	4.9%	4.7%	#DIV/0!	#DIV/0!	
Urban	%			0.0%			0.0%			0.0%	0.0%	0.0%	6.7%	6.3%	#DIV/0!	#DIV/0!	
TOTAL INVESTMENT IN FIXED ASSETS																	
Capital Construction																	
Primary Sectors	RMB billion	0.4	0.4	0.5	0.4	0.5	0.7	0.9	1.1	2.1	3.6	4.1	4.4	8.4			
Secondary Sectors	RMB billion	3.0	3.5	6.3	10.0	18.4	24.0	24.7	25.1	25.1	23.7	28.8	32.6	34.8			
Tertiary Sectors	RMB billion	2.3	2.9	4.3	8.1	24.0	11.9	16.0	18.0	24.9	28.6	29.1	32.2	33.0			
Total - Capital Construction	RMB billion	5.7	6.8	11.2	18.5	42.9	36.6	41.6	43.8	52.1	55.9	62.1	69.3	76.2	84.5		
Others (Innovation, real estate development, etc.)	RMB billion	8.8	10.0	12.9	19.8	16.4	46.0	56.8	64.5	71.0	74.3	80.1	85.9	93.3	103.8		
Grand Total	RMB billion	14.4	16.8	24.1	38.3	59.3	82.7	98.4	108.4	123.1	130.2	142.2	155.2	169.5	188.4	235.6	
INVESTMENT IN ENVIRONMENTAL INFRASTRUCTURE																	
Water Supply (production and distribution)	RMB billion						0.4					0.59	0.71	0.81		n/a	
Water Conservancy Management	RMB billion															n/a	
Environmental Management	RMB billion													0.2	0.2	0.4	
Sanitation	RMB billion						0.4					1.5	1.4	1.8		n/a	
Total	RMB billion	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.0	0.0	2.1	2.1	2.8	0.2	0.4	
INVESTMENT AS PROPORTION OF:																	
Fixed Assets as % of GDP	%	18%	18%	22%	27%	32%	35%	33%	31%	33%	34%	33%	33%	34%	35%	37%	
Environmental Infrastructure as % of GDP	%											0%	0%	1%	0%	0%	
Environmental infra. as % of Investment in Fixed Assets	%											1.5%	1.3%	1.6%	0.1%	0.2%	
INVESTMENT PER CAPITA																	
Total Investment in Fixed Assets	RMB per capita	266	305	431	678	1037	1432	1690	1845	2084	2193	2385	2597	2831	3139	3917	
Investment in Environmental Infrastructure	RMB per capita											36	35	46	3	7	
FOREIGN CAPITAL (actually used)																	
Foreign Loans	US\$ million	139					487					246	456	505	566	285	
Direct Foreign Investment	US\$ million	29					623					944	1210	1402	1557	2071	
Total Foreign Capital	US\$ million	168	0	0	0	0	1109	0	0	0	0	1189	1666	1907	2123	2356	
FOREIGN TRADE																	
Exports	US\$ million	1072	1162	1382	1686	2097	2330	2232	2531	2805	1514	1931	1798	2099	2656	3384	
Imports	US\$ million	118	210	368	858	751	1369	974	752	687	1167	1279	1780	1856	2455	3388	
Trade Balance	US\$ million	954	952	984	828	1346	961	1258	1779	2117	346	651	17	243	201	-4	
TOURISM																	
Domestic Visitors																	
Numbers	million												60.6	66.7	56.84	68.49	
Average Spending	RMB per capita												556	576	583	575	
Total Spending	RMB billion												33.7	38.4	33.16	39.42	
Foreign Visitors																	
Numbers	000	156					271				305	451	668	1024	405.2	611.9	
Foreign Exchange Earnings	US\$ million	15.6					73.17				104.98	145.7	200.8	283.9	136.0	192.0	
Average Expenditure per Visitor	US\$ million	100					270				344	323	301	277	336	314	

TABLE 3 (a)

WUHAN MUNICIPALITY - GENERAL ECONOMIC INDICATORS

Component	Unit	1990	1995	2000	2001	2002	2003	2004
POPULATION								
Agricultural	million	2.95	3.03	3.08	3.09	3.09	3.06	3.01
Non-Agricultural	million	3.74	4.07	4.41	4.49	4.59	4.75	4.85
Total	million	6.70	7.10	7.49	7.58	7.68	7.81	7.86
Growth Rates								
Agricultural	% p.a.		#DIV/0!	#DIV/0!	0.4%	-0.2%	-0.8%	-1.6%
Non-Agricultural	% p.a.		#DIV/0!	#DIV/0!	1.8%	2.3%	3.4%	2.0%
Total	% p.a.		1.4%	1.2%	1.2%	1.3%	1.7%	0.6%
GROSS DOMESTIC PRODUCT (GDP) - CURRENT PRICES								
Primary Sectors	RMB billion	2.8	6.1	8.1	8.5	9.0	9.5	10.3
Secondary Sectors	RMB billion	9.2	29.5	53.3	59.5	68.0	74.2	90.3
Tertiary Sectors	RMB billion	5.7	25.2	59.2	66.8	74.2	82.5	95.0
of which: Water Conservancy, Environment & Public Facilities Management	RMB billion					1.2	1.3	
Total	RMB billion	17.7	60.7	120.7	134.8	149.3	166.2	195.6
GDP DISTRIBUTION								
Primary Sectors	%	18%	10%	7%	6%	6%	6%	5%
Secondary Sectors	%	52%	49%	44%	44%	44%	45%	46%
Tertiary Sectors	%	32%	41%	49%	50%	50%	50%	49%
Water Conservancy, Environment & Public Facilities Management	%					1%	1%	
Total	%	100%	100%	100%	100%	100%	100%	100%
PER CAPITA GDP								
Current Prices	RMB per capita	2673	8609	16208	17882	19560	21457	24963
INFLATION								
General Retail Price Index	% per year	2.5%	14.0%	-2.6%	-4.0%	-2.3%	0.4%	
General Consumer Price Index	% per year	3.0%	18.4%	0.6%	-0.5%	-1.4%	2.3%	
EMPLOYMENT								
Rural	million							1.54
Urban	million			0.16				2.63
Total	million	3.58	3.99	4.18	4.06	4.07	4.12	4.18
UNEMPLOYMENT RATE								
Rural	%							
Urban	%			3.5%	5.2%	5.0%	4.7%	4.2%
EMPLOYMENT BY SECTOR								
Primary Sectors	million		0.94	0.91	0.90	0.88	0.83	0.82
Secondary Sectors	million		1.51	1.49	1.41	1.43	1.44	1.41
Tertiary Sectors	million		1.54	1.77	1.74	1.78	1.84	1.94
Total	million		3.99	4.18	4.06	4.07	4.12	4.18
Proportion Economically Active	%		56%	56%	54%	53%	53%	53%
EMPLOYMENT DISTRIBUTION								
Primary Sectors	%			22%	22%	21%	20%	20%
Secondary Sectors	%			36%	35%	35%	35%	34%
Tertiary Sectors	%			42%	43%	44%	45%	47%
Total	%			100%	100%	100%	100%	100%
AVERAGE WAGE (staff and workers)								
Average Wage	RMB per year	2,093	5,327	7,626	9,080	10,039	11,719	13,816
PER CAPITA INCOME AND EXPENDITURE								
Urban - Average								
Number of Households Surveyed	numbers		400	500	500	500	500	500
Household Size	persons		3.15	3.12	3.08	3.04	3.03	2.99
Numbers Employed per Household	persons		1.76	1.58	1.56	1.42	1.53	1.52
Disposable Income - Per Capita	RMB per year	1465	4170	6781	7305	7820	8525	9564
Living Expenditure - Per Capita	RMB per year	1417	4059	6075	6342	6833	7251	7793
of which:	Expenditure RMB per year		189	409	462	466	598	n.a.
	Proportion %		4.5%	6.1%	6.3%	6.0%	7.0%	
Monthly Household Income	RMB per month		1095	1758	1875	1981	2152	2393
Rural - Average								
Number of Households Surveyed	numbers		500	540	560	560	590	590
Household Size	persons		4.39	4.02	3.98	3.95	3.89	3.87
Numbers Employed per Household	persons		2.75	2.73	2.70	2.73	2.82	2.83
Numbers Employed in Agriculture	persons		n.a.	1.86	1.90	1.75	1.70	
Cultivated Area	mu		7.0	7.3	6.8	6.9	7.2	7.7
Disposable Income - Per Capita	RMB per year	815	1842	2953	3100	3295	3497	3955
Living Expenditure - Per Capita	RMB per year	744	1443	1882	1969	2123	2302	2687
Monthly Household Income	RMB per month		673	990	1028	1083	1134	1275

TABLE 3 (b)

WUHAN MUNICIPALITY - GENERAL ECONOMIC INDICATORS

Component	Unit	1990	1995	2000	2001	2002	2003	2004
WATER SUPPLY IN URBAN AREAS								
Population with access to tap water	%		100%	100%	100%	100%	100%	100%
Length of Water Distribution Pipes	km					4,714	5,727	
Water Treatment Capacity	m3 million/day					3.85	3.85	
Reported Water Usage								
Domestic	m3 million					327.1	424.5	
Industry	m3 million					160.3	185.5	
Institutional	m3 million					239.5	124.4	
Fire Protection and Others	m3 million					10.7	15.5	
Total - Water Usage	m3 million					737.6	749.9	
Average Daily Water Usage	m3 million/day					2.02	2.05	
Reported Water Sales and Consumption								
Recorded Water Sales	m3 million					573.3	687.9	
Free Water	m3 million					21.9	7.7	
Total - Water Sales and Consumption	m3 million					595.2	695.6	
Average Daily Water Sales and Consumption	m3 million/day					1.63	1.91	
Reported Average Domestic Water Consumption	lcd		340	253	281	354	368	390
SEWERAGE IN URBAN AREAS								
Sewage Collection System	km					417	417	
Wastewater Treatment Plants								
Numbers	numbers					5	5	
Capacity	m3 000/day					530	530	
Reported Total Wastewater Discharge	m3 million/year		624	715	737	737.3	748.3	752
	m3 million/day		1.71	1.96	2.02	2.02	2.05	2.06
Reported Total Wastewater Treated	m3 million/year			n.a.	150	158	180	n.a.
	m3 million/day				0.41	0.43	0.44	
Proportion of Wastewater Treated	%				20%	21%	21%	
STORMWATER AND FLOOD PROTECTION								
Flood Protection Dikes	km					396.37	396.37	
TOTAL INVESTMENT IN FIXED ASSETS								
Capital Construction								
Primary Sectors	RMB billion					0.41	0.67	
Secondary Sectors	RMB billion					4.3	4.7	
Tertiary Sectors	RMB billion					14.9	19.3	
Total - Capital Construction	RMB billion	1.4	11.1	14.1	16.5	19.6	24.8	32.3
Others (Innovation, real estate development, etc.)	RMB billion	2.5	21.1	32.1	34.3	37.5	39.7	49.9
Grand Total	RMB billion	3.9	32.2	46.2	50.8	57.0	64.5	82.2
Investment Indicators								
Investment as Proportion of GDP	%			38%	38%	38%	39%	42%
Investment Per Capita	RMB per capita			6168	6706	7427	8257	10462
Investment in Water, Power and Gas								
Capital Construction	RMB billion						0.78	
Innovation	RMB billion						0.56	
Total - Water, Power and Gas	RMB billion						1.34	
As Proportion of Total Investment	%						2.1%	
Investment Per Capita	RMB per capita						172	
Investment in Water Conservancy, Environment & Public Facilities								
Capital Construction	RMB billion						5.87	
Innovation	RMB billion						0.40	
Total - Water Conservancy, Environment and Public Facilities	RMB billion						6.07	
As Proportion of Total Investment	%						9.4%	
Investment Per Capita	RMB per capita						777	
FOREIGN CAPITAL, LOANS AND TRADE								
Foreign Capital								
Direct Foreign Investment (actual)	US\$ million	11	592	754	722	883	1,111	1,520
Foreign Loans	US\$ million	69	499	351	270	304	348	
Others	US\$ million		24	198	440	409	304	
Total - Foreign Capital	US\$ million	80	1,115	1,303	1,432	1,576	1,762	
Foreign Trade								
Exports	US\$ million	285	1,503	1,174	947	1,091	1,481	1,931
Imports	US\$ million	91	1,043	857	1,210	1,112	1,655	
Trade Balance	US\$ million	174	460	317	283	21	174	1,931
TOURISM								
Domestic Visitors								
Numbers	million			19.50		28.7	20.99	26.07
Average Spending	RMB per capita			635.76	#DIV/0!	645.46	724.12	737.39
Total Spending	RMB billion			12.40	15.1	18.5	15.20	19.22
Foreign Visitors								
Numbers	000		157	222	286	384	224	315
Foreign Exchange Earnings	US\$ million		56	96	121	160	94	126
Average Expenditure per Visitor	US\$		358	444	423	417	419	401

TABLE 4

WUHAN MAIN URBAN DISTRICTS - GENERAL ECONOMIC INDICATORS

Component	Unit	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
JIANG'AN DISTRICT						WUCHANG DISTRICT					
Population											
Agricultural	000		25		22		18			20	
Non-Agricultural	000		605		611		866			924	
Total	000	626	629	633	633	635	859	884	909	943	977
Growth rate	% per year		0.6%	0.6%	0.0%	0.4%		2.9%	2.9%	3.7%	3.6%
GDP - Current Prices											
Total	RMB million				8562	9909				9,164	10,668
Per Capita GDP											
Current Prices	RMB per capita	0	0	0	13529	15593	0	0	0	9715	10919
Average Wage (staff and workers)											
Average Wage	RMB per year	6140	7120	8294	9115	10667	5562	6984	8550	8874	11154
Per Capita Income and Expenditure											
Average Rural Net Income	RMB per year										
Average Urban Disposable Income	RMB per year					9343					9512
Total Investment in Fixed Assets											
Capital Construction	RMB million		143		239		244			522	
Others (innovation, real estate development, etc.)	RMB million		216		481		316			539	
Grand Total	RMB million		359		720		559			1061	
Proportion of GDP	%	#DIV/0!	#DIV/0!	#DIV/0!	8%		#DIV/0!	#DIV/0!	#DIV/0!	12%	0%
Investment per capita	RMB per capita	0	570	0	1138		0	633	0	1125	0
HANYANG DISTRICT						QINGSHAN DISTRICT					
Population											
Agricultural	000		69		82		0			1	
Non-Agricultural	000		386		416		438			453	
Total	000	387	456	466	478	483	431	438	450	454	456
Growth rate	% per year		17.9%	2.3%	2.4%	1.1%		1.6%	2.7%	0.8%	0.4%
GDP - Current Prices											
Total	RMB million				5,748	6,616				7,537	9,067
Per Capita GDP											
Current Prices	RMB per capita	0	0	0	12034	13698	0	0	0	16606	19889
Average Wage (staff and workers)											
Average Wage	RMB per year	5501	6833	7513	8660	10792	7194	9384	11398	11102	13444
Per Capita Income and Expenditure											
Average Rural Net Income	RMB per year										
Average Urban Disposable Income	RMB per year					9488					9656
Total Investment in Fixed Assets											
Capital Construction	RMB million		199		330		159			296	
Others (innovation, real estate development, etc.)	RMB million		314		621		57			117	
Grand Total	RMB million		513		951		216			413	
Proportion of GDP	%	#DIV/0!	#DIV/0!	#DIV/0!	17%	0%	#DIV/0!	#DIV/0!	#DIV/0!	5%	
Investment per capita	RMB per capita	0	1125	0	1991	0	0	492	0	911	
QIAOKOU DISTRICT						0.0375	HONGSHAN DISTRICT				
Population											
Agricultural	000		13		10		194			177	
Non-Agricultural	000		524		28		454			553	
Total	000	535	537	537	538	537	609	647	676	729	791
Growth rate	% per year		0.4%	0.0%	0.2%	-0.2%		6.2%	4.5%	7.8%	8.4%
GDP - Current Prices											
Total	RMB million				6,958	8,007				7557	8746
Per Capita GDP											
Current Prices	RMB per capita	0	0	0	12924	14905	0	0	0	10359	11062
Average Wage (staff and workers)											
Average Wage	RMB per year	5294	6957	7203	8802	11390	7374	8182	10371	12647	15898
Per Capita Income and Expenditure											
Average Rural Net Income	RMB per year						4228	4445	4676	4960	5409
Average Urban Disposable Income	RMB per year					9210					9837
Total Investment in Fixed Assets											
Capital Construction	RMB million		365		555		602			1,230	
Others (innovation, real estate development, etc.)	RMB million		180		355		1079			1,713	
Grand Total	RMB million		544		910		1681			2,943	
Proportion of GDP	%	#DIV/0!	#DIV/0!	#DIV/0!	13%		#DIV/0!	#DIV/0!	#DIV/0!	39%	
Investment per capita	RMB per capita		1013		1690		0	2596	0	4034	
OTHER DISTRICT											
Population											
Agricultural	000		8.8		8.9						
Non-Agricultural	000		451.2		453.3						
Total	000	457.8	460.0	460.8	462.2	460.1					
Growth rate	% per year		0.5%	0.2%	0.3%	-0.5%					
GDP - Current Prices											
Total	RMB million				8,824	10,144					
Per Capita GDP											
Current Prices	RMB per capita	0	0	0	19091	22047					
Average Wage (staff and workers)											
Average Wage	RMB per year	5683	6870	7888	8656	10487					
Per Capita Income and Expenditure											
Average Rural Net Income	RMB per year										
Average Urban Disposable Income	RMB per year					9821					
Total Investment in Fixed Assets											
Capital Construction	RMB million		222		446						
Others (innovation, real estate development, etc.)	RMB million		307		448						
Grand Total	RMB million		529	0	894						
Proportion of GDP	%	#DIV/0!	#DIV/0!	#DIV/0!	10%						
Investment per capita	RMB per capita	0	1151	0	1934						

TABLE 5

Component	Unit	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004	2000	2001	2002	2003	2004
DONGXIHU DISTRICT							CAIDIAN DISTRICT						OTHER SUBURBAN DISTRICTS			
Population																
Agricultural	000		173		173			365		360			2,227		360	
Non-Agricultural	000		56		67			113		120			595		120	
Total	000	226	229	236	239	246	545	478	481	480	463	2,813	2,822	2,831	2,855	2,810
Growth rate	% per year		1.6%	2.9%	1.4%	2.6%		-12.3%	0.4%	-0.2%	-3.6%		0.3%	0.3%	0.8%	-1.6%
GDP - Current Prices																
Total	RMB million				4,391	5053				3,992	4518	-	-	-	23,771	27,028
Per Capita GDP																
Current Prices	RMB per capita	0	0	0	18341	20564	0	0	0	8321	9766	0	0	0	8326	9617
Average Wage (staff and workers)																
Average Wage	RMB per year	5231	6279	7280	8341	9316	5379	5769	6751	7773	9683	4,694	5,478	6,185	7,607	8,231
Per Capita Income and Expenditure																
Average Rural Net Income	RMB per year	3110	3298	3506	3733	4167	2922	3098	3291	3490	3946	2,848	2,979	3,170	3,365	3,828
Average Urban Disposable Income	RMB per year															
Total Investment in Fixed Assets																
Capital Construction	RMB million		809		1,232			403		717			1,344		2,564	
Others (innovation, real estate development, etc.)	RMB million		801		1,194			229		253			2,254		3,028	
Grand Total	RMB million		1610		2,425			632		970			3,598		5,591	
Proportion of GDP	%	#DIV/0!	#DIV/0!	#DIV/0!	55%	0%	#DIV/0!	#DIV/0!	#DIV/0!	24%	0%	#DIV/0!	#DIV/0!	#DIV/0!	24%	0%
Investment per capita	RMB per capita	0	7017	0	10130	0	0	1321	0	2021	0	0	1275	0	1958	0

TA 4436-PRC

Project Preparatory Technical Assistance

Wuhan Wastewater and Storm Water Management Project

FINAL REPORT

APPENDIX I2 Wastewater Demand Projection

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Project Preparatory Technical Assistance

Wuhan Wastewater and Storm Water Management Project

FINAL REPORT

APPENDIX I3 Least Cost Analysis

TABLE 1 WASTEWATER LEAST-COST ANALYSIS: SUMMARY RESULTS BY SUB-PROJECT

(a) Main Components - WWTP Capacities, Sewers and Pumping Stations

Sub-Project	Existing Capacity		Upgrade of Existing		Proposed Project Package Additional Capacity		Total (m ³ /day)	Sewers (km)	P. St. (nos.)
	Standard	(m ³ /day)	Standard	(m ³ /day)	Standard	(m ³ /day)			
Erlangmiao WWTP	Primary	180,000	Secondary	180,000	Secondary	60,000	240,000		
Nantaizi Lake WWTP	Secondary	100,000			Secondary	100,000	100,000	7.4	3
Huangpu Road WWTP	Screening	100,000	Secondary	100,000			100,000		
Caidian WWTP					Secondary	50,000	50,000	4.6	1
Dongxihu Sewerage							-	25.3	1
Total		380,000		280,000	-	210,000	490,000	37.3	5

(b) Population Served - Registered Residents and Floating (000)

Sub-Project	2003	2004	2005	2006	2007	2008	2009	2010	2015	2020
Total Population (000)										
Erlangmiao WWTP	533	542	550	583	592	601	611	620	671	725
Nantaizi Lake WWTP	393	409	425	443	461	480	500	520	636	777
Huangpu Road WWTP	349	346	344	349	346	343	341	338	290	254
Caidian WWTP	100	107	114	121	127	134	142	150	182	221
Dongxihu Sewerage	111	118	125	132	140	148	157	166	220	293
Total	1486	1522	1559	1627	1666	1707	1750	1794	1999	2271

(c-) Summary Results in Financial and Economic Costs - all values are expressed in mid-2005 constant prices

Sub-Project	Unit	Financial Costs						Economic Costs					
		A	B	C	D	E	F	A	B	C	D	E	F
Capital Costs													
Erlangmiao WWTP	RMB mln	200	199	0	0			189	187	0	0		
Nantaizi Lake WWTP	RMB mln	200	201	221	0			186	187	206	0		
Huangpu Road WWTP	RMB mln	131	0	0	0	213	248	125	0	0	0	199	232
Caidian WWTP	RMB mln	104	110	109	0			97	102	102	0		
Dongxihu Sewerage	RMB mln	174	0	0	0			161	0	0	0		
Total	RMB mln	809	510	330	0	213	248	758	477	308	0	199	232
Annual O&M Costs (at full capacity)													
Erlangmiao WWTP	RMB mln	18.3	17.4	0	0			17.7	17.1	0.0	0		
Nantaizi Lake WWTP	RMB mln	12.8	15.6	13.6	0			12.5	15.3	13.3	0		
Huangpu Road WWTP	RMB mln	19.6	0	0	0	14.0	14.8	19.8	0	0	0	13.6	14.3
Caidian WWTP	RMB mln	6.8	7.9	6.8	0			6.7	7.6	6.7	0		
Dongxihu Sewerage	RMB mln	9.1	0	0	0			8.8	0	0	0		
Total	RMB mln	66.6	40.9	20.5	0.0	14.0	14.8	65.5	39.9	20.0	0	13.6	14.3
Net Present Values @ 12% discount rate													
Erlangmiao WWTP	RMB mln	208.3	203.6	0.0	0.0			198.1	194.4	0.0	0.0		
Nantaizi Lake WWTP	RMB mln	174.8	185.2	191.4	0.0			164.7	174.8	180.4	0.0		
Huangpu Road WWTP	RMB mln	163.2	0.0			194.7	220.2	159.5	0.0			183.8	207.5
Caidian WWTP	RMB mln	97.3	105.8	100.7	0.0			91.7	99.5	94.8	0.0		
Dongxihu Sewerage	RMB mln	162.2	0.0	0.0	0.0			151.6	0.0	0.0	0.0		
Total	RMB mln	806	495	292	0	195	220	766	469	275	0	184	208
Average Incremental Cost - Water Sales @ 12% discount rate													
Erlangmiao WWTP	RMB/m3	0.50	0.49	0	0			0.48	0.47	0	0		
Nantaizi Lake WWTP	RMB/m3	1.19	1.26	1.30	0			1.12	1.19	1.23	0		
Huangpu Road WWTP	RMB/m3	1.07	0			1.28	1.44	1.05	0			1.21	1.36
Caidian WWTP	RMB/m3	0.88	0.96	0.91	0			0.83	0.90	0.86	0		
Dongxihu Sewerage	RMB/m3	0.48	0	0	0			0.45	0	0	0		

TABLE 1

MAIN URBAN AREA - POPULATION, WATER AND WASTEWATER FLOW PROJECTIONS BY SUB-PROJECT

Component	Protection Parameters (% p.a.)			Unit	2003-2005 2006-2010 2011-2020																	
	2003-2005	2006-2010	2011-2020		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
ERLANGMAO SUB-PROJECT																						
Population Served				persons	483,800	478,879	478,271	483,780	483,407	501,153	509,022	517,013	525,130	533,373	541,748	550,234	558,833	567,668	576,540	585,833	594,827	604,188
Resident Population (Registered)	1.6%	1.6%	1.6%	persons	89,540	70,832	71,741	87,156	86,881	100,251	101,804	103,403	105,026	106,673	108,350	110,061	111,779	113,534	115,318	117,127	118,965	120,833
Floating Population (% of resident pop.)	15%	20%	20%	persons	333,140	341,310	350,012	343,858	392,088	401,384	403,618	412,016	418,457	425,023	431,688	438,465	445,300	452,230	459,252	466,368	473,562	480,809
Total Population Served	0.8%	0.8%	0.3%	persons	315	317	320	322	324	326	328	330	331	332	333	334	335	336	337	338	339	340
Per capita water consumption				l/c/d	167,909	171,924	176,004	187,691	191,615	196,029	200,326	204,737	209,141	213,541	217,942	222,341	226,740	231,139	235,538	239,937	244,336	248,735
Non-industrial water consumption				m³/d																		
Industry				hectares	200	197	193	190	187	184	181	178	175	172	169	166	163	161	158	155	153	150
Industrial land area	-1.7%	-1.7%	-1.7%	m²/day	213	205	199	192	186	180	174	168	162	157	152	147	142	137	133	128	124	120
Industrial water consumption index	-3.3%	-3.3%	-3.3%	m³/d	42,500	40,408	38,414	36,521	34,721	33,010	31,383	29,857	28,398	26,968	25,539	24,178	22,833	21,547	20,314	19,133	18,000	16,914
Industrial water consumption				m³/day	218,438	212,330	214,416	224,212	228,336	229,830	231,718	234,874	238,340	242,130	246,194	250,527	254,980	259,493	264,066	268,698	273,380	278,112
Total Water Consumption				%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Unaccounted for Water (UFW) Percentage				%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
UFW				m³/day	90,180	90,086	91,693	96,091	97,087	98,100	99,308	100,532	101,784	103,061	104,363	105,690	107,041	108,417	109,818	111,244	112,695	114,171
Total Water Supply				m³/day	300,627	303,328	306,312	320,333	325,825	327,188	329,027	331,027	333,108	335,145	342,071	344,880	348,649	352,417	356,186	360,000	363,857	367,757
Return flow factors				%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%
Non-industrial water				%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
Industrial water				%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Infiltration rate				%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%	40%
Collection ratio	9.8%	9.8%	2.7%	%	77.238	82.611	84.967	100.118	101.080	134.470	148.425	166.134	172.365	178.915	185.798	193.021	200.527	208.401	216.572	225.038	234.871	244.838
Wastewater Collected				m³/day	77.238	85.811	84.967	100.118	101.080	134.470	148.425	166.134	172.365	178.915	185.798	193.021	200.527	208.401	216.572	225.038	234.871	244.838
Industrial portion of wastewater				%	17%	16%	13%	13%	13%	12%	11%	10%	10%	9%	8%	8%	8%	7%	7%	6%	6%	6%
Design capacity of WWTP				m³/day				100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Existing - Primary Treatment				m³/day																		
Upgrade - Secondary Treatment				m³/day																		
Extension - Secondary Treatment				m³/day																		
Total				m³/day				100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Incremental Volumes				m³																		
Water Sales				m³ million/year																		
Wastewater Flows				m³ million/year																		
HANTAI LAKE SUB-PROJECT																						
Population Served				persons	327,200	340,815	354,580	369,118	384,232	400,008	416,407	433,479	451,232	469,733	489,013	509,063	529,934	551,682	574,280	597,828	622,338	647,832
Resident Population (Registered)	4.1%	4.1%	4.1%	persons	81,149	81,123	70,816	73,824	78,560	80,801	83,281	85,988	88,820	91,881	95,163	98,667	102,397	106,353	110,532	114,945	119,607	124,520
Floating Population (% of resident pop.)	20%	20%	20%	persons	382,640	400,738	423,487	442,842	461,102	480,008	499,888	520,173	541,502	563,794	586,816	610,575	635,321	661,094	688,136	717,390	748,803	777,422
Total Population Served				persons	203	210	218	226	234	242	251	260	269	278	287	297	307	317	327	337	347	357
Per capita water consumption	3.6%	3.6%	1.4%	l/c/d	78,708	85,860	92,704	99,978	107,822	116,282	125,406	135,246	145,920	158,018	171,255	185,184	199,803	215,114	231,139	247,988	265,672	284,200
Non-industrial water consumption				m³/d																		
Industry				hectares	117	123	130	136	143	151	159	167	176	185	195	205	216	227	239	251	264	278
Industrial land area	5.2%	5.2%	5.2%	m²/day	282	282	273	264	255	247	239	231	223	216	209	202	195	189	183	177	171	165
Industrial water consumption index	-3.3%	-3.3%	-3.3%	m³/day	33,000	33,564	34,170	34,785	35,401	36,028	36,667	37,316	37,977	38,650	39,335	40,032	40,741	41,463	42,197	42,945	43,706	44,480
Industrial water consumption				m³/day	112,708	119,544	126,884	134,763	143,223	152,311	162,073	172,582	183,787	195,648	208,218	218,344	228,012	238,230	249,096	260,613	272,777	285,600
Total Water Consumption				%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Unaccounted for Water (UFW) Percentage				%	48.302	51,233	54,370	57,768	61,381	65,276	69,460	73,955	78,744	83,801	89,114	94,690	100,538	106,661	113,064	119,754	126,734	134,007
UFW				m³/day	181,008	170,777	181,282	192,518	204,808	217,587	231,332	246,517	263,282	279,889	297,314	315,621	334,837	354,972	376,038	398,126	421,246	445,399
Total Water Supply				m³/day																		
Return flow factors				%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%	85%
Non-industrial water				%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
Industrial water				%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%	15%
Infiltration rate				%	62%	62%	64%	66%	68%	70%	73%	76%	79%	82%	85%	88%	91%	94%	97%	100%	103%	106%
Collection ratio	3.2%	3.2%	1.8%	%	64.963	71.147	78.928	85,850	94,037	103,308	113,580	124,800	137,318	151,882	168,344	186,803	207,427	230,388	255,843	283,843	314,343	348,413
Wastewater Collected				m³/day	24%	22%	21%	21%	21%	20%	19%	18%	17%	17%	16%	15%	14%	13%	12%	11%	10%	9%
Industrial portion of wastewater				%																		
Design capacity of WWTP				m³/day				100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Existing - Secondary Treatment				m³/day																		
Upgrade - Secondary Treatment				m³/day																		
Extension - Secondary Treatment				m³/day																		
Total				m³/day				100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000	100,000
Incremental Volumes				m³																		
Water Sales				m³ million/year																		
Wastewater Flows				m³ million/year																		
HUANGPU ROAD SUB-PROJECT																						
Population Served				persons	303,800	301,293	299,063	296,730	294,475	292,227	290,016	287,812	279,133	270,794	262,808	254,707	247,044	239,811	232,402	225,410	218,828	212,650
Resident Population (Registered)	-0.8%	-0.8%	-3.0%	persons	43,540	43,194	44,890	45,828	47,383	49,133	51,142	53,367	55,852	58,588	61,584	64,944	68,672	72,781	77,271	82,141	87,372	92,964
Floating Population (% of resident pop.)	15%	16%	20%	persons	349,140	346,487	343,853	348,858	346,098													

TABLE 3

ALL SUB-PROJECTS - POPULATION, WATER AND WASTEWATER FLOW PROJECTIONS FOR URBAN AND SUBURBAN SUB-PROJECT AREAS

Component	Unit	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
MAIN URBAN AREA SUB-PROJECTS																			
Population Served	persons	1,294,400	1,112,786	1,131,833	1,191,829	1,172,134	1,193,387	1,215,444	1,238,305	1,255,535	1,273,882	1,293,370	1,314,024	1,335,871	1,358,940	1,383,282	1,408,867	1,435,791	1,464,068
Resident Population (Registered)	persons	1,000,320	853,949	867,507	922,807	922,055	931,373	935,836	940,466	944,126	946,008	947,109	947,481	947,809	948,089	948,278	948,384	948,411	948,441
Resident Population (% of resident pop.)	persons	1,274,820	1,286,732	1,318,362	1,374,536	1,398,189	1,424,771	1,451,283	1,478,770	1,499,863	1,521,690	1,545,479	1,570,481	1,596,889	1,624,728	1,653,914	1,684,541	1,716,641	1,750,881
Total Population Served	persons	293	287	286	292	294	297	300	303	304	306	307	308	309	311	313	315	317	317
Per capita water consumption	l/cd	363,210	371,918	381,228	401,110	411,574	422,783	434,728	447,524	455,060	463,295	472,150	481,681	491,910	504,703	518,340	532,758	547,960	564,064
Non-industrial water consumption	m³/d	81,125	79,191	77,403	75,753	74,234	72,840	71,565	70,423	69,269	68,219	67,249	66,355	65,541	64,795	64,119	63,509	62,964	62,490
Industrial water consumption	m³/d	444,333	451,187	458,521	478,853	485,807	493,803	504,283	517,827	524,381	531,515	538,489	545,039	551,451	558,498	565,439	572,289	579,043	585,744
Total Water Consumption	m³/d	222,538	238,418	253,844	280,800	302,877	328,673	353,380	382,828	395,120	408,280	422,465	437,734	454,152	473,421	492,367	512,363	534,278	557,538
Wastewater Collected	m³/d	14%	14%	13%	13%	12%	12%	11%	11%	11%	10%	10%	10%	10%	9%	9%	9%	8%	8%
Industrial portion of wastewater	%																		
Design capacity of WWTP	m³/d																		
Existing	m³/d			380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000
Upgrade - Secondary Treatment	m³/d																		
Expansion - Secondary Treatment	m³/d																		
Total	m³/d			380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000
Incremental Volumes																			
Water Sales	l/cd																		
Wastewater Flows	l/cd																		
SUBURBAN AREA SUB-PROJECTS																			
Population Served	persons	182,822	209,252	218,480	236,871	243,854	257,778	272,389	287,827	301,897	316,679	332,218	348,531	365,581	383,708	402,630	422,562	443,494	465,488
Resident Population (Registered)	persons	18,564	19,650	20,800	22,017	23,305	24,658	26,111	27,639	29,236	30,907	32,679	34,556	36,542	38,644	40,868	43,216	45,690	48,291
Resident Population (% of resident pop.)	persons	211,388	234,803	238,280	252,888	287,259	282,447	298,568	315,488	331,152	347,848	364,889	383,227	402,487	422,580	443,788	466,118	489,587	514,288
Total Population Served	persons	200	203	236	259	262	266	269	269	269	269	269	269	269	269	269	269	269	269
Per capita water consumption	l/cd	48,688	52,425	56,455	60,481	64,795	69,417	74,370	79,676	84,811	89,853	95,422	101,337	107,621	114,296	121,388	128,822	136,626	144,830
Non-industrial water consumption	m³/d	66,450	70,889	75,713	80,927	86,596	92,708	99,435	106,740	114,683	123,220	132,395	142,255	152,852	164,242	176,483	189,640	203,781	218,960
Industrial water consumption	m³/d	115,138	123,325	132,167	141,408	151,381	162,133	173,808	186,416	199,280	213,073	227,816	243,382	259,873	278,338	297,871	318,562	340,707	364,419
Total Water Consumption	m³/d	55,400	60,761	65,734	71,442	78,953	86,426	95,123	105,171	116,571	129,347	143,855	159,857	177,876	198,296	220,946	245,680	284,253	318,945
Wastewater Collected	m³/d	51%	51%	50%	50%	49%	49%	49%	49%	49%	49%	49%	49%	50%	50%	50%	51%	51%	51%
Industrial portion of wastewater	%																		
Design capacity of WWTP	m³/d																		
Existing	m³/d																		
Upgrade - Secondary Treatment	m³/d																		
Expansion - Secondary Treatment	m³/d																		
Total	m³/d																		
Incremental Volumes																			
Water Sales	l/cd																		
Wastewater Flows	l/cd																		
TOTAL SUB-PROJECTS																			
Population Served	persons	1,297,222	1,118,038	1,150,313	1,208,700	1,196,988	1,451,178	1,487,833	1,526,132	1,537,432	1,580,281	1,625,588	1,662,555	1,701,533	1,742,948	1,785,912	1,831,430	1,879,284	1,929,568
Resident Population (Registered)	persons	1,000,320	853,949	867,507	922,807	922,055	931,373	935,836	940,466	944,126	946,008	947,109	947,481	947,809	948,089	948,278	948,384	948,411	948,441
Resident Population (% of resident pop.)	persons	1,486,308	1,521,838	1,558,832	1,627,434	1,666,458	1,707,218	1,749,783	1,794,258	1,830,818	1,868,535	1,908,488	1,949,688	1,991,577	2,035,309	2,081,713	2,130,759	2,182,548	2,237,180
Total Population Served	persons	411,508	424,342	437,683	461,591	478,369	492,180	508,068	527,200	549,704	573,145	597,572	623,015	649,589	677,297	706,181	736,380	767,891	800,000
Per capita water consumption	l/cd	147,575	150,000	153,115	156,980	160,820	165,578	171,000	177,143	183,952	191,439	199,644	208,613	218,383	229,037	240,602	253,149	266,745	281,480
Non-industrial water consumption	m³/d	59,473	57,432	59,796	61,871	63,718	65,738	68,008	70,543	73,358	76,457	79,816	83,431	87,304	91,436	95,826	100,473	105,389	110,574
Industrial water consumption	m³/d	277,841	298,171	312,325	334,342	354,329	374,133	394,489	423,100	455,888	494,163	534,402	579,411	629,411	684,448	744,427	804,427	864,427	924,427
Total Water Consumption	m³/d	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%	30%
Wastewater Collected	%																		
Industrial portion of wastewater	%																		
Design capacity of WWTP	m³/d																		
Existing	m³/d			380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000
Upgrade - Secondary Treatment	m³/d																		
Expansion - Secondary Treatment	m³/d																		
Total	m³/d			380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000	380,000
Incremental Volumes																			
Water Sales	l/cd																		
Wastewater Flows	l/cd																		

Source: Tables 1 and 2

TABLE 2

ERLANGMIAO WWTP - LEAST-COST ANALYSIS OF WASTEWATER ALTERNATIVES

(a) WASTEWATER ALTERNATIVES - PARAMETERS AND COSTS

Component	Units	A	B	C	D
Wastewater Plant					
WWTP Capacity					
Existing	m ³ /day	180,000	180,000		
Proposed	m ³ /day	60,000	60,000		
Total	m ³ /day	240,000	240,000		
Effluent Discharge					
BOD	mg/litre	20	20		
COD	mg/litre	60	60		
Parameters					
WWTP Site	location	Erlangmiao	Erlangmiao		
WWTP Process	type	A ² O	Oxidation Ditch		
Pumping Stations	numbers				
Sewerage	Capacity				
Trunk	km				
Secondary	km				
Sludge Disposal	site				
Others (specify)	km				
Capital Costs					
Land Acquisition & Resettlement	RMB million	0.0	0.0		
Advance Site Works	RMB million	12.5	12.5		
WWTP Civil Works	RMB million	72.0	75.8		
E&M Equipment	RMB million	80.9	75.5		
Sewerage & Pumping Stations					
Civil Works	RMB million				
E&M Equipment	RMB million				
Others (1)	RMB million	17.7	17.7		
Total - Base Costs	RMB million	183.2	182.4	0.0	0.0
Physical Contingencies	RMB million	16.5	16.4	0.0	0.0
Total - mid-2005 Constant Prices	RMB million	199.7	198.8	0.0	0.0
E&M Proportion					
WWTP Process	%	48.9%	45.8%		
Sewerage & Pumping Stations	%				
Others (specify)	%				
Foreign Exchange Proportion					
WWTP Process	%	49.3%	47.5%		
Sewerage & Pumping Stations	%				
Others (specify)	%				
Weighted Average	%	44.6%	42.9%		
Annual Phasing					
2006	%	10.0%	10.0%		
2007	%	25.0%	25.0%		
2008	%	35.0%	35.0%		
2009	%	20.0%	20.0%		
2010	%	10.0%	10.0%		
Capital Costs - Financial					
2006	RMB million	20.0	19.9		
2007	RMB million	49.9	49.7		
2008	RMB million	69.9	69.6		
2009	RMB million	39.9	39.8		
2010	RMB million	20.0	19.9		
Total - Financial	RMB million	199.7	198.8	0.0	0.0
Capital Costs - Economic					
2006	RMB million	18.9	18.7		
2007	RMB million	47.1	46.9		
2008	RMB million	66.0	65.6		
2009	RMB million	37.7	37.5		
2010	RMB million	18.9	18.7		
Total - Economic	RMB million	189.6	187.5	0.0	0.0
Annual O&M Costs					
Labour	RMB million	0.56	0.43		
Electricity	RMB million	6.20	7.19		
Chemicals	RMB million	2.02	2.02		
Repairs	RMB million	3.67	2.74		
Maintenance	RMB million	1.83	1.10		
Sludge Transport	RMB million	1.66	1.66		
Administration	RMB million	2.39	2.27		
Others (specify)	RMB million				
Total - Financial	RMB million	18.3	17.4	0.0	0.0
Total - Economic	RMB million	17.7	17.1	0.0	0.0

Note: (1) Others: engineering design; construction supervision; preparation of engineering drawings; commissioning; and technical assistance.

(b) LEAST-COST RESULTS - INCREMENTAL SERVICE, COST STREAMS, NET PRESENT VALUES AND AVERAGE INCREMENTAL COSTS

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030	2040
Population Served																
Resident Population	000	478	486	493	501	509	517	525	533	542	550	559	604	604	604	604
Non-Resident Population	000	70	71	72	97	99	100	102	103	105	107	108	117	117	117	117
Total	000	550	563	562	601	611	620	630	640	650	660	671	725	725	725	725
Incremental Service																
Billed Water Sales	m3 million	0	0	0	0	0	85.6	86.5	87.4	88.4	89.4	90.5	94.7	94.7	94.7	94.7
Wastewater Volume	m3 million	0	0	0	0	0	60.6	62.9	65.3	67.8	70.5	73.2	87.6	87.6	87.6	87.6
Alternative A																
Financial Costs																
Capital Costs	RMB million		20.0	49.9	69.9	39.9	20.0								80.9	
Incremental O&M Costs	RMB million						12.7	13.2	13.7	14.2	14.7	15.3	18.3	18.3	18.3	18.3
Total	RMB million	0	20.0	49.9	69.9	39.9	32.7	13.2	13.7	14.2	14.7	15.3	18.3	18.3	18.3	18.3
Economic Costs																
Capital Costs	RMB million		18.9	47.1	66.0	37.7	18.9								72.8	
Incremental O&M Costs	RMB million						12.3	12.7	13.2	13.7	14.3	14.8	17.7	17.7	17.7	17.7
Total	RMB million	0	18.9	47.1	66.0	37.7	31.1	12.7	13.2	13.7	14.3	14.8	17.7	17.7	17.7	17.7
Alternative B																
Financial Costs																
Capital Costs	RMB million		19.9	49.7	69.6	39.8	19.9								75.5	
Incremental O&M Costs	RMB million						12.0	12.5	13.0	13.5	14.0	14.5	17.4	17.4	17.4	17.4
Total	RMB million	0	19.9	49.7	69.6	39.8	31.9	12.5	13.0	13.5	14.0	14.5	17.4	17.4	17.4	17.4
Economic Costs																
Capital Costs	RMB million		18.7	46.9	65.6	37.5	18.7								67.9	
Incremental O&M Costs	RMB million						11.8	12.3	12.7	13.2	13.7	14.3	17.1	17.1	17.1	17.1
Total	RMB million	0	18.7	46.9	65.6	37.5	30.6	12.3	12.7	13.2	13.7	14.3	17.1	17.1	17.1	17.1
Alternative C																
Financial Costs																
Capital Costs	RMB million		0	0	0	0	0								0	
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Economic Costs																
Capital Costs	RMB million		0	0	0	0	0								0	
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternative D																
Financial Costs																
Capital Costs	RMB million		0	0	0	0	0								0	
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Economic Costs																
Capital Costs	RMB million		0	0	0	0	0								0	
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Present Values																
		Financial Costs				Economic Costs										
		Discount Rate				Discount Rate										
		6%	8%	10%	12%	6%	8%	10%	12%							
Incremental Service	m3 million	958	708	537	417	958	708	537	417							
Water Sales	m3 million	821	599	449	345	821	599	449	345							
Wastewater Volume	m3 million															
Costs																
Alternative A	RMB million	355	289	243	208	338	275	231	198							
Alternative B	RMB million	344	281	237	204	329	269	226	194							
Alternative C	RMB million	-	-	-	-	-	-	-	-							
Alternative D	RMB million	-	-	-	-	-	-	-	-							
Average Incremental Cost - Water Sales																
Alternative A	RMB m3	0.37	0.41	0.45	0.50	0.35	0.39	0.43	0.48							
Alternative B	RMB m3	0.36	0.40	0.44	0.49	0.34	0.38	0.42	0.47							
Alternative C	RMB m3	0	0	0	0	0	0	0	0							
Alternative D	RMB m3	0	0	0	0	0	0	0	0							
Average Incremental Cost - Wastewater Volume																
Alternative A	RMB m3	0.43	0.48	0.54	0.60	0.41	0.46	0.51	0.57							
Alternative B	RMB m3	0.42	0.47	0.53	0.59	0.40	0.45	0.50	0.56							
Alternative C	RMB m3	0	0	0	0	0	0	0	0							
Alternative D	RMB m3	0	0	0	0	0	0	0	0							

TABLE 3

NANTAIZI LAKE WWTP - LEAST-COST ANALYSIS OF WASTEWATER ALTERNATIVES

(a) WASTEWATER ALTERNATIVES - PARAMETERS AND COSTS

Component	Units	A	B	C	D
Investment Plant					
WWTP Capacity					
Existing	m ³ /day	100,000	100,000	100,000	
Proposed	m ³ /day	100,000	100,000	100,000	
Total	m ³ /day	200,000	200,000	200,000	
Effluent Discharge					
BOD	mg/l	20	20	20	
COO	mg/l	60	60	60	
Parameters					
WWTP Site	location	Nantao Lake	Nantao Lake	Hanyang West	
	mu			139.4	
WWTP Process	type	Oxidation Ditch	A ² O	Oxidation Ditch	
Pumping Stations					
Numbers	numbers	3	3	3	
Capacity	m ³ /sec	2.94	3	3	
Sewerage					
Trunk	km	7.435	7.435	7.40	
Secondary	km				
Sludge Disposal	site				
Others (specify)	km				
Capital Costs					
Land Acquisition & Resettlement	RMB million	34.8	34.8	46.0	
Advance Site Works	RMB million	14.6	14.6	17.5	
WWTP Civil Works	RMB million	50.5	47.0	96.5	
E&M Equipment	RMB million	37.9	43.1	49.8	
Sewerage & Pumping Stations					
Civil Works	RMB million	21.8	21.8	8.23	
E&M Equipment	RMB million	9.9	9.9		
Others (1)	RMB million	13.8	13.1	14.6	
Total - Base Costs	RMB million	183.4	184.4	202.6	0
Physical Contingencies	RMB million	16.5	16.6	18.2	0
Total - mid-2005 Constant Prices	RMB million	199.9	201.0	220.9	0
E&M Proportion					
WWTP Process	%	36.8%	41.2%		
Sewerage & Pumping Stations	%	31.3%	31.3%		
Others (specify)	%				
Foreign Exchange Proportion					
WWTP Process	%	42.1%	44.7%		
Sewerage & Pumping Stations	%	38.6%	38.6%		
Others (specify)	%				
Weighted Average	%	30.3%	32.1%	33.0%	
Annual Phasing					
2006	%	10.0%	10.0%	10.0%	
2007	%	25.0%	25.0%	25.0%	
2008	%	35.0%	35.0%	35.0%	
2009	%	20.0%	20.0%	20.0%	
2010	%	10.0%	10.0%	10.0%	
Capital Costs - Financial					
2006	RMB million	20.0	20.1	22.1	
2007	RMB million	50.0	50.2	55.2	
2008	RMB million	70.0	70.3	77.3	
2009	RMB million	40.0	40.2	44.2	
2010	RMB million	20.0	20.1	22.1	
Total - Financial	RMB million	199.9	201.0	220.9	0
Capital Costs - Economic					
2006	RMB million	18.6	18.7	20.6	
2007	RMB million	46.5	46.6	51.5	
2008	RMB million	65.1	65.6	72.1	
2009	RMB million	37.2	37.5	41.2	
2010	RMB million	18.6	18.7	20.6	
Total - Economic	RMB million	186.0	187.3	206.1	0
Annual O&M Costs					
Labour	RMB million	0.27	0.27	0.63	
Electricity	RMB million	5.30	6.14	5.30	
Chemicals	RMB million	0.69	0.69	0.69	
Repairs	RMB million	2.76	3.70	3.04	
Maintenance	RMB million	1.10	1.65	1.22	
Sludge Transport	RMB million	0.89	0.91	0.89	
Administration	RMB million	1.67	2.03	1.78	
Others (specify)	RMB million				
Total - Financial	RMB million	12.8	15.6	13.6	0
Total - Economic	RMB million	12.5	15.3	13.3	0

Note: (1) Others: engineering design; construction supervision; preparation of engineering drawings; commissioning; and technical assistance.

(b) LEAST-COST RESULTS - INCREMENTAL SERVICE, COST STREAMS, NET PRESENT VALUES AND AVERAGE INCREMENTAL COSTS

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030	2040
Population Served																
Resident Population	000	355	369	384	400	416	433	451	470	489	509	530	648	648	648	648
Non-Resident Population	000	71	74	77	80	83	87	90	94	98	102	106	130	130	130	130
Total	000	425	443	461	480	500	520	542	564	587	611	636	777	777	777	777
Incremental Service																
Billed Water Sales	m ³ million	0	0	0	0	0	12.6	16.5	20.6	24.8	29.2	33.7	43.5	43.5	43.5	43.5
Wastewater Volume	m ³ million	0	0	0	0	0	9.1	12.2	15.5	19.0	22.8	26.8	36.5	36.5	36.5	36.5
Alternative A																
Financial Costs																
Capital Costs	RMB million		20.0	50.0	70.0	40.0	20.0								47.8	
Incremental O&M Costs	RMB million						3.2	4.3	5.4	6.6	8.0	9.4	12.8	12.8	12.8	12.8
Total	RMB million	0	20.0	50.0	70.0	40.0	23.2	4.3	5.4	6.6	8.0	9.4	12.8	60.6	12.8	12.8
Economic Costs																
Capital Costs	RMB million		18.6	46.5	65.1	37.2	18.6								43.0	
Incremental O&M Costs	RMB million						3.1	4.2	5.3	6.5	7.8	9.2	12.5	12.5	12.5	12.5
Total	RMB million	0	18.6	46.5	65.1	37.2	21.7	4.2	5.3	6.5	7.8	9.2	12.5	55.6	12.5	12.5
Alternative B																
Financial Costs																
Capital Costs	RMB million		20.1	50.2	70.3	40.2	20.1								53.1	
Incremental O&M Costs	RMB million						3.9	5.2	6.6	8.1	9.7	11.4	15.6	15.6	15.6	15.6
Total	RMB million	0	20.1	50.2	70.3	40.2	24.0	5.2	6.6	8.1	9.7	11.4	15.6	68.6	15.6	15.6
Economic Costs																
Capital Costs	RMB million		18.7	46.8	65.6	37.5	18.7								47.7	
Incremental O&M Costs	RMB million						3.8	5.1	6.5	7.9	9.5	11.2	15.3	15.3	15.3	15.3
Total	RMB million	0	18.7	46.8	65.6	37.5	22.5	5.1	6.5	7.9	9.5	11.2	15.3	63.0	15.3	15.3
Alternative C																
Financial Costs																
Capital Costs	RMB million		22.1	55.2	77.3	44.2	22.1								49.8	
Incremental O&M Costs	RMB million						3.4	4.5	5.8	7.1	8.5	10.0	13.6	13.6	13.6	13.6
Total	RMB million	0	22.1	55.2	77.3	44.2	25.5	4.5	5.8	7.1	8.5	10.0	13.6	63.5	13.6	13.6
Economic Costs																
Capital Costs	RMB million		20.6	51.5	72.1	41.2	20.6								44.9	
Incremental O&M Costs	RMB million						3.3	4.4	5.6	6.9	8.3	9.8	13.3	13.3	13.3	13.3
Total	RMB million	0	20.6	51.5	72.1	41.2	23.9	4.4	5.6	6.9	8.3	9.8	13.3	58.2	13.3	13.3
Alternative D																
Financial Costs																
Capital Costs	RMB million		0	0	0	0	0								0	
Incremental O&M Costs	RMB million														0	
Total	RMB million	0	0	0	0	0	0								0	
Economic Costs																
Capital Costs	RMB million		0	0	0	0	0								0	
Incremental O&M Costs	RMB million														0	
Total	RMB million	0	0	0	0	0	0								0	
Net Present Values																
Incremental Service																
Water Sales	m ³ million		372	266	195	147										
Wastewater Volume	m ³ million		305	217	159	119										
Costs																
Alternative A	RMB million		280	234	200	175		266	221	189	166					
Alternative B	RMB million		308	252	214	185		291	239	202	175					
Alternative C	RMB million		305	255	219	191		289	241	206	180					
Alternative D	RMB million		-	-	-	-		-	-	-	-					
Average Incremental Cost - Water Sales																
Alternative A	RMB m ³		0.75	0.88	1.02	1.19		0.71	0.83	0.97	1.12					
Alternative B	RMB m ³		0.82	0.95	1.09	1.26		0.78	0.90	1.03	1.19					
Alternative C	RMB m ³		0.82	0.96	1.12	1.30		0.78	0.91	1.06	1.23					
Alternative D	RMB m ³		0	0	0	0		0	0	0	0					
Average Incremental Cost - Wastewater Volume																
Alternative A	RMB m ³		0.92	1.07	1.28	1.47		0.87	1.02	1.19	1.38					
Alternative B	RMB m ³		1.00	1.16	1.34	1.56		0.95	1.10	1.27	1.47					
Alternative C	RMB m ³		1.00	1.17	1.37	1.61		0.95	1.11	1.30	1.52					
Alternative D	RMB m ³		0	0	0	0		0	0	0	0					

TABLE 4 HUANGPU ROAD WWTP - LEAST-COST ANALYSIS OF WASTEWATER ALTERNATIVES

(a) WASTEWATER ALTERNATIVES - PARAMETERS AND COSTS

Component	Units	A	B	C	D	E	F
Investment Plant							
WWTP Capacity							
Existing Screening only	m ³ /day	100,000					
Proposed Secondary Treatment	m ³ /day	100,000				100,000	100,000
Effluent Discharge							
BOD	m ³ /day	20					
COD	m ³ /day	60					
Discharge Point							
Parameters							
WWTP Site	location	Huangpu Road			Zhujiu River	Hanbei River	
	mu	139.4			139.4	139.4	
WWTP Process	type	BAF			Oxidation Ditch	Oxidation Ditch	
Pumping Stations							
Numbers	numbers						
Capacity	Capacity						
Sewerage							
Trunk	km				6.5	13.0	
Secondary	km						
Sludge Disposal	site						
	km						
Others (specify)							
Capital Costs							
Land Acquisition & Resettlement	RMB million	0.0			36.6	46.2	
Advance Site Works	RMB million	5.8			16.0	16.0	
WWTP Civil Works	RMB million	29.2			40.5	40.5	
E&M Equipment	RMB million	73.6			65.2	65.2	
Sewerage & Pumping Stations							
Civil Works	RMB million	0.0			19.2	37.1	
E&M Equipment	RMB million	0.0			2.2	4.4	
Others (1)	RMB million	11.8			15.5	17.7	
Total - Base Costs	RMB million	129.4	0	0	196.2	227.1	
Physical Contingencies	RMB million	10.8	0	0	17.6	20.4	
Total - mid-2005 Constant Prices	RMB million	131.2	0	0	212.7	247.5	
E&M Proportions							
WWTP Process	%	67.8%			53.6%	53.6%	
Sewerage & Pumping Stations	%						
Others (specify)	%						
Foreign Exchange Proportion							
WWTP Process	%	60.7%			52.2%	52.2%	
Sewerage & Pumping Stations	%				20.0%	20.0%	
Others (specify)	%						
Weighted Average	%	54.7%			35.4%	32.6%	
Annual Phasing							
2006	%	10.0%			10.0%	10.0%	
2007	%	25.0%			25.0%	25.0%	
2008	%	35.0%			35.0%	35.0%	
2009	%	20.0%			20.0%	20.0%	
2010	%	10.0%			10.0%	10.0%	
Capital Costs - Financial							
2006	RMB million	13.1			21.3	24.8	
2007	RMB million	32.8			53.2	61.9	
2008	RMB million	45.9			74.5	86.6	
2009	RMB million	26.2			42.5	49.5	
2010	RMB million	13.1			21.3	24.8	
Total - Financial	RMB million	131.2	0	0	212.7	247.5	
Capital Costs - Economic							
2006	RMB million	12.5			19.9	23.2	
2007	RMB million	31.3			49.7	57.9	
2008	RMB million	43.8			69.6	81.0	
2009	RMB million	25.1			39.8	46.3	
2010	RMB million	12.5			19.9	23.2	
Total - Economic	RMB million	125.3	0	0	199.0	231.5	
Annual O&M Costs							
Labour	RMB million	0.36			1.17	1.17	
Electricity	RMB million	10.96			5.23	5.23	
Chemicals	RMB million	0.91			0.69	0.69	
Repairs	RMB million	2.41			2.92	3.40	
Maintenance	RMB million	1.20			1.18	1.37	
Sludge Transport	RMB million	1.18			0.99	0.99	
Administration	RMB million	2.55			1.83	1.93	
Others (specify)	RMB million						
Total - Financial	RMB million	19.6	0	0	14.0	14.8	
Total - Economic	RMB million	19.8	0	0	13.6	14.3	

Note: (1) Others: engineering design; construction supervision; preparation of engineering drawings; commissioning; and technical assistance.

(b) LEAST-COST RESULTS - INCREMENTAL SERVICE, COST STREAMS, NET PRESENT VALUES AND AVERAGE INCREMENTAL COSTS

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030	2040
Population Served																
Resident Population	000	299	297	294	292	290	288	279	271	263	255	247	648	648	648	648
Non-Resident Population	000	45	52	52	51	51	50	49	47	46	45	43	130	130	130	130
Total	000	344	349	346	343	341	338	328	318	309	299	290	777	777	777	777
Incremental Service																
Billed Water Sales	m3 million	0	0	0	0	0	40.4	38.9	37.4	36.0	34.6	33.3	27.9	27.9	27.9	27.9
Wastewater Volume	m3 million	0	0	0	0	0	33.5	32.6	31.8	30.9	30.1	29.2	25.9	25.9	25.9	25.9
Alternative A																
Financial Costs																
Capital Costs	RMB m3/con		13.1	32.8	45.9	26.2	13.1								73.6	
Incremental O&M Costs	RMB million						18.0	17.5	17.0	16.6	16.1	15.7	13.9	13.9	13.9	13.9
Total	RMB million	0	13.1	32.8	45.9	26.2	31.1	17.5	17.0	16.6	16.1	15.7	13.9	13.9	13.9	13.9
Economic Costs																
Capital Costs	RMB million		12.5	31.3	43.8	25.1	12.5								66.2	
Incremental O&M Costs	RMB million						18.2	17.7	17.2	16.8	16.3	15.9	14.0	14.0	14.0	14.0
Total	RMB million	0	12.5	31.3	43.8	25.1	30.7	17.7	17.2	16.8	16.3	15.9	14.0	14.0	14.0	14.0
Alternative B																
Financial Costs																
Capital Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Economic Costs																
Capital Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternative E																
Financial Costs																
Capital Costs	RMB million		21.3	53.2	74.5	42.5	21.3								67.4	
Incremental O&M Costs	RMB million						12.9	12.5	12.2	11.9	11.5	11.2	9.9	9.9	9.9	9.9
Total	RMB million	0	21.3	53.2	74.5	42.5	34.1	12.5	12.2	11.9	11.5	11.2	9.9	9.9	9.9	9.9
Economic Costs																
Capital Costs	RMB million		19.9	49.7	69.6	39.8	19.9								60.7	
Incremental O&M Costs	RMB million						12.5	12.2	11.9	11.5	11.2	10.9	9.7	9.7	9.7	9.7
Total	RMB million	0	19.9	49.7	69.6	39.8	32.4	12.2	11.9	11.5	11.2	10.9	9.7	9.7	9.7	9.7
Alternative F																
Financial Costs																
Capital Costs	RMB m3/con		24.8	61.9	86.6	49.5	24.8								69.6	
Incremental O&M Costs	RMB million						13.6	13.2	12.9	12.5	12.2	11.8	10.5	10.5	10.5	10.5
Total	RMB m3/con	0	24.8	61.9	86.6	49.5	38.3	13.2	12.9	12.5	12.2	11.8	10.5	10.5	10.5	10.5
Economic Costs																
Capital Costs	RMB million		23.2	57.9	81.0	46.3	23.2								62.7	
Incremental O&M Costs	RMB million						13.2	12.8	12.5	12.1	11.8	11.5	10.2	10.2	10.2	10.2
Total	RMB million	0	23.2	57.9	81.0	46.3	36.3	12.8	12.5	12.1	11.8	11.5	10.2	10.2	10.2	10.2
Net Present Values																
		Financial Costs					Economic Costs									
		Discount Rate					Discount Rate									
		6%	8%	10%	12%		6%	8%	10%	12%						
Incremental Service																
Water Sales	m3 million	329	249	193	153			329	249	193	153					
Wastewater Volume	m3 million	294	221	170	134			294	221	170	134					
Costs																
Alternative A	RMB million	284	230	192	163			279	226	188	159					
Alternative B	RMB million	-	-	-	-			-	-	-	-					
Alternative E	RMB m3/con	302	256	221	195			286	242	209	184					
Alternative F	RMB million	336	286	249	220			318	271	235	208					
Average Incremental Cost - Water Sales																
Alternative A	RMB m3	0.86	0.93	0.99	1.07			0.85	0.91	0.97	1.05					
Alternative B	RMB m3	0	0	0	0			0	0	0	0					
Alternative E	RMB m3	0.92	1.03	1.15	1.28			0.87	0.97	1.08	1.21					
Alternative F	RMB m3	1.02	1.15	1.29	1.44			0.97	1.09	1.22	1.38					
Average Incremental Cost - Wastewater Volume																
Alternative A	RMB m3	0.97	1.04	1.13	1.22			0.96	1.02	1.10	1.19					
Alternative B	RMB m3	0	0	0	0			0	0	0	0					
Alternative E	RMB m3	1.03	1.16	1.30	1.45			0.97	1.10	1.23	1.37					
Alternative F	RMB m3	1.15	1.30	1.46	1.64			1.08	1.23	1.38	1.55					

TABLE 5

(g) WASTEWATER ALTERNATIVES - PARAMETERS AND COSTS

Component	Units	A	B	C	D
Treatment Plant					
WWTP Capacity					
Existing	m ³ /day				
Proposed	m ³ /day	100,000	100,000	100,000	
Total	m ³ /day	100,000	100,000	100,000	
Effluent Discharge					
BOD	m ³ /l/ste	20	20	20	
COO	m ³ /l/ste	60	60	60	
Parameters					
WWTP Site					
location		East Jinchou Exp.	East Jinchou Exp.	West Jinchou Exp.	
mu		83.6	83.6	83.6	
WWTP Process					
type		Oxidation Ditch	A ² O	Oxidation Ditch	
Pumping Stations					
Numbers	numbers	1	1	1	
Capacity	m ³ /sec	1.0	1.0	1.0	
Sewerage					
Trunk	km	4.59	4.59	4.59	
Secondary	km				
Sludge Disposal					
site	km				
Others (specify)					
Capital Costs					
Land Acquisition & Resettlement	RMB million	15.6	15.6	21.8	
Advance Site Works	RMB million	2.9	2.9	2.9	
WWTP Civil Works	RMB million	29.4	29.8	29.4	
E&M Equipment	RMB million	23.5	27.8	23.5	
Sewerage & Pumping Stations					
Civil Works	RMB million	12.3	12.3	11.1	
E&M Equipment	RMB million	2.2	2.2	2.2	
Others (1)	RMB million	9.4	10.1	9.3	
Total - Base Costs	RMB million	95.4	100.7	100.3	0
Physical Contingencies	RMB million	8.6	9.1	9.0	0
Total - mid-2005 Constant Prices	RMB million	104.0	109.8	109.3	0
E&M Proportion					
WWTP Process	%	42.1%	45.9%	42.1%	
Sewerage & Pumping Stations	%	15.4%	15.4%	16.7%	
Others (specify)					
Foreign Exchange Proportion					
WWTP Process	%	45.2%	47.5%	45.2%	
Sewerage & Pumping Stations	%	29.2%	29.2%	30.0%	
Others (specify)	%				
Weighted Average	%	30.9%	32.6%	29.2%	
Annual Phasing					
2006	%	10.0%	10.0%	10.0%	
2007	%	25.0%	25.0%	25.0%	
2008	%	35.0%	35.0%	35.0%	
2009	%	20.0%	20.0%	20.0%	
2010	%	10.0%	10.0%	10.0%	
Capital Costs - Financial					
2006	RMB million	10.4	11.0	10.9	
2007	RMB million	26.0	27.4	27.3	
2008	RMB million	36.4	36.4	36.2	
2009	RMB million	20.8	22.0	21.8	
2010	RMB million	10.4	11.0	10.9	
Total - Financial	RMB million	104.0	109.8	109.3	0
Capital Costs - Economic					
2006	RMB million	9.7	10.2	10.2	
2007	RMB million	24.2	25.6	25.4	
2008	RMB million	33.9	35.8	35.5	
2009	RMB million	19.4	20.5	20.3	
2010	RMB million	9.7	10.2	10.2	
Total - Economic	RMB million	96.8	102.4	101.5	0
Annual O&M Costs					
Labour	RMB million	0.68	0.68	0.68	
Electricity	RMB million	2.62	2.62	2.62	
Chemicals	RMB million	0.37	0.37	0.37	
Repairs	RMB million	1.43	2.02	1.43	
Maintenance	RMB million	0.57	1.01	0.57	
Sludge Transport	RMB million	0.26	0.26	0.26	
Administration	RMB million	0.89	1.03	0.89	
Others (specify)					
Financial	RMB million	6.8	7.8	6.8	0
France/	RMB million	8.7	7.5	6.7	0

Note: (1) Others: engineering design; construction supervision; preparation of engineering drawings; commissioning; and technical assistance.

(b) LEAST-COST RESULTS - INCREMENTAL SERVICE, COST STREAMS, NET PRESENT VALUES AND AVERAGE INCREMENTAL COSTS

[illegible]

TABLE 6

DONGXIHU WWTP - LEAST-COST ANALYSIS OF WASTEWATER ALTERNATIVES

(a) WASTEWATER ALTERNATIVES - PARAMETERS AND COSTS

Component	Units	A	B	C	D
Treatment Plant					
WWTP Capacity					
Existing	m ³ /day				
Proposed	m ³ /day				
Total	m ³ /day				
Effluent Discharge					
BOD	ml/litre				
COD	ml/litre				
Parameters					
WWTP Site					
location	mu				
WWTP Process					
Pumping Stations					
Numbers	numbers	1			
Capacity	m ³ /sec	6.1			
Sewerage					
Trunk	km	15.55			
Box Culverts	km	9.8			
Sludge Disposal					
site	km				
Others (specify)					
Capital Costs					
Land Acquisition & Resettlement	RMB million	7.4			
Advance Site Works	RMB million	0.0			
WWTP Civil Works	RMB million				
E&M Equipment	RMB million				
Sewerage & Pumping Stations					
Civil Works	RMB million	121.1			
E&M Equipment	RMB million	16.1			
Others (1)	RMB million	15.4			
Total - Base Costs	RMB million	160.1	0	0	0
Physical Contingencies	RMB million	14.4	0	0	0
Total - mid-2005 Constant Prices	RMB million	174.5	0	0	0
E&M Proportion					
WWTP Process	%				
Sewerage & Pumping Stations	%	11.7%			
Others (specify)	%				
Foreign Exchange Proportion					
WWTP Process	%				
Sewerage & Pumping Stations	%	27.0%			
Others (specify)	%				
Weighted Average	%	23.2%			
Annual Phasing					
2006	%	10.0%			
2007	%	25.0%			
2008	%	35.0%			
2009	%	20.0%			
2010	%	10.0%			
Capital Costs - Financial					
2006	RMB million	17.4			
2007	RMB million	43.6			
2008	RMB million	61.1			
2009	RMB million	34.9			
2010	RMB million	17.4			
Total - Financial	RMB million	174.5	0	0	0
Capital Costs - Economic					
2006	RMB million	16.1			
2007	RMB million	40.3			
2008	RMB million	56.4			
2009	RMB million	32.2			
2010	RMB million	16.1			
Total - Economic	RMB million	161.1	0	0	0
Annual O&M Costs					
Labour	RMB million	0.27			
Electricity	RMB million	2.87			
Chemicals	RMB million	0.00			
Repairs	RMB million	3.21			
Maintenance	RMB million	1.60			
Sludge Transport	RMB million	0.00			
Administration	RMB million	1.19			
Others (specify)	RMB million				
Total - Financial	RMB million	8.1	0	0	0
Total - Economic	RMB million	8.8	0	0	0

(b) LEAST-COST RESULTS - INCREMENTAL SERVICE, COST STREAMS, NET PRESENT VALUES AND AVERAGE INCREMENTAL COSTS

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2030	2040
Population Served																
Resident Population	000	104	110	117	123	131	138	146	155	164	173	184	244	244	244	244
Non-Resident Population	000	21	22	23	25	26	28	29	31	33	35	37	49	49	49	49
Total	000	125	132	140	148	157	166	176	186	197	208	220	293	293	293	293
Incremental Service																
Billed Water Sales	m ³ million	0	0	0	0	0	48.9	52.3	56.0	59.9	64.1	68.6	96.5	96.5	96.5	96.5
Wastewater Volume	m ³ million	0	0	0	0	0	28.5	31.9	35.6	39.7	44.4	49.5	86.1	86.1	86.1	86.1
Alternative A																
Financial Costs																
Capital Costs	RMB million		17.4	43.6	61.1	34.9	17.4							15.1		
Incremental O&M Costs	RMB million						5.3	5.9	6.6	7.3	8.2	9.1	15.9	15.9	15.9	15.9
Total	RMB million	0	17.4	43.6	61.1	34.9	22.7	5.9	6.6	7.3	8.2	9.1	15.9	32.0	15.9	15.9
Economic Costs																
Capital Costs	RMB million		16.1	40.3	56.4	32.2	16.1							14.5		
Incremental O&M Costs	RMB million						5.1	5.7	6.3	7.1	7.9	8.8	15.3	15.3	15.3	15.3
Total	RMB million	0	16.1	40.3	56.4	32.2	21.2	5.7	6.3	7.1	7.9	8.8	15.3	29.7	15.3	15.3
Alternative B																
Financial Costs																
Capital Costs	RMB million		0	0	0	0	0							0		
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Economic Costs																
Capital Costs	RMB million		0	0	0	0	0							0		
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternative C																
Financial Costs																
Capital Costs	RMB million		0	0	0	0	0							0		
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Economic Costs																
Capital Costs	RMB million		0	0	0	0	0							0		
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alternative D																
Financial Costs																
Capital Costs	RMB million		0	0	0	0	0							0		
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Economic Costs																
Capital Costs	RMB million		0	0	0	0	0							0		
Incremental O&M Costs	RMB million						0	0	0	0	0	0	0	0	0	0
Total	RMB million	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Present Values																
Incremental Service																
Water Sales	m ³ million		834	601	444	337							834	601	444	337
Wastewater Volume	m ³ million		680	482	351	262							680	482	351	262
Costs																
Alternative A	RMB million		269	221	187	162				253	208	175	152			
Alternative B	RMB million		-	-	-	-				-	-	-	-			
Alternative C	RMB million		-	-	-	-				-	-	-	-			
Alternative D	RMB million		-	-	-	-				-	-	-	-			
Average Incremental Cost - Water Sales																
Alternative A	RMB m ³		0.32	0.37	0.42	0.48				0.30	0.35	0.39	0.45			
Alternative B	RMB m ³		0	0	0	0				0	0	0	0			
Alternative C	RMB m ³		0	0	0	0				0	0	0	0			
Alternative D	RMB m ³		0	0	0	0				0	0	0	0			
Average Incremental Cost - Wastewater Volume																
Alternative A	RMB m ³		0.40	0.46	0.53	0.62				0.37	0.43	0.50	0.58			
Alternative B	RMB m ³		0	0	0	0				0	0	0	0			
Alternative C	RMB m ³		0	0	0	0				0	0	0	0			
Alternative D	RMB m ³		0	0	0	0				0	0	0	0			

Note: (1) Others: engineering design; construction supervision; preparation of engineering drawings; commissioning; and technical assistance.

TABLE 7 PREFERRED WASTEWATER SUB-PROJECTS (ALTERNATIVE "A") - AICs FOR URBAN, SUBURBAN AND COMBINED PACKAGES

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2040
URBAN SUB-PROJECTS														
Population Served														
Resident Population	000	1132	1152	1172	1193	1215	1238	1256	1274	1293	1314	1336	1464	1464
Non-Resident Population	000	188	223	227	231	236	240	244	248	252	256	261	293	293
Total	000	1319	1375	1399	1425	1451	1479	1500	1522	1545	1570	1597	1757	1757
Incremental Service														
Billed Water Sales	m3 million	0	0	0	0	0	138.8	141.9	145.4	149.2	153.2	157.5	166.0	166.0
Wastewater Volume	m3 million	0	0	0	0	0	103.3	107.7	112.5	117.7	123.3	129.3	150.0	150.0
Alternative "A"														
Financial Costs														
Capital Costs	RMB million	0	53.1	132.7	185.8	106.1	53.1	33.9	36.1	37.4	38.8	40.4	45.0	45.0
Incremental O&M Costs	RMB million	0						34.9	36.1	37.4	38.8	40.4	45.0	45.0
Total	RMB million	0	53.1	132.7	185.8	106.1	86.9	34.9	36.1	37.4	38.8	40.4	45.0	45.0
Economic Costs														
Capital Costs	RMB million	0	50.0	125.0	174.9	100.0	50.0	33.6	34.6	35.8	37.0	38.4	39.9	44.3
Incremental O&M Costs	RMB million	0						34.6	35.8	37.0	38.4	39.9	44.3	44.3
Total	RMB million	0	50.0	125.0	174.9	100.0	83.6	34.6	35.8	37.0	38.4	39.9	44.3	44.3
SUBURBAN SUB-PROJECTS														
Population Served														
Resident Population	000	218	231	244	258	272	288	302	317	332	349	366	465	465
Non-Resident Population	000	21	22	23	25	26	28	29	31	33	35	37	49	49
Total	000	239	253	267	282	298	315	331	348	365	383	402	514	514
Incremental Service														
Billed Water Sales	m3 million	0	0	0	0	0	88.0	72.7	77.8	83.2	88.9	94.8	122.6	122.6
Wastewater Volume	m3 million	0	0	0	0	0	40.2	44.7	49.6	55.1	61.2	67.8	104.3	104.3
Alternative "A"														
Financial Costs														
Capital Costs	RMB million	0	27.8	69.6	97.4	55.7	27.8	9.6	10.7	11.8	13.1	14.5	16.0	22.7
Incremental O&M Costs	RMB million	0						10.7	11.8	13.1	14.5	16.0	22.7	22.7
Total	RMB million	0	27.8	69.6	97.4	55.7	37.5	10.7	11.8	13.1	14.5	16.0	22.7	22.7
Economic Costs														
Capital Costs	RMB million	0	25.8	64.5	90.2	51.6	25.8	9.3	10.3	11.4	12.7	14.0	15.5	21.9
Incremental O&M Costs	RMB million	0						10.3	11.4	12.7	14.0	15.5	21.9	21.9
Total	RMB million	0	25.8	64.5	90.2	51.6	35.1	10.3	11.4	12.7	14.0	15.5	21.9	21.9
TOTAL SUB-PROJECTS														
Population Served														
Resident Population	000	1350	1382	1416	1451	1488	1526	1557	1591	1628	1663	1702	1930	1930
Non-Resident Population	000	208	245	250	256	262	268	273	279	285	291	298	342	342
Total	000	1559	1627	1666	1707	1750	1794	1831	1870	1910	1954	1999	2271	2271
Incremental Service														
Billed Water Sales	m3 million	0	0	0	0	0	206.7	214.6	223.2	232.3	242.1	252.3	288.6	288.6
Wastewater Volume	m3 million	0	0	0	0	0	143.5	152.4	162.1	172.8	184.5	197.0	254.3	254.3
Alternative "A"														
Financial Costs														
Capital Costs	RMB million	0	80.9	202.3	283.2	161.8	80.9	43.5	45.6	47.9	50.5	53.3	67.7	67.7
Incremental O&M Costs	RMB million	0						45.6	47.9	50.5	53.3	56.3	67.7	67.7
Total	RMB million	0	80.9	202.3	283.2	161.8	124.4	45.6	47.9	50.5	53.3	56.3	67.7	67.7
Economic Costs														
Capital Costs	RMB million	0	75.8	189.4	265.2	151.5	75.8	42.9	44.9	47.2	49.7	52.4	66.3	66.3
Incremental O&M Costs	RMB million	0						44.9	47.2	49.7	52.4	55.3	66.3	66.3
Total	RMB million	0	75.8	189.4	265.2	151.5	118.7	44.9	47.2	49.7	52.4	55.3	66.3	66.3

Net Present Values		Financial Costs				Economic Costs			
		Discount Rate				Discount Rate			
		6%	8%	10%	12%	6%	8%	10%	12%
Incremental Service									
Urban Sub-Projects									
Water Sales	m3 million	1,658.79	1,222.37	924.92	716.07	1,658.79	1,222.37	924.92	716.07
Wastewater Volume	m3 million	1,419.54	1,037.25	778.41	597.93	1,419.54	1,037.25	778.41	597.93
Suburban Sub-Projects									
Water Sales	m3 million	1,091.60	790.14	587.54	447.38	1,091.60	790.14	587.54	447.38
Wastewater Volume	m3 million	856.17	610.97	447.86	336.27	856.17	610.97	447.86	336.27
Total Sub-Projects									
Water Sales	m3 million	2,750.39	2,012.51	1,512.46	1,163.46	2,750.39	2,012.51	1,512.46	1,163.46
Wastewater Volume	m3 million	2,275.70	1,648.22	1,226.27	934.20	2,275.70	1,648.22	1,226.27	934.20
Costs - Alternative "A"									
Urban Sub-Projects	RMB million	917.98	753.00	634.47	548.30	881.70	721.98	607.37	522.22
Suburban Sub-Projects	RMB million	425.44	351.77	298.88	259.47	401.40	331.11	280.74	243.29
Total Sub-Projects	RMB million	1,343.41	1,104.77	933.36	805.77	1,283.10	1,053.08	888.12	765.51
Average Incremental Cost - Water Sales: Alternative "A"									
Urban Sub-Projects	RMB m3	0.55	0.62	0.69	0.76	0.53	0.59	0.66	0.73
Suburban Sub-Projects	RMB m3	0.39	0.45	0.51	0.58	0.37	0.42	0.48	0.54
Total Sub-Projects	RMB m3	0.49	0.55	0.62	0.69	0.47	0.52	0.59	0.66
Average Incremental Cost - Wastewater Volume: Alternative "A"									
Urban Sub-Projects	RMB m3	0.65	0.73	0.82	0.91	0.62	0.70	0.78	0.87
Suburban Sub-Projects	RMB m3	0.50	0.58	0.67	0.77	0.47	0.54	0.63	0.72
Total Sub-Projects	RMB m3	0.59	0.67	0.76	0.86	0.56	0.64	0.72	0.82

TABLE 8

STORM WATER SUB-PROJECTS - COST COMPARISONS

		Luojia Road	Yangsigang Drainage Improvements		Dongxihu Three Gates Connections		Changqing
Component	Units	Drainage	A	B	A	B	Pumping Station
Drainage Infrastructure							
Storm Drains	km		1.34	1.34			
Open Channels	km	8.81			8.82	16.06	
Box Culverts	km	0.39	1.90	1.90	3.92		
Total	km	9.20	3.24	3.24	12.74	16.06	-
Pumping Stations							
Numbers	numbers	1	1	1			1
Capacity	m3/sec	55.0	20.0	20.0			135.0
Land	mu		34.8	34.8			
Capital Costs							
Land Acquisition & Resettlement	RMB million	137.9	23.6	28.3	62.2	78.5	5.1
Advance Site Works	RMB million	9.5	4.5	4.5	0.0	0.0	12.0
Pumping St. Civil Works	RMB million	29.3	11.7	11.7	0	0.0	47.1
E&M Equipment	RMB million	52.1	21.3	22.1			80.0
Storm Water Collection System							
Civil Works	RMB million	118.9	17.2	13.6	230.2	198.0	
E&M Equipment	RMB million	0.0	0.0	0.0			
Others (1)	RMB million	20.3	5.5	5.2	21.3	18.3	14.1
Total - Base Costs	RMB million	367.9	83.8	85.4	313.8	294.8	158.3
Physical Contingencies	RMB million	33.1	7.5	7.7	28.2	26.5	14.2
Total - mid-2005 Constant Prices	RMB million	401.0	91.4	93.1	342.0	321.3	172.5
E&M Proportion							
Pumping Station	%	57.3%	56.8%	57.6%			57.5%
Storm Water Collection System	%	0.0%	0.0%	0.0%	0.0%	0.0%	
Others (specify)	%						
Foreign Exchange Proportion							
Pumping Station	%	54.4%	54.1%	54.6%			54.5%
Storm Water Collection System	%	20.0%	20.0%	20.0%	20.0%	20.0%	
Others (specify)	%						
Weighted Average	%	19.9%	28.3%	27.7%	14.7%	13.4%	47.9%
Annual Phasing							
2006	%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
2007	%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
2008	%	35.0%	35.0%	35.0%	35.0%	35.0%	35.0%
2009	%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
2010	%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
Capital Costs - Financial							
2006	RMB million	40.1	9.1	9.3	34.2	32.1	17.3
2007	RMB million	100.3	22.8	23.3	85.5	80.3	43.1
2008	RMB million	140.4	32.0	32.6	119.7	112.5	60.4
2009	RMB million	80.2	18.3	18.6	68.4	64.3	34.5
2010	RMB million	40.1	9.1	9.3	34.2	32.1	17.3
Total - Financial	RMB million	401.0	91.4	93.1	342.0	321.3	172.5
Capital Costs - Economic							
2006	RMB million	36.9	8.4	8.6	31.5	29.6	15.9
2007	RMB million	92.2	21.0	21.4	78.7	73.9	39.7
2008	RMB million	129.1	29.4	30.0	110.1	103.5	55.5
2009	RMB million	73.8	16.8	17.1	62.9	59.1	31.7
2010	RMB million	36.9	8.4	8.6	31.5	29.6	15.9
Total - Economic	RMB million	368.9	84.1	85.6	314.6	295.6	158.7
Annual O&M Costs							
Labour	RMB million	0.56	0.65	0.65			0.61
Electricity	RMB million	4.21	0.65	0.65			7.62
Chemicals	RMB million	0.00	0.00	0.00	0.00	0.00	0.00
Repairs	RMB million	7.38	1.68	1.71	6.29	5.91	3.17
Maintenance	RMB million	3.69	0.84	0.86	3.15	2.95	1.59
Sludge Transport	RMB million	0.00	0.00	0.00	0.00	0.00	0.00
Administration	RMB million	2.37	0.57	0.58	1.42	1.33	1.95
Others (specify)	RMB million						
Total Financial	RMB million	18.2	4.4	4.4	10.9	10.2	14.9
Total Economic	RMB million	17.2	4.1	4.1	9.8	9.2	15.0

Note: (1) Others: engineering design; construction supervision; preparation of engineering drawings; commissioning; and technical assistance.

TA 4436-PRC

Project Preparatory Technical Assistance

Wuhan Wastewater and Storm Water Management Project

FINAL REPORT

APPENDIX I4 Economic Evaluation – Data and Results

TABLE 1 WUHAN WASTEWATER AND STORMWATER MANAGEMENT PROJECT - SUMMARY RESULTS

(a) TOTAL POPULATION IN WASTEWATER AND DRAINAGE AREAS

Sector	Unit	2003	2004	2005	2006	2007	2008	2009	2010	2015	2020
Resident (Registered)											
Wastewater Sub-Project Areas	000	1287	1318	1350	1382	1416	1451	1488	1526	1702	1930
Stormwater Sub-Project Areas	000	1372	1384	1397	1410	1423	1437	1450	1464	1537	1616
Total	000	2659	2702	2747	2792	2839	2888	2938	2990	3239	3546
Floating											
Wastewater Sub-Project Areas	000	199	204	208	245	250	256	262	268	298	342
Stormwater Sub-Project Areas	000	206	208	210	211	213	215	218	220	231	242
Total	000	405	411	418	456	464	472	479	488	528	584
Total											
Wastewater Sub-Project Areas	000	1486	1522	1559	1627	1666	1707	1750	1794	1999	2271
Stormwater Sub-Project Areas	000	1577	1592	1607	1621	1637	1652	1668	1684	1768	1859
Total	000	3064	3113	3165	3249	3303	3359	3418	3478	3767	4130

(b) TOTAL CAPITAL COST ESTIMATES BY SUB-PROJECT (RMB million, mid-2005 constant prices)

Sub-Project	2005	2006	2007	2008	2009	2010	Total	%
Financial Costs								
Wastewater Sub-Project Areas	0	84.2	208.4	290.5	166.4	80.9	830.4	44%
Stormwater Sub-Project Areas	0	103.8	266.9	363.8	201.4	100.7	1036.6	56%
Total	0	188.0	475.3	654.4	367.8	181.6	1867.1	100%
Economic Costs								
Wastewater Sub-Project Areas	0	78.7	194.9	271.8	155.6	75.8	776.8	45%
Stormwater Sub-Project Areas	0	95.4	245.2	334.5	185.3	92.6	953.0	55%
Total	0	174.2	440.1	606.2	340.9	168.4	1729.8	100%

(c.) COMBINED ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2020	2025	2040
Costs															
Financial Costs															
Capital Costs	RMB million	0.0	188.0	475.3	654.4	367.8	181.6							397.4	
Incremental O&M Costs	RMB million	0.0	0.0	0.0	0.0	0.0	104.8	106.0	107.3	108.8	110.4	112.2	119.7	119.7	119.7
Total	RMB million	0.0	188.0	475.3	654.4	367.8	286.4	106.0	107.3	108.8	110.4	112.2	119.7	517.1	119.7
Economic Costs															
Capital Costs	RMB million	0.0	174.2	440.1	606.2	340.9	168.4							357.7	
Incremental O&M Costs	RMB million	0.0	0.0	0.0	0.0	0.0	99.5	100.8	102.2	103.8	105.5	107.4	115.5	115.5	115.5
Total	RMB million	0.0	174.2	440.1	606.2	340.9	267.9	100.8	102.2	103.8	105.5	107.4	115.5	473.2	115.5
Benefits															
Wastewater Benefits	RMB million	0	0	0	0	0	252	263	274	286	300	314	370	370	370
Stormwater Benefits	RMB million	0	0	0	0	0	242	251	260	269	278	288	343	343	343
Total - Benefits	RMB million	0	0	0	0	0.0	494.3	513.4	533.8	555.2	578.0	602.0	712.9	712.9	712.9
Net Benefit Stream	RMB million	0.0	-174.2	-440.1	-606.2	-340.9	226.5	412.6	431.5	451.4	472.5	494.6	597.4	239.7	597.4

Economic Internal Rate of Return (EIRR)

	%
1. Base Case	21.5%
Sensitivity Tests	
2. Costs +10%	19.6%
3. Costs -10%	23.7%
4. Benefits +10%	23.5%
5. Benefits -10%	19.4%
6. Benefits Lagged 2 years	15.9%
7. Tests 2 and 6	14.6%

TABLE 2

WUHAN WASTEWATER MANAGEMENT COMPONENT - SUMMARY RESULTS

(a) WWTP CAPACITY, SEWERS AND POPULATION SERVED BY SUB-PROJECT

Sub-Project	WWTP (m3/day)	Sewers (km)	Unit	Population Served									
				2003	2004	2005	2006	2007	2008	2009	2010	2015	2020
Resident Population													
Erlangmiao WWTP Upgrade and Expansion	240,000	7.4	000	484	471	478	486	493	501	509	517	559	604
Nantazi Lake WWTP Expansion and Sewers	100,000		000	327	341	355	369	384	400	416	433	530	648
Huangpu Road WWTP Upgrade	100,000		000	304	301	299	297	294	292	290	288	247	212
Caidian New WWTP and Sewers	50,000	4.6	000	100	107	114	121	127	134	142	150	182	221
Dongxiyu Wastewater Collection System		25.4	000	93	98	104	110	117	123	131	138	184	244
Total	490,000	37.4	000	1287	1318	1350	1382	1416	1451	1488	1526	1702	1930
Floating Population													
Erlangmiao WWTP Upgrade and Expansion			000	70	71	72	97	99	100	102	103	112	121
Nantazi Lake WWTP Expansion and Sewers			000	65	68	71	74	77	80	83	87	106	130
Huangpu Road WWTP Upgrade			000	46	45	45	52	52	51	51	50	43	42
Caidian New WWTP and Sewers			000	0	0	0	0	0	0	0	0	0	0
Dongxiyu Wastewater Collection System			000	19	20	21	22	23	25	26	28	37	49
Total			000	199	204	208	245	250	256	262	268	298	342
Total Population													
Erlangmiao WWTP Upgrade and Expansion			000	533	542	550	583	592	601	611	620	671	725
Nantazi Lake WWTP Expansion and Sewers			000	393	409	425	443	461	480	500	520	636	777
Huangpu Road WWTP Upgrade			000	349	346	344	349	346	343	341	338	290	254
Caidian New WWTP and Sewers			000	100	107	114	121	127	134	142	150	182	221
Dongxiyu Wastewater Collection System			000	111	118	125	132	140	148	157	166	220	293
Total			000	1486	1522	1559	1627	1666	1707	1750	1794	1999	2271

(b) TOTAL CAPITAL COST ESTIMATES BY SUB-PROJECT (RMB million, mid-2005 constant prices)

Sub-Project	2005	2006	2007	2008	2009	2010	Total
Financial Costs							
Erlangmiao WWTP Upgrade and Expansion	0	20.0	49.9	69.9	39.9	20.0	199.7
Nantaizi Lake WWTP Expansion and Sewers	0	23.3	53.3	73.3	43.3	20.0	213.1
Huangpu Road WWTP Upgrade	0	13.1	32.8	45.9	26.2	13.1	131.2
Caidian New WWTP and Sewers	0	10.4	28.7	39.1	20.8	10.4	109.5
Dongxiyu Wastewater Collection System	0	17.4	43.6	62.3	36.2	17.4	177.0
Total	0	84.2	208.4	290.5	166.4	80.9	830.4
Economic Costs							
Erlangmiao WWTP Upgrade and Expansion	0	18.9	47.1	66.0	37.7	18.9	188.6
Nantaizi Lake WWTP Expansion and Sewers	0	21.6	49.5	68.1	40.2	18.6	197.9
Huangpu Road WWTP Upgrade	0	12.5	31.3	43.8	25.1	12.5	125.3
Caidian New WWTP and Sewers	0	9.7	26.7	36.4	19.4	9.7	101.7
Dongxiyu Wastewater Collection System	0	16.1	40.3	57.5	33.4	16.1	163.3
Total	0	78.7	194.9	271.8	155.8	75.8	776.8

(c.) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2025	2040
Population																	
Registered	000	1350	1362	1416	1451	1488	1526	1557	1591	1626	1663	1702	1743	1786	1930	1930	1930
Floating	000	208	245	250	256	262	268	273	279	285	291	298	311	318	342	342	342
Total	000	1559	1627	1666	1707	1750	1794	1831	1870	1910	1954	1999	2053	2104	2271	2271	2271
Incremental Service																	
Billed Water Sales	m3 million	0	0	0	0	0	207	215	223	232	242	252	262	272	289	289	289
Domestic	m3 million	0	0	0	0	0	153	158	163	169	175	181	188	194	200	200	200
Industrial	m3 million	0	0	0	0	0	54	57	60	63	67	71	75	78	89	89	89
Wastewater Volume	m3 million	0	0	0	0	0	143	152	162	173	184	197	210	223	254	254	254
Domestic	m3 million	0	0	0	0	0	115	122	128	136	144	153	162	171	189	189	189
Industrial	m3 million	0	0	0	0	0	28	31	34	37	40	44	48	52	65	65	65
Costs																	
Financial Costs																	
Capital Costs	RMB million	0	84	208	291	166	81									244	
Sewer Connections	RMB million	0	8	8	8	8	8	8	8	8	8	8					
Incremental O&M Costs	RMB million	0	0	0	0	0	55	56	57	58	59	61	62	63	65	65	65
Total	RMB million	0	93	217	299	175	144	64	65	66	68	69	72	75	130	309	370
Economic Costs																	
Capital Costs	RMB million	0	79	195	272	156	76									220	
Sewer Connections	RMB million	0	7	7	7	7	7	7	7	7	7	7					
Incremental O&M Costs	RMB million	0	0	0	0	0	53	54	55	56	58	59	61	62	64	64	64
Total	RMB million	0	86	202	279	163	136	62	63	64	65	67	69	71	130	283	340
Benefits																	
Willingness to Pay	RMB million	0	0	0	0	0	211	218	225	233	241	250	259	267	275	275	275
Industrial WWT Savings	RMB million	0	0	0	0	0	41	45	49	54	59	64	70	76	95	95	95
Total - Benefits	RMB million	0	0	0	0	0	252	263	274	286	300	314	328	343	370	370	370
Net Benefit Stream	RMB million	0	-86	-202	-279	-163	116	201	211	223	235	247	268	281	307	87	307

Net Present Values (NPV)

		Discount Rate			
		6%	8%	10%	12%
Incremental Service					
Water Sales	m3 million	2,877	1,975	1,493	1,153
Wastewater Volume	m3 million	2,211	1,615	1,209	925
Costs					
Financial Costs	RMB million	1,420	1,182	1,008	876
Economic Costs	RMB million	1,350	1,122	955	829
Average Incremental Cost (AIC)					
Water Sales					
Financial	RMB m3	0.53	0.60	0.68	0.76
Economic	RMB m3	0.50	0.57	0.64	0.72
Wastewater Volume					
Financial	RMB m3	0.64	0.73	0.83	0.95
Economic	RMB m3	0.61	0.69	0.79	0.90

Economic Internal Rate of Return (EIRR)

	%
1. Base Case	22.6%
Sensitivity Tests	
2. Costs +10%	20.6%
3. Costs -10%	24.9%
4. Benefits +10%	24.7%
5. Benefits -10%	20.4%
6. Benefits Lagged 2 years	16.4%
7. Tests 2 and 6	15.1%

TABLE 3

WUHAN STORMWATER MANAGEMENT COMPONENT - SUMMARY RESULTS

(a) POPULATION IN DRAINAGE AREAS BY SUB-PROJECT

Sub-Project	Unit	2003	2004	2005	2006	2007	2008	2009	2010	2015	2020	2003-20
Resident (Registered)												
Luojia Road Drainage Improvement	000	442	448	454	461	468	474	481	488	524	562	1.4%
Yangsiqiang Drainage Improvement	000	37	37	38	38	39	39	40	40	43	46	1.4%
Dongxihu Three Gates Connections	000	647	647	648	649	649	650	650	651	654	657	0.1%
Changqing Pumping Station (1)	000	246	252	257	262	268	273	279	285	318	351	2.1%
Total	000	1372	1384	1397	1410	1423	1437	1450	1484	1537	1616	
Floating 15%												
Luojia Road Drainage Improvement	000	68	67	68	69	70	71	72	73	79	84	
Yangsiqiang Drainage Improvement	000	5	5	6	6	6	6	6	6	6	7	
Dongxihu Three Gates Connections	000	97	97	97	97	97	97	98	98	98	99	
Changqing Pumping Station (1)	000	37	38	39	39	40	41	42	43	47	53	
Total	000	206	208	210	211	213	215	218	220	231	242	
Total												
Luojia Road Drainage Improvement	000	508	515	523	530	538	545	553	561	602	646	
Yangsiqiang Drainage Improvement	000	42	43	43	44	44	45	46	46	50	53	
Dongxihu Three Gates Connections	000	744	744	745	746	747	747	748	749	752	756	
Changqing Pumping Station (1)	000	283	289	295	302	308	314	321	328	364	403	
Total	000	1677	1682	1697	1721	1737	1752	1768	1784	1884	1959	

Note:

(b) TOTAL CAPITAL COST ESTIMATES BY SUB-PROJECT (RMB million, mid-2005 constant prices)

Sub-Project	2005	2006	2007	2008	2009	2010	Total
Financial Costs							
Luojia Road Drainage Improvement	0	40.1	109.8	149.9	80.2	40.1	420.1
Yangsiqiang Drainage Improvement	0	9.1	24.7	33.8	18.3	9.1	95.1
Dongxihu Three Gates Connections	0	37.3	88.6	118.7	68.4	34.2	348.3
Changqing Pumping Station	0	17.3	43.8	60.4	34.5	17.3	173.2
Total	0	103.8	266.9	363.8	201.4	100.7	1039.8
Economic Costs							
Luojia Road Drainage Improvement	0	38.9	100.8	137.7	73.8	38.9	386.1
Yangsiqiang Drainage Improvement	0	8.4	22.7	31.1	16.8	8.4	87.4
Dongxihu Three Gates Connections	0	34.3	81.5	110.1	62.9	31.5	320.2
Changqing Pumping Station	0	15.9	40.3	56.5	31.7	15.9	159.3
Total	0	95.4	245.2	334.5	185.3	92.6	953.0

(c.) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2025	2040
Population																	
Resident (Registered)	000	1397	1410	1423	1437	1450	1464	1478	1493	1507	1522	1537	1552	1568	1616	1616	1616
Floating	000	210	211	213	215	218	220	222	224	228	228	231	233	235	242	242	242
Population	000	1607	1621	1637	1652	1668	1684	1700	1717	1733	1750	1768	1785	1803	1859	1859	1859
Total Households	000	554	559	564	570	575	581	586	592	598	604	610	616	622	641	641	641

Costs

Financial Costs																	
Capital Costs	RMB million	0	103.8	266.9	363.8	201.4	100.7									153	
Incremental O&M Costs	RMB million	0	0.0	0.0	0.0	0.0	49.9	60.2	50.5	50.8	51.2	51.7	52.1	52.7	54.8	54.8	54.8
Total	RMB million	0	103.8	266.9	363.8	201.4	150.6	60.2	50.5	50.8	51.2	51.7	52.1	52.7	54.8	208.2	54.8
Economic Costs																	
Capital Costs	RMB million	0	95.4	245.2	334.5	185.3	92.6									138.1	
Incremental O&M Costs	RMB million	0	0.0	0.0	0.0	0.0	48.3	46.6	47.0	47.3	47.8	48.3	48.8	49.4	51.7	51.7	51.7
Total	RMB million	0	95.4	245.2	334.5	185.3	138.9	48.6	47.0	47.3	47.8	48.3	48.8	49.4	51.7	189.7	51.7
Benefits																	
Direct Beneficiaries - Damage Savings	RMB million	0	0	0	0	0	32.8	33.9	35.2	36.7	38.1	39.7	41.3	42.9	48.3	48.3	48.3
Indirect Beneficiaries - Damage Savings	RMB million	0	0	0	0	0	67.3	70.2	73.2	76.3	79.6	83.1	86.6	90.4	102.7	102.7	102.7
Commercial & Industrial Benefits	RMB million	0	0	0	0	0	142.5	148.8	151.2	155.7	160.4	165.2	170.2	175.3	191.5	191.5	191.5
Total - Benefits	RMB million	0	0	0	0	0	242.4	250.8	259.6	268.7	278.2	287.9	298.1	308.6	342.6	342.6	342.6
Net Benefit Stream	RMB million	0	-95.4	-245.2	-334.5	-185.3	103.4	204.2	212.7	221.4	230.4	239.7	249.3	259.2	290.9	152.8	290.9

Net Present Values (NPV)

Discount Rate			
6%	8%	10%	12%

Costs				
Financial Costs	RMB million	1,409	1,200	1,043
Economic Costs	RMB million	1,305	1,110	964

Economic Internal Rate of Return (EIRR)

	%
1. Base Case	19.6%
Sensitivity Tests	
2. Costs +10%	17.9%
3. Costs -10%	21.7%
4. Benefits +10%	21.5%
5. Benefits -10%	17.7%
6. Benefits Lagged 2 years	14.8%
7. Tests 2 and 6	13.5%

TABLE 4 ERLANGMAO WASTEWATER MANAGEMENT SUB-PROJECT - EIRR CALCULATIONS

(a) CAPITAL COST ESTIMATES (RMB million, mid-2005 constant prices)

Component	2005	2006	2007	2008	2009	2010	Total
Financial Prices	0	20.0	49.9	69.9	39.9	20.0	199.7
Economic Prices	0	18.9	47.1	66.0	37.7	18.9	188.6

(b) INCREMENTAL ANNUAL O&M COSTS (RMB million, mid-2005 constant prices)

Component	Unit	Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capacity	m ³ /day		240000										
Utilization	%		69%	72%	75%	77%	80%	84%	87%	90%	94%	98%	100%
Category													
Labour	RMB million	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Electricity	RMB million	6.20	4.29	4.45	4.62	4.80	4.99	5.18	5.39	5.61	5.83	6.07	6.20
Chemicals	RMB million	2.02	1.40	1.45	1.51	1.57	1.63	1.69	1.76	1.83	1.90	1.98	2.02
Repairs	RMB million	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67	3.67
Maintenance	RMB million	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83	1.83
Sludge Transport	RMB million	1.66	1.15	1.19	1.24	1.28	1.33	1.39	1.44	1.50	1.56	1.62	1.66
Administration	RMB million	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39	2.39
Others	RMB million	0.00											
Total													
Financial	RMB million	18.33	15.29	15.55	15.82	16.10	16.40	16.71	17.04	17.38	17.74	18.12	18.33
Economic	RMB million	17.73	14.61	14.87	15.15	15.44	15.74	16.06	16.40	16.76	17.13	17.52	17.73

(c.) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2025	2040
Population																	
Registered	000	478	488	493	501	509	517	525	533	542	550	559	568	577	604	604	604
Floating	000	72	97	99	100	102	103	105	107	108	110	112	114	115	121	121	121
Total	000	550	583	592	601	611	620	630	640	650	660	671	681	692	725	725	725
Incremental Service																	
Billed Water Sales	m ³ million	0	0	0	0	0	85.6	86.5	87.4	88.4	89.4	90.5	91.6	92.7	94.7	94.7	94.7
Non-Industrial	m ³ million	0	0	0	0	0	74.7	76.1	77.6	79.0	80.5	82.0	83.5	85.1	88.3	88.3	88.3
Industrial	m ³ million	0	0	0	0	0	10.9	10.4	9.8	9.4	8.9	8.5	8.0	7.6	6.4	6.4	6.4
Wastewater Volume	m ³ million	0	0	0	0	0	60.6	62.9	65.3	67.8	70.5	73.2	76.1	79.2	87.6	87.6	87.6
Non-Industrial	m ³ million	0	0	0	0	0	54.3	56.7	59.2	61.9	64.7	67.6	70.6	73.8	82.7	82.7	82.7
Industrial	m ³ million	0	0	0	0	0	6.4	6.2	6.1	5.9	5.8	5.6	5.5	5.4	4.9	4.9	4.9
Costs																	
Financial Costs																	
Capital Costs	RMB million	0	20.0	49.9	69.9	39.9	20.0										80.9
Sewer Connections	RMB million		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0					
Incremental O&M Costs	RMB million						15.3	15.5	15.8	16.1	16.4	16.7	17.0	17.4	18.3	18.3	18.3
Total	RMB million	0	22.0	51.9	71.9	41.9	37.3	17.5	17.8	18.1	18.4	18.7	17.0	17.4	18.3	99.2	18.3
Economic Costs																	
Capital Costs	RMB million	0	18.9	47.1	66.0	37.7	18.9										72.8
Sewer Connections	RMB million		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8					
Incremental O&M Costs	RMB million						14.6	14.9	15.1	15.4	15.7	16.1	16.4	16.8	17.7	17.7	17.7
Total	RMB million	0	20.7	48.9	67.8	39.5	35.3	16.7	16.9	17.2	17.5	17.9	18.4	18.8	17.7	90.5	17.7
Benefits																	
Willingness to Pay	RMB million	0	0	0	0	0	103.1	105.1	107.0	109.0	111.1	113.2	115.3	117.4	121.8	121.8	121.8
Industrial WWT Savings	RMB million	0	0	0	0	0	9.3	9.1	8.8	8.6	8.4	8.2	8.0	7.8	7.2	7.2	7.2
Total - Benefits	RMB million	0	0.0	0.0	0.0	0.0	112.4	114.1	115.9	117.7	119.5	121.4	123.3	125.3	129.0	129.0	129.0
Net Benefit Stream	RMB million	0	-20.7	-48.9	-67.8	-39.5	77.1	97.5	98.9	100.4	102.0	103.5	106.9	108.5	111.2	38.4	111.2

Net Present Values (NPV)		Discount Rate			
		6%	8%	10%	12%
Incremental Service					
Water Sales	m ³ million	934	695	530	413
Wastewater Volume	m ³ million	799	588	443	342
Costs					
Financial Costs	RMB million	373	307	259	223
Economic Costs	RMB million	354	291	246	211
Average Incremental Cost (AIC)					
Water Sales					
Financial	RMB m ³	0.40	0.44	0.49	0.54
Economic	RMB m ³	0.38	0.42	0.46	0.51
Wastewater Volume					
Financial	RMB m ³	0.47	0.52	0.58	0.65
Economic	RMB m ³	0.44	0.49	0.55	0.62

Economic Internal Rate of Return (EIRR)		%
1. Base Case		35.1%
Sensitivity Tests		
2. Costs +10%		32.3%
3. Costs -10%		38.2%
4. Benefits +10%		37.9%
5. Benefits -10%		32.1%
6. Benefits Lagged 2 years		23.7%
7. Tests 2 and 6		22.1%

TABLE 5 NANTAIZI LAKE WASTEWATER MANAGEMENT SUB-PROJECT - EIRR CALCULATIONS

(a) CAPITAL COST ESTIMATES (RMB million, mid-2005 constant prices)

Component	2005	2006	2007	2008	2009	2010	Total
Financial Prices	0	23.3	53.3	73.3	43.3	20.0	213.1
Economic Prices	0	21.6	49.5	68.1	40.2	18.6	197.9

(b) INCREMENTAL ANNUAL O&M COSTS (RMB million, mid-2005 constant prices)

Component	Unit	Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capacity	m3/day		100000										
Utilization	%		25%	33%	42%	52%	62%	73%	85%	96%	100%	100%	100%
Category													
Labour	RMB million	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Electricity	RMB million	5.30	1.32	1.76	2.24	2.75	3.30	3.89	4.52	5.19	5.30	5.30	5.30
Chemicals	RMB million	0.69	0.17	0.23	0.29	0.36	0.43	0.51	0.59	0.68	0.69	0.69	0.69
Repairs	RMB million	2.76	2.76	2.76	2.76	2.76	2.76	2.76	2.76	2.76	2.76	2.76	2.76
Maintenance	RMB million	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
Sludge Transport	RMB million	0.99	0.25	0.33	0.42	0.51	0.61	0.72	0.84	0.97	0.99	0.99	0.99
Administration	RMB million	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67	1.67
Others	RMB million	0.00											
Total													
Financial	RMB million	12.77	7.53	8.12	8.75	9.42	10.14	10.91	11.74	12.63	12.77	12.77	12.77
Economic	RMB million	12.54	7.04	7.65	8.32	9.02	9.78	10.60	11.47	12.40	12.54	12.54	12.54

(c.) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2025	2040
Population																	
Registered	000	355	369	384	400	416	433	451	470	489	509	530	552	574	648	648	648
Floating	000	71	74	77	80	83	87	90	94	98	102	106	110	115	130	130	130
Total	000	425	443	461	480	500	520	542	564	587	611	636	662	689	777	777	777
Incremental Service																	
Billed Water Sales	m3 million	0	0	0	0	0	12.6	16.5	20.6	24.8	29.2	33.7	38.5	43.4	43.5	43.5	43.5
Non-Industrial	m3 million	0	0	0	0	0	9.8	13.0	16.4	19.9	23.6	27.4	31.5	35.8	36.5	36.5	36.5
Industrial	m3 million	0	0	0	0	0	2.7	3.5	4.2	4.9	5.6	6.3	7.0	7.6	7.0	7.0	7.0
Wastewater Volume	m3 million	0	0	0	0	0	9.1	12.2	15.5	19.0	22.8	26.8	31.1	35.8	36.5	36.5	36.5
Non-Industrial	m3 million	0	0	0	0	0	7.5	10.0	12.8	15.9	19.1	22.7	26.5	30.6	31.7	31.7	31.7
Industrial	m3 million	0	0	0	0	0	1.6	2.1	2.6	3.1	3.6	4.1	4.7	5.2	4.8	4.8	4.8
Costs																	
Financial Costs																	
Capital Costs	RMB million	0	23.3	53.3	73.3	43.3	20.0										47.8
Sewer Connections	RMB million		2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1					
Incremental O&M Costs	RMB million						7.5	8.1	8.7	9.4	10.1	10.9	11.7	12.6	12.8	12.8	12.8
Total	RMB million	0	25.4	55.4	75.4	45.4	29.7	10.2	10.9	11.6	12.3	13.0	11.7	12.6	12.8	60.6	12.8
Economic Costs																	
Capital Costs	RMB million	0	21.6	49.5	68.1	40.2	18.6										43.0
Sewer Connections	RMB million		1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.9					
Incremental O&M Costs	RMB million						7.0	7.7	8.3	9.0	9.8	10.6	11.5	12.4	12.5	12.5	12.5
Total	RMB million	0	23.5	51.4	70.0	42.1	27.6	9.6	10.2	10.9	11.7	12.5	11.5	12.4	12.5	55.6	12.5
Benefits																	
Willingness to Pay	RMB million	0	0	0	0	0	13.6	18.0	22.6	27.4	32.5	37.9	43.5	49.4	50.4	50.4	50.4
Industrial WWT Savings	RMB million	0	0	0	0	0	2.4	3.1	3.8	4.5	5.3	6.0	6.8	7.6	7.1	7.1	7.1
Total - Benefits	RMB million	0	0.0	0.0	0.0	0.0	16.0	21.1	26.4	32.0	37.8	43.9	50.3	57.0	57.4	57.4	57.4
Net Benefit Stream	RMB million	0	-23.5	-51.4	-70.0	-42.1	-11.6	11.5	16.2	21.0	26.1	31.4	38.8	44.6	44.9	1.9	44.9

Net Present Values (NPV)		Discount Rate			
		6%	8%	10%	12%
Incremental Service					
Water Sales	m3 million	361	260	192	145
Wastewater Volume	m3 million	296	213	157	118
Costs					
Financial Costs	RMB million	314	266	229	202
Economic Costs	RMB million	296	250	215	189
Average Incremental Cost (AIC)					
Water Sales					
Financial	RMB m3	0.87	1.02	1.19	1.39
Economic	RMB m3	0.82	0.96	1.12	1.30
Wastewater Volume					
Financial	RMB m3	1.06	1.25	1.47	1.71
Economic	RMB m3	1.00	1.17	1.37	1.61

Economic Internal Rate of Return (EIRR)		%
1. Base Case		12.1%
Sensitivity Tests		
2. Costs +10%		10.8%
3. Costs -10%		13.5%
4. Benefits +10%		13.4%
5. Benefits -10%		10.7%
6. Benefits Lagged 2 years		9.4%
7. Tests 2 and 6		8.4%

TABLE 6 HUANGPU ROAD WASTEWATER MANAGEMENT SUB-PROJECT - EIRR CALCULATIONS

(a) CAPITAL COST ESTIMATES (RMB million, mid-2005 constant prices)

Component	2005	2006	2007	2008	2009	2010	Total
Financial Prices	0	13.1	32.8	45.9	26.2	13.1	131.2
Economic Prices	0	12.5	31.3	43.8	25.1	12.5	125.3

(b) INCREMENTAL ANNUAL O&M COSTS (RMB million, mid-2005 constant prices)

Component	Unit	Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capacity	m ³ /day		100000										
Utilization	%		92%	89%	87%	85%	82%	80%	80%	77%	75%	73%	71%
Category													
Labour	RMB million	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Electricity	RMB million	10.96	10.07	9.80	9.53	9.28	9.02	8.78	8.71	8.47	8.23	8.00	7.77
Chemicals	RMB million	0.91	0.84	0.81	0.79	0.77	0.75	0.73	0.72	0.70	0.68	0.66	0.65
Repairs	RMB million	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41	2.41
Maintenance	RMB million	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
Sludge Transport	RMB million	1.18	1.09	1.06	1.03	1.00	0.97	0.95	0.94	0.91	0.89	0.86	0.84
Administration	RMB million	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55
Others	RMB million	0.00											
Total													
Financial	RMB million	19.58	18.52	18.20	17.88	17.58	17.27	16.98	16.90	16.61	16.33	16.05	15.78
Economic	RMB million	19.80	18.67	18.33	17.99	17.67	17.34	17.03	16.95	16.64	16.33	16.04	15.74

(c.) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2025	2040
Population																	
Registered	000	299	297	294	292	290	288	279	271	263	255	247	240	232	212	212	212
Floating	000	45	52	52	51	51	50	49	47	46	45	43	46	46	42	42	42
Total	000	344	349	346	343	341	338	328	318	309	299	290	286	279	254	254	254
Incremental Service																	
Billed Water Sales	m3 million	0	0	0	0	0	40.4	38.9	37.4	36.0	34.6	33.3	32.7	31.4	27.9	27.9	27.9
Non-Industrial	m3 million	0	0	0	0	0	39.3	37.9	36.5	35.2	33.9	32.7	32.2	31.1	27.9	27.9	27.9
Industrial	m3 million	0	0	0	0	0	1.2	1.1	0.9	0.8	0.7	0.6	0.5	0.4	0.0	0.0	0.0
Wastewater Volume	m3 million	0	0	0	0	0	33.5	32.6	31.8	30.9	30.1	29.2	29.0	28.2	25.9	25.9	25.9
Non-Industrial	m3 million	0	0	0	0	0	32.7	31.9	31.1	30.3	29.6	28.8	28.7	28.0	25.9	25.9	25.9
Industrial	m3 million	0	0	0	0	0	0.8	0.7	0.7	0.6	0.5	0.4	0.3	0.3	0.0	0.0	0.0
Costs																	
Financial Costs																	
Capital Costs	RMB million	0	13.1	32.8	45.9	26.2	13.1										73.6
Sewer Connections	RMB million		1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3					
Incremental O&M Costs	RMB million						18.5	18.2	17.9	17.6	17.3	17.0	16.9	16.6	15.8	15.8	15.8
Total	RMB million	0	14.4	34.1	47.2	27.6	32.9	19.5	19.2	18.9	18.6	18.3	16.9	16.6	15.8	15.8	15.8
Economic Costs																	
Capital Costs	RMB million	0	12.5	31.3	43.8	25.1	12.5										66.2
Sewer Connections	RMB million		1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2					
Incremental O&M Costs	RMB million						18.7	18.3	18.0	17.7	17.3	17.0	16.9	16.6	15.7	15.7	15.7
Total	RMB million	0	13.7	32.5	45.0	26.2	32.4	19.5	19.2	18.8	18.5	18.2	16.9	16.6	15.7	15.7	15.7
Benefits																	
Willingness to Pay	RMB million	0	0	0	0	0	54.2	52.2	50.4	48.8	46.8	45.2	44.5	42.9	38.5	38.5	38.5
Industrial WWT Savings	RMB million	0	0	0	0	0	1.2	1.1	1.0	0.9	0.7	0.6	0.5	0.4	0.0	0.0	0.0
Total - Benefits	RMB million	0	0.0	0.0	0.0	0.0	55.3	53.3	51.3	49.4	47.6	45.8	45.0	43.3	38.5	38.5	38.5
Net Benefit Stream	RMB million	0	-13.7	-32.5	-45.0	-26.2	23.0	33.8	32.2	30.6	29.0	27.6	28.0	26.6	22.7	-43.5	22.7

Net Present Values (NPV)		Discount Rate			
		6%	8%	10%	12%
Incremental Service					
Water Sales	m3 million	322	245	191	152
Wastewater Volume	m3 million	287	217	168	133
Costs					
Financial Costs	RMB million	304	247	206	175
Economic Costs	RMB million	297	241	200	170
Average Incremental Cost (AIC)					
Water Sales					
Financial	RMB m3	0.94	1.01	1.08	1.16
Economic	RMB m3	0.92	0.98	1.05	1.12
Wastewater Volume					
Financial	RMB m3	1.06	1.14	1.22	1.32
Economic	RMB m3	1.03	1.11	1.19	1.28

Economic Internal Rate of Return (EIRR)		%
1. Base Case		17.9%
Sensitivity Tests		
2. Costs +10%		15.1%
3. Costs -10%		21.1%
4. Benefits +10%		20.8%
5. Benefits -10%		14.8%
6. Benefits Lagged 2 years		11.3%
7. Tests 2 and 6		9.4%

TABLE 7

CAIDIAN WASTEWATER MANAGEMENT SUB-PROJECT - EIRR CALCULATIONS

(a) CAPITAL COST ESTIMATES (RMB million, mid-2005 constant prices)

Component	2005	2006	2007	2008	2009	2010	Total
Financial Prices	0	10.4	28.7	39.1	20.8	10.4	109.5
Economic Prices	0	9.7	26.7	36.4	19.4	9.7	101.7

(b) INCREMENTAL ANNUAL O&M COSTS (RMB million, mid-2005 constant prices)

Component	Unit	Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capacity	m ³ /day		50000										
Utilization	%		64%	70%	77%	84%	92%	100%	100%	100%	100%	100%	100%
Category													
Labour	RMB million	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68	0.68
Electricity	RMB million	2.62	1.67	1.83	2.01	2.20	2.42	2.62	2.62	2.62	2.62	2.62	2.62
Chemicals	RMB million	0.37	0.24	0.26	0.28	0.31	0.34	0.37	0.37	0.37	0.37	0.37	0.37
Repairs	RMB million	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43	1.43
Maintenance	RMB million	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Sludge Transport	RMB million	0.26	0.17	0.18	0.20	0.22	0.24	0.26	0.26	0.26	0.26	0.26	0.26
Administration	RMB million	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89	0.89
Others	RMB million	0.00											
Total													
Financial	RMB million	6.83	5.65	5.85	6.07	6.31	6.58	6.83	6.83	6.83	6.83	6.83	6.83
Economic	RMB million	6.65	5.41	5.62	5.85	6.11	6.39	6.65	6.65	6.65	6.65	6.65	6.65

(c.) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2023	2040
Population																	
Registered	000	114	121	127	134	142	150	156	162	168	175	182	189	197	221	221	221
Floating	000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	000	114	121	127	134	142	150	156	162	168	175	182	189	197	221	221	221
Incremental Service																	
Billed Water Sales	m ³ million	0	0	0	0	0	19.1	20.4	21.8	23.2	24.8	26.1	26.1	26.1	26.1	26.1	26.1
Non-Industrial	m ³ million	0	0	0	0	0	10.9	11.7	12.5	13.3	14.2	15.0	15.0	15.0	15.0	15.0	15.0
Industrial	m ³ million	0	0	0	0	0	8.2	8.8	9.3	9.9	10.6	11.2	11.1	11.1	11.1	11.1	11.1
Wastewater Volume	m ³ million	0	0	0	0	0	11.7	12.8	14.0	15.4	16.9	18.3	18.3	18.3	18.3	18.3	18.3
Non-Industrial	m ³ million	0	0	0	0	0	7.5	8.2	9.0	9.9	10.8	11.7	11.7	11.7	11.7	11.7	11.7
Industrial	m ³ million	0	0	0	0	0	4.2	4.6	5.0	5.5	6.0	6.5	6.5	6.5	6.5	6.5	6.5
Costs																	
Financial Costs																	
Capital Costs	RMB million	0	10.4	28.7	39.1	20.8	10.4										25.7
Sewer Connections	RMB million		1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1					
Incremental O&M Costs	RMB million						5.7	5.9	6.1	6.3	6.6	6.8	6.8	6.8	6.8	6.8	6.8
Total	RMB million	0	11.5	29.8	40.2	21.9	17.1	6.9	7.2	7.4	7.7	7.9	6.8	6.8	6.8	32.5	6.8
Economic Costs																	
Capital Costs	RMB million	0	9.7	26.7	36.4	19.4	9.7										23.1
Sewer Connections	RMB million		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0					
Incremental O&M Costs	RMB million						5.4	5.6	5.9	6.1	6.4	6.7	6.7	6.7	6.7	6.7	6.7
Total	RMB million	0	10.7	27.7	37.3	20.3	16.1	6.6	6.8	7.1	7.4	7.6	6.7	6.7	6.7	29.8	6.7
Benefits																	
Willingness to Pay	RMB million	0	0	0	0	0	15.0	16.0	17.1	18.2	19.4	20.5	20.5	20.5	20.6	20.6	20.6
Industrial WWT Savings	RMB million	0	0	0	0	0	6.1	6.7	7.4	8.1	8.8	9.5	9.5	9.5	9.5	9.5	9.5
Total - Benefits	RMB million	0	0.0	0.0	0.0	0.0	21.1	22.7	24.4	26.3	28.3	30.1	30.1	30.1	30.1	30.1	30.1
Net Benefit Stream	RMB million	0	-10.7	-27.7	-37.3	-20.3	5.0	16.1	17.6	19.2	20.9	22.4	23.4	23.4	23.4	0.3	23.4

Net Present Values (NPV)		Discount Rate			
		6%	8%	10%	12%
Incremental Service					
Water Sales	m ³ million	251	186	141	110
Wastewater Volume	m ³ million	172	127	96	74
Costs					
Financial Costs	RMB million	169	143	123	108
Economic Costs	RMB million	160	134	116	101
Average Incremental Cost (AIC)					
Water Sales					
Financial	RMB m ³	0.67	0.77	0.87	0.99
Economic	RMB m ³	0.64	0.72	0.82	0.93
Wastewater Volume					
Financial	RMB m ³	0.98	1.13	1.28	1.46
Economic	RMB m ³	0.93	1.06	1.21	1.37

Economic Internal Rate of Return (EIRR)		%
1. Base Case		15.5%
Sensitivity Tests		
2. Costs +10%		13.9%
3. Costs -10%		17.5%
4. Benefits +10%		17.3%
5. Benefits -10%		13.7%
6. Benefits Lagged 2 years		11.6%
7. Tests 2 and 6		10.4%

TABLE 8 DONGXIHU WASTEWATER MANAGEMENT SUB-PROJECT - EIRR CALCULATIONS

(a) CAPITAL COST ESTIMATES (RMB million, mid-2005 constant prices)

Component	2005	2006	2007	2008	2009	2010	Total
Financial Prices	0	17.4	43.6	62.3	36.2	17.4	177.0
Economic Prices	0	16.1	40.3	57.5	33.4	16.1	163.3

(b) INCREMENTAL ANNUAL O&M COSTS (RMB million, mid-2005 constant prices)

Component	Unit	Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capacity	m ³ /day												
Utilization	%		58%	64%	72%	80%	90%	100%	112%	125%	139%	156%	174%
Category													
Labour	RMB million	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Electricity	RMB million	2.87	1.65	1.85	2.06	2.30	2.57	2.87	3.20	3.58	4.00	4.46	4.99
Chemicals	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs	RMB million	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21	3.21
Maintenance	RMB million	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
Sludge Transport	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Administration	RMB million	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19
Others	RMB million	0.00											
Total													
Financial	RMB million	9.14	7.93	8.12	8.34	8.58	8.84	9.14	9.48	9.85	10.27	10.74	11.26
Economic	RMB million	8.80	7.46	7.67	7.91	8.17	8.47	8.80	9.17	9.58	10.04	10.55	11.13

(c.) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2025	2040
Population																	
Registered	000	104	110	117	123	131	138	146	155	164	173	184	194	208	244	244	244
Floating	000	21	22	23	25	26	28	29	31	33	35	37	39	41	49	49	49
Total	000	125	132	140	148	157	166	176	186	197	208	220	233	247	293	293	293
Incremental Service																	
Billed Water Sales	m3 million	0	0	0	0	0	48.9	52.3	56.0	59.9	64.1	68.6	73.5	78.6	96.5	96.5	96.5
Non-Industrial	m3 million	0	0	0	0	0	18.2	19.2	20.3	21.5	22.8	24.1	25.5	27.0	32.1	32.1	32.1
Industrial	m3 million	0	0	0	0	0	30.7	33.1	35.6	38.4	41.3	44.5	47.9	51.6	64.4	64.4	64.4
Wastewater Volume	m3 million	0	0	0	0	0	28.5	31.9	35.6	39.7	44.4	49.5	55.3	61.8	86.1	86.1	86.1
Non-Industrial	m3 million	0	0	0	0	0	13.3	14.7	16.3	18.1	20.0	22.2	24.6	27.3	37.1	37.1	37.1
Industrial	m3 million	0	0	0	0	0	15.3	17.1	19.3	21.6	24.3	27.3	30.7	34.5	49.0	49.0	49.0
Costs																	
Financial Costs																	
Capital Costs	RMB million	0	17.4	43.6	62.3	36.2	17.4										16.1
Sewer Connections	RMB million		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8					
Incremental O&M Costs	RMB million						7.9	8.1	8.3	8.6	8.8	9.1	9.5	9.9	11.3	11.3	11.3
Total	RMB million	0	19.2	45.4	64.1	37.9	27.1	9.9	10.1	10.3	10.6	10.9	9.5	9.9	11.3	27.3	11.3
Economic Costs																	
Capital Costs	RMB million	0	16.1	40.3	57.5	33.4	16.1										14.5
Sewer Connections	RMB million		1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8					
Incremental O&M Costs	RMB million						7.5	7.7	7.9	8.2	8.5	8.8	9.2	9.6	11.1	11.1	11.1
Total	RMB million	0	17.7	41.9	59.1	35.0	25.2	9.3	9.5	9.8	10.1	10.4	9.2	9.6	11.1	25.6	11.1
Benefits																	
Willingness to Pay	RMB million	0	0	0	0	0	24.9	26.3	27.9	29.5	31.2	33.1	35.0	37.0	43.9	43.9	43.9
Industrial WWT Savings	RMB million	0	0	0	0	0	22.3	25.0	28.1	31.6	35.5	39.9	44.8	50.4	71.5	71.5	71.5
Total - Benefits	RMB million	0	0.0	0.0	0.0	0.0	47.1	51.4	56.0	61.1	66.7	72.9	79.8	87.4	115.4	115.4	115.4
Net Benefit Stream	RMB million	0	-17.7	-41.9	-59.1	-35.0	22.0	42.1	46.5	51.3	56.7	62.6	70.7	77.8	104.3	89.8	104.3

Net Present Values (NPV)

		Discount Rate			
		6%	8%	10%	12%
Incremental Service					
Water Sales	m3 million	809	588	438	333
Wastewater Volume	m3 million	658	470	345	258
Costs					
Financial Costs	RMB million	260	220	191	168
Economic Costs	RMB million	245	206	178	157
Average Incremental Cost (AIC)					
Water Sales					
Financial	RMB m3	0.32	0.37	0.44	0.50
Economic	RMB m3	0.30	0.35	0.41	0.47
Wastewater Volume					
Financial	RMB m3	0.39	0.47	0.55	0.65
Economic	RMB m3	0.37	0.44	0.52	0.61

Economic Internal Rate of Return (EIRR)

	%
1. Base Case	25.6%
Sensitivity Tests	
2. Costs +10%	23.8%
3. Costs -10%	27.7%
4. Benefits +10%	27.5%
5. Benefits -10%	23.7%
6. Benefits Lagged 2 years	19.3%
7. Tests 2 and 6	18.1%

TABLE 9

LUOJIA ROAD STORMWATER MANAGEMENT SUB-PROJECT - EIRR CALCULATIONS

(a) CAPITAL COST ESTIMATES (RMB million, mid-2005 constant prices)

Component	2005	2006	2007	2008	2009	2010	Total
Financial Prices	0	40.1	109.8	149.9	80.2	40.1	420.1
Economic Prices	0	36.9	100.8	137.7	73.8	36.9	386.1

(b) INCREMENTAL ANNUAL O&M COSTS (RMB million, mid-2005 constant prices)

Component	Unit	Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capacity	m ³ /day												
Utilization	%		58%	64%	72%	80%	90%	100%	112%	125%	139%	156%	174%
Category													
Labour	RMB million	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Electricity	RMB million	4.21	2.43	2.71	3.02	3.37	3.77	4.21	4.70	5.25	5.86	6.55	7.31
Chemicals	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs	RMB million	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38
Maintenance	RMB million	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69
Sludge Transport	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Administration	RMB million	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
Others	RMB million	0.00											
Total													
Financial	RMB million	18.20	16.42	16.70	17.02	17.37	17.76	18.20	18.69	19.24	19.86	20.54	21.31
Economic	RMB million	17.21	15.25	15.56	15.91	16.30	16.73	17.21	17.75	18.36	19.03	19.79	20.63

(c.) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2025	2040
Population																	
Resident (Registered)	000	454	461	468	474	481	488	495	502	509	516	524	531	539	562	562	562
Floating	000	68	69	70	71	72	73	74	75	76	77	79	80	81	84	84	84
Total	000	523	530	538	545	553	561	569	577	585	594	602	611	619	646	646	646
Households																	
Average Household Size	persons	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Total Households	000	180	183	185	188	191	193	196	199	202	205	208	211	214	223	223	223
Costs																	
Financial Costs																	
Capital Costs	RMB million	0	40.1	109.8	149.9	80.2	40.1									52.1	
Incremental O&M Costs	RMB million						16.4	16.7	17.0	17.4	17.8	18.2	18.7	19.2	21.3	21.3	21.3
Total	RMB million	0	40.1	109.8	149.9	80.2	56.5	16.7	17.0	17.4	17.8	18.2	18.7	19.2	21.3	73.4	21.3
Economic Costs																	
Capital Costs	RMB million	0	36.9	100.8	137.7	73.8	36.9									46.9	
Incremental O&M Costs	RMB million						15.3	15.6	15.9	16.3	16.7	17.2	17.8	18.4	20.6	20.6	20.6
Total	RMB million	0	36.9	100.8	137.7	73.8	52.1	15.6	15.9	16.3	16.7	17.2	17.8	18.4	20.6	67.5	20.6
Benefits																	
Direct Beneficiaries - Damage Savings	RMB million	0	0	0	0	0	10.9	11.3	11.8	12.4	12.9	13.5	14.1	14.7	16.8	16.8	16.8
Indirect Beneficiaries - Damage Savings	RMB million	0	0	0	0	0	31.6	33.0	34.5	36.1	37.7	39.4	41.1	42.9	49.0	49.0	49.0
Commercial & Industrial Benefits	RMB million	0	0	0	0	0	17.5	18.0	18.6	19.1	19.7	20.3	20.9	21.5	23.5	23.5	23.5
Total - Benefits	RMB million	0	0	0	0	0	60.0	62.4	64.9	67.5	70.3	73.1	76.1	79.2	89.3	89.3	89.3
Net Benefit Stream	RMB million	0	-36.9	-100.8	-137.7	-73.8	7.8	46.8	49.0	51.3	53.6	55.9	58.4	60.8	68.6	21.8	68.6

Net Present Values (NPV)	Discount Rate			
	6%	8%	10%	12%

Costs				
Financial Costs	RMB million	548	468	408
Economic Costs	RMB million	511	435	379

Economic Internal Rate of Return (EIRR)	
	%

1. Base Case 12.4%

Sensitivity Tests

2. Costs +10%	11.0%
3. Costs -10%	14.0%
4. Benefits +10%	13.8%
5. Benefits -10%	10.8%
6. Benefits Lagged 2 years	9.5%
7. Tests 2 and 6	8.4%

TABLE 10

YANGSIGANG STORMWATER MANAGEMENT SUB-PROJECT - EIRR CALCULATIONS

(a) CAPITAL COST ESTIMATES (RMB million, mid-2005 constant prices)

Component	2005	2006	2007	2008	2009	2010	Total
Financial Prices	0	9.1	24.7	33.8	18.3	9.1	95.1
Economic Prices	0	8.4	22.7	31.1	16.8	8.4	87.4

(b) INCREMENTAL ANNUAL O&M COSTS (RMB million, mid-2005 constant prices)

Component	Unit	Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capacity	m3/day												
Utilization	%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Category													
Labour	RMB million	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Electricity	RMB million	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Chemicals	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs	RMB million	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68
Maintenance	RMB million	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Sludge Transport	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Administration	RMB million	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
Others	RMB million	0.00											
Total													
Financial	RMB million	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39	4.39
Economic	RMB million	4.07	4.07	4.07	4.07	4.07	4.07	4.07	4.07	4.07	4.07	4.07	4.07

(c) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2025	2040
Population																	
Resident (Registered)	000	38	38	39	39	40	40	41	41	42	43	43	44	45	46	46	46
Floating	000	6	6	6	6	6	6	6	6	6	6	6	7	7	7	7	7
Total	000	43	44	44	45	46	46	47	48	48	49	50	50	51	53	53	53
Households																	
Average Household Size	persons	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Total Households	000	15	15	15	16	16	16	16	16	17	17	17	17	18	18	18	18
Costs																	
Financial Costs																	
Capital Costs	RMB million	0	9.1	24.7	33.8	18.3	9.1									21.3	
Incremental O&M Costs	RMB million						4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4
Total	RMB million	0	9.1	24.7	33.8	18.3	13.5	4.4	4.4	4.4	4.4	4.4	4.4	4.4	4.4	25.7	4.4
Economic Costs																	
Capital Costs	RMB million	0	8.4	22.7	31.1	16.8	8.4									19.2	
Incremental O&M Costs	RMB million						4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1
Total	RMB million	0	8.4	22.7	31.1	16.8	12.5	4.1	4.1	4.1	4.1	4.1	4.1	4.1	4.1	23.3	4.1
Benefits																	
Direct Beneficiaries - Damage Savings	RMB million	0	0	0	0	0	0.9	0.9	1.0	1.1	1.1	1.1	1.2	1.2	1.4	1.4	1.4
Indirect Beneficiaries - Damage Savings	RMB million	0	0	0	0	0	2.3	2.5	2.6	2.7	2.8	2.9	3.1	3.2	3.6	3.6	3.6
Commercial & Industrial Benefits	RMB million	0	0	0	0	0	11.5	11.8	12.2	12.6	12.9	13.3	13.7	14.1	15.5	15.5	15.5
Total - Benefits	RMB million	0	0.0	0.0	0.0	0.0	14.7	15.2	15.7	16.3	16.8	17.4	18.0	18.6	20.5	20.5	20.5
Net Benefit Stream	RMB million	0	-8.4	-22.7	-31.1	-16.8	2.3	11.2	11.7	12.2	12.7	13.3	13.9	14.5	16.4	-2.8	16.4

Net Present Values (NPV)	Discount Rate			
	6%	8%	10%	12%

Costs					
Financial Costs	RMB million	127	108	94	83
Economic Costs	RMB million	117	100	87	77

Economic Internal Rate of Return (EIRR)	
	%

1. Base Case 12.8%

Sensitivity Tests

2. Costs +10%	11.4%
3. Costs -10%	14.5%
4. Benefits +10%	14.3%
5. Benefits -10%	11.2%
6. Benefits Lagged 2 years	9.8%
7. Tests 2 and 6	8.7%

TABLE 11

DONGXIHU STORMWATER MANAGEMENT SUB-PROJECT - EIRR CALCULATIONS

(a) CAPITAL COST ESTIMATES (RMB million, mid-2005 constant prices)

Component	2005	2006	2007	2008	2009	2010	Total
Financial Prices	0	37.3	88.8	119.7	88.4	34.2	348.3
Economic Prices	0	34.3	81.5	110.1	82.9	31.5	320.2

(b) INCREMENTAL ANNUAL O&M COSTS (RMB million, mid-2005 constant prices)

Component	Unit	Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capacity	m ³ /day												
Utilization	%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Category													
Labour	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Electricity	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chemicals	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs	RMB million	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29	6.29
Maintenance	RMB million	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15	3.15
Sludge Transport	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Administration	RMB million	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
Others	RMB million	0.00											
Total													
Financial	RMB million	10.85	10.85	10.85	10.85	10.85	10.85	10.85	10.85	10.85	10.85	10.85	10.85
Economic	RMB million	9.77	9.77	9.77	9.77	9.77	9.77	9.77	9.77	9.77	9.77	9.77	9.77

(c.) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2025	2040
Population																	
Resident (Registered)	000	648	649	649	650	650	651	652	652	653	654	654	655	655	657	657	657
Floating	000	97	97	97	97	98	98	98	98	98	98	98	98	98	99	99	99
Total	000	745	746	747	747	748	749	749	750	751	752	752	753	754	756	756	756
Households																	
Average Household Size	persons	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Total Households	000	257	257	257	258	258	258	258	259	259	259	259	260	260	261	261	261
Costs																	
Financial Costs																	
Capital Costs	RMB million	0	37.3	88.8	119.7	88.4	34.2										0.0
Incremental O&M Costs	RMB million						10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Total	RMB million	0	37.3	88.8	119.7	88.4	45.1	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9	10.9
Economic Costs																	
Capital Costs	RMB million	0	34.3	81.5	110.1	82.9	31.5										0.0
Incremental O&M Costs	RMB million						9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
Total	RMB million	0	34.3	81.5	110.1	82.9	41.2	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8	9.8
Benefits																	
Direct Beneficiaries - Damage Savings	RMB million	0	0	0	0	0	14.5	14.9	15.4	15.9	16.4	16.9	17.4	17.9	18.7	18.7	18.7
Indirect Beneficiaries - Damage Savings	RMB million	0	0	0	0	0	16.7	17.2	17.7	18.3	18.9	19.4	20.0	20.7	22.5	22.6	22.6
Commercial & Industrial Benefits	RMB million	0	0	0	0	0	82.4	84.9	87.4	90.0	92.7	95.5	98.4	101.3	110.7	110.7	110.7
Total - Benefits	RMB million	0	0.0	0.0	0.0	0.0	113.6	117.0	120.5	124.2	127.9	131.6	135.8	139.9	153.0	153.0	153.0
Net Benefit Stream	RMB million	0	-34.3	-81.5	-110.1	-82.9	72.3	107.2	110.8	114.4	118.2	122.1	126.0	130.2	143.3	143.3	143.3

Net Present Values (NPV)

		Discount Rate			
		6%	8%	10%	12%
Costs					
Financial Costs	RMB million	388	341	304	274
Economic Costs	RMB million	355	312	278	251

Economic Internal Rate of Return (EIRR)

	%
1. Base Case	27.1%
Sensitivity Tests	
2. Costs +10%	25.1%
3. Costs -10%	29.4%
4. Benefits +10%	29.1%
5. Benefits -10%	24.9%
6. Benefits Lagged 2 years	20.0%
7. Tests 2 and 6	18.7%

TABLE 12

CHANGQING STORMWATER MANAGEMENT SUB-PROJECT - EIRR CALCULATIONS

(a) CAPITAL COST ESTIMATES (RMB million, mid-2005 constant prices)

Component	2005	2006	2007	2008	2009	2010	Total
Financial Prices	0	17.3	43.8	60.4	34.5	17.3	173.2
Economic Prices	0	15.9	40.3	55.5	31.7	15.9	159.3

(b) INCREMENTAL ANNUAL O&M COSTS (RMB million, mid-2005 constant prices)

Component	Unit	Base	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Capacity	m ³ /day												
Utilization	%		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Category													
Labour	RMB million	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Electricity	RMB million	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21	4.21
Chemicals	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Repairs	RMB million	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38	7.38
Maintenance	RMB million	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69	3.69
Sludge Transport	RMB million	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Administration	RMB million	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37	2.37
Others	RMB million	0.00											
Total													
Financial	RMB million	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20	18.20
Economic	RMB million	17.21	17.21	17.21	17.21	17.21	17.21	17.21	17.21	17.21	17.21	17.21	17.21

(c.) ECONOMIC INTERNAL RATE OF RETURN

Component	Unit	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2020	2025	2040
Population																	
Resident (Registered)	000	257	262	268	273	279	285	291	297	303	310	316	323	329	351	351	351
Floating	000	39	39	40	41	42	43	44	45	45	46	47	48	49	53	53	53
Total	000	295	302	308	314	321	328	335	342	349	356	364	371	379	403	403	403
Households																	
Average Household Size	persons	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9	2.9
Total Households	000	102	104	106	108	111	113	115	118	120	123	125	128	131	139	139	139
Costs																	
Financial Costs																	
Capital Costs	RMB million	0	17.3	43.8	60.4	34.5	17.3										80.0
Incremental O&M Costs	RMB million						18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2
Total	RMB million	0	17.3	43.8	60.4	34.5	35.5	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2	18.2
Economic Costs																	
Capital Costs	RMB million	0	15.9	40.3	55.5	31.7	15.9										72.0
Incremental O&M Costs	RMB million						17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
Total	RMB million	0	15.9	40.3	55.5	31.7	33.1	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2	17.2
Benefits																	
Direct Beneficiaries - Damage Savings	RMB million	0	0	0	0	0	6.3	6.7	7.0	7.4	7.8	8.2	8.6	9.0	10.5	10.5	10.5
Indirect Beneficiaries - Damage Savings	RMB million	0	0	0	0	0	16.6	17.5	18.4	19.3	20.3	21.3	22.4	23.6	27.4	27.4	27.4
Commercial & Industrial Benefits	RMB million	0	0	0	0	0	31.1	32.1	33.0	34.0	35.1	36.1	37.2	38.3	41.9	41.9	41.9
Total - Benefits	RMB million	0	0.0	0.0	0.0	0.0	54.1	56.2	58.4	60.7	63.1	65.6	68.2	70.8	79.8	79.8	79.8
Net Benefit Stream	RMB million	0	-15.9	-40.3	-55.5	-31.7	21.0	39.0	41.2	43.5	45.9	48.4	51.0	53.7	62.6	-9.4	62.6

Net Present Values (NPV)

		Discount Rate			
		6%	8%	10%	12%
Costs					
Financial Costs	RMB million	346	282	238	202
Economic Costs	RMB million	323	263	220	188

Economic Internal Rate of Return (EIRR)

	%
1. Base Case	22.4%
Sensitivity Tests	
2. Costs +10%	20.3%
3. Costs -10%	24.9%
4. Benefits +10%	24.7%
5. Benefits -10%	20.1%
6. Benefits Lagged 2 years	15.9%
7. Tests 2 and 6	14.4%

14.1 General

The economic evaluation is based on the further development of the costs and other data presented in Appendix I3:

1. Capital costs – the capital costs were amended to include the updated resettlement costs for seven (7) of the sub-projects (Nantaizi Lake WWTP, Caidian WWTP, Dongxihu wastewater collection system, Luoia Road drainage improvement, Yangsigang drainage improvement, Dongxihu Three Gates Connections and Changqing pumping station expansion). For the economic analysis of the five (5) wastewater sub-projects, the capital costs also include an allowance for new sewer connections in each of the drainage areas. These costs are assumed to be 10% of the capitals spread over 10 years from 2006 to 2015.
2. Construction program – implementation of the sub-projects is scheduled over five years from 2006 to 2010.
3. Economic life of the main sub-project facilities after the completion of construction – 30 years (2010 to 2040).
4. Capital replacement of electrical and mechanical equipment – assumed to have an economic life of 15 years. Therefore, replacement is programmed to take place in 2025.
5. Incremental annual operations and maintenance costs for the preferred alternatives by sub-project were transferred from the data files for the least-cost analysis. The results are illustrated in the tables for each sub-project option.
6. Shadow/conversion factors have been applied to derive the economic costs. The following factors have been used:
 - Labour - skilled 1.0
 - Labour - unskilled 0.8
 - Electricity 1.1
 - Standard conversion factor 0.9
 - Foreign exchange 1.0
7. Application of the shadow/conversion factors is based on the following assumptions of cost distribution:
 - Capital costs: (i) labour skilled 5%; (ii) labour unskilled 15%; (iii) electricity 5%.
 - Annual O&M costs: (i) labour skilled 40%; and (ii) labour unskilled 60%.

14.2 Benefits

8. Wastewater management – the wastewater benefits have been assessed in terms of willingness to pay (WTP) and savings industrial wastewater treatment. The WTP values are derived from the household socio-economic survey that was carried out in August-September 2005. The resulting WTP values were RMB 1.38 (US\$ (US\$ 0.17) per m³ in the main urban areas and RMB 1.37 (US\$ 0.17) per m³ in the suburban areas (see: Chapter 6). The savings in industrial wastewater treatment amounted to RMB 1.46 (US\$ 0.18) per m³, based on the difference in unit costs between primary and secondary wastewater treatment (see: Chapter 9, Section 9.7).
9. Storm Water management – the Storm Water benefits were measured in terms of the annual damage estimates reported by households in the socio-economic survey, and the disruption of normal commercial and industrial activity in the respective drainage service areas. Firstly, the household damage estimate amounted to RMB 47 (US\$ 6) per household for direct beneficiaries (i.e. those in the drainage service area) and RMB 41 (US\$ 5) per household for indirect beneficiaries (i.e. those residing in adjacent areas who would be indirectly affected by storm events in the without project case (i.e. unable to travel into or through the affected area to work, school, or other commercial and household activities). Ratios of indirect to direct beneficiaries were derived from an examination of the registered population residing in adjacent areas in 2003 (see: Wuhan Statistical Yearbook 2004). The following ratios were derived: (a) Luoja Road 3.3; (b) Yangsigang 3.0; (c) Dongxihu 1.3; and (d) Changqing 3.0. Secondly, The disruption to normal commercial and industrial activity was assessed on the basis of reported retail sales of consumer goods and industrial value added for each district in 2003 (see: Wuhan Statistical Yearbook 2004). Values were allocated to each drainage area on a pro-rata basis relative to the respective land areas. Daily values were calculated to indicate the approximate average value of commercial and industrial activity in each drainage area for 2003. Estimates of the number of days affected by annual storm events were derived from the FSRs and consultations with the PMO, design institutes and other local specialists. The estimates indicate an average of 10 days per year are affected by storm events that causes economic losses in terms of disrupted commercial and industrial activity, damage to infrastructures, clean-up costs, and additional work of welfare and emergency services. The proposed sub-projects (i.e. the with project case) will reduce the adverse economic impact of the flooding. It is conservatively assumed that the Storm Water interventions will save approximately 25% of normal commercial and industrial activity in Luoja Road, Dongxihu and Changqing drainage areas; and 40% in Yangsigang drainage areas. The resulting average annual values are as follows: Luoja Road RMB 14.6 million (US\$ 1.8 million); Yangsigang RMB 3.9 million (US\$ 480,000); Dongxihu RMB 69 million (US\$ 8.5 million); and Changqing RMB 26.1

million (US\$ 3.3 million). Finally, it is assumed that the flood impact values will increase in real terms by 3% per year up to 2020 for both household damage and the disruption to commercial and industrial activity in the without project case.

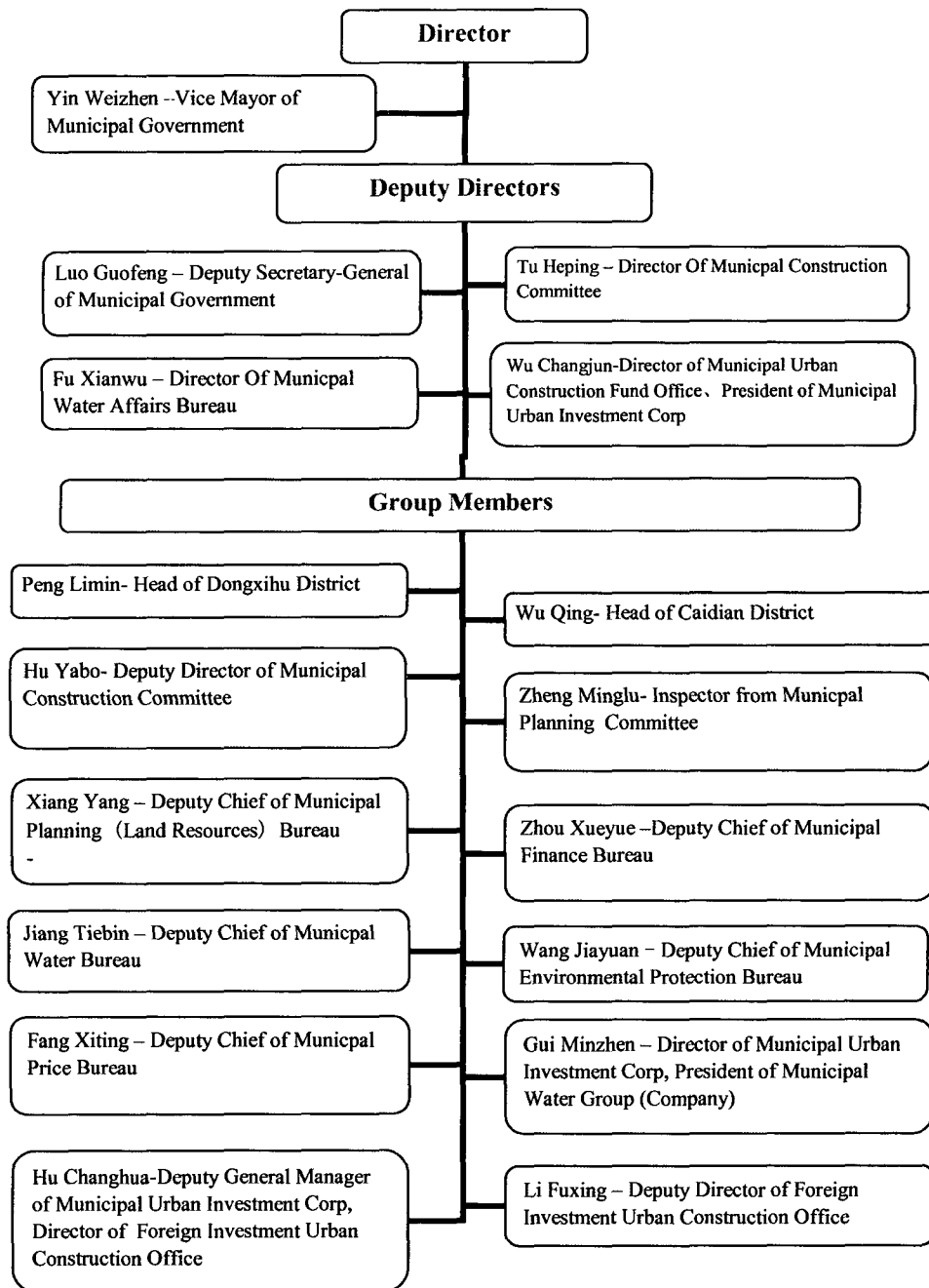
I4.3 Results and Tables

10. The results of the calculation are presented in the following tables:

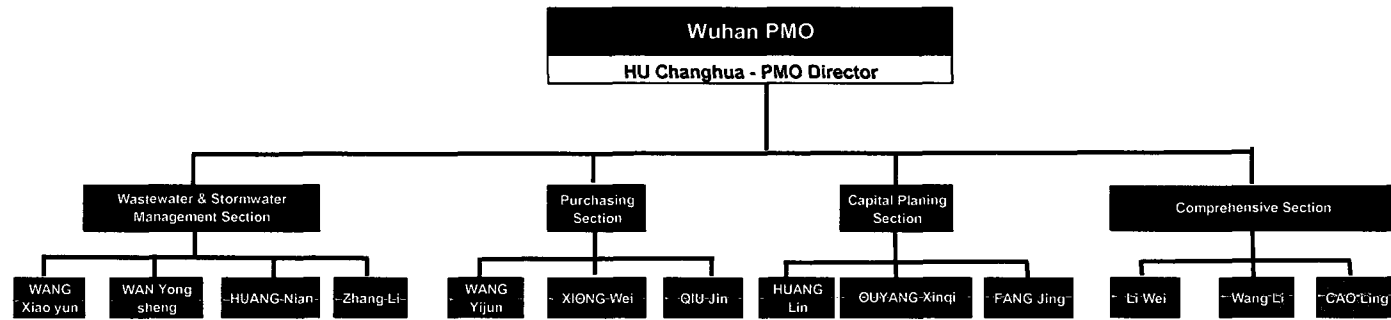
Table I.4.1	Wastewater and Storm Water Management Project – Summary Results
Table I.4.2	Wastewater Management Component – Summary Results
Table I.4.3	Storm Water Management Component – Summary Results
Table I.4.4	Erlangmiao Wastewater Sub-Project – EIRR Calculations
Table I.4.5	Nantaizi Lake Wastewater Sub-Project – EIRR Calculations
Table I.4.6	Huangpu Road Wastewater Sub-Project – EIRR Calculations
Table I.4.7	Caidian Wastewater Sub-Project – EIRR Calculations
Table I.4.8	Dongxihu Wastewater Sub-Project – EIRR Calculations
Table I.4.9	Luoja Road Storm Water Sub-Project – EIRR Calculations
Table I.4.10	Yangsigang Storm Water Sub-Project – EIRR Calculations
Table I.4.11	Dongxihu Storm Water Sub-Project – EIRR Calculations
Table I.4.12	Changqing Storm Water Sub-Project – EIRR Calculations

Appendix J1

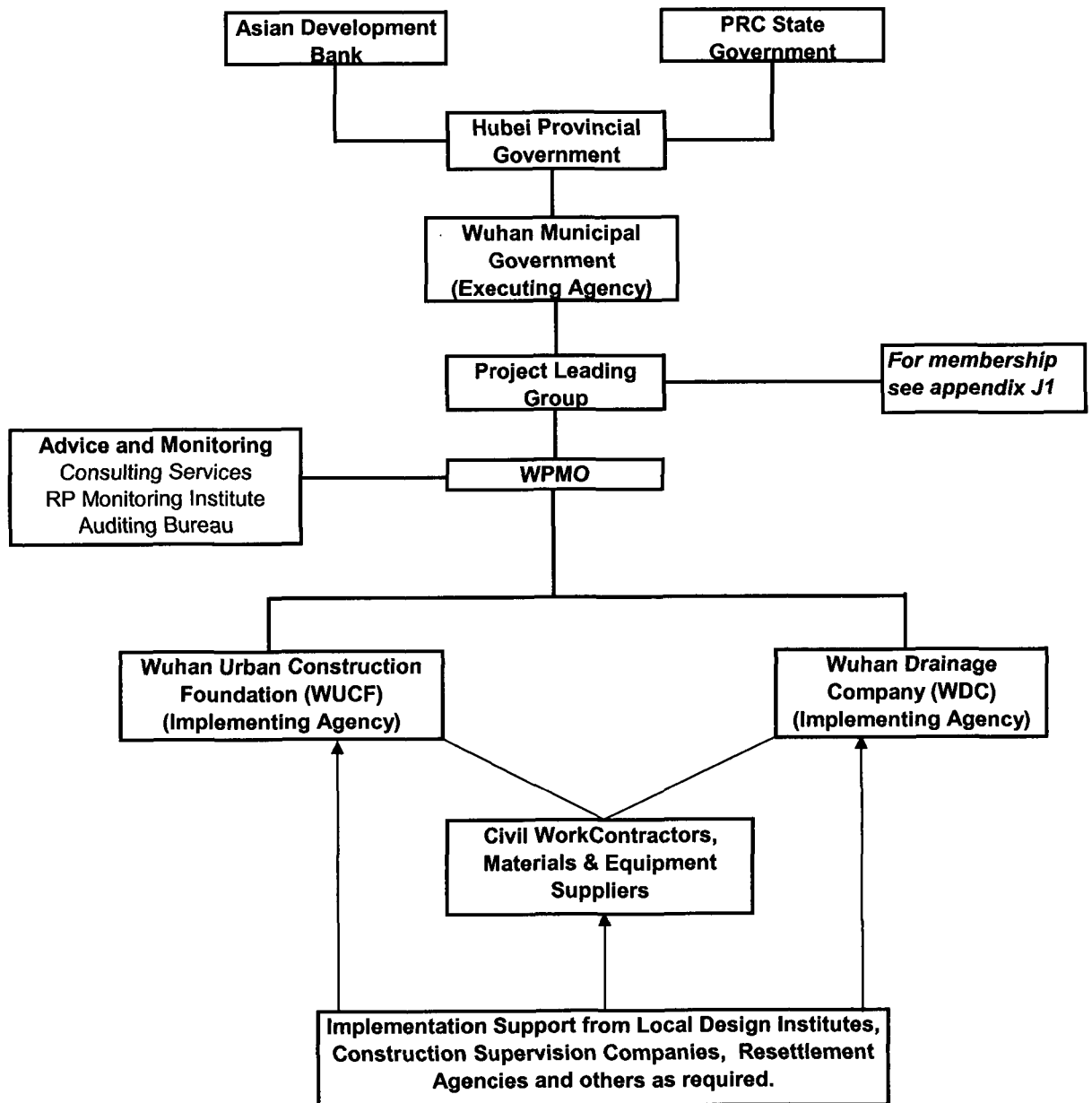
Organization Chart of the Leading Group for Wuhan Wastewater and Storm Water Management Project



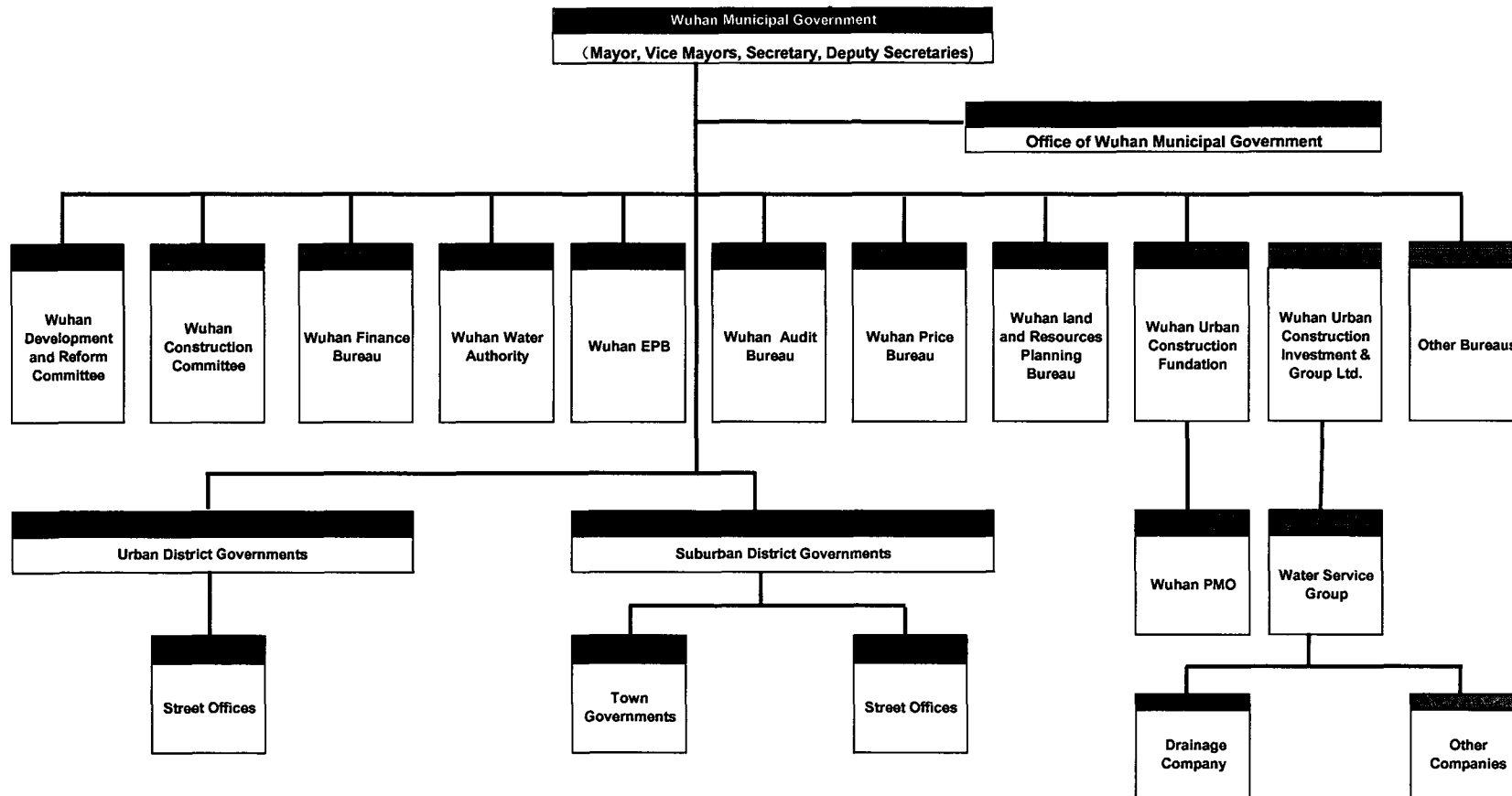
Appendix J2 Organization & Staffing Chart of WPMO



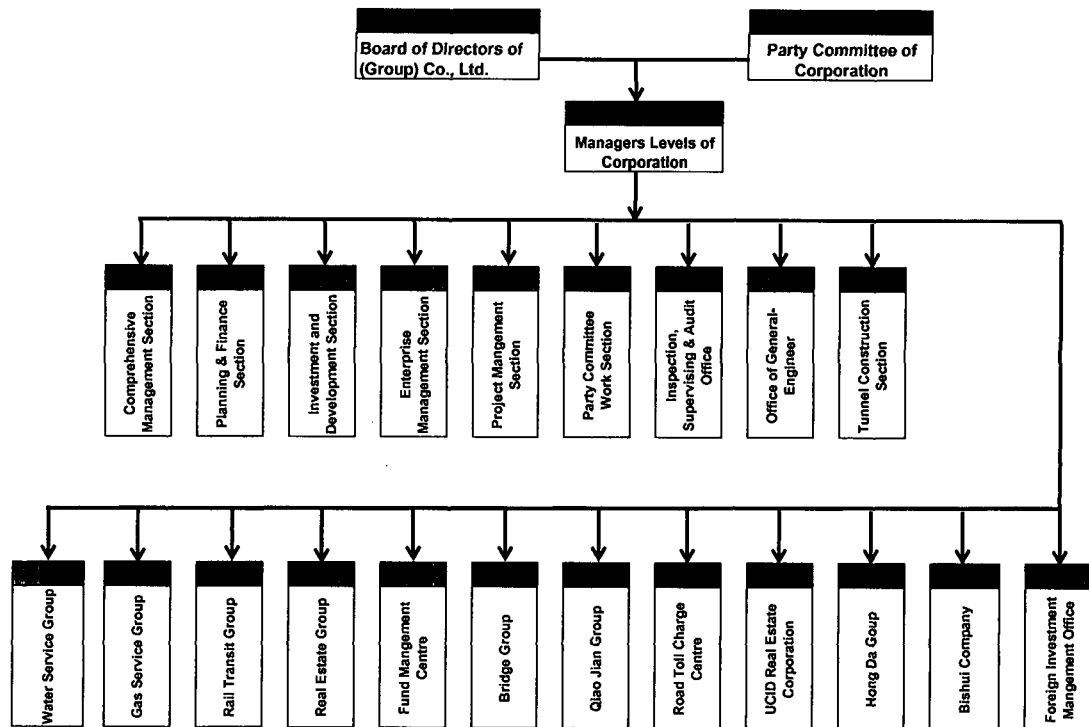
Appendix J3 Organization of Wuhan Wastewater and Storm Water Management Project



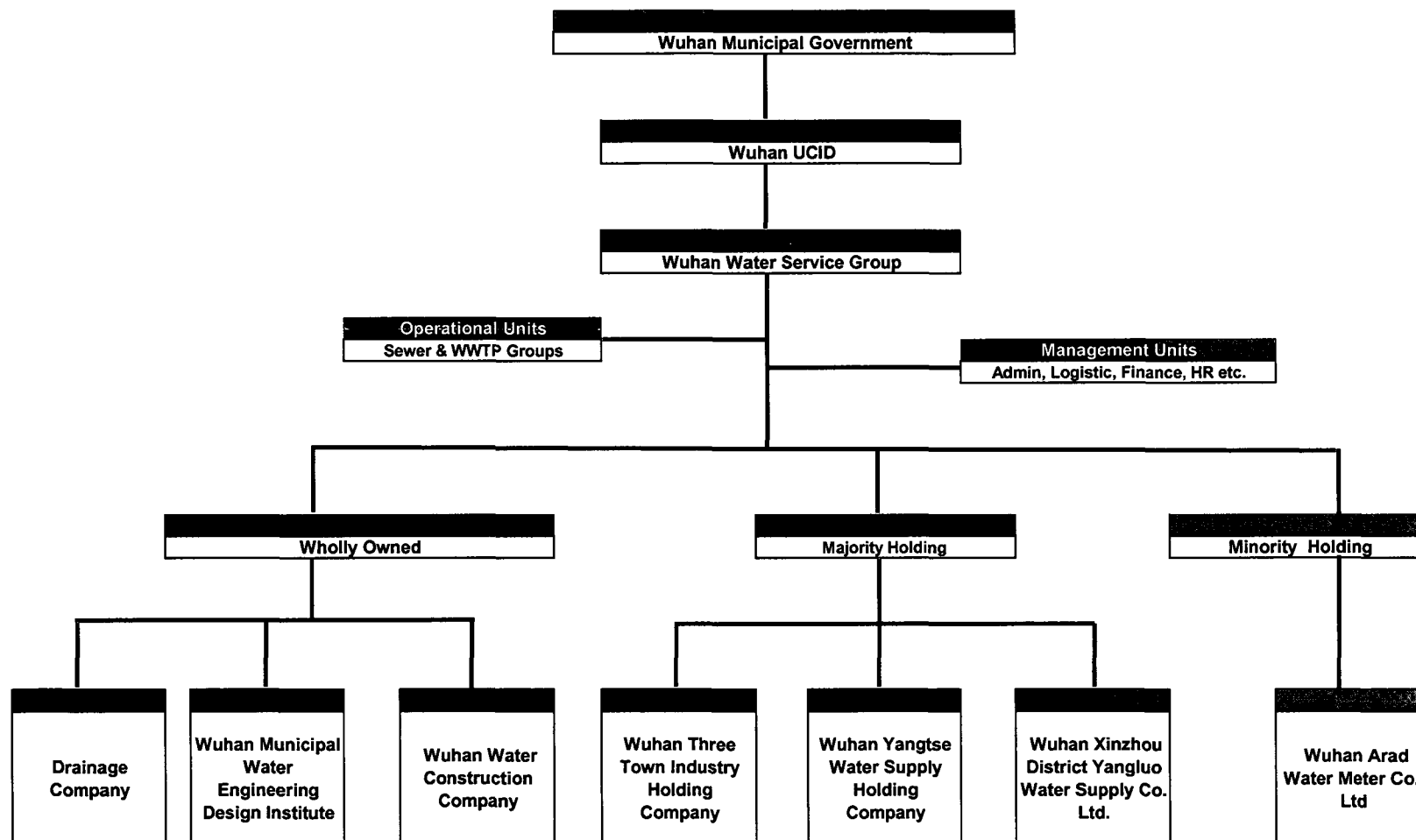
Appendix J4 Organization Chart of Wuhan Municipal Government



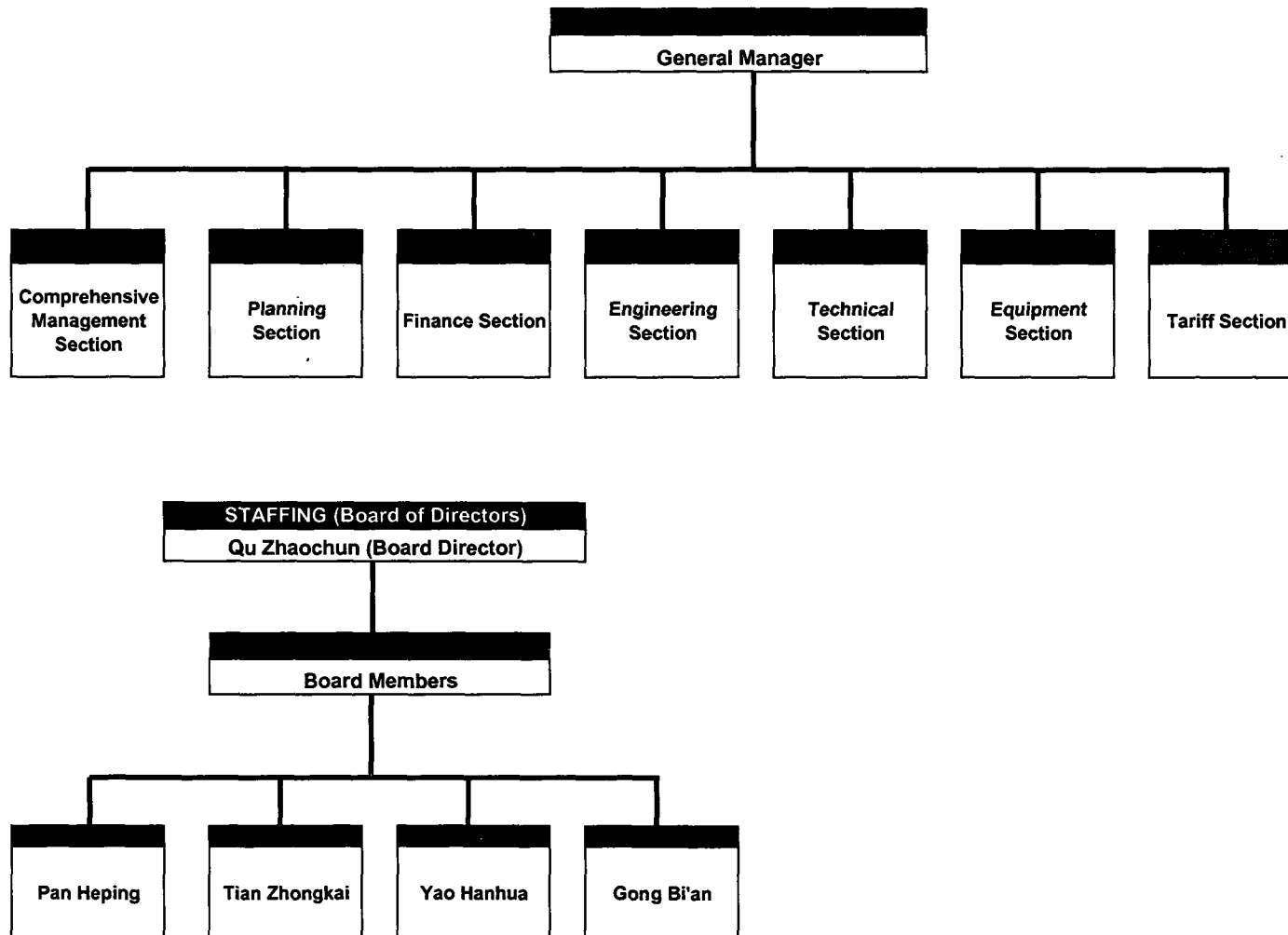
Appendix J5 Organization Chart of Wuhan Urban Investment DC



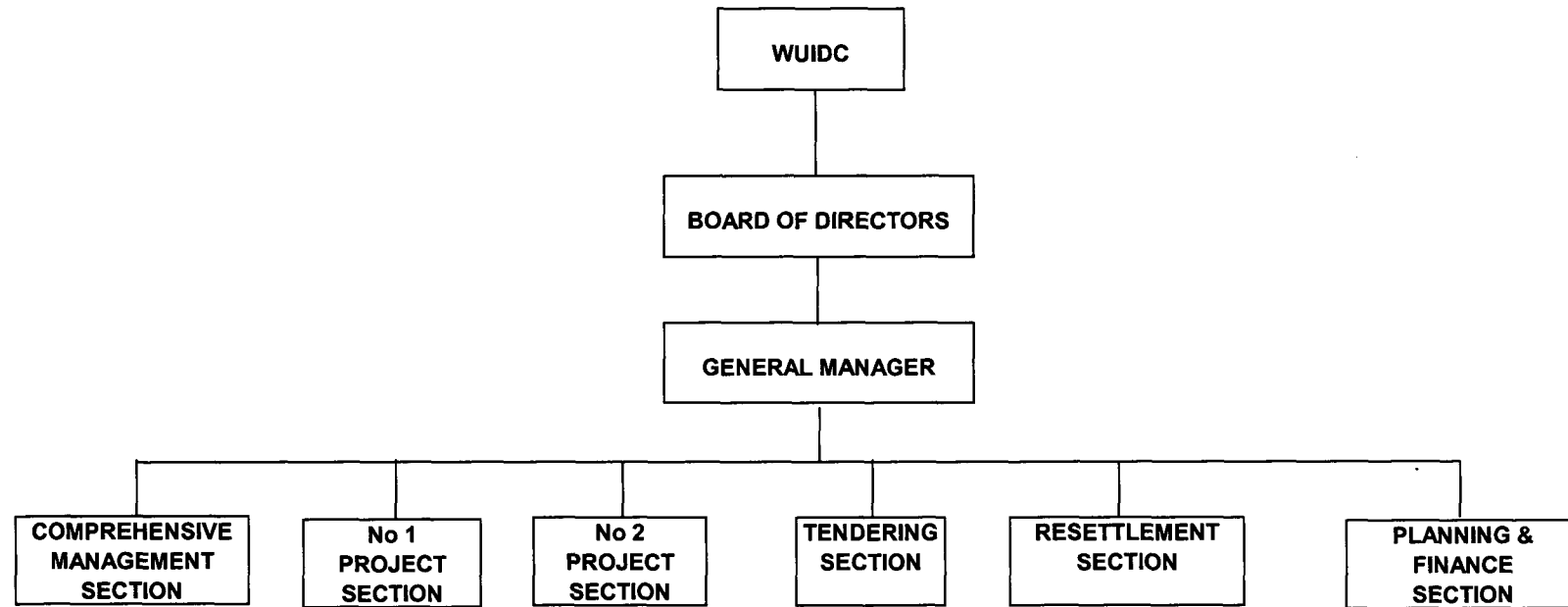
Appendix J6 Organization Chart of Wuhan Water Services Group



Appendix J7 Organization and Staffing of Wuhan Drainage Company



Appendix J8 Organization of Jiangxing Construction Management Company



APPENDIX J9

OUTLINE TERMS OF REFERENCE FOR IMPLEMENTATION ASSISTANCE CONSULTING SERVICES

Scope of Work

The Consultant will work with WPMO, the local IAs and relevant government agencies, providing assistance and advice on the following:

1. Project Management and Implementation Support

- 1.1 The development of comprehensive project implementation plans and procedures for monitoring and control.
- 1.2 Design review, the preparation of bidding documents, and procurement advice.
- 1.3 Advice on all aspects of construction supervision and management.
- 1.4 Establish a Project Performance Monitoring System including its design, data collection and analysis procedures, and the provision of training in its use.
- 1.5 Develop an environmental monitoring program and reporting procedures.
- 1.6 Provide training and on-the-job guidance on the above items

2. Private Sector Participation (PSP) Strategy

- 2.1 Consider how market reforms could be introduced.
- 2.2 Prepare a detailed strategy for PSP in the wastewater sector.
- 2.3 Develop a performance contract between WDC and the WMG.
- 2.4 Identify opportunities for the application of service contracts (outsourcing)
- 2.5 Provide advice on arrangements for corporate governance.
- 2.6 Work with WMG to assess regulatory capacity and how it can be improved.
- 2.7 Design and provide training in PSP procurement and regulation.
- 2.8 Actively support the process of market reform implementation where this is sanctioned by WMG.

3. Improvements to Storm Water Management

- 3.1 Review organizational arrangements for storm water operations
- 3.2 Review the operational procedures and maintenance programs for the storm water sewer system and the cost effectiveness of these arrangements.
- 3.3 Review arrangements for reporting and recording localised flooding incidents
- 3.4 Consider how outsourcing contracts might improve the efficiency and standards of operations, and identify potential constraints in their application.

4. Sludge Management Plan

- 4.1 Work with WDC and relevant units of WMG to develop a sludge management plan for Wuhan city. This to include the following requirements:
- Identify relevant Chinese laws and regulations and any specific local constraints that apply in the disposal of WWTP sludge.
 - Determine in consultation with WDC the opportunities and constraints for dried sludge handling and disposal in the context of local circumstances. This will identify the viable alternatives for detailed review
 - Review alternatives utilizing proven international experience where appropriate.
 - Discuss favoured alternatives with managers of other large Chinese treatment facilities to verify their practicality.
 - Identify the costs of different viable alternatives
 - Verify long term environmental sustainability of preferred disposal processes
 - Consider health, safety and monitoring requirements
 - Identify future research and investment needs.
 - Prepare a comprehensive Sludge Management Plan (SMP) taking account of all of the above.
 - Support WDC/WMWA in presenting the SMP and gaining approval.
 - Prepare operational guidance manuals to support the SMP

5. Improvements in Operational Management

- 5.1 Review sewer inspections and maintenance programs, including activities to reduce infiltration and unauthorized connections.
- 5.2 Review the operation of new and existing WWTP and suggest modification to operating methods & procedures to save costs and/or the effectiveness of performance. Particular attention is to be given to process control and energy consumption.
- 5.3 Using the Erlangmiao catchment as a case study area undertake a detailed investigation into the degree, causes and potential remedies for infiltration into the collection system.
- 5.4 Support WDC in the implementation of remedial action.
- 5.5 Review policies and procedures for sewer connections programs, use of septic tanks, and arrangements for protecting the structural integrity of buried assets.

6. Financial Management Strengthening

- 6.1 Develop detailed costing systems and benchmarking to highlight poor performance and to support tariff review studies
- 6.2 Investigate financial issues of current PSP arrangements and recommend solutions.
- 6.3 Generally support the improved financial management of existing operations, with particular emphasis on storm water management.

Reporting and Timetable

Item	Requirement
Loan Consultancy Program Duration	Three Years
Inception Report	Two months after commencement of work
Progress Reporting	Quarterly
Other Reporting	As needed
Final Report	At conclusion of Consultancy
Report Format for all Reports	English and Chinese
Number of Copies	To be determined at negotiations

Indicative Resourcing

Indicative resourcing, based on the needs of the IAs as assessed during the project preparation phase is given below:

Area of Expertise	International Person Months	Domestic Person Months
Project management, and technical support (including bid document preparation).	8	74
Private Sector Participation	2	10
Financial management	16	30
Sludge management	4	12
Operational management	5	36
Hydraulic modeling	2	6
PPMS	2	8
Environmental monitoring and reporting	2	4
Total	41	180

Indicative Budget

Item	Budget (\$)
International consultancy (41 months @ \$20,000)	820,000
National consultancy (180 months @ \$3,000)	540,000
Office facilities and support staff (36 months @ \$1000)	36,000
Overseas training	200,000
Local training	50,000
Office equipment for consultants	35,000
Local transport	25,000
Total	1,706,000

Appendix K1 – Draft Policy Framework

Policy Issue and Explanation	Action Needed
<p>1. Promotion of Private Sector Involvement</p> <ul style="list-style-type: none"> The large investments needed in the PRC water sector cannot be financed by the public sector alone. There is accordingly a need to promote diversified investment channels to achieve sector goals. Private investors can also add value by improving efficiency and service standards. 	<ul style="list-style-type: none"> (i) Promote a fuller understanding of the different financing options and for these to be considered early in the project life-cycle (ii) Development of best practise guidelines on private sector procurement and market testing for outsourcing contracts. (iii) Provide capacity building in PSP procurement and contract supervision.
<p>2. Wastewater Management</p> <p>Effective policies, guidance and procedures are needed to ensure</p> <ul style="list-style-type: none"> Collection and treatment of wastewater that is generated Sewerage separation policies are fit for local circumstances and can be effectively implemented and policed. Prevention of infiltration to the wastewater sewerage system Protection of wastewater facilities from pollution discharges Centralised treatment of industrial and non-industrial wastewater is encouraged where this is economic 	<ul style="list-style-type: none"> (i) Continuation of sewerage connection programs promoted under WWMP. (ii) Continuation of sewer separation programs promoted under WWMP. (iii) Application of GIS, sewer network and water quality modeling to improve operational performance and optimize investments. (iv) Extended application of the discharge permit system and consideration to be given to the application of pollution load charging for industrial discharges. (v) Penalties applying to non-compliance with discharge standards need to be reviewed and potentially strengthened.
<p>3. Consideration of Alternative Approaches to Storm Water Management</p> <ul style="list-style-type: none"> PRC practice and policy is for storm water management to be financed from government revenues, but internationally alternative funding mechanisms have been shown to offer certain advantages Existing service delivery by local 	<ul style="list-style-type: none"> (i) ADB/MOF to consider a national advisory TA to examine alternative funding and service delivery mechanisms, with Wuhan as a case study city. (ii) Examination through overseas study tours of alternative storm water management arrangements in North America and Europe. (iii) Pilot testing of outsourcing contracts to

government agencies is manpower intensive. Corporatisation and/or outsourcing have been shown to bring improvements in service standards and efficiency.	<p>assess potential efficiency gains.</p> <p>(iv) WMG to review alternative institutional arrangements and prepare an institutional development strategy.</p>
<p>4. Cost recovery and tariff reform</p> <ul style="list-style-type: none"> • Tariff levels based on the principles of full cost recovery will allow WDC to be financially autonomous. • Tariffs structures and levels should promote the economic use of resources. • Adequate funds for loan repayment, operations, maintenance, and ultimate replacement of project facilities must be assured. 	<p>(i) Implementation of Circular (1999) 1192, which encapsulates full cost recovery as an objective in tariff setting.</p> <p>(ii) Development of more specific guidance to support policy implementation, especially in the use of tariff design to promote economic objectives.</p> <p>(iii) Development and implementation of social policies to protect financially disadvantaged customers.</p> <p>(iv) Improved arrangements for enforcibility of wastewater charges.</p>
<p>5. Enterprise reform and corporate governance.</p> <ul style="list-style-type: none"> • Sustainability of wastewater facilities requires establishing the implementing agencies as financially and managerially autonomous enterprises. • High standards of corporate governance are required to retain public confidence. 	<p>(i) Implementation of PRC Government policies in respect of government and enterprise separation.</p> <p>(ii) Development of governance best practice and guidance on its application</p>

Appendix K2

Alternative Financing & Institutional Arrangements for Storm Water Management

1. Introduction

Storm water management in the PRC is currently considered a non revenue-generating public service, there is no legal provision for levying a user charge, and the service is funded from the local government budget. This means storm water management budgets are subject to whatever resource constraints apply from time to time on the local government budget. As with most services so funded, this leads to uncertainty in planning and, on occasions, restrictions in funds for necessary maintenance of equipment, although to date we are advised that funding has been generally adequate within the central urban area of Wuhan, with the WMG paying close attention to the adequacy of urban drainage. Responsibility for service provision is vested in local governments and normally undertaken by local direct labor units, although some governments assign/contract day to day operations to the local wastewater utilities, albeit funded by the local Finance Bureau.

In the days prior to WWTP construction it was logical for cities to construct combined wastewater and storm water sewerage systems as all flows ended up in the nearest local watercourse without treatment. Under such circumstances, the construction and separation of flows into separate wastewater and storm water sewer systems was an unnecessary expense with no obvious benefit. However, the construction of municipal WWTP fundamentally changes the approach to the design of sewerage systems and a separation of flows (wastewater and storm water) becomes more economic as the treatment of storm water flows can be largely avoided.

Quite naturally, the historic approach to combined sewerage was replicated in the institutional arrangements, with one single government department assuming responsibility for sewerage operations and maintenance. In Wuhan this was a department under the former Construction Administration Bureau and its district level equivalents dealt with the operations and maintenance of the secondary and local networks.

The policy of sewerage separation together with the recent institutional and financial reforms have also led to a division in responsibilities for management and operation of the separated network. Whilst the wastewater network is under the management of WDC as the local wastewater utility company, the storm water network is under the overall management of the Wuhan Municipal Water

Authority, with most operations performed at a local level by units at the district level under the jurisdiction of the relevant district level water bureau.

The decentralized nature of storm water operations (with most activity being at the local district level) almost certainly results in operational inefficiencies and makes it much harder to introduce modern and higher technology operating methods and equipment. Quantifying the extent of such inefficiencies is beyond the scope of this PPTA and would require more in depth study. However, in total it is understood some 2000 operatives are engaged on storm water drainage and pumping activities (operations and maintenance).

In summary the current storm water management arrangements potentially suffer from:

- lack of a dedicated source of funding
- inefficiencies due a loss in economy of scale through local operation
- inefficiencies due to a lack of modern operating methods and equipment.

However there are some benefits gained from the detailed localized knowledge that local operators possess, enabling them to focus maintenance on known trouble spots in the local sewer system.

2. International Experience

General Trends

The storm water issues identified above are by no means unique to the PRC and continue to be faced by many cities across the world. The funding and institutional arrangements can in theory be decoupled, but in practice these are often closely inter-related. Internationally, and especially in developed countries, there are trends for

- More funding from user charges or specific tax levies to provide dedicated funding and thus better ensure adequate and stable financing of the storm water service.
- More corporatisation by forming either separate storm water utilities or making the wastewater utility responsible for service provision. This is seen as a way of promoting accountability for service standards and also (if the utilities are large enough) facilitates efficiency improvements through economies of scale and more readily introducing modern operational techniques and equipment.
- Use of limited private sector involvement to promote competition and hence further operational efficiencies. This is most commonly done through short to medium term outsourcing contracts, but some fuller forms of PSP do exist.

Financing of Storm Water Services

There are significant variations in how storm water services are financed. The most common approach remains for the service to be financed from local tax revenues. Where the service is financed from taxation this may be as a budget allocation from general tax revenues or a specific tax or levy dedicated to financing storm water infrastructure may be applied. Thus a dedicated storm water levy may be applied as a specific supplement to either a local property tax or a local income tax.

The alternative to financing storm water services from taxation is to apply a form of user charge. Alternative structures can be used for storm water charges. Basic charge structures are:

- Flat rate charges - A uniform charge for all customers. Charge rates may be differentiated by type of customer (e.g. residential, commercial, etc).
- Charge based on surface area - a uniform charge rate per unit area of the customer's property.
- Charge based on lot area adjusted for flow contribution - a uniform charge rate per unit area of the customer's property adjusted to account for factors affecting storm water runoff such as permeability, onsite storm water management and contributing area.
- Charges based on other factors – storm water charges are at times based on assessed property value or metered water use.

These alternative structures may be combined within a single rate schedule. For instance, residential and small commercial customers may be charged a flat rate while larger commercial and industrial customers might be charged based on area. As with any charging structure the design should take account of administrative efficiency, customer understanding, fairness of charges (between individual customers and customer groups), social considerations such as the impact of charges on the poor, and the predictability and stability of revenues.

It is possible, and indeed not totally uncommon, for a charging structure to finance operations, maintenance and minor capital improvements, with larger capital investments financed from taxation.

Charges can have certain potential advantages over the financing of storm water via taxation:

- Provide secure, dedicated funding, (this is almost certainly the most common justification given for introducing charges)
- Achieving a more equitable allocation of storm water costs by more closely matching what people pay with the benefit that they receive,
- Increased public awareness of storm water services and that these need to be paid for.

- Dedicated financing promotes transparency in the costs and “value” offered by the storm water service. It also facilitates corporatization and private sector involvement.
- Promoting efficient water management by encouraging on-site efforts by property owners to manage of SW,

However, not all charging structures are capable of achieving all these objectives, and the last objective can only be met by the administratively complex adjusted area based charging method, which is certainly not suitable for domestic or smaller non-domestic customers. Thus storm water charging is generally not effective as a demand management device.

Charges also have potential disadvantages which include:

- They may meet customer resistance (especially initially or if they are structured in a manner that is viewed as unfair).
- They incur additional administrative costs in billing and collection (although these costs can be minimized if the charges are collected with another utility bill).
- They are more likely to impact adversely on the poor.

As can be seen from the above discussion there is no over-riding argument for charges replacing taxation as the main or only funding source for storm water services. Rather the decision needs to have regard to local circumstances and policies.

The fact that some financing arrangements via taxation are more applicable to public provision of services, whilst charging is more applicable to corporatized provision of services means there is often a strong link between financing arrangements and institutional arrangements.

Alternative Institutional Arrangements

Examples are found where:

- Storm water services are managed as a dedicated independent service
- Storm water services are coupled institutionally with highway maintenance.
(as often highways are the main contributors of public storm water flows)
- Storm water services are coupled with wastewater services (as the maintenance of storm water sewers requires the largely the same skills and equipment as wastewater sewers and there are therefore apparent

efficiencies to be achieved). This model is required where combined sewerage systems are installed.

Institutional models identified include:

- Direct service provision by a government department
- Government managed with services outsourced to a private contractor(s)
- Managed by a dedicated government owned storm water utility
- Managed by a government owned wastewater utility
- Managed by a privatised utility (which may also have wastewater responsibilities)

Where utilities are established these may also use outsourcing if by doing so they can improve service efficiency.

There is no clear best practice institutional model and selection of the model should have regards to local circumstances, and especially the degree of sewerage separation that has been accomplished (and is proposed in the future), and the existing/planned institutional arrangements for wastewater services and highways maintenance.

There are some principles and factors that can be used to guide selection of a suitable institutional model:

- A corporatized utility model fits best with a dedicated funding source. The advantages of a corporate structure are reduced (but not altogether eliminated) if financing is simply from general taxation.
- The volume of storm water discharge (and hence the service quantity) is not determined by users and except in a few cases cannot be readily influenced by users. Instead it is climate dependent.
- This climate dependency means it is not possible to create the normal commercial relationship between service user and service provider. This makes the privatized utility model intrinsically less suitable except where storm water services are only a small part of the utilities scope (as applies with the water/wastewater utilities in UK). This may explain why the privatized utility model is rarely used for storm water alone.
- Outsourcing contracts are also potentially affected by the climate factor, but this impact can be reduced by making some items "cost pass through". (eg energy costs from pumping).
- Use of government direct labor precludes the use of competition as a means of promoting service efficiency. Competition can also promote innovation to improve service levels.

- Use of relatively small decentralized operating units to deliver services has the benefit of providing local knowledge, but prevents economies of scale and constrains the adoption of modern methods and use of modern equipment.
- Where outsourcing or fuller private sector involvement is contemplated then there must be sufficient expertise in contract management to ensure services are properly provided. This is a capacity building need that is often overlooked.
- More sophisticated institutional arrangements generally require good information systems and free flows of information to achieve the twin goals of equity and transparency in the arrangements. As information systems take time to develop it is logical for institutional arrangements to evolve over time from the simple to the more complex. Thus simple outsourcing contracts are often a sensible first step in PSI.

3. Applicability of International Experience in the PRC and Wuhan - Some initial conclusions and considerations

Over the last 10 years many public services in the PRC have moved from being financed principally from taxation to financing from user charges. A similar policy review appears appropriate for the storm water drainage service. ADB has supported the PRC with studies in water supply, wastewater and municipal solid waste. A similar study in storm water management would appear to be a logical follow on.

Whilst large and relatively affluent cities like Wuhan appear to have the resources to adequately finance storm water management from general taxation, this may well not be the case in smaller and less affluent cities. Dedicated funding of the service may therefore bring significant safeguards in service sustainability.

Existing storm water management is manpower intensive and low technology. Current institutional arrangements are consistent with existing localized service delivery methods, but do not readily facilitate the introduction of modern methods and technology. Opportunities for improved service efficiency are not easy to judge without a degree of controlled experimentation with alternatives such as the use of outsourcing contracts and merging of local units into larger corporate entities.

The natural trend is the PRC continues to develop will be for manpower costs to increase relative to other costs. Thus the economic trend is in conflict with the existing manpower intensive arrangements for storm water management. It would appear opportunistic to investigate and test alternative institutional

structures that would better facilitate the introduction of modern methods and equipment.

One possible approach would be to create two separate storm water utilities to serve central Wuhan (one each side of the river). These utilities would then facilitate a degree of competition in the storm water management sector and be of sufficient size and capacity to introduce new working methods and approaches – including outsourcing.

However, this is just one possible option, and needs further investigation along with other alternatives.

Appendix K3

POLICY DIALOGUE

Cost Recovery/Tariff Reform

1. The Project will support the Government's ongoing economic and enterprise reform programs that require all wastewater management projects to be financially sustainable and capable of cost recovery. Water supply and drainage companies are required to improve their cost recovery capability. Appropriate mechanisms for tariff setting are a critical factor in attracting the needed investment to the sector, ending the water supply and drainage companies' reliance on government subsidies and providing incentives to users to conserve water resources. ADB is actively encouraging this transition in its policy dialogue and lending operations. Two ADB water tariff studies supported the Government's initiatives :

- A technical assistance (TA) to prepare the National Guidelines on Water Tariffs (NGWT); and
- A water tariff study TA.

2. A major output of the first TA, NGWT was subsequently promulgated by the National Development & Reform Commission (NDRC)¹ and the Ministry of Construction (MOC) in September 1998. Major features in the NGWT that reflect specific recommendations of the TA include:

- selecting a tariff structure based on local conditions and priorities;
- considering a two part tariff with a volumetric charge and fixed demand charge;
- adopting full cost recovery as the main objective in setting and approving tariff levels;
- use of the public hearings mechanism to disseminate tariff increase plans to the public and obtain their feedback; and
- adopting a simplified process for tariff regulation, requiring evaluation and approval at the local municipal government level and supported by review and monitoring at the provincial and national level.

3. Following the NGWT recommendations would improve the long term financial viability of the water supply companies, and provide for operations and maintenance (O&M) and service expansion, which in turn would help increase private sector participation (PSP) in the water sector.

4. The second TA, the water tariff study focused on providing assistance to

¹ Previously State Development and Planning Commission.

the Government in developing institutional and methodological capacities to implement the NGWT. The TA assisted in preparing the draft local implementing regulations of the NGWT for Zhangjiakou, Fuzhou and Chengdu. Enactment of a local tariff regulation provides a legal basis for regulating water tariffs and ensures transparency and efficiency.

5. The Zhangjiakou Implementation Regulation was approved by the Zhangjiakou Municipal Government in September 2000; it was the first local water tariff regulation under the NGWT. Public hearing meetings are a mandatory requirement of the NGWT. It advocates the use of hearings to obtain public views on the water supply services and to promote public understanding of water supply companies and their policies and efforts to develop improved water supply services. Based on the first public hearing meeting, Zhangjiakou increased its water tariffs by 75%. The TA recommendations including the achievements in Zhangjiakou have been acknowledged by the State Council as a good example for tariff reforms. NDRC issued a notice to local governments nationwide indicating that the Zhangjiakou water tariff reforms were recognized as a good example for undertaking the reforms required by the NGWT. Upon completion of the NDRC, the Ministry of Finance (MOF), MOC, Ministry of Water Resources (MWR) and State Environmental Protection Administration (SEPA) officially issued a notice on further strengthening urban water tariff reforms on April 1, 2002, followed by a nation wide video conference to discuss the Zhangjiakou experience on water tariff reforms on April 9, 2002. Nationwide replication of the Zhangjiakou tariff reforms model is ongoing. Generation of funds for future expansion and rehabilitation of water supply and wastewater systems directly from tariff increases is gaining momentum and having a positive impact on the financial sustainability of water supply companies and wastewater utility agencies.

6. Specific impacts of the overall package of reforms are best illustrated by the benefits in Zhangjiakou. The benefits included:

- Price Bureau's lead role in tariff administration was clearly established;
- The water supply administration of the Public Utility Bureau was streamlined;
- A financial plan was in place for the Zhangjiakou Water Supply Company to service the debt within a reasonable time frame while recovering other costs and earning profits;
- The municipal government of Zhangjiakou has funds to repay international and domestic loans within 6 years and will have funds for future development;
- The construction commission, which is responsible for Zhangjiakou's new water treatment plant has the funding required to finish its work;
- The proposed tariffs are affordable for domestic customers and poor households benefit from a new program to provide relief from cost of their water bills;

- Public hearings make the tariff approval process transparent, encourage cost control and service improvements, promote understanding of the importance of tariff increases and help to support tariff adjustments;
- The institutional capacity to control costs and tariff increases was strengthened; and
- Water conservation was improved by tariff increases and an appropriate tariff structure.

7. Multi-year tariff adjustment proposals such as the one developed for Zhangjiakou will result in other benefits. First, the underlying financial plan for the proposal provides the basis of a service contract between the municipality and the water supply companies, which can serve as a tool to control costs. Second, the long term financial planning provides a framework within which to attract private investors.

8. The ADB's wastewater tariff study TA implemented between 2002 and 2003 also contributed to the Government's initiative to tariff reforms. The major output of the TA was a detailed draft National Guidelines for Urban Wastewater Tariffs (NGWWT), which comprises a short and concise main text of 37 clauses, and 5 annexes covering:

- Rationale and explanation;
- Tariff calculation methodology;
- A model agreement for tariff billing and collection,
- Penalty and administrative remedies for non-payment; and
- A model contract for industrial discharge to sewer network.

9. The TA's recommendations on wastewater tariff policies, objectives and structure were supported by MOC, who indicated their intention to use the recommendations in preparing the draft NGWWT for submission to the PRC State Council for approval in 2005. The PRC policy guidance on setting wastewater tariffs was amended by Circular No. 1192, issued in September 1999 by the NDRC, MOC and SEPA jointly. The Circular includes provisions that wastewater tariffs be set on the basis of full cost recovery principles but allows local governments flexibility in deciding the time scale for implementation.

10. Since the Wuhan Municipal Government (WMG) is required to implement the NGWT and the NGWWT, the Zhangjiakou Implementation Regulation is a good example to follow. Cost recovery is a key issue for successful implementation of Project components involving water supply and wastewater services. An effective tariff mechanism is needed to ensure sufficient contributions from beneficiaries to recover O&M, overhead and debt servicing costs. Tariff revenues can also serve as an effective source of counterpart funds during project implementation. During the Interim Review Mission in September 2005, the Mission stated that the introduction of appropriate wastewater tariffs in the suburban districts is necessary to ensure cost recovery. The Executing

Agency (EA) addressed the necessity to construct wastewater treatment facilities with the financial support from WMG in Caidian and Dongxihu. Such support will act as a model and will have strong demonstrative effects to other suburban districts and areas for the overall water and wastewater management in Wuhan. During the Mission, Wuhan Project Management Office (WPMO) confirmed that it was the Government policy that wastewater tariffs be introduced in the suburban districts, and a realistic step-by-step wastewater tariff increase could be only applied progressively to specific project related areas in the two suburban districts. The WPMO recognized the need for tariff increases and their belief that required tariffs are generally affordable. It was agreed that the PPTA consultant work with the EA and WPMO to establish a realistic wastewater tariff increase action plan for the subprojects' related areas in the two suburban districts. The Mission stated that suitable assurances from the Government would be included in the loan documentation to ensure cost recovery in the suburban districts. The tariff increase action plan for the suburban districts and related assurances would be further discussed at the Loan Fact Finding Mission.

11. Wastewater charges were implemented in the central urban area of Wuhan in 1988 at a rate of CNY 0.08 / m³. The rate has been increased progressively over the years to the current level of CNY 0.80 / m³. The increase is equivalent to 400 % from 1988 to 2005. Between 1999 and 2005, the wastewater tariff has increased by 317 %, while the water tariffs have increased by about 14 %. The aggregate (water plus wastewater) tariff increase for different categories of consumers are:

- domestic 86 %;
- industrial 70 %;
- institution 83%;
- commercial 53%; and
- special industry 47%.

12. It is noted that wastewater tariffs had not yet been introduced in Caidian, while CNY 0.05 / m³ wastewater tariff is levied on top of tap water sold in Dongxihu.

13. The PPTA consultants conducted discounted cash flow (DCF) analysis and financial statement projections to test wastewater tariff required to achieve full cost recovery for the Project. It was realized that it would not be possible to apply a uniform wastewater tariff in a whole suburban district given one subproject would serve only a small area in the one suburban district, while residents in the other area are not beneficiaries. In view of that, it is important to identify the subproject related area where a wastewater tariff introduction or increase is to apply. Equally important issues to achieve full cost recovery and to ensure long term sustainability of a subproject include :

- realist population projection in the subproject related area;

- realistic water demand assessments in the subproject related area, as a wastewater tariff is to be levied on top of the water sold;
- improved water supply system; and
- strengthened water and wastewater tariff revenues collecting system.

14. For the subprojects in the central urban area, given that the current wastewater tariff is CNY 0.80 / m³, a progressive tariff increase plan with an initial increase to CNY 0.95 / m³ in real terms in 2006 the subproject implementation commences. The wastewater tariff is suggested to increase further to CNY 1.00 / m³ in real terms in 2009.

15. An initial wastewater water tariff of CNY 0.40 / m³ in real terms is proposed to be introduced in 2006 or 2007 in Dongxihu for WMG to accumulate significant amount of fund during construction period. It is further suggested that the wastewater tariff in real terms be increased to CNY 0.95 / m³ in 2010 and onwards for full cost recovery of the subproject and to cover wastewater treatment costs incurred.

16. For the subproject in Caidian, a progressive wastewater tariff increase plan has been suggested. An initial wastewater water tariff of CNY 0.40 / m³ in real terms being introduced in 2006 or 2007 in the subproject related area would allow the Caidian district and WMG to accumulate fund during construction period. The wastewater tariff in real terms is proposed to increase to CNY 0.80 / m³ in 2010 when the subproject comes into initial operation, and then to CNY 0.95 / m³ in 2012 when the wastewater system is fully operational.

17. The wastewater charges on beneficiaries in the two suburban districts would initially be set at adequate and affordable levels to achieve full cost recovery for the subprojects. WMG has indicated its intention to consider the same wastewater tariffs to be applied to the whole Wuhan municipality in the long run.

Appendix K4

Private Sector Participation Strategy for the Wuhan Wastewater Sector

1. Introduction

This appendix identifies a possible strategy for improving the standard of wastewater management in Wuhan through a staged and structured approach to private sector involvement (PSI). It must be emphasized from the outset that this strategy cannot be considered as a definitive solution, rather it needs to be tested by a more rigorous and staged design and review process. Indeed it is the absence of such a rigorous process that has often led to inappropriate or badly designed PSI initiatives being implemented. A proposed PSI should go through a process similar to a construction project

- Identification of need (agreement of objectives/purpose)
- Conceptual design
- Detailed Design
- Procurement
- Implementation

PSI solutions can be applied at a project level or at a sector level; at sector level they can be single city or multi-city in scope. Here the scope of this paper is the Wuhan (ie whole city) wastewater sector. It is not project specific and therefore integrated with the more project specific PPTA work.

The reason for this approach is that the WWSMP was conceived and has been designed as a public sector project. Whilst private investment in the Project could have been built into the project design this was not considered appropriate in developing initial financing plans. To redesign the Project to fully embrace PSI is not viable at this stage without causing significant delay, and there is no specific evidence this would result in an improved outcome. The PSI strategy developed here does not therefore disturb proposed financing arrangements for WWSMP, but instead looks at future opportunities for effective use of PSI, including ways to unlock sunken public sector investment capital in the future.

The approach taken in this paper is to:

- Briefly review the historic use of PSI in the Hubei wastewater sector
- Identify the relevant objectives for adopting PSI solutions
- Consider a possible PSI strategy going forward, together with alternatives for detailed investigation.

- Identify specific issues and factors that should be considered at the detailed investigation stage.

2. Historic Use of PSI in the Wuhan Wastewater Sector

In accordance with central PRC government policy WMG has embraced the policy of using diversified funding sources for urban construction and has undertaken a number of such initiatives in recent years. Wastewater PSI has been restricted in scope to the following:

Two wastewater BOT projects for construction and operation of WWTP
A linked EPC contract and operating concession for Hanxi WWTP
Flotation of part of the equity of the Three Towns Investment Company

The two wastewater BOTs involve the construction and operations of the Tansun Hu (50,000 m³/d capacity) and Zhuankou (60,000 m³/d) WWTP. The Hanxi WWTP is currently under construction and due to become operational in 2006. It will have an eventual capacity of 400 m³/d. These PSI initiatives are all understood to have been entered into on a negotiated basis with the same contractor - Kaidi Power and Environment Company. The first two facilities are already operational but there are understood to be contractual difficulties due to low volumes of wastewater being delivered to the WWTP because of inadequacies in the local sewerage collection networks. The precise reasons for the failure of these PSIs has not been investigated in detail as to do so is not within the scope of the PPTA and would require a detailed analysis of the contract documents, more detailed site investigations, and discussions with the contracting parties. However it is noteworthy that:

- All three contracts were negotiated rather than competitively bid
- The contractual terms are not known indicating a lack of transparency
- It is understood that WDC has no involvement and is not a contracting party
- The deals do not appear to be consistent with institutional reforms agreed between WMG and both the ADB and WB.

It would appear that insufficient efforts were put into the design of at least two of these PSI deals. It is too early to judge the success of the Hanxi WWTP deal. The inherent competitiveness of the deals are also an unknown factor, although the absence of bidding does not necessarily mean they are not competitive.

The Three Towns initiative is not a PSI in the traditional sense as it did not result in the construction of additional infrastructure, and merely involved the asset transfer of certain water assets (including a large Pumping Station) to support the creation and partial stock market flotation of this investment company.

A common problem in introducing PSI is for governments to move too quickly to implement more sophisticated models of PSI before they have sufficient capacity to manage them. Governments can overcome this problem by deliberately experimenting with more simple forms of PSI initially and then moving up to more complex models as expertise and capacity to manage them is created. A further advantage in this staged approach is that the simpler models as well as being easier to manage are also generally shorter in duration and easier to terminate/change if they go wrong.

3. Objectives for Adopting PSI Solutions to Wastewater Management

Government objectives for introducing the private sector can potentially include one or more of the following:

- Provision of investment capital (for either treatment plants or the network or both)
- Improvements in the efficiency of capital investments
- Improvements in the efficiency of operations and maintenance
- Improved service levels
- Improved customer responsiveness
- Reductions in government involvement in sector management
- Access to greater technical expertise
- Access to management expertise

It is important that government makes a clear decision on its objectives in adopting PSI because some PSI solutions are better suited to meeting some objectives than others. ***The determination of objectives is therefore crucial to successful PSI design.***

The Annex to this Appendix provides a step by step approach to matching the basic PSI models to government objectives. It is important to emphasize that it is possible to combine several PSI models as a means of achieving ones objectives.

For WMG the majority of required WWTP investment will have been made once the WWSMP has been completed. Undoubtedly some ongoing capital investment will be needed in the future but this will be at a lower level than over the last decade, and will probably focus on improvement to the collection network. However, the operation and maintenance of WWTP in Wuhan is relatively new, and also there is evidence that management and operation of the sewerage network can be improved, together with operational efficiency. A further opportunity that PSI potentially provides is to “unlock” capital investments already made and thus providing a source of investment capital that can be used for other purposes. PSI models that unlock investment capital include concessions, TOT and full or partial divestiture of assets.

Under these circumstances a key decision WMG needs to make is the extent it wants to raise finance from wastewater PSI. A second strategic decision is whether it wishes to restrict PSI to the management and operation of treatment plants or is prepared to allow PSI across the whole sector.

One common concern of government in the introduction of PSI is how to make the PSI arrangement socially acceptable, that is ordinary customers will accept the arrangement as adding value in the provision of wastewater services and be a balanced arrangement that potentially offers benefit to all stakeholder groups. These are likely to become important concerns in Wuhan - and especially so because of the apparent poor performance of PSI that has been experienced so far. Use of stakeholder analysis and identifying stakeholder expectations and concerns is a well proven way of designing PSI arrangements that are capable of being socially acceptable.

4. A Possible PSI strategy for the Wuhan Wastewater Sector.

In order to suggest a PSI strategy it is first necessary to assume (preferably agree) the objectives of using the private sector. Discussions held in Wuhan, together with our analysis of relative strengths and weaknesses of wastewater management in Wuhan indicate the main objectives would be:

- Introduction of a new source of investment capital for use in future investments after WWSMP.
- Improving the standards and efficiency of wastewater operations.
- Unlocking capital from previous investments and using this for other public investments less able to attract private capital.

WDC has shown it is able to undertake the project management of large wastewater investments and there is strong engineering design capability in Wuhan. Therefore the need for private sector involvement in engineering design and construction is only likely to be appropriate where use of advanced technology is being contemplate, and for which no local expertise or experience exists. Thus a BOT for Huangpu Lu WWTP would have been a potentially viable option if this had been considered at the outset. However, apart from this example, there does not appear to be any obvious advantage in use of BOT in the local situation found in Wuhan, where alternative financing methods are available. Also the cost of capital in a BOT arrangement is almost always higher than other financing means leading to greater upward pressure on tariffs.

TOT is a currently favoured option by many Chinese cities for unlocking capital from previous investments. However, this PSI model has few other advantages

and the cost of the capital released is likely to be even higher than for BOT (as the TOT contractor has to use existing infrastructure and does not have the opportunity to design in the operating and other efficiency improvements that are available to a BOT contractor). In considering a TOT, governments must always remember that the TOT investor will focus on strength of net revenue stream and not on WWTP asset value.

Realization of operational service and efficiency improvements through PSI can be achieved by letting simple service contracts (outsourcing), longer term management contracts or concessions, or by partnership with a strategic investor. The concession and strategic investor options also make available new sources of investment capital.

Simple outsourcing initiatives can be proceeded with independently and as part of the broader PSI strategy. Creation of a shareholder company leading to stock market flotation is an alternative way of attracting diversified external finance and, once the initial flotation has been made) has the benefit that the cost of this capital can be readily assessed by the market price of the shares. However, stock market flotation alone does not give access to outside management and technical expertise that a strategic investor would bring. Also depending on circumstances a strategic investor may pay more or less than market price for shares in a water/wastewater utility – depending on what future risks or opportunities the strategic investor identifies.

Based on the above considerations it would appear the most appropriate model for PSI in Wuhan would be to:

- **Firstly**, make early progress in gaining some experience of competitive outsourcing to gain experience in managing this type of contract, and also to better assess the potential service and efficiency improvements that might be available.
- **Secondly**, and in parallel with the outsourcing initiative, to conduct more detailed investigations into creation of a shareholder company that raises part of its capital through a strategic investor and/or stock market flotation.

Normally strategic investors will look to invest in the larger utilities where they can get best leverage from the technical and managerial expertise they introduce. Equally to make stock market flotation viable and cost effective (as there are administrative overheads with this) then a large corporate entity is required, probably even more so than for strategic investor interest. These factors suggest the most appropriate entity to select for this purpose would be the Wuhan Water Services Group.

A further strategic option to investigate and consider would be to create two water services groups giving each one part of the city to serve. The most logical

way of implementing this would be to use the Yangtze river as a natural boundary in the service area of the two companies. This approach loses a degree of economy in scale but facilitates comparative competition between the two service providers. It would probably better fit with strategic investment and less so with the stock market flotation model.

5. Other Considerations

1. Strategic investment could be combined with a stock market flotation, giving advantages of both.
2. A stock market flotation could be structured to give incentives and opportunities to Wuhan water consumers to invest in their own water & wastewater utility. This opportunity if well presented and publicized could overcome public concerns over the lack of transparency and profiteering that often surface with public service "privatizations"
3. One or two strong privatised or semi-privatized water services groups would form a strong platform to extend private sector arrangement to suburban districts through merger with water companies in those areas. Those suburban utilities are much less likely to be able to attract good quality private investors yet probably have even greater needs in terms of investment capital and service improvements.
4. The strategy provided above can and should be pursued independently of the WWMP and WWSMP implementations. Indeed the fact most WWTP investment in Wuhan has made use of foreign capital with related engineering safeguards will likely give some assurance to private investors on the quality of assets they would inherit.
5. The consulting services of WWSMP could be used in part to further further develop the PSI strategy and advise on the implementation, especially the outsourcing aspects.

ADB TA - 4436 - PRC

Project Preparatory Technical Assistance Wuhan Wastewater and Storm Water Management Project

**Final Report
December 2005**



Volume 2 - 5

Consultant
Black & Veatch (Asia) Ltd

Executing Agency
Wuhan Municipal Government

Asian Development Bank
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FINAL REPORT

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ADB TA - 4436 - PRC

**Project Preparatory Technical Assistance
Wuhan Wastewater and Storm Water
Management Project**

Final Report

December 2005

Volume 2

Summary Environmental Impact Assessment

Consultant

Black & Veatch (Asia) Ltd

Executing Agency

Wuhan Municipal Government

Environmental Assessment Report

Summary Environmental Impact Assessment
Project Number: 34472
January 2006

PRC: Wuhan Wastewater and Storm Water Management Project

Prepared by government agency for the Asian Development Bank (ADB).

The summary environmental impact assessment is a document of the borrower. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff, and may be preliminary in nature.

CURRENCY EQUIVALENTS

(as of 15 December 2005)

Currency Unit	–	yuan (CNY)
\$1.00	=	CNY 8.11

The exchange rate of the RMB is determined under a floating exchange rate system. In this report a rate of \$ 1.00 = CNY 8.11 is used.

ABBREVIATIONS

ADB	–	Asian Development Bank
A ² O	–	anaerobic/anoxic/oxidation
AP	–	affected person
BAF	–	biological aerated filter
BOD	–	biochemical oxygen demand
COD	–	chemical oxygen demand
CSC	–	construction supervision company
DI	–	design institute
EIA	–	environmental impact assessment
EIRR	–	economic internal rates of return
EMC	–	environmental management consultants
EMP	–	environmental management plan
EPB	–	Environmental Protection Bureau
FSR	–	feasibility study report
GDP	–	gross domestic product
HEPB	–	Hubei Provincial Environmental Protection Bureau
H ₂ S	–	hydrogen sulfide
IA	–	implementing agency
NH ₃ -N	–	ammonia nitrogen
NO ₂	–	nitrogen dioxide
NH ₃	–	Ammonia
O&M	–	operation and maintenance
PDMF	–	project design and monitoring framework
PE	–	polyethylene
pH	–	factor of acidity
PMO	–	Project Management Office
PPTA	–	Project Preparatory Technical Assistance
PRC	–	the People's Republic of China
RP	–	Resettlement Plan
SBR	–	sequencing batch reactor
SEIA	–	Summary Environmental Impact Assessment
SEPA	–	State Environmental Protection Administration
SO ₂	–	sulfur dioxide
SS	–	suspended solids
TA	–	technical assistance
TN	–	
TP	–	
TSP	–	total suspended particles
uPVC	–	unplasticised polyvinyl chloride

WEPB	–	Wuhan Municipal Environmental Protection Bureau
WMG	–	Wuhan municipal government
WWTP	–	wastewater treatment plant
WWMP	–	Wuhan Wastewater Management Project

WEIGHTS AND MEASURES

dB	–	decibel
ha	–	hectare
m ³	–	cubic meter
m ³ /s	–	cubic meter per second
mg/L	–	milligram per liter
km	–	kilometer
km ²	–	square kilometer
m ²	–	square meter
mm	–	Millimeter
m/s	–	meter per second
m ³ /d	–	cubic meter per day
t/d	–	tonne per day
t/y	–	tonne per year

NOTES

- (i) The fiscal year (FY) of the Government coincides with the calendar year.
- (ii) In this report, "\$" refers to US dollars.

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I. INTRODUCTION

1. Rapid economic growth and continuing urbanization places pressure on an overloaded urban infrastructure and causes a rapid increase in the demands for urban services and the environmental threats from pollution. The growing need for basic urban services is straining the physical and financial capacity of most cities to provide adequate wastewater and storm water infrastructure. This has led to a deterioration of the quality of life for urban residents, degradation of the urban environment, and inefficient economic development. Of the total industrial wastewater discharged annually in the People's Republic of China (PRC), less than 40 % is treated. This causes severe pollution of streams, canals, rivers, lakes and oceans. Municipal wastewater management is still at an early stage, with only 35% of urban wastewater treated in 2000. In most of the PRC cities, untreated industrial wastewater is the major source of water pollution which poses a risk to public health, particularly by waterborne diseases. Because of the seriousness of the situation, the Government is paying increasing attention to water resources management, wastewater treatment and pollution control, storm water management, and the formulation of associated investment plans. Government policies require that urban environmental pollution and ecological damage be controlled by 2010, and recent State guidelines require that major cities, such as provincial capitals, have a wastewater treatment rate of 80% by 2010.¹

2. Water quality in Wuhan section of the Yangtze River (also referred to as the Changjiang River) has decreased over the last 15 years mainly due to the wastewater discharge from the city. In 2004, about 2.0 million cubic meter per day (m³/d) of wastewater was generated, but the four wastewater treatment plants (WWTPs) had capacity to treat only 27% of this quantity. To achieve sustainable wastewater management and water resource protection, Asian Development Bank (ADB) approved the Wuhan Wastewater Management Project (WWMP) in 2003, which will increase the WWTP capacity to 45% of the wastewater generated by 2008. The Municipal Government is undertaking a comprehensive wastewater management program through 2010. The proposed Project complements the ongoing WWMP, the World Bank Urban Improvement Project, and wastewater treatment facilities constructed with bilateral assistance from Poland and Finland. The WWMP supports the construction of three WWTPs and associated wastewater collection systems, as these facilities have not yet been completed it cannot be established yet whether the anticipated benefits of the WWMP will be achieved fully.

3. Wuhan is served by a mixture of wastewater, storm water and combined sewer networks and its urban and suburban areas face a serious and growing deficit in infrastructure, service and environment. Wuhan Municipal Government (WMG) is accordingly planning a comprehensive urban drainage and flood control program through 2010. The proposed Project will assist WMG in developing further a practical approach to provide urban environmental services, incorporating the principles of integrated water resource management and pollution control. The Project will help improve the urban environment and public health through improved wastewater and storm water management. The Project will provide sufficient capacity for the city to treat 80% of the wastewater generated by 2010, and WMG is working on the implementation of the city's wastewater masterplan for longer term compliance with national environmental targets. The Project will improve the quality of surface and groundwater in and downstream of the project districts, and will also help improve the quality of life for urban poor by reducing waterborne diseases and relieving urban flooding threats. The Project will have a direct beneficial impact on

¹ National guidelines for construction of municipal wastewater treatment facilities require that all major cities should have a wastewater treatment rate of 80% of wastewater generated by 2010. Notice on Planning the Construction of Municipal Wastewater Treatment and Water Reuse Facilities Throughout the Country. National Development and Reform Commission, Ministry of Construction, State Environmental Protection Administration. 15 March 2005.

the lives of approximately three million people including 0.23 million with incomes below the official poverty line. Another three million people will benefit indirectly as a result of the Project.

4. Economic development has degraded the aquatic environmental quality in Wuhan. The surface waters have been seriously polluted: 56% of the rivers and 89% of the lakes in Wuhan have been polluted to different levels with organic materials and nutrients. This situation is worse for urban areas and lakes than for rural areas and rivers. Severe pollution accidents have occurred several times in the Han River (1992, 1998 and 2000), the largest drinking water source for Wuhan. Moreover along the Yangtze River, the other major drinking water source, a pollution belt (band of near shore pollution) has formed, which has led to adverse impacts on the intakes of water treatment plants. Therefore increased municipal wastewater treatment capacity is necessary for Wuhan.

5. This Summary Environmental Impact Assessment (SEIA) report has been prepared under a project preparation technical assistance² (PPTA) which has contributed to the preparation of the Project in a form suitable for partial financing by ADB. The PPTA has added value to the Project through: (i) recommendations of specific changes to improve the design or implementation of the Project, (ii) independent confirmation of the justification of the Project to facilitate smooth processing, and (iii) identification of proposals for further investigations and studies.

6. The SEIA is primarily based on information contained in the Environmental Impact Assessment (EIA) reports and forms for the 9 subprojects in the Wuhan Wastewater and Storm water Management Project, to be partially funded by a loan from the ADB. These reports and forms were prepared by a specialist environmental company (Junbang) engaged by the Wuhan Project Management Office (PMO). These EIA reports have just been approved by Hubei Provincial Environmental Protection Bureau (HEPB) in January 2006. Additional information was obtained by the PPTA consultant through a series of meetings with local environmental, socio-economic and resettlement specialists, with project planners and design engineers, and with officers from the PMO. Direct observations during site visits to the project area further improved the understanding of the general project settings and the physical conditions of the surrounding environment. The SEIA also draws information from the two preliminary Resettlement Plans³ (RPs), the project feasibility study report⁴, project social and poverty assessment reports,⁵ prepared by local specialists and reports, review and assessment by the PPTA consulting team. Data contained in the EIA reports and other above referenced reports were updated, where appropriate, during the SEIA preparation, following ADB safeguard policies and environmental assessment guidelines. WMG will approve the SEIA prior to uploading on ADB's website.

7. This SEIA was prepared in accordance with PRC Environmental Impact Assessment Technical Guidelines and ADB *Environmental Assessment Guidelines* (May 2003). It was based on the EIA reports and forms for the individual subprojects prepared using methods and standards consistent with guidelines established by the State Environmental Protection

² ADB TA No.4436-PRC, May 2005, Technical Assistance to the People's Republic of China for Preparing the Hubei Wastewater and Storm Water Management Project.

³ Project Implementing Agencies, 2005, Resettlement Action Plans.

⁴ Wuhan Municipal Engineering Design and Research Institute and Wuhan Municipal Planning Design & Research Institute, September 2005, Draft Feasibility Study Report for the Wuhan Wastewater and Storm Water Management Project.

⁵ PPTA Consultants, 2005, Social Assessment Report and the Assessment Report Poverty Alleviation in Project Area, for the overall project.

Administration (SEPA) and in compliance with applicable laws and regulations.

II. DESCRIPTION OF THE PROJECT

8. The Project consists of five wastewater management subprojects and four storm water management subprojects. The Project Area is shown in Map 1, while the locations of the wastewater and storm water subprojects are shown in Map 2 and Map 3 respectively. More detailed maps of the individual subprojects are given in Appendix 2. Key features of these subprojects are summarized in Table 1 below. The outputs of the nine subprojects include: (i) WWTPs capable of providing secondary treatment to about 490,000 m³/d of untreated or partially-treated industrial and domestic wastewater, (ii) more than 37 kilometers (km) of sewers and nine pumping stations for wastewater collection, (iii) more than 7 km of pipelines and box culverts, and more than 13 km of open canal for storm water drainage, and (iv) 210 cubic meter per second (m³/s) of additional storm water pumping capacity through the expansion of two existing pumping stations and the construction of one new pumping station.

Table 1: Summary of Subprojects

District	Subproject	Sewers or Drains	Pump Stations	Treatment Capacity
Wastewater Management Subprojects				
Wuchang	Erlangmiao WWTP Expansion and Upgrade	Nil	Nil	Existing 180,000 m ³ /d (Primary) WWTP to be upgraded and expanded to 240,000 m ³ /d (Secondary)
Hanyang	Nantaizi Lake WWTP Expansion and Wastewater Collection System	7.43 km of collection system	Three pumping stations (0.31 m ³ /s, 0.53 m ³ /s, 2.1 m ³ /s)	Existing 100,000 m ³ /d (Secondary) WWTP to be expanded to 200,000 m ³ /d (Secondary)
Hankou	Huangpu Road WWTP Upgrade	Nil	Nil	Existing 100,000 m ³ /d (Screening) WWTP to be upgraded to Secondary
Dongxihu	Dongxihu Wastewater Collection System	25.35 km of collection system	Five pumping stations (0.3 – 2.0 m ³ /s)	Nil (Wastewater to be discharged to Hanxi WWTP)
Caidian	Caidian WWTP and Wastewater Collection System	4.59 km of collection system	One pumping station (1.0 m ³ /s)	New 50,000 m ³ /d (Secondary) WWTP
Storm water Management Subprojects				
Hangyang	Yangsigang Pumping Station and Drainage	1.34 km of pipeline and 1.90 km of culvert	One pumping station (20 m ³ /s)	Nil
Storm water Management Subprojects				
Dongxihu	Three Gates Connection	3.91 km of culvert, 4.34 km of channel, and renovation of 4.48 km of existing channel.	Nil	Nil
Dongxihu	Changqing Pumping Station Expansion	Nil	Existing pumping station to be increased by	Nil

District	Subproject	Sewers or Drains	Pump Stations	Treatment Capacity
Storm water Management Subprojects				
			135 m ³ /s	
Wuchang	Luojia Road Pumping Station Expansion and Drainage	0.39 km of culvert and renovation of 8.81 km of existing channel	Existing pumping station to be increased by 55 m ³ /s	Nil

km = kilometer, m³/d = cubic meter per day, m³/s = cubic meter per second, WWTP = wastewater treatment plant
Source: Draft Feasibility Study Report

9. The Project also proposes several institutional and capacity building components including: (i) support for the further development of a regional water quality model which has commenced under the ADB's WWMP; (ii) a pilot inflow/infiltration study in the Erlangmiao catchment to address the cause of relatively weak wastewater, which will contribute to the detail design of the wastewater subprojects; (iii) training in operation and maintenance of wastewater treatment facilities; (iv) support to WMG for a strategic sludge management study; and (v) monitoring of future performance of the operation and maintenance (O&M) of the wastewater facilities against a number of indicators under the Project design and monitoring framework (PDMF).

A. Wastewater Component

10. **Erlangmiao wastewater subproject** serves an area of 32.2 square kilometers (km²) and a population that is expected to reach 723,800 in 2020. There is an existing WWTP with a capacity of 180,000 m³/d which provides primary treatment of wastewater. Partially treated wastewater is currently discharged from the WWTP to the Yangtze River. The facilities proposed include an expansion of the capacity of the WWTP to 240,000 m³/d and the upgrade of the process to provide secondary treatment. In future the fully treated wastewater will be discharged to the Yangtze River.

11. **Nantaizi Lake wastewater subproject** serves an area of 67.0 km² and a population that is expected to reach 610,900 in 2015. There is an existing WWTP with a capacity of 100,000 m³/d which provides secondary treatment of wastewater. Untreated wastewater which currently discharges into local watercourses and drains and then to Nantaizi Lake, Moshui Lake, Longyang Lake and Sanjiao Lake will be collected and treated. The facilities proposed include 7.43 km of new collection system and expansion of the capacity of the WWTP to 200,000 m³/d. In future the treated wastewater will be discharged to the Yangtze River.

12. **Huangpu Road wastewater subproject** serves an area of 7.48 km² and a population that is expected to reach 311,900 in 2010. There is an existing WWTP with a capacity of 100,000 m³/d which provides preliminary treatment of wastewater through screening and grit removal. Partially treated wastewater is currently discharged from the WWTP to the Yangtze River. The facilities proposed include an upgrade of the process to provide secondary treatment. In future fully treated wastewater will be discharged to the Yangtze River.

13. **Dongxihu wastewater subproject** serves an area of 55.2 km² and a population that is expected to reach 210,000 in 2015. Untreated wastewater which currently discharges into local watercourses and drains and then to Jinyin Lake will be collected and treated at the existing Hanxi WWTP. The facilities proposed include 18.67 km of new collection system. In future treated wastewater will be discharged to the Fu River.

14. **Caidian wastewater subproject** serves an area of 23.8 km² and a population that is expected to reach 165,000 in 2015. There is no wastewater treatment facility at present. Untreated wastewater from the area currently discharges into local watercourses and drains and then into the Han River. The facilities proposed include 4.59 km of new collection system and a new WWTP with a capacity of 50,000 m³/d which will provide secondary treatment of wastewater. In future treated wastewater will be discharged to the Han River.

B. Stormwater Component

15. **Yangsigang storm water subproject** serves an area of 3.67 km² and a population that is expected to reach 53,000 in 2020. The area served is currently affected by flooding. Wastewater and storm water currently discharges to Moshui Lake and the Yangtze River. The facilities proposed include 1.34 km of pipeline, 1.90 km of box culvert and a pumping station of 20 m³/s capacity. In future wastewater will discharge to the Nantaizi WWTP and storm water will discharge to the Yangtze River.

16. **Three Gates Connection storm water subproject** serves an area of 54.5 km² and a population that is expected to reach 756,000 in 2020. The area is currently affected by flooding. Wastewater and storm water currently discharges to Jinyin Lake and the Fu River. The facilities proposed include 3.91 km of box culvert, 4.34 km of open canal, and renovation of 4.48 km of existing canal. In future wastewater will be discharged to the Hanxi WWTP and storm water will discharge to the Fu River.

17. **Changqing storm water subproject** serves an area of 54.5 km² and a population that is expected to reach 756,000 in 2020. The area is currently affected by flooding. Wastewater and storm water currently discharges to Jinyin Lake and the Fu River. The facilities proposed include an increase in the capacity of the existing pumping station by 135 m³/s. In future wastewater will discharge to the existing Hanxi WWTP and storm water will discharge to the Fu River. This subproject complements the Three Gates Connection subproject which provides a new canal that will convey storm water to the Changqing pumping station.

18. **Luoja Road storm water subproject** serves an area of 154 km² and a population that is expected to reach 646,000 in 2020. The area served is currently affected by flooding. The facilities proposed include 0.39 km of box culvert and 8.81 km of open channel, and an increase in the capacity of the existing pumping station by 55 m³/s. In future storm water will discharge to the Yangtze River.

III. DESCRIPTION OF THE PROJECT

A. General Project Setting and Physical Environment

19. The project area is located in Wuhan City, in the eastern part of Hubei Province. It lies in the middle and downstream portions of the Yangtze River, east of the Jiangnan Plain. The topography of Wuhan is characterized by a plain in the central area, hilly terrain in the northern and southern parts, and low mountains in the north. There are many lakes and ponds in the project area. The land elevation varies from 21 to 30 meters (m) above sea level, with a natural gradient of approximately 0.1%. The soil is mostly clay and sandy clay.

20. The project area is in the subtropical monsoon climate zone. The climate is characterized by distinct seasonal variation and abundant rainfall. Average annual precipitation is 1,281 millimeters (mm), with the majority occurring from May to October. The annual average

temperature is 15.8 to 17.5°C, with recorded temperatures ranging from 41.3°C (August) to -18.1°C (January). The annual average relative moisture is 80% and average annual non-frozen time is 211 to 272 days. The wind directions are primarily from southeast in the summer and from the north and northeast during the winter with an annual average wind speed of 2.7 meter per second (m/s).

B. River System and Hydrology

21. The project area is in the Yangtze River basin and is criss-crossed by rivers, channels, and drainage ditches. Surface waters, such as the Yangtze River and the Han River, are the primary water sources for most residential, commercial, industrial, agricultural, and fishery use, which are characterized as high flow throughout the year. The total annual water resources are 707 billion cubic meter (m³) in Wuhan. Besides the Han River, six other major tributaries, including the Fu River, flow into the Yangtze River. Within Wuhan there are also more than 350 smaller rivers, 147 lakes (38 within the urban area), 273 reservoirs, and 113 channels and drainage ditches (44 within the urban area). The Wuhan Urban Area Lakes Protection Plan (2004-2020) was approved in March 2005 to protect the 38 urban lakes including Longyang Lake, Moshui Lake, Nantaizi Lake, and Sanjiao Lake which are involved in this project.

C. Water Quality

22. The project location is now heavily urbanized, and many of the water bodies in the urban areas of Wuhan are deteriorating in quality as a result of the ongoing discharge of untreated wastewater. This wastewater eventually drains in part to some lakes, in part to the Han River, in part to the Fu River and in part direct to the Yangtze River itself. The receiving water bodies for the service areas with and without the proposed subprojects are presented in Table 2.

Table 2: Receiving Water Bodies for the Proposed Subprojects

Proposed Subproject	Service Area	Receiving Water Courses	
		Existing	Proposed
Wastewater Management Subprojects			
Erlangmiao WWTP	Wuchang and Hongshan Districts	Yangtze River	Yangtze River (through Shahu Channel and Luoja Channel)
Nantaizi Lake WWTP	Hanyang District	Nantaizi Lake, Moshui Lake, Longyang Lake, Sanjiao Lake	Yangtze River
Huanpu Road WWTP	Jiang'an and Jianghan Districts	Yangtze River	Yangtze River
Caidian WWTP	Caidian District	Han River	Han River
Dongxihu sewer system	Dongxihu District	Jinyin Lake	Fu River (receiving water course for effluent from Hanxi WWTP)
Storm water Management Subprojects			
Yangsigang Drainage Improvements	Hanyang District	Combined sewerage to: Yangtze River, Moshui Lake	Storm water to: Yangtze River Wastewater to: Yangtze River through Nantaizihu WWTP

Storm water Management Subprojects				
Luojia Drainage Improvements	Road	Qingshan District	Yangtze River	Yangtze River
Dongxihu Gates Connections	Three	Qiaokou District	Combined sewerage to: Fu River, Jinyin Lake	Storm water to: Fu River Wastewater to: Fu River through Hanxi WWTP
Changqing Station Expansion	Pumping	Dongxihu District	Combined sewerage to: Fu River, Jinyin Lake	Storm water to: Fu River Wastewater to: Fu River through Hanxi WWTP

WWTP = wastewater treatment plant

Source:

23. The current and target water quality of these water bodies are given in Tables 3 and 4: in the project area rivers current water quality is relatively good and meets or is close to the target water quality; but in the project area lakes current water quality is poor and exceeds Class V. The main pollutants detected are chemical oxygen demand (COD), biochemical oxygen demand (BOD₅), ammonia nitrogen, nutrients and coliform bacteria.

Table 3: Water Quality of Major Rivers Involved in the Project

Receiving Water Bodies		Target Water Quality	Existing Water Quality	Major Pollutants Exceeding the Standard	Planning Functions in 2010
Yangtze River	Shamao ^a	Class III	Class III	No	Water source, floodway, navigation, ecological regulation, tourism
	Yangsigang	Class III	Class III	No	
	Baihushan ^b	Class III	Class IV	Fecal coliform bacteria	
Han River	Guojiatai ^a	Class III	Class III	No	Water source, floodway, navigation, ecological regulation, tourism
	Xingang	Class III	Class III	No	
	Zongguan	Class III	Class III	No	
	Longwangmiao ^b	Class III	Class IV	Fecal coliform bacteria	
Fu River	Taipingsha ^a	Class IV	Class IV	No	Floodway, ecological regulation, tourism
	Lijia Gate	Class V	Class V	No	
	Daishan Bridge	Class V	>Class V	Ammonia Nitrogen, Fecal coliform bacteria, TP	
	Zhuji River mouth ^b	Class V	>Class V	Ammonia Nitrogen, Fecal coliform bacteria, TP	

TP =

Note: ^a Section where the river enters Wuhan

^b Section where the river leaves Wuhan

Monitoring Year: 2004;

Sources: 2004 Wuhan Environmental Monitoring Briefing, Wuhan Water Environmental Management and Protection Plan issued in March 2005, draft EIAs of the Project

Table 4: Water Quality of Major Lakes Involved in the Project

Receiving Water Bodies	Target Water Quality	Existing Water Quality	Major Pollutants Exceeding the Standard	Planning Functions in 2010
Nantaizi Lake	Class IV	>Class V	Permanganate index, BOD ₅ , Ammonia Nitrogen, TN, TP, Fecal coliform bacteria, COD	Urban park and lake wetland (landscape and entertainment, water storage, ecological regulation)
Moshui Lake	Class IV	>Class V	BOD ₅ , Ammonia Nitrogen, TN, TP, COD	Scenic spot (landscape and entertainment, water storage, ecological regulation)
Longyang Lake	Class III	>Class V	Permanganate index, BOD ₅ , Ammonia Nitrogen, TP, TN, volatile hydroxybenzene, COD	Scenic spot (landscape and entertainment, water storage, ecological regulation)
Sanjiao Lake	Class III	>Class V	Permanganate index, BOD ₅ , TP, Oil, COD, Ammonia Nitrogen	Urban park (landscape and entertainment, water storage, ecological regulation)
Sha Lake	Class IV	>Class V	Permanganate index, BOD ₅ , TP, TN	Urban park (landscape and entertainment, water storage and ecological regulation)
Jinyin Lake	Class III	>Class V	TP, TN, COD	Scenic spot (ecological regulation, landscape and entertainment, water storage, irrigation)

BOD₅ = biochemical oxygen demand, COD = chemical oxygen demand, TN = Monitoring Year: 2004

Sources: 2004 Wuhan Environmental Monitoring Briefing, Wuhan Water Environmental Management and Protection Plan issued in March 2005, draft EIAs of the Project

24. The Target Water Quality for rivers and lakes are related to the functional classification of the waters as noted in Tables 3 and 4 above,⁶ and are considered reasonable: Class III for potable water sources, fisheries, contact recreational use; Class IV for general industrial use, non-contact recreational use; and Class V for agricultural use and general aesthetics.

D. Ecological Environment

25. Biological resources are relatively abundant and diverse in Wuhan with camphor trees, *B.sinospinosa* McClure, fir, tea, camellia oleifera abel, parasol tree, glossy privet and orange, while in the north, there are mainly horsetail pine, metasequoia, chinara, deciduous cypress, robur, persimmon, millet and so on. In the Caidian flooded area some natural aquatic plants are present such as wormwood, reed, Chinese lotus and fern. There are also some species from foreign countries such as olive, marsh fir, black cypress, pine and cherry blossom. Major crops are rice, corn, tea and rapeseed.

26. The Yangtze River has an abundant ecological system and within Wuhan provides migration channels for the endangered white-flag dolphin and Chinese paddlefish, which are Class I protected species in the PRC. Various lakes area are local bases for fishery, and aquaculture is one of the major activities, with over 20 major species include grass carp, silver carp, chub and the famous Wuchang fish. Major aquatic animals include wild goose, stork, cowfish, turtle. White stork is classified as a rare water fowl with Class I protection, and cowfish has Class II protection.

⁶ GB3838-2002: Environmental Quality Standards for Surface Waters June 2002

27. It is not anticipated that the Project will have any significant adverse impact on the ecological environment, and the anticipated improvements in water quality in lakes and rivers should have a beneficial effect.

E. Social and Economic Conditions

28. As the capital of Hubei Province, Wuhan is the Province's main political, economic, trading, information and cultural center and also a famous historical and cultural city. Major social and economic conditions of the project area are summarized in Table 5.

Table 5: Major Social and Economic Conditions

Items	Values
Population	Total population: 7,859,000 [Urban: 4,340,000 Suburban: 3,519,000]
Land	Total area: 8,494 km ² [Urban: 888 km ² Suburban: 7,606 km ² Farmland: 2,060 km ² (paddy land 1249 km ² , dry land 802 km ²)
Administrative Area	7 urban districts: Hanyang, Hongshan, Jian'an, Jiangnan, Qiaokou, Qingshan, Wuchang, 6 suburban districts: Caidian, Dongxihu, Hannan, Huangpi, Jiangxia, , Xinzhou
Economics	Gross Domestic Product (2004): RMB 195.6 billion Disposable income per urban resident (2004): RMB 9,564 per year Income per rural resident (2004): RMB 3,955 per year
Water Supply	10 existing water supply plants with capacity of 2,900,000m ³ /day in urban area, and 2 water supply plants with capacity of 120,000 m ³ /day in suburban and rural areas Population with access to tap water: 100%
Wastewater Treatment	4 existing WWTPs (Erlangmiao, Huangpulu, Longwangzui, Shahu) with capacity of 530,000 m ³ /day (of which 480,000 m ³ /day is preliminary or primary treatment). Urban domestic wastewater collection and treatment rate: 27%
Transportation	4,752 km highways, 2,920 km major railways, one international airport
Educational Facilities	52 universities and/or colleges (615,800 students), 531 middle schools (543,200 students), 1,192 primary schools(577,700 students)
Medical Facilities	142 hospitals (28,700 beds)
Ecology	Greenbelt in built urban area: 36.0%, 2 nature reserves with area of 404 km ²
Historical and Tourism	17 public libraries, 57 theaters, 16 museums, 5 scenic spots with area of 339 km ² , 32 parks, 339 cultural sites (eg Guiyuan Temple, Yellow Crane Tower, Qingchuan Pavilion)
km = kilometer, km ² = kilometer, m = meter, m ³ /day = cubic meter per day, RMB = Sources: 2005 Wuhan Basic Facts, Draft FSR of the Project.	

IV. ALTERNATIVES

A. With or Without the Project

29. Wuhan is deficient in wastewater treatment facilities and the water quality of many surface waters (particularly the urban lakes) cannot meet the designated water use. Storm water drainage is inadequate and flooding in some areas of the city is common. Without the Project, surface water and groundwater will continue to be polluted and the water quality of the receiving waters will deteriorate. Flooding will continue to be experienced and may be exacerbated in future as development continues

30. With the Project, living conditions in significant urban and suburban areas of the city will

be improved by increased collection and treatment of wastewater and reduced flooding. The wastewater management component will provide secondary wastewater treatment for 440,000 m³/d in the urban area of Wuhan, bringing the total wastewater treatment capacity in the urban area to more than 80% of the wastewater generated. Water quality of surface waters such as the Fu River, the Han River, East Lake, Sha Lake, Nantaizi Lake, Moshui Lake, Longyang Lake, Sanjiao Lake and Jinyin Lake will improve, and drinking water sources will be protected. The storm water management component will reduce the frequency and severity of flooding in several urban areas.

B. Alternatives for Wastewater Collection

31. The wastewater management component mostly involves expansion and upgrade of existing WWTPs, so analysis of alternative configurations of collection system has been limited, except for the Nantaizi and the Caidian subprojects for which two alternative configurations were considered. For the Caidian subproject alternative pipeline materials (unplasticised polyvinyl chloride [uPVC], polyethylene [PE] and concrete) were considered. For newly developed areas wastewater will be collected in separate systems to the surface water, whereas in areas which are already fully developed and which are served by existing combined drainage systems the separation of wastewater and surface water collection will be progressively introduced.

C. Alternatives Sites for Wastewater Treatment

32. For the Nantaizi and Caidian wastewater subprojects, alternative sites were considered for the WWTPs. The proposed sites were selected based on land acquisition and resettlement, environmental impacts, capital costs, O&M costs and the wastewater collection system.

D. Alternatives Sites for Wastewater Treatment

33. The proposed WWTPs will all provide secondary treatment. Alternative processes considered included: (i) anaerobic-aerobic-oxic (A²/O) process, (ii) variants of oxidation ditches, (iii) high-rate sedimentation with biological aerated filter (BAF), and (iv) sequencing batch reactor (SBR). The proposed processes were selected based on effluent quality required, construction and operating cost, available site area and the existing processes already used. For Erlangmiao WWTP, A²/O was selected because of the effluent quality required; for Nantaizi WWTP, an anaerobic tank plus a carousel oxidation ditch was selected as this process is already used; for Huangpu Road WWTP, high-rate sedimentation plus BAF was selected because of the limited area available; and for Caidian WWTP, an anaerobic tank plus a carousel oxidation ditch was selected.

34. For Erlangmiao WWTP and Huangpu Road WWTP alternatives were also considered regarding the extent of odor control facilities to be provided, through either partial or complete covering of process units, with associated ducting and treatment of odorous gases using biological soil filter or biofilter. For both of these WWTPs it is proposed that partial covering of the inlet works and sludge treatment processes should be undertaken, with scope for covering other process units in future if necessary. No odor control is currently proposed for Nantaizi Lake WWTP or for Caidian WWTP.

E. Alternatives for Industrial Wastewater Treatment

35. The following alternatives for treatment of industrial wastewater are possible: (i) full wastewater treatment facilities for major industries to meet environmental discharge standards

and municipal WWTPs for domestic wastewater only, (ii) pretreatment facilities at individual industrial sites to meet sewer discharge standards and municipal WWTPs for domestic and pretreated industrial wastewater, or (iii) larger municipal WWTPs for all domestic and industrial wastewaters. The second alternative is the most environmentally reliable and has the least negative impact. Pretreatment provides protection to the biological treatment processes at the municipal WWTPs. Professionally-managed municipal WWTPs would be more reliable than many industry-operated WWTPs discharging effluent directly into watercourses.

F. Alternatives for Effluent Reuse)

36. Wuhan has abundant surface water resources available and effluent reuse is not proposed under the Project for any of the wastewater subprojects except for service water within the WWTPs. Use of effluent from Nantaizi WWTP in a proposed constructed wetland area is being considered, but this does not form part of the Project.

G. Alternatives Sludge Disposal)

37. Sludge will be produced from the operation of each of the Project WWTPs and also from the construction of drainage facilities which are to be upgraded. Alternatives for sludge disposal considered included: (i) landfill, (ii) incineration, and (iii) beneficial reuse in landscaping. Beneficial reuse is the preferred method of disposal if the quality is acceptable, otherwise landfill will be adopted, as it has been confirmed that incineration will not be used. However a sludge management study is required to consider the disposal of sludge from all the city's WWTPs including those which are to be constructed under the Project.

H. Alternatives Sludge Disposal)

38. Alternatives considered for storm water management, included two alternative locations for Yangsigang pumping station, alternative configurations of pumping stations, and two alternative alignments for the Three Gates Connection drainage system. For the Yangsigang subproject the selected pumping station location minimized the length of the pressure mains that would be required with the associated land acquisition. For the Three Gates Connection subproject the selected alignment is parallel to an existing large drainage channel rather than close to the eastern shore of Jinyin Lake.

39. As noted above, full separation of wastewater and storm water is proposed for newly developed areas, while in areas which are already fully developed and which are served by combined drainage systems the separation of wastewater and surface water collection will be progressively introduced. The combined flow is either treated at WWTPs (some combined flows enter into Erlangmiao and Huangpu Road WWTPs) or is discharged at designated locations where wastewater services are not accessible. (Combined flows from western Hankou are currently discharged into Jinying Lake, but will be discharged into the Fu River with the implementation of the Three Gates Connection and Changqing Pumping Station subprojects.

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

A. Positive Impacts and Environmental Benefits

40. The Project can be anticipated to bring significant benefits to the urban and suburban areas of Wuhan and the water systems downstream through some water quality improvements associated with the collection and treatment of wastewater in accordance with the progressive

implementation of the City's overall wastewater masterplan. These project benefits will be cumulative with those achieved through other earlier and ongoing interventions in the sector. The Project will have a direct beneficial impact on the lives of approximately 2.59 million people, including 0.23 million with incomes below the official poverty line. Another 2.2 million people who live outside of the Project service area will benefit indirectly as a result of the Project.

41. There is currently no comprehensive detailed water quality model available for predicting the cumulative impact of the improved wastewater collection or of the disposal of treated effluent on the quality of the receiving water bodies.⁷ According to the process design of the four WWTPs it is estimated that reductions of 20,100 tonne per year (t/yr) of BOD₅, 35,800 t/yr of COD, 24,700 t/yr of suspended solids and 340 t/yr of total phosphorus will be achieved after all of the WWTPs become operational, which will result in improvements to the water quality of the existing receiving waters. These improvements in water quality will reduce risks of algal blooms in the receiving water courses and reduce risks of disturbance to water treatment plants and other users located downstream. The anticipated improvements in water quality, particularly of urban lakes, will also have a beneficial effect on the natural environment.

42. Significant health benefits can be anticipated due to decreased exposure to waterborne and water washed disease, particularly through the increased collection of wastewater leading to improvements in water quality and the improved management of storm water. It is estimated that 37,000 cases of illness will be avoided each year

43. Reductions in the frequency and severity of flooding will bring other substantial benefits too through improvements to the urban environment, reduced disruption to commercial and social activities and improved economic activity. There will be a reduction in women's burden of work by reducing time spent cleaning after flooding, and there will be an increase in disposable income by reduction of lost work days, the direct costs of flooding and medical treatment costs

44. The Project will result in the direct creation of 5,000 full-time jobs over the 5 year construction period and 220 permanent jobs in the new project facilities. The Project will also result in the indirect creation throughout the regional economy of 8,100 person-years of work over the construction period and 130 permanent jobs once operations begin.

B. Mitigation Measures during Design Phase

45. The following mitigation measures will be undertaken during the design phase:

- (i) all subproject sites will be carefully selected to avoid or minimize potential impacts to the environment and surrounding communities;
- (ii) the facilities will be located and designed to minimize resettlement impacts;
- (iii) the WWTP layouts will be designed so sources of noise and odors will be as far away from nearby residential areas as possible;
- (iv) the WWTP designs will limit odor emissions and noise to acceptable levels; and
- (v) mitigation measures requiring design such as landfill site drainage control, leachate collection and treatment plants, will be incorporated into the design of sanitary landfills.

⁷ A comprehensive water quality model is being developed under the ADB funded Wuhan Wastewater Management Project.

C. Environmental Impacts and Mitigation Measures during the Construction Phase

46. Construction activities are expected to generate the following adverse impacts:

- (i) **Airborne dust** will be caused by excavation, demolition, vehicle movement and materials handling, particularly downwind from the construction sites.
- (ii) **Air pollution** will be caused by emissions from vehicles and machinery.
- (iii) **Noise** will be caused by construction equipment and vehicular movement, potentially affecting nearby residents and schools.
- (iv) **Traffic congestion** will be caused by pipeline construction and increased construction traffic in urban areas. Roads may be fully or partially closed during construction causing temporary inconvenience to residents, commercial operations and institutions.
- (v) **Waste discharge from construction camps.** The discharge of wastewater from construction camps could create potential new pollution sources. The camps could also be sources of solid waste and waste oil from machinery maintenance.
- (vi) **Excavated materials.** Pipeline and drainage construction will generate about 1.5 million m³ of excess materials for disposal, of which about 280,000 m³ may be odorous, while site preparation for the treatment plants will need 750,000 m³ of fill material.⁸
- (vii) **Interruption of municipal services.** Construction of project facilities may require relocation of underground municipal utilities such as sewers, gas, water supplies, communication cables, and power poles.
- (viii) **Land impact.** About 3.5 hectares (ha) of land will be temporarily occupied by construction activities while pipelines and pumping stations are being constructed, which may require removal of vegetation and temporary disturbance to livelihoods.

47. Based on the results of the impact assessments, the following mitigation measures will be taken during the construction phase:

- (i) Construction sites, transportation routes and materials handling sites will be water-sprayed on dry and windy days up to three times a day, especially if these sites are near sensitive receptors, such as residential areas.
- (ii) Vehicles and construction machinery will be required to be properly maintained and to comply with relevant emission standards.
- (iii) Construction activities will be scheduled carefully to minimize the impact of noise from construction machinery. Night time uses of certain noisy machines, such as pile-drivers and concrete vibrators, will be prohibited.
- (iv) In conjunction with the relevant authority, traffic plans will be prepared ahead of construction in congested urban areas.
- (v) Sewage and other wastewater from construction camps will be collected and treated using septic tanks before being discharged to avoid contamination of the surrounding areas.

⁸ Volumes of excavated and fill materials to be confirmed during design development.

- (vi) Temporary land occupation will be planned well ahead of the construction to minimize the impact of the disturbance. Land will be reinstated to its original condition on completion of construction.
- (vii) Materials will be stored appropriately and covered or sprayed to minimize dust.
- (viii) Construction waste will be promptly removed from the sites. Burning of construction waste will be prohibited.
- (ix) Materials will be covered during transportation to avoid spillage or leakage.
- (x) Construction will be immediately suspended if any archaeological or other cultural properties are found. The relevant cultural authority, as well as the PMO, will be notified promptly, and only after a thorough investigation will construction resume.
- (xi) Contractors will be required to take necessary safety measures at the construction sites to protect the public, and warning signs will be provided to alert the public of potential safety hazards at and around the construction sites.
- (xii) All contractors and construction supervisors will be required to participate in an environmental training program before construction begins.

48. The above mitigation measures will, where appropriate, be included in the tender documents and subsequently in the construction contracts.

D. Environmental Impacts and Mitigation Measures during Operation Phase

49. The primary air emissions from the WWTPs will be nuisance odors generated by preliminary treatment and sludge treatment processes. The pumping stations could also be a source of odor. The main constituents of such odors are typically ammonia (NH₃), hydrogen sulfide (H₂S), and methyl sulfide. An air diffusion model was used by the domestic consultants in the EIAs to predict odor concentrations, which showed that without odor control the required standards⁹ for NH₃ and H₂S cannot be met for any of the proposed WWTPs except Caidian WWTP, and so odor control facilities are proposed for Erlangmiao WWTP and Huangpu Road WWTP. The expected air quality around the WWTPs can then meet the required standards¹⁰ for residential areas except for limited downwind areas, and buffer zones are proposed as noted below in Table 6 to avoid odor impacts. A complaints desk will be established by the Drainage Company.

Table 6: Proposed Buffer Zones around the WWTPs

Subproject	Estimated Impacted Distance (m)	Buffer Zone (m)	Minimum Distance to Existing Residential Area (m)
Erlangmiao WWTP	25	50	35
Nantaizi WWTP	200	200	200
Huangpu Road WWTP	40	50	120
Caidian WWTP	100	80	400

m = meter, WWTP = wastewater treatment plant

Source: Draft EIAs of the Project

⁹ Discharge Standard of Pollutants from Municipal WWTPs (GB18918 – 2002).

¹⁰ Industrial Enterprise Design Sanitation Standard (TJ 36-79) for residential areas around WWTPs.

50. Overall there should be a positive impact in terms of air quality related to odor. Currently, there are many urban and suburban residents living close to open ditches, rivers or canals which carry some untreated domestic and industrial wastewater. Through the construction of the proposed wastewater collection systems, many of these open ditches will be improved or covered.

51. Chlorine leakage could result in serious injury to WWTP staff and in property damage. Mitigation measures include: (i) the installation of safety detectors and chlorine scrubber systems, (ii) minimizing the amount of chlorine stored on-site, (iii) placing a buffer zone around the chlorine room, (iv) providing gas masks and breathing apparatus for workers, and (v) providing training on safe operational procedures.

52. Corrosive, toxic and explosive gases and liquids could accumulate in long-distance trunk sewers, resulting in structural damage, sewer leakage and threat to life or injury. Mitigation measures will include: (i) inspection of potential sources, (ii) reasonable spacing between manholes to allow access and sampling to track sources, (iii) implementation of emergency response plans by coordinating associated city agencies, and (iv) training on safe operational procedures on entry into confined spaces.

53. The four municipal WWTPs will generate about 235 tonnes per day (t/d) of sludge cake containing around 75% moisture for disposal. The Project proposes use of landfill at existing or proposed solid waste disposal sites. A key potential environmental concern is contamination of groundwater and surface water by leachate unless it is contained by an impermeable layer which allows leachate to be collected for subsequent treatment. Leachate treatment will be included in the sanitary landfills design. Proposed landfills should be sited such that there are no sensitive receptors in immediately adjacent areas.

54. Based on the results of the impact assessment, the following mitigation measures have been identified for the operations phase: (i) ensure facilities are operated as designed through training of plant managers and operators, and the use of indicators of plant performance; (ii) develop contingency plans for power failure, overflows, equipment malfunctions and other conditions which may result in discharge of raw wastewater into the receiving environment; (iii) consult regularly with residents in nearby communities and respond promptly to any concerns raised; and (iv) landscape project sites and include trees, lawns and community parks.

E. Land Acquisition and Resettlement

55. People affected physically and economically by the Project include: (i) people affected by the acquisition of land; (ii) people affected by the temporary use of land for the wastewater collection systems, WWTPs, storm water drainage and pumping stations; and (iii) people whose livelihoods are impacted during construction activities. The nine subprojects will require the permanent acquisition of 62.5 ha of land, the temporary acquisition of 26.0 ha of land, and the demolition of 39,288 square meter (m²) of residential buildings, and 18,881 m² of non-residential buildings. The affected people are summarized in Table 7 below. It is understood that no indigenous people or ethnic minorities will be adversely affected by the nine subprojects.

Table 7: Summary of Permanently Affected Households / Enterprises and People

	Storm Water Component	Wastewater Component	Total
Directly Affected Households	268	83	351
Directly Affected Persons	1,383 ^a	364	1,747 ^a
Directly Affected Enterprises, Institutions and Shops	61	4	65

Source: Draft RPs of the Project
Note: ^aIncludes 161 floating population

56. The total cost for both land acquisition and resettlement for the nine subprojects is estimated to be CNY 352 million (\$42.9 million) at 2005 prices. Resettlement impacts have been identified and RPs prepared in accordance with PRC land law and ADB's *Policy on Involuntary Resettlement*. The RPs provide a socioeconomic profile of affected persons (APs) and scope of impacts, and address issues related to compensation entitlement, the legal framework, public consultations, grievance procedures, environmental protection, rehabilitation measures, and budget and implementation milestones. Resettlement requirements have been carefully considered and incorporated into project design.

57. WMG and the two implementing agencies (IAs) will implement ADB's full disclosure policy for the resettlement activities, including: (i) preparation of a summary RP; (ii) distribution of the resettlement information booklet to affected persons and enterprises; and (iii) posting of the full resettlement plan in Chinese and English at resident committees, village offices and enterprise offices, and on the ADB website upon its approval and/or endorsement by WMG. The PMO will establish a specific project resettlement office to continue public information activities and respond to any questions or grievances.

58. All APs will be compensated and resettled in a timely and adequate manner in accordance with the RP, so that they will be at least as well off as they would have been without the Project. To ensure that APs have been adequately compensated and rehabilitated, the HPG and the IAs, will keep the ADB informed of the progress of implementation of the resettlement plans through quarterly progress reports until the resettlement is completed and will prepare a resettlement completion report. The PMO and IAs will engage an independent agency for semi-annual monitoring and annual evaluation of land acquisition and resettlement until two years after the land acquisition, resettlement implementation and completion of resettlement.

VI. ECONOMIC ASSESSMENT

59. The Project is based on controlling externalities (water pollution and storm water drainage) and managing natural monopolies (WWTPs, sewerage networks and drainage areas). Its economic rationale is sound. The justification for each wastewater subproject is the application of wastewater treatment to achieve the water quality class assigned to the reach into which the plant will discharge. The justification for the storm water subprojects is to reduce the adverse impact of storm events on normal domestic, commercial and industrial activity. The subprojects have been subject to least-cost analysis to ensure that each component is the most appropriate solution in terms of scale, timing, location, and technology. The future utilization of the wastewater subprojects, especially the WWTPs, will depend on future user charges and the impact of price and income elasticities in an urban environment where household incomes are increasing significantly in real terms. Each subproject has been subject to cost-benefit analysis following

ADB's guidelines. Analysis of the nine subprojects indicates that they will have economic internal rates of return (EIRRs) of at least 12%.

VII. ENVIRONMENTAL MANAGEMENT PLAN

A. Environmental Management

60. The Environmental Management Plan (EMP) covers all phases of the Project from preparation and construction to commissioning and operation, and aims to monitor environmental impacts and their mitigation. The EMP (Appendix 2), has been incorporated in the design stage, and will be incorporated into the construction and operation management plans.

61. The EMP will ensure effective implementation of various identified mitigation measures. During project preparation and implementation, various organizations with different environmental management responsibilities, HEPB, PMO, Wuhan Municipal Environmental Protection Bureau (WEPB), the IAs, design institutes (DIs), environmental management consultants (EMCs), contractors and construction supervision companies (CSCs), have been involved and will be involved in the EMP. The PMO, contractors and IAs, will each nominate full-time dedicated, trained and qualified environmental specialists to undertake environmental management activities and ensure effective implementation of the EMP.

62. Plans for public involvement during the design, construction and operation phases have been developed during the project preparation stage. These plans include public participation in: (i) monitoring impacts and mitigation measures during the construction and operation phases, (ii) evaluating environmental and economic benefits and social impacts, and (iii) interviews after the Project has been completed. There will be several types of public involvement, e.g. site visits, workshops, investigation of specific issues, interviews, and public hearings as presented in the EMP.

63. The PMO will ensure that the Project's progress and impacts are monitored and reported in line with ADB requirements. The effectiveness of mitigation measures and monitoring plans will be evaluated through the feedback reporting system. The measures required by the EMP will be adjusted if necessary.

64. Costs of all mitigation measures during the construction phase will be included in the tender and contract documents and will be borne by contractors. Costs related to mitigation measures for the operation phase will be borne by IAs. Cost of EMCs and of training will be borne by the Project as a whole. Corresponding cost estimates are presented in the EMP.

B. Environmental Management

65. A detailed environmental monitoring program is presented in the EMP, which complements the monitoring proposed in the Project Design and Monitoring Framework (PDMF). Environmental monitoring programs will evaluate the: (i) extent and severity of environmental impacts as compared to the predicted impacts, (ii) performance of the environmental protection measures and compliance with related rules and regulations, (iii) trends of impacts, and (iv) overall effectiveness of the project EMP.

66. During the construction and operation phases, the IAs will be responsible for monitoring the performance of their facilities and the environmental impact of the Project. Each IA will make appropriate arrangements for monitoring in consultation with WEPB and monitoring reports will

be made available to WEPB on a monthly basis. WEPB has qualified staff with monitoring equipment and technical capability for monitoring of the aquatic, air, and physical environment (noise), soil and receiving water conditions, solid waste disposal, industrial pretreatment, water source pollution control and traffic conditions. When any complaints are received from the public, monitoring staff will immediately conduct additional inspections. The laboratories of WEPB are appropriately certified, assuring the accuracy of the analytical results and their legal standing.

67. Besides compliance monitoring, detailed internal environmental monitoring programs during the construction and operation phases with higher monitoring frequency will be prepared at the beginning of project implementation by PMO, IAs and EMCs. These monitoring programs and budgets will be included in the construction and operation contracts and program, with mitigation measures monitored by the CSCs and EMCs. At the beginning of project implementation, the PMO, IAs and the project implementation consultants, will develop comprehensive PDMF procedures to systematically generate data on inputs and outputs of the project components and develop detailed *environmental and related socio-economic indicators* to be used to measure project impacts. Results from the detailed internal environmental monitoring for both construction and operation phases will be submitted by the contractors and the IAs to the WEPB and PMO monthly.

68. Environmental monitoring costs are included in the EMP. During the construction and operation stage, IAs should, monitor the operation of facilities and environmental impact caused by construction and operations according to the requirements of the monitoring plan; and all the cost related to these actions should be borne by IAs and/or their contractors and CSCs. Before implementing the monitoring plan, responsible agencies will present a further detailed breakdown of the estimated budget. During project implementation, the budgets will be adjusted based on actual requirements.

C. Institutional Enhancement

69. The PMO, contractors and the IAs, will each nominate full-time dedicated, trained and qualified environmental specialists to undertake environmental management activities and ensure effective implementation of the EMP. Local governments will ensure that the IAs will have financial and managerial autonomy to operate the project facilities. The environmental management capacities of the IAs will be strengthened by environmental management training provided by the Project as detailed in the EMP. Training will also be provided for the managers and operators of the WWTPs to ensure that the Project facilities are correctly operated.

VIII. PUBLIC INVOLVEMENT AND INFORMATION DISCLOSURE

A. Institutional Enhancement

70. Two rounds of public consultation were conducted during the course of the EIA. The public consultation comprised meetings attended by members of the public and other concerned stakeholders, and a questionnaire survey of project-affected people and beneficiaries from different age groups, genders, educational backgrounds and occupations. Additional consultation was undertaken through inclusion of some queries in the household socio-economic and enterprise surveys undertaken for the poverty and social analysis.

71. The primary objective of the first round of consultation was to disclose information to the public and to gather information on potential concerns about the project. Two meetings were held with a concise project description and a questionnaire in plain language prepared and distributed

to the public at the meetings. The first meeting was held in Erlangmiao WWTP and the second public meeting was held in Caidian Construction Bureau.¹¹ From these meetings, public concerns about the Project are: (i) most participants support the Project and believe adverse impacts can be alleviated by using advanced technologies and appropriate mitigation measures; (ii) the proximity of Huangpu Road WWTP to the proposed River Beach Landscaping Project, Huangpu Road WWTP is a potential concern; (iii) major concerns include odor, noise during construction, mosquitoes and sludge disposal; and (iv) for the proposed Caidian wastewater subproject, the affected people wanted the resettlement and land acquisition compensation to be fair, in compliance with relevant state and provincial policies, and to be paid on time and in full to the affected households.

72. The primary objective of the second round was to communicate the preliminary EIA findings and proposed mitigation measures and determine public acceptance. In August 2005, the second round of public consultation was conducted by questionnaire survey.¹² A summary of main EIA findings, proposed mitigation measures as well as relevant project information and the responsible organizations' contact hotlines were prepared and distributed to the public at the time of the survey.

73. From the results of the second round of public consultation, the major opinions and concerns on the Project can be summarized as: (i) more than 80% of the people surveyed knew about the proposed project through the media, conferences, public meetings etc; (ii) 95% supported the project and have expected social and economic developments and quality of life improvement from project implementation, and more than 77% believed that water quality of local rivers and lakes would be improved significantly; (iii) as for the locations of the proposed WWTPs, more than 95% of the people surveyed thought they were reasonable. Twenty five percent (25%) expressed their concerns on noise, airborne dust and waste during construction and nuisance odor, sludge and effluent discharge during operation of WWTPs. The affected public demanded sound environmental management during construction and operation to minimize impacts to the surrounding communities, and the public surveyed also expected that the project facilities would be well constructed to high quality.

74. During the socio-economic impact analysis of the PPTA, focus group meetings, household surveys and enterprise surveys were undertaken,¹³ which sought views of the public on a wide range of issues related to the Project including environmental aspects. The discussions at the focus group meetings are summarized below by topic covered: (i) as for impact of storm water and wastewater services on households, most agreed that there are problems with odor and mosquitoes and that flooding problems persist in older areas of the city; (ii) anticipated impacts of wastewater or storm water service improvements include elimination of odor and insect problems and increased tariffs; and (iii) as for diseases caused by contaminated wastewater and storm water, skin infections were identified as a disease caused by exposure to flood water, and the hygiene habits of the urban population are generally good and prevent water borne disease. The results of the household and business surveys identified similar views regarding environmental issues as the questionnaire survey.

¹¹ The meeting on 21 July 2005 at Erlangmiao WWTP was attended by 15 participants, while the meeting on 19 September 2005 at Caidian Construction Bureau was attended by 11 participants. The participants included affected residents farmers, police, village committee officers and representatives of affected enterprises. The meeting in Caidian was delayed until confirmation of the proposed location of the WWTP.

¹² A total of 305 copies of a questionnaire were distributed to local residents, office workers, teachers, students and farmers, of which 260 were completed and returned.

¹³ These surveys consisted of 500 households and 100 businesses / institutions.

75. It is considered that the issues and concerns raised by the public through the public consultation process have been appropriately addressed during the EIA and mitigation planning. Specific mitigation measures have been designed to avoid or minimize the adverse impacts of most concern to the public, with specific proposals incorporated into the EMP.

B. Future Plans for Public Involvement

76. Future plans for public involvement during the design, construction and operational phases include public participation in: (i) monitoring impacts and mitigation measures during the construction and operational phases; (ii) evaluating environmental, economic and social impacts; and (iii) interviewing public opinion after the Project is completed.

C. Information Disclosure

77. The final version of the SEIA and EMP will be posted on ADB's website for at least 120 days prior to Board approval. The domestic EIAs are to be made available at the EIA institute and at the PMO office.

IX. CONCLUSION

A. Future Plans for Public Involvement

78. The main project risks include: (i) the EAs failure to implement the required institutional reforms, (ii) failure to increase wastewater tariffs to meet cost recovery targets, and (iii) failure to meet equity requirements to implement the Project.

79. These risks can be addressed by mitigation measures which include: (i) use of contingencies in cost estimates, (ii) appointment of project implementation consultants including EMCs, (iii) use of appropriate project implementation monitoring arrangements, (iv) support from higher levels of government (notably at the provincial level), (v) environmental management training provided by the Project, (vi) a series of specific assurances from Government, and (vii) project reviews by ADB.

80. Assurances and covenants related to the environmental aspects of the Project are required as follows:

- (i) WMG will cause the IAs, to construct, operate, maintain, and monitor the project facilities in strict conformity with (a) all applicable laws and regulations, including national and local regulations and standards for environmental protection, health, labor, and occupational safety; and (b) ADB's *Environment Policy* and the environmental mitigation and monitoring measures detailed in the approved EIAs, SEIA, and EMP for the Project.
- (ii) WMG, will ensure that the IAs provide monthly monitoring reports to PMO who will prepare and submit to ADB semi-annual environmental reports in a format acceptable to ADB until loan closure.
- (iii) WMG and IAs will ensure that: (a) before startup of the WWTPs, measures will be completed to collect wastewater from all major industries, and all substantial residential and commercial discharges; and (b) arrangements will be in place for sludge disposal in accordance with PRC regulations.
- (iv) An industrial pollution control plan will be prepared to ensure effective

pretreatment of industrial wastewater, including relevant monitoring and enforcement arrangements. These plans are to be prepared and submitted to ADB by the end of December 2007.

B. Benefits

81. The Project can be anticipated to bring significant benefits to the urban and suburban areas of Wuhan and the water bodies within the City and downstream through water quality improvements associated with the collection and treatment of wastewater in accordance with the progressive implementation of the City's overall wastewater masterplan. These project benefits will be cumulative with those achieved through other earlier and ongoing interventions in the sector.

82. The nine subprojects are expected to achieve the following targets: (i) water bodies in the project area will meet target water quality levels by 2010, (ii) a total COD reduction of 35,800 t/yr will be achieved by 2010, (iii) 80 % of wastewater within the urban areas of Wuhan will be collected by 2010, (iv) all project-related WWTPs will meet discharge standards from 2010, and (v) all sludge will be disposed of in compliance with PRC regulations by 2010.

83. Significant health benefits can be anticipated, particularly through the increased collection of wastewater leading to improvements in water quality and the improved management of storm water. Reductions in the frequency and severity of flooding will bring other substantial benefits too through improvements to the urban environment, reduced disruption to commercial and social activities and improved economic activity.

C. Potential Negative Impacts and Associated Mitigation Measures

84. The adverse impacts generated by the Project will be avoided or reduced to acceptable levels by taking appropriate mitigation and compensation measures. The main measures include: (i) careful selection of WWTP sites to avoid sensitive locations, (ii) control of noise, dust, and release of wastewater during construction, (iii) soil erosion control during earthworks, (iv) odor and noise control during operation, and (v) landscaping after project completion.

85. Some limited adverse impacts, while mitigated to acceptable levels, include the relocation of 1,747 persons and the permanent loss of about 62.5 ha of land which will be appropriately compensated.

REFERENCES

A. Documents and Reports

1. ADB. 2003. *Environmental Assessment Guidelines*. Manila.
2. ADB. 2003. *Environmental Considerations in ADB Operations. Operations Manual*, Section 20. Manila.
3. ADB. 2002. *Environmental Policy*. Manila.
4. ADB. 2002. Summary Environmental Impact Assessment, Wuhan Wastewater Management Project
5. Wuhan Water Environmental Renovation and Protection Plan, Wuhan Water Bureau, March 2005
6. 2005 Wuhan Basic Facts
7. 2004 Wuhan Environmental Monitoring Briefing
8. 2004 Wuhan Environmental Quality Communiqué
9. Wuhan Municipal Engineering Design and Research Institute and Wuhan Municipal Planning Design & Research Institute, September 2005, Draft Feasibility Study Report for the Wuhan Wastewater and Storm Water Management Project.
10. Environmental impact assessment (EIA) reports for each subproject.
11. Green Water and Blue Sky Action Plan, Wuhan Municipal Environmental Protection Bureau (April, 2002).
12. Summary of Hubei Han River Midstream and Downstream Water Pollution Prevention Plan (Draft) (June, 2003).

B. Laws and Regulations

1. Environmental Protection Law of the PRC (December 26, 1989)
2. Water Law of the PRC (October 1, 2002)
3. Land Management Law of the PRC (January 1, 1999)
4. Water and Soil Conservation Law of the PRC (June 29, 1991)
5. Environmental Impact Assessment Law of the PRC (September 1, 2003)
6. Water Pollution Prevention Law of the PRC (May 15, 1996)
7. Solid Waste Pollution Control Law of the PRC (April 1, 2005)
8. Noise Pollution Control Law of the PRC (March 1, 1999)
9. Air Pollution Prevention Law of the PRC (September 1, 2000)
10. Flood Control Law of the PRC (Jan 1, 1998)
11. River Course Management Ordinance of the PRC (June 10, 1988)
12. Environmental Protection Management Regulations for Construction Projects, issued by the State Council of the PRC (November 28, 1998)
13. Environmental Protection Management Directories for Construction Projects (No 9), issued by SEPA (January 1, 2003)
14. Notice to Strengthen the Environmental Impact Assessment and Management of Construction Projects Financed by Loan from International Financial Organizations, jointly issued by SEPA, the State Planning Commission, the Ministry of Finance and the People's Bank of China (June 21, 1993)
15. Municipal Wastewater Treatment and Pollution Control Technical Policy, jointly issued by Construction Ministry, SEPA, the Ministry of Science and Technology (May 29, 2000)
16. Hubei Wuhan Lakes Protection Regulation (Jan 18, 2002)
17. Hubei Han River Basin Water Pollution Prevention Regulation (May 1, 2000)
18. Wuhan Environmental Protection Regulation (Dec, 1997)
19. Wuhan Surface Water Functional Zones (Jan 1, 2000)

C. Standards

1. Environmental Impact Assessment Technical Guideline (HJ/T2.1-2.3-93, HJ/T2.4-1995, HJ/T19-1997), issued by SEPA
2. Environmental Quality Standards for Surface Water of the PRC (GH3838-2002)
3. Integrated Wastewater Discharge Standard (GB8978-1996)
4. Discharge Standard of Pollutants for Municipal WWTP (GB18918-2002)
5. Municipal Sewer Discharge Standard (CJ3082-1999)
6. Standard of Environmental Noise of Urban Area (GB3096-93)
7. Integrated Emission Standard of Air Pollutants (GB16297-1996)
8. Ambient Air Quality Standard of the PRC (GB3095-1996)
9. Emission Standard for Odor Pollutants of the PRC (GB14554-93)
10. The Control Standards of Pollutants in Sludge for Agricultural Use of the PRC (GB4284-84)
11. Industry Design Sanitation Standard (TJ36-79).

SUMMARY ENVIRONMENTAL IMPACT ASSESSMENT

WUHAN WASTEWATER AND STORM WATER MANAGEMENT PROJECT

IN THE

PEOPLE'S REPUBLIC OF CHINA

APPENDIX 2

ENVIRONMENTAL MANAGEMENT PLAN

November 2005

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ENVIRONMENTAL MANAGEMENT PLAN

A. INTRODUCTION

1. The Environmental Management Plan (EMP) covers all phases of the Project from preparation through commissioning and operation, and aims to ensure the monitoring of environmental impacts and the implementation of environmental mitigation measures. Maps of the five wastewater subprojects are given in Figures A2.1 – 2.5. and Maps of the four storm water subprojects are given in Figures A2.6 – A2.8.

2. Environmental monitoring programs will be carried out and the results will be used to evaluate: (i) the extent and severity of actual environmental impacts against the predicted impacts, (ii) the performance of the environmental protection measures or compliance with related rules and regulations, (iii) trends of impacts, and (iv) overall effectiveness of the project EMP.

3. Environmental protection measures will: (i) mitigate environmental impacts, (ii) ensure compliance with environmental regulations, (iii) provide compensation for lost environmental resources, and (iv) enhance environmental resources.

B. SUMMARY OF POTENTIAL IMPACTS

4. Potential impacts of the Project during the construction and operation phases, as identified by the environmental impact assessment (EIA), as well as corresponding mitigation measures designed to minimize the impacts are summarized in Table A2.1.

C. MITIGATION MEASURES

5. The mitigation measures will be incorporated into tender documents (where appropriate), construction contracts and operational management plans, and will be implemented by contractors and implementing agencies (IAs) under supervision of the project management office (PMO). The effectiveness of these measures will be evaluated based on the results of the environmental monitoring to determine whether to continue or to make improvements. Improvement measures need to be confirmed through stipulated environmental management procedures.

6. Resettlement plans (RPs) were prepared to ensure proper resettlement of the affected persons (APs) to avoid deterioration of APs' quality of life. Details of required actions are given in the project RPs.

Table A2.1: Summary of Potential Impacts and Mitigation Measures

Subject	Potential Impacts	Mitigation Measures ^a	Budget (CNY 10,000)										Remarks
			Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-di an WW	Dong- xihu WW	Luojia Road SW	Yangs -igang SW	Three Gate SW	Chang -qing SW	Total	
Design Stage													
Water	Inadequate attention given to influent characteristics during design, leading to poor performance of WWTPs	Undertake an inflow-infiltration study and incorporate the results in the design of the WWTPs.	0	50	0	0	0	0	0	0	0	50	Design and implementation consultancy budgets
Construction Stage													
Water	Wastewater generated by site construction activities, and runoff of silt-laden water.	Enclose construction sites by a temporary perimeter wall, build temporary drainage ditches and sediment traps	10	5	5	10	10	10	10	10	5	75	Construction budgets
	Short term increase in pollutants in water from channel rehabilitation.	Adopt section by section construction.	0	0	0	0	0	10	0	10	0	20	Construction budgets
	Wastewater generated by construction workers	Install temporary screening to treat washing and cooking wastewater and then discharge into local sewer	5	5	5	5	5	5	5	5	5	45	Construction budgets
		Use existing or provide temporary septic tanks for collection of wastewater from toilets and then discharge into local sewer or remove waste by tanker for disposal to a WWTP.	5	5	5	5	5	5	5	5	5	45	Construction budgets

Subject	Potential Impacts	Mitigation Measures ^a	Budget (CNY 10,000)										Remarks
			Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-di an WW	Dong- xihu WW	Luoja Road SW	Yangs -igang SW	Three Gate SW	Chang -qing SW	Total	
Air	Dust suspension from construction activities and transportation	Enclose construction sites, cover or spray water at exposed storage sites, minimize on-site storage of materials, spray water at construction sites and on dusty roads, transport materials in covered vehicles or in closed containers, control vehicle speeds, and select transport routes.	10	5	5	10	10	10	5	10	5	70	Construction budgets
	Pollution by emissions from vehicles and construction machinery	Operate with proper maintenance and in compliance with relevant emission standards.	2	2	2	2	2	2	2	2	2	18	Construction budgets
Noise	Noise generated by vehicles and construction machinery	Reasonable construction arrangements, install on-site sound barriers, select suitable equipment, correct operation and maintenance, avoid night-time working.	5	5	5	5	5	5	5	5	5	45	Construction budgets
Solid Waste	Refuse generated on construction site	Timely clean-up, transport in covered vehicles or in closed containers.	2	2	2	2	2	2	2	2	2	18	Construction budgets

Subject	Potential Impacts	Mitigation Measures ^a	Budget (CNY 10,000)										Remarks
			Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-di an WW	Dong- xihu WW	Luojia Road SW	Yangs -igang SW	Three Gate SW	Chang -qing SW	Total	
	Disposal of surplus excavated material from construction activities	Reuse surplus material in construction, landscaping or agricultural if suitable or dispose to sanitary landfills if testing shows material to be unsuitable	5	5	5	5	5	5	5	5	5	45	Construction budgets
	Disposal of sludge from rehabilitation of drainage channels and sewer construction.	Characterize sludge, transport to appointed landfill site, along a suitable pre-determined route.	5	0	0	5	10	10	5	10	0	45	Construction budgets
Ecology	Removal or relocation of trees and other vegetation	Replant trees and vegetation on completion of construction.	5	5	5	5	5	5	5	5	5	45	Resettlement Plan budgets ^b
	Run-off of silt-laden water, soil erosion and dust affecting surrounding crops and vegetation.	Enclose construction sites by a temporary perimeter wall, build temporary drainage ditches and sediment traps, spray water to prevent dust.	10	5	5	10	10	10	10	10	5	75	Construction budgets
	Changes of land function following land acquisition	Implement Resettlement Plan in accordance with ADB policies.	-	-	-	-	-	-	-	-	-	-	
Social	Changes of affected people's lives due to land acquisition and resettlement	Implement Resettlement Plan in compliance with ADB policies.	-	-	-	-	-	-	-	-	-	-	- Resettlement Plan budgets ^b

Subject	Potential Impacts	Mitigation Measures ^a	Budget (CNY 10,000)										Total	Remarks
			Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-di an WW	Dong- xihu WW	Luojia Road SW	Yangs -igang SW	Three Gate SW	Chang -qing SW			
Public Safety	Safety hazard to the general public	Provide warning barriers and signage.	5	2	2	5	5	5	5	5	2	36	Construction budgets	
Other	Traffic congestion including inconvenience to pedestrians and shop owners	Construct temporary roads, select transport routes, divert traffic at peak hours, repair disturbed roads shortly after the construction, and make interim traffic arrangements.	5	5	5	5	5	5	5	5	5	45	Construction budgets ^b	
	Disturbance of existing utilities (pipelines, cables)	Avoid other utilities in design and if necessary divert or reinstate during construction.	10	10	10	10	10	10	10	10	10	90	Construction budgets ^b	
	Discovery of cultural artifacts during excavation	Suspend excavation and notify relevant authorities.	2	0	0	2	2	2	2	2	0	12	Construction budgets	
Total			86	66	56	86	91	101	81	101	61	729		
Operational Phase														
Water	Discharge from WWTP outfalls	Select reasonable locations in compliance with national standards, monitor discharge, provide notice boards near outlets.	5	5	5	5	-	-	-	-	-	20	Construction budgets or IA's O&M budgets	

Subject	Potential Impacts	Mitigation Measures ^a	Budget (CNY 10,000)									Total	Remarks
			Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-di an WW	Dong- xihu WW	Luojia Road SW	Yangs -igang SW	Three Gate SW	Chang -qing SW		
	Overflow or bypassing of wastewater	Install standby equipment at pumping stations, use dual power source supply system, implement proper maintenance program, enhance operational monitoring, and emergency measures	20	20	20	20	20	-	-	-	-	100	Construction budgets or IA's O&M budgets
	Damage to sewers of WWTPs from corrosive industrial discharges	Adequate pretreatment of industrial wastewater, selection of appropriate construction materials, adequate process control of WWTPs.	20	20	20	20	20	0	0	0	0	100	Industry budgets, Construction budgets, IA's O&M budgets
	Pollution of receiving water courses following failure to operate WWTPs correctly.	Adequate process control of WWTPs, adequate training of WWTP managers and operators, enhancement of environmental monitoring.	5	5	5	5	0	0	0	0	0	20	IA's O&M budgets
	Pollution of receiving water courses following upset of WWTP processes by industrial discharges.	Adequate pretreatment of industrial wastewater, efficient monitoring and enforcement.	-	-	-	-	-	0	0	0	0	0	0 Industry budgets (cost not estimated)
	Storm water drainage pump failure or collapse or leakage of storm water pipeline resulting in flooding	Implement proper maintenance program, enhance operational monitoring, prepare emergency measures.	-	-	-	-	-	20	20	20	20	80	IA's O&M budgets

Subject	Potential Impacts	Mitigation Measures ^a	Budget (CNY 10,000)										Remarks
			Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-di an WW	Dong- xihu WW	Luojia Road SW	Yangs -igang SW	Three Gate SW	Chang -qing SW	Total	
Air	Odor emitted from WWTPs and wastewater pumping stations.	Cover potential odor sources and treat odorous gases,	0	20	20	0	0	0	0	0	0	40	Construction budgets, IA's O&M budgets
		Dispose of sludge regularly, transport sludge and other residues in covered containers	10	10	10	10	0	0	0	0	0	40	IA's O&M budgets
		Establish buffer zones, provide green zones with vegetation	10	10	10	10	0	0	0	0	0	40	Construction budgets
	Safety risk from chlorine used for wastewater disinfection.	Appropriate storage of chlorine drums, install alarm annunciators, implement proper operation and maintenance, prepare emergency measures.	5	5	5	5	0	0	0	0	0	20	IA's O&M budgets
	Safety risk from toxic gases	Installation of inspection and control equipment, appropriate spacing of manholes, provide ventilation, monitoring atmospheric conditions, adopt safe working systems and emergency measures	10	5	5	10	5	0	0	0	0	35	IA's O&M budgets

Subject	Potential Impacts	Mitigation Measures ^a	Budget (CNY 10,000)									Total	Remarks
			Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-di an WW	Dong- xihu WW	LuoJia Road SW	Yangs -igang SW	Three Gate SW	Chang -qing SW		
Noise	Noise generated by pumps and machinery	Select low noise machines, locate noisy equipment indoors, install noise enclosures or buffers, semi-underground setting of pump stations, provide green zone around WWTPs and pumping stations.	20	10	10	15	10	10	10	0	10	95	Construction Budgets
Solid Waste	Pollution by sludge from WWTPs	Dispose of sludge at sanitary landfills (with leachate collection and treatment) if testing shows sludge to be unsuitable for beneficial reuse	-	-	-	-	0	0	0	0	0	0	0 WMG budgets (not estimated)
	Pollution by sludge or silt from wastewater pumping stations and wastewater collection systems	Timely clean-up and transportation in covered containers to sanitary landfill sites.	10	10	10	10	10	10	10	10	10	90	IA's budgets O&M
	Rubbish generated by workers.	Provide dustbins for collection, timely clean-up and transportation in covered containers to sanitary landfill sites	2	2	2	2	0	2	2	2	0	14	IA's budgets O&M
Landscaping	Urban environmental aesthetics affected	Plant vegetation to screen facilities	10	10	10	10	10	10	10	0	10	80	Construction budgets
Health and safety	Workers may be endangered by pathogenic	Provide personal protective clothing, store chemicals	10	10	10	10	5	0	0	0	0	45	IA's budgets O&M

Subject	Potential Impacts	Mitigation Measures ^a	Budget (CNY 10,000)										Remarks
			Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-di an WW	Dong-xihu WW	Luojia Road SW	Yangs -igang SW	Three Gate SW	Chang -qing SW	Total	
workers	and chemical constituents of wastewater.	safely, encourage good personal hygiene											
Environ-mental Risk	Sewer house connections not completed resulting in discharge of untreated wastewater to watercourses and aquifers	Government assurance to implement connections to house	-	-	-	-	-	0	0	0	0	0	Developer or Local government construction budgets
Total			137	192	142	132	80	52	52	32	50	869	

ADB = Asian Development Bank, IA = Implementing Agency, O&M = operation and maintenance, SW = storm water management subproject,

WW = wastewater management subproject,

^a Responsible Agencies – Implementation: IAs; Supervisory Agencies: WEPB and PMO; Review Agencies: HEPB and ADB

^b Budget can only be determined following completion of surveys and detailed design

Source:

D. ENVIRONMENTAL MONITOR

1. Monitoring Program

7. The Project monitoring program will focus on the environment within the Project area. A detailed environmental monitoring program is presented in Table A2.2. This program considers the scope of monitoring, monitoring parameters and frequency, data processing and quality control requirements. For compliance monitoring, the monitoring will follow the methodology provided in the national standard methods for monitoring pollutants. Other associated standards are national environmental quality standards and pollutant discharge/emission standards. The IAs will be responsible for implementing this program of compliance monitoring.

8. As well as compliance monitoring, detailed and more frequent internal environmental monitoring programs during the construction and operation phases will be prepared at the beginning of project implementation by the PMO, the IAs, the environmental management consultants (EMCs) and the construction supervision companies (CSCs). Internal monitoring will also be undertaken by industry of their wastewater pre-treatment processes. These monitoring programs and budgets will be included in the construction and operation contracts. At the beginning of project implementation, PMO, IAs and the EMCs, will develop a comprehensive project design and monitoring framework (PDMF) procedures to systematically generate data on inputs and outputs of the project components and develop detailed environmental and related social economic indicators to be used to measure project impacts.

9. The PDMF indicators for the Project include service levels, treated wastewater quality and other measures of operational performance, percentages of wastewater collected and treated, user satisfaction with the urban environment, and relevant economic and social data, such as income and health, to monitor project impacts. Under the PDMF, baseline and progress data will be reported at the requisite time intervals by the IAs. The IAs will be responsible for analyzing and consolidating the data through their management information system (MIS). The PDMF will be designed to permit adequate flexibility to adopt remedial action regarding project design, schedules, activities, and development impacts. The PMO and IAs will refine the PDMF, confirm achievable goals, firm up monitoring and recording arrangements, and establish systems and procedures no later than 6 months after loan effectiveness.

2. Monitoring Management

During the construction and operation phases, IAs will be responsible for monitoring the performance of their facilities and the environmental impact of the Project. Each IA will make appropriate arrangements for monitoring in consultation with the Wuhan Municipal Environmental Protection Bureau (WEPB) and monitoring reports will be made available to the WEPB on a monthly basis. When complaints are received from the public, WEPB's monitoring staff will conduct additional immediate inspections.

Table A2.2: Environmental Monitoring Program

Item	Monitoring Details	Budget, CNY 10,000 (annually)									Total, CNY 10,000 (annually)
		Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-dia n WW	Dong-x ihu WW	Luoja Road SW	Yangsi-gang SW	Three Gate SW	Chang -qing SW	
<u>Construction Phase</u>											
Air Monitoring		2	2	2	2	2	2	2	2	2	18
Locations	Construction sites, haul roads, borrow area										
Parameters	TSP, PM ₁₀ , NO ₂										
Frequency	4 times a year, 2 days duration, 2 times a day										
Noise Monitoring		2	2	2	2	2	2	2	2	2	18
Locations	Sensitive areas within 150m from construction sites										
Parameters	Noise										
Frequency	4 times a year, 2 days duration, 2 times a day										
Water Quality Monitoring		5	5	5	5	5	5	5	5	5	45
Locations	Water courses close to construction sites										
Parameters	COD, BOD ₅ ,SS, NH ₃ -N, pH, oil										
Frequency	4 times a year, 3 days duration, 2 times a day										
Total – Construction Phase		9	9	9	9	9	9	9	9	9	81
<u>Operation Phase</u>											
Air Monitoring		1	1	1	1	1	0	0	0	0	5
Locations	Boundary of and sensitive locations surrounding WWTPs and pumping stations										
Parameters	Odor, NH ₃ , H ₂ S										

Item	Monitoring Details	Budget, CNY 10,000 (annually)									Total, CNY 10,000 (annually)
		Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-dia n WW	Dong-x ihu WW	Luoja Road SW	Yangsi-gang SW	Three Gate SW	Chang -qing SW	
Frequency	4 times a year, 2 days duration, 2 times a day										
Noise Monitoring		1	1	1	1	1	1	1	0	1	8
Locations	Boundary of and sensitive locations surrounding WWTPs and pumping stations										
Parameters	Noise										
Frequency	4 times a year, 2 days duration, 2 times a day										
Surface Water Quality Monitoring		2	2	2	2	2	2	2	2	2	18
Locations	Surface water control sections										
Parameters	BOD ₅ , COD, SS, O&G, heavy metals, pH, color, turbidity, organic substances, total P, total N										
Frequency	4 times a year, 3 days duration, 2 times a day										
Wastewater Quality Monitoring		10	10	10	10	0	0	0	0	0	40
Locations	WWTP inlets, WWTP outlets										
Parameters	Temperature, pH, COD, SS: once per 4 hours BOD ₅ , NH ₃ -N, total P, total N: once a week WWTP operation will also be monitored by PMO and EMCs by applying performance indicators (to be developed prior to WWTP start-up): semi-annually										
Sludge Monitoring		5	5	5	5	2	2	2	2	2	30
Locations	WWTPs, sanitary landfill sites, drainage and sewerage systems, pumping stations										
Parameters	Moisture content, heavy metals										
Frequency	Various times and durations as necessary for disposal purposes										

Item	Monitoring Details	Budget, CNY 10,000 (annually)									Total, CNY 10,000 (annually)
		Nantaizi Lake WW	Erlang miao WW	Huang -pulu WW	Cai-dian WW	Dong-xihu WW	Luojia Road SW	Yangsi-gang SW	Three Gate SW	Chang-qing SW	
Total – Operation Phase		19	19	19	19	6	5	5	4	5	101

BOD = biochemical oxygen demand, COD = chemical oxygen demand, H₂S = hydrogen sulfide, m = meter, N = nitrogen, NH₃ = ammonia, NH₃-N = ammonia nitrogen, NO₂ = nitrogen dioxide, O&G = , P = phosphorus, pH = factor of acidity, PM₁₀ = SS = suspended solids, TSP = total suspended particles, WWTP = wastewater treatment plant

Note: Detailed internal monitoring program during the construction and operation phases will be prepared at the beginning of project implementation by PMO, IAs and EMCs.

In addition to regular compliance monitoring, other unannounced monitoring will be carried out to determine compliance.

Source:

E. PUBLIC CONSULTATION

1. Public Consultation during Project Preparation

11. Direct public participation was conducted through two rounds of public consultations by EIA preparation agencies following PRC national guidelines and Environmental Impact Assessment Technical Guidelines, and the project preparatory technical assistance (TA) consultants following ADB *Guidelines Operations Manual* (F1/OP issued on 29 October 2003).

2. Future Public Consultation Plan

12. Plans for public involvement during the design, construction and operation phases were developed during project preparation. These plans include public participation in: (i) monitoring impacts and mitigation measures during the construction and operation stages; (ii) evaluating environmental and economic benefits and social impacts; and (iii) interviewing the public after the Project is completed. These plans will include several types of public involvement, such as site visits, workshops, investigation on specific issues, interviews, and public hearings as indicated in Table A2.3.

13. The public participation plans are part of the project implementation and management plan. IAs are responsible for ensuring there is public participation during project implementation. The contractors will be asked to communicate and consult with the communities near the construction site. An eye-catching public notice board will be erected at each construction site to notify the public of the main construction activities and the construction duration. The board will also provide contact names and telephone numbers to enable for the public to express their concerns and complaints about the construction activities. Costs for public participation activities during project implementation are included in the project funding. The costs are estimated as CNY 22,000 for each expert workshop, CNY 9,000 for each public investigation on a particular issue, CNY 6,000 for each resettlement survey, CNY 12,000 for each public workshop, and CNY 5,000 for each press conference.

Table A2.3: Public Consultation Plan

Organizer	Approach	Times	Subject	Attendees
A. Project Preparation				
PMO, EIA Preparation Company, PPTA Consultants	Public meeting	Once	Environmental quality status, project information, major impacts and benefits, mitigation measures, and attitudes, comments and recommendations of the public	Residents, enterprises and other stakeholders within construction and service area, specialists from various sectors
	Questionnaire	Once		
PMO, Fanhua Company, PPTA Consultants	Social survey	Once		
PMO, Wuhan University, PPTA Consultants	Survey on resettlement	As required by relevant RP	Comments on resettlements, improvement of living conditions, livelihood and poverty reduction; comments and suggestions	Persons affected by resettlement and relocation
B. Construction Phase				
IAs, PMO	Public consultation and site visits	At least once	Adjusting of mitigation measures if necessary, construction impacts, comments and suggestions	Residents adjacent to subprojects, representatives of social sectors
IAs, PMO	Expert workshop or press conference	As needed based on public consultation	Comments and suggestions on mitigation measures, public opinions	Experts of various sectors, media
IAs, PMO	Survey on resettlement	As required by relevant RP	Comments on resettlements, improvement of living conditions, livelihood and poverty reduction; comments and suggestions	Persons affected by resettlement and relocation
C. Operation Phase				
IAs, PMO	Public consultation and site visits	Once in the beginning 2 years	Effects of mitigation measures, impacts of operation, comments and suggestions	Residents adjacent to treatment plants Downstream beneficiaries, representatives of residents and social sectors
IAs, PMO	Expert workshop or press conference	As needed based on public consultation	Comments and suggestions on operational impacts, public opinions	Experts of various sectors, media

EIA = environmental impact assessment, PMO = project management office, PPTA = project preparatory technical assistance, RP = resettlement plan

Source

F. RESPONSIBILITIES AND AUTHORITIES

1. Environmental Responsibilities and Institutional Requirements

14. The EMP will ensure effective implementation of mitigation measures.

15. During project preparation and implementation, various organizations with different environmental management responsibilities, Hubei Provincial Environmental Protection Bureau (HEPB), PMO, WEPB, IAs, EIA preparation company, EMCs, CSCs, design institutes and contractors, have been involved and will be involved in the EMP. The PMO, contractors and IAs, will each nominate full-time, trained and qualified environmental specialists to undertake environmental management activities and ensure effective implementation of the EMP. Table A2.4 shows the environmental responsibilities in different phases of the Project.

Table A2.4: Environmental Responsibilities

Phase	Responsible Agencies	Environmental Responsibilities
Preparation	EIA preparation company	Preparation of EIAs for subprojects.
	PMO, HEPB	Review and approval of the EIAs
	PMO, WEPB, ADB	Review and approval of the SEIA including EMP
Design	Design Institutes	Incorporate mitigation measures in engineering designs and contracts
	PMO, IAs	Review and approval of environmental measures
Tendering	Contractors, PMO, IAs	Incorporate EMP clauses in the bids
Construction	EMCs, PMO, IAs	Advise on implementation of mitigation measures
	Contractors, WUCF, CSC	Implementation of mitigation measures and internal monitoring
	WEPB, IAs	Implementation of compliance monitoring
	WEPB, IAs, EMCs	Supervise implementation of mitigation measures and monitoring
Operation	EMCs, WEPB	Advise on compliance monitoring and internal monitoring requirements
	IAs	Implementation of mitigation measures and internal monitoring
	WEPB, Water Bureaus, IAs	Implementation of compliance monitoring
	IAs, WEPB, EMCs	Supervise implementation of mitigation measures and monitoring

ADB = Asian Development Bank, CSC = construction supervision company, EIA = environmental impact assessment, EMC = environmental management consultant, EMP = environmental management plan, HEPB = Hubei Provincial Environmental Protection Bureau, IA = implementing agency, PMO = Project Management Office, SEIA = Summary Environmental Impact Assessment, WEPB = Wuhan Municipal Environmental Protection Bureau, WUCF = Wuhan Urban Construction Foundation

Note: EMCs appointed for project implementation will advise PMO and IAs on carrying out their environmental responsibilities, budgeted inputs: 9 person-months.

Source:

16. IAs will be responsible for environmental management and implementation of mitigation measures. They will ensure the EMP will be carried out and will engage design institutes and professional consultants to help with environmental management at the preparation, design, construction and operation phases. The IAs will be responsible for arranging environmental

monitoring review and responding to any adverse impacts beyond those foreseen in the EIAs. The IAs will also attend to EPB's and ADB's requests for mitigating measures.

17. Construction contractors and IAs will be responsible for actual implementation of mitigation measures during construction and operation, respectively.

18. In accordance with the EMP, the IAs will establish an environmental management office that will generally require two employees. During the Project, this office will be responsible for: (i) implementing the EMP and developing further implementation details, (ii) supervising implementation of mitigation measures during construction, (iii) implementation of training programs, (iv) incorporating environmental management, monitoring, and mitigation measures into construction and operation management plans, (v) developing and implementing internal routine environmental monitoring, and (vi) reporting performance of the EMP to the responsible agencies. This office will be supported and supervised by WEPB and the EMCs.

19. Local governments will ensure that IAs will have financial and managerial autonomy to operate the project facilities. The IAs have relatively limited environmental management capacities, which will, however, be strengthened by environmental management training provided by the Project as summarized in Table A2.5. They will incorporate environmental management activities into construction and operation management plans. Local governments will ensure that local regulations for management of the wastewater/drainage systems are reviewed annually, and that responsibilities of the agencies involved are clearly defined, appropriate penalties for non-compliance established, and the effectiveness of regulations reviewed annually and modified if necessary in accordance with applicable legal procedures.

20. EMCs will advise the PMO, the IAs and contractors on all aspects of environmental management and monitoring for the project components. The EMCs will: (i) review project environmental practices and procedures, (ii) provide guidance in environmental standard setting and assist in implementation procedures, (iii) review the start-up of the WWTPs, (iv) advise on mitigation during construction and operation phases in accordance with the EMP, (v) review procedures for the control of discharges of industrial waste and recommend improvements, and (vi) investigate and make recommendations on other environmental issues.

2. Institutional Strengthening and Training

21. The two Project Implementing Units (PIUs), one under the Wuhan Drainage Company (WDC) and the other under the Wuhan Urban Construction Foundation (WUCF), will coordinate and monitor activities of the IAs. An assessment undertaken during the PPTA indicates that both IAs have sufficient technical and institutional capacities, which are adequate for Project implementation. Still, the IAs will receive the EMP training (see Table A2.5).

22. WDC will implement the construction and operation of the wastewater component, undertaking project investments construction and operation management directly. WDC is a limited liability company incorporated under the PRC Company Law and is also the IA for the ongoing WWMP. It is experienced in ADB project implementation.

23. WUCF is a government agency responsible for coordinating the implementation of government sponsored urban infrastructure projects. WUCF is not an operator or provider of services. WUCF will outsource this activity to an experienced qualified construction management company. Once the physical construction is completed WUCF will pass the storm water assets to the municipal Water Bureau (pumping stations) and to the local district Water Bureau (collection

systems) for operations and maintenance. The Water Bureau has some capacity to operate and maintain the Project's storm water investments which will be enhanced by capacity building during implementation. Also WUCF will need environmental training on the relevant ADB procedures during implementation of the Project.

24. With the help of the EMC and support from the loan consultancy services, the PMO and the IAs will develop expertise in efficient operations of the wastewater and storm water facilities. WDC is already a recipient of consulting services support under the WWMP, so capacity building will be weighted towards the storm water component.

25. Environmental specialists of WEPB and the IAs will receive training in environmental management, monitoring and supervision, mitigation planning, emergency response, environmental policymaking, and other environmental management techniques. Funding for this training will be included in the project budget and in the operation and maintenance (O&M) budgets during the operational phase.

Table A2.5: Institutional Strengthening and Training

Strengthening Activities	Agencies	Strengthening Plan	Timing				
Capacity Building	PMO, IAs	Institutional organization, development of responsibilities for each position	During project preparation and implementation				
Monitoring	Same as above	Procurement of related monitoring instruments and equipment	During project preparation and implementation				
Training	Attendees	Contents	Times	Period (days)	Number of person	Cost (CNY/ person/ day)	Total Cost (10,000 CNY)
EMP implementation and adjustment, settlement of disputes	PMO, IAs, Contractors	Development and adjustment of EMP, emergency response, environmental laws and regulations, environmental management	1	6	40	300	7
Environmental processes	PMO, IAs, Water Bureaus, Contractors	Engineering technologies; pollution control; equipment selection and procurement; operation, control and maintenance of treatment processes and storm water facilities	2	10	60	300	36

Training	Attendees	Contents	Times	Period (days)	Number of person	Cost (CNY/ person/ day)	Total Cost (10,000 CNY)
Water quality and quantity monitoring	PMO, IAs, Contractors	Monitoring methods, data collection and processing, reporting system	2	10	40	300	24
Industrial pollution control	PMO, IAs, Industry	Development, operation and monitoring of industrial wastewater pollution control facilities	1	5	40	300	6
Environmental policies and plans	PMO, IAs, Contractors	Environmental laws and regulations; environmental management; emergency response	1	5	40	300	6
Water quality modeling	PMO, WDC, MEPB	Further development of water quality modeling commenced under WWMP	2	20	5	300	6
Inflow and infiltration studies	PMO, WDC	Investigation of inflow and infiltration	2	5	10	300	3
Sludge management studies	PMO, WDC	Study of sludge management options	1	3	10	300	1
Total							89

EMP = environmental management plan, IA = implementing agency, MEPB

PMO = project management office, WDC =

Source:

26. The institutional components of the Project will also involve significant training in operation and maintenance of wastewater and storm water facilities. Part of this training is a set of indicators for the monitoring of future performance of the WWTPs, to be designed prior to operation start-up by the loan implementation consultants. WUCF will also receive environmental training on the relevant ADB procedures during project implementation.

G. REPORTING AND SUPERVISION

27. The compliance monitoring reports will include the project background, construction activities, environmental conditions, measurement or sampling locations, analytical results, interpretation and implication of the monitoring results, determination of the compliance status with regard to applicable regulations and standards, and recommendations for improvement. The PMO will submit compliance monitoring reports to ADB as appropriate.

28. During the construction period, results from the internal monitoring by contractors and CSCs will be reflected in the construction weekly reports. The reports will include environmental issues during construction, mitigation measures taken if any, and consequences of the impacts to the environment and/or surrounding communities.

29. The contractors will be trained to take immediate actions to correct unexpected adverse impacts or ineffective or insufficient mitigation measures, as required by the EMP. The PMO and IAs will also respond to these reports, to ensure contractors have taken appropriate and timely action. Additional measures may be taken if needed to ensure all issues raised by these monitoring reports will be appropriately addressed.

30. Results from the detailed internal environmental monitoring program and mitigation actions for both construction and operational phases will be submitted by the Contractors and IAs to WEPB and PMO monthly. HEPB, and/or ADB may request that further environmental mitigation actions be taken, as they deem necessary, and may determine further mitigation measures for different stages, if necessary.

31. The PMO will submit to ADB the EMP progress reports and information including project implementation, and environmental performance of the contractors, IAs and EMCs. These reports will include: (i) semi-annual environmental reports on EMP implementation, and (ii) a project completion report no later than 3 months after completion of the Project. Progress reports will emphasize progress made in the areas of water quality improvements, monitoring results, implementation of mitigation measures, environmental compliance, training and capacity building progress.

32. The PMO, with the assistance of the project consultants, will monitor and assess overall project activities under the PDMF, including environmental targets. The PMO will report to ADB twice a year on the physical implementation including environmental aspects of the Project to ensure that its progress and impacts are monitored and reported in line with ADB requirements.

H. WORK PLAN

33. Before construction, IAs will develop detailed responsibilities and requirements for contractors and will provide detailed cost estimates of mitigation measures and environmental monitoring in the construction contracts. The PMO and IAs also will detail the responsibilities of their environmental management offices and prepare their work schedules.

34. Before operation, IAs will develop detailed work plans for environmental management and monitoring during operation based on the EMP. These work plans will be submitted to WEPB and the PMO to help them to supervise implementation.

I. PROCUREMENT PLAN AND COST ESTIMATES

35. The IAs will develop detailed plans for procurement of equipment and materials and civil works for implementing mitigation measures and monitoring plans. These plans will be incorporated into the project contracts.

36. Cost estimates for mitigation measures and monitoring plans are summarized in Table A2.1 and Table A2.2. Compliance monitoring costs will be borne by IAs who will ensure the budgets are available. Internal monitoring costs will be borne by IAs, contractors and CSCs during construction, and by IAs during operation. IAs will ensure the necessary budgets are available. Before implementing the monitoring plan, responsible agencies will present a further detailed breakdown of the estimated budget. During project implementation, the budgets will be adjusted based on actual requirements. A detail breakdown of the internal monitoring cost estimates will

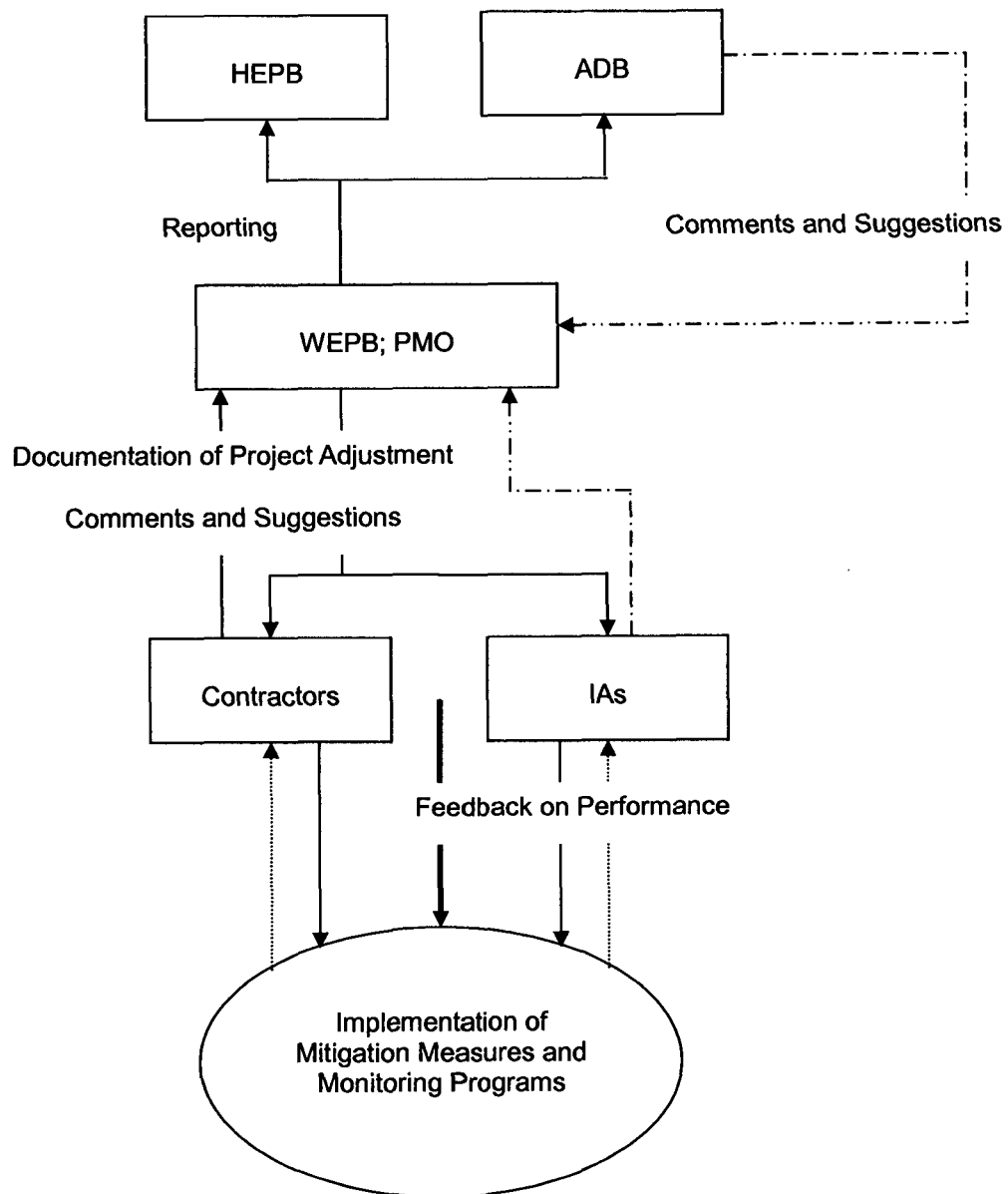
be prepared by the design institutes. Costs for all mitigation measures during construction will be included in the tender and contract documents and be borne by contractors. Costs related to mitigation measures during operation will be borne by IAs. Costs for the EMCs and for the training will be borne by the Project as a whole.

J. MECHANISMS FOR FEEDBACK AND ADJUSTMENT

37. The effectiveness of mitigation measures and monitoring plans will be evaluated through a feedback reporting system. Adjustments to the EMP will be made if necessary. WEPB and the PMO will play critical roles in this feedback and adjustment mechanism as shown in Figure A2.9.

38. There will be two tiers of feedback and adjustment. If EMP modification is requested by the contractors and/or IAs, WEPB will review their proposals in detail. If the modifications are approved in principle, specific modifications will then be submitted by contractors and IAs to WEPB for further review. Comments and suggestions from HEPB and ADB will also be considered by WEPB and revisions

Figure A2.9: Mechanism for Feedback and Adjustment of Environmental Management Plan



ADB = Asian Development Bank, HEPB = Hubei Provincial Environmental Protection Bureau,
 WEPB = Wuhan Municipal Environmental Protection Bureau, IA = implementing agency,
 PMO = Wuhan project management office

ADB TA - 4436 - PRC

**Project Preparatory Technical Assistance
Wuhan Wastewater and Storm Water
Management Project**

Final Report

December 2005

Volume 3

Summary Resettlement Plan

Wastewater Component Resettlement Plan

Storm Water Component Resettlement Plan

Consultant

Black & Veatch (Asia) Ltd

Executing Agency

Wuhan Municipal Government

SUMMARY RESETTLEMENT PLAN

A. Background

1. Wuhan Wastewater and Storm Water Management Project (hereinafter known as the Project) is composed of Wastewater component and Storm water component. Wastewater component includes five subprojects which are Erlangmiao WWTP expansion and upgrade in the urban area; Nantaizi Lake WWTP expansion and sewage collection system in the urban area; Huangpu Road WWTP upgrade in the urban area; Caidian WWTP and sewage collection system in the suburban area; and Dongxihu wastewater collection system in the suburban area. Storm water component includes four sub-projects which are Yangsigang drainage pumping station and its associated storm water network; Dongxihu Three Drainage Gates connections, Changqing pumping station expansion; and Luoja Road drainage pumping station and rehabilitation of Luojiagang open channel.

2. In the wastewater component, the subprojects relating to Erlangmiao WWTP and Huangpu Road WWTP acquired and set aside land in 1998 and 1999 respectively, during the Phase I construction of these two WWTPs. The affected people have been compensated and relocated with a satisfactory outcome. The lands provided for are sufficient for the subsequent expansion / upgrade of these two facilities. No additional land therefore needs to be acquired for these two subprojects under the upcoming Project.

3. The remaining works in the two components of the Project will involve a relatively large amount of land acquisition and resettlement. Two full Resettlement Plans (RPs) have already been prepared based on ADB procedures. The cut-off date for eligibility for compensation and assistance under the Project will be the date of the Hubei Development and Reform Commission (HDRC) approval, which will be announced to all affected persons as soon as possible. When the detailed engineering of each subproject has been finalized, if necessary, the resettlement plans will be amended on the basis of any design changes.

B. Resettlement Impacts

4. In order to avoid or minimize land acquisition and resettlement, there has been close consultation with the local officials and village committees/street committees during the preliminary and final feasibility study stages, and the best site was recommended by comparison with alternative sites.

5. The proposed Project will affect 4 districts, 15 villages and 1 neighborhood in Hanyang District, Dongxihu District, Hongshan District and Caidian District of Wuhan city. In total, 421 households with 1799 persons (including 161 persons classified as floating population) will be affected directly by land acquisition and/or house demolition. 938.3 mu of land will be permanently occupied, of which 59.4% is classified as cultivated land. In addition, 390.7 mu of land will be occupied temporarily during the construction phase. 39,288 m² of residential housing (including 4157 m² of unlicensed housing) will be demolished among which 34,638 m² (88.2%) are rural residents' housing,, and 4,650 m² (11.8%) are urban residents' housing. 43 enterprises and institutions with 18,881.85 m² of structures to be demolished, and 19 shops with 10912 m² (among which 4070 m² are unlicensed) of structures to be demolished will also be affected. The details are tabulated in Table 1.

Table 1 Summary of Land Acquisition and Resettlement Impacts

Subcomponent / IA	Subproject Name	Site	Affected Villages/ Neighborhood	Permanent Land Acquisition (mu)	Temporary Land Acquisition (mu)	Households/ enterprises/shops (unit)	Affected Persons
Wastewater Wuhan Municipal Wastewater Company (WMWC)	Wuchang Erlangmiao WWTP Expansion & Upgrade	Hongshan District	0*	0	0	0/0/0	0
	Hanyang Nantaizi Lake WWTP Expansion & Collection System	Hanyang District	4	146	188	20/0/0	99
	Hankou Huangpu Road WWTP Upgrade	Jiang'an District	0*	0	0	0/0/0	0
	Donxihu Collection System	Dongxihu District	1/1	24.3	119.8	5/0/0	29
	Caidian WWTP & Collection System	Caidian District	2	83.6	30	57/1/0	233
Storm Water Wuhan Urban Construction Foundation (WUCF)	Luojiagang Open Channel Rehabilitation & Luoia Road Pumping Station Expansion	Hongshan District	4	208.1	24	243/36/18	1037
	Hanyang Yangsigang Pumping Station & Storm Water Pipework	Hanyang District	2	34.8	18.9	43/2/1	198
	Donxihu Three Gates Connection	Dongxihu District	2	422.6	10	29/2/0	123
	Changqing Pumping Station Expansion	Dongxihu District	1	18.9	0	24/2/0	80
Total		4	16/1	938.3	390.7	421/43/19	1799

Note: No RP or due diligence required because sufficient land was acquired in 1999 for expansion.

C. Policy and Legal Framework

6. For people unavoidably affected by the Project, the resettlement objective is to achieve equal, or better, income and living standards in line with not only the Chinese laws and regulations, but also ADB's "Policy on Involuntary Resettlement". The compensation for permanent land loss and house demolition is based on the Land Administration Law of PRC (2004) and the State Council Decision to Deepen Reform and Strictly Enforce Land Administration (Document 28 dated November 2004) and Implementing regulation of Land Administrative law of Hubei province (2nd revision) (effective September 27, 1999), Method of collective land acquisition and compensation for housing demolition on collective land of Wuhan Municipality, (Wuhan Government No.148, effective February 1, 2004) and Management & Implementation Method of Urban Housing Demolition of Wuhan Municipality (Wuhan Government No.130, effective March 1, 2002).

7. Based on consultations with local governments and those affected, and general practice in the project districts, a set of compensation standards, based on the replacement cost, was adopted by the respective project implementing agencies (IAs). The resettlement principles established for the Project are ;(i)land acquisition and involuntary resettlement should be avoided or minimized where feasible by developing and comparing a series of design alternatives; (ii)compensation and entitlements provided are based on market value or replacement value and must be adequate to allow those affected to at least maintain their pre-project standard of living, with the prospect of improvement; (iii)land temporarily occupied and the period for disruption are to be kept to a minimum; (iv)all the people affected, legal and illegal, are to be taken into consideration and accounted for; (v)the per capita landholding after land acquisition will be sufficient to maintain the previous livelihood standard; (vi)where land allocation per capita is not sufficient to maintain the previous livelihood standards, other income generating activities will be provided for; (vii)a preferential policy will be provided to vulnerable groups and floating population in such things as compensation, housing assignment, transfer, and employment; (viii)all those affected will be adequately informed about eligibility, compensation rates and standards, livelihood and income restoration plans, and project timing; and (ix)close monitoring and timely actions will be carried out to identify and resolve any problems.

8. Land acquisition compensation and resettlement subsidy will be paid to the affected village committee. Compensation for young crops, auxiliaries and other assets will also be paid directly to affected farmers. Compensation for the losses of residential housing, enterprises, institutions and shops, will be paid to owners directly on the basis of the agreements signed with them in accordance with the provisions of the component RPs. The payments will be made in cash according to the appraised value of the property. Income losses resulting from reduced production/sales and wages caused by the Project will be compensated in cash.

D. Resettlement and Rehabilitation

9. In order to minimize the resettlement impacts to Affected Persons (APs) and restore their living standards, the detailed programs of restoration and relocation have been arranged in the RPs. APs can choose from the available programs according to their requirements.

10. According to the economic characteristics of affected villages, different schemes for income restoration will be carried out. As to the land acquisition, the most affected villages located in the suburban / urban of Wuhan can be defined as "villages in a city". Households are only partially engaged in agricultural activities, and family members supplement incomes through outwork or other activities which likely contribute the greater portion of their income.

The main income restoration strategies and measures are cash compensation, provision of employment opportunities during the project construction and operational phases, provision of training and employment information etc. Through these measures it is envisaged APs will achieve stable incomes that fully restore their living standards.

11. Demolition of housing and other structures will be compensated at replacement cost. Displaced persons will have the options to purchase commercial houses, to exchange properties, or to rebuild their houses with free house sites provided to them.

12. In addition, more attention will be paid to vulnerable groups for their compensation and rehabilitation. The vulnerable groups will receive additional assistance from the Project: (i) if the demolished house is 20 m² or less, it will be compensated / relocated on the basis of 25 m²; and if the demolished house is ranged from 20 m² to 30 m², it will be compensated / relocated on the basis of 30 m²; (ii) providing low rental housing for vulnerable families; (iii) setting up special supporting funds; (iv) providing potential employment opportunities to serious affected vulnerable groups, especially women; and (v) providing labor support to the vulnerable groups in house reconstruction.

E. Resettlement Cost and Fund Management

13. The cost estimate for land acquisition and resettlement is CNY 355 million (\$43.8million, 17.1% of the total project cost), including contingencies, taxes and duties. This land acquisition and resettlement cost will be included as part of total project cost. The RPs for individual components contains a detailed budget, together with a compensation matrix. According to the compensation policies and standards defined in the resettlement plans, the payment and usage of compensation funds will be carried out under the supervision of the internal monitoring agencies; with regularly review by the external monitoring agency. Detailed measurement surveys will be conducted in each village, enterprise and shop, and the compensation contracts will be negotiated and signed with village committees, households, enterprises and shop owners.

F. Information Disclosure, Participation and Grievance

14. The people affected will be notified about the key elements of the RP prior to ADB loan appraisal. On various occasions during meetings, interviews, focus group discussions, public consultation workshops, and community consultation meetings, local representatives have participated in the planning and their concerns have been integrated into the RPs. The RPs will be disclosed to the affected districts and villages, and resettlement information booklets will be disseminated to affected households. In accordance with ADB's Public Communications Policy, the draft RPs will be posted on ADB website prior to loan appraisal and the approved RPs will be posted by board approval. The respective project IAs will establish project resettlement units for supervising implementation, continuing public consultation, monitoring progress and responding to grievances. The grievance procedures are well established and explanations are included in the resettlement plans and referred to in the resettlement information booklets (RIBs).

G. Institutional Responsibilities

15. The Wuhan Urban Construction Utilization of Foreign Investment Project Management Office (WPMO) will assume the overall responsibility for implementing resettlement. The IAs for the 2 components are Wuhan Municipal Wastewater Company (WMWC) and Wuhan Urban Construction Foundation (WUCF); whose roles include resettlement compensation payment and supervision. A Resettlement Office (RO) within WPMO will coordinate the planning, implementation, financing and reporting of land acquisition and resettlement. The ROs will entrust a qualified house demolition agency to carry out the house demolition affected by the

Project, and for the land acquisition under the Project. The RO will be assisted by the Wuhan Land Administrative Bureau.

H. Monitoring and Evaluation

16. Internal and external monitoring of RP implementation will be conducted. Monitoring methodologies are specified in the RPs. Internal supervision and monitoring will be done by each IA to ensure compliance with the provisions of the RP. The WPMO and IAs have agreed to a set of supervision milestones with ADB, to ensure timely and effective implementation of resettlement activities. The capacity building for each resettlement units will be conducted during the process of resettlement implementation, the resettlement staff training program and budgets has been included in each RP. WPMO will engage an independent agency for semi-annual monitoring and annual evaluation of land acquisition and resettlement activities until 2 years after the completion of land acquisition and resettlement. External monitoring reports will be forwarded directly to both the WPMO and ADB.

I. Resettlement Milestones

17. The resettlement implementation schedule has been prepared based on the overall project preparation and construction timetable. No land acquisition shall start until the project RP's are cleared by ADB. Based on the current project appraisal schedule, it is anticipated land acquisition may commence in April 2006 and be completed by the end of 2008. Under this schedule, housing relocation would start from early 2006; the livelihoods and living conditions will be fully restored to the pre-project level by the end of 2008 (see Table 2).

Table 2 Resettlement Supervision Milestones

No.	Resettlement Tasks	Target	Responsible Agency	Deadline	Status
1.	RP Disclosure and Approval				
1.1	Distribution of 2 draft RPs	4 districts, sub-districts, 15 villages* and 1 neighborhood	WUCF & WMWC	Jan 15, 2006	
1.2	Information booklet distribution	421 households, 43 enterprises/institutions and 19 shops	WUCF & WMWC	Jan 15, 2006	
1.3	Draft RPs on ADB website	2 RPs	WPMO & ADB	Feb 05, 2006	
1.4	Distribute WMG approved RPs	As per 1.1	WUCF & WMWC	Mar 31, 2006	Before LN
1.5	Approved RPs on website	2 RPs	WPMO & ADB	Apr 15, 2006	
2.	Resettlement Plans and Budgets				
2.1	Approval of compensation rates and 2 RP budgets	CNY 33.1 million CNY 10.4 million	WUCF WMWC	Feb 28, 2006	
2.2	Final village compensation allocation and utilization (rehabilitation) plans	Jiangdi Fish Farm, Machi	Village, Farm or Neighborhoods Committees & WPMO	Sept 31, 2006	
		Shiyuan, Xiangyang, Heping, Machi		Jun 30, 2007	
2.3	Updated RPs based on DMS (if design changes)	2 RPs	WUCF, WMWC & WPMO	prior to LAR	
3.	Compensation Agreements				
3.1	Village agreements	7 villages/ neighborhood	WUCF & WMWC	Sep 15, 2006	
		10 villages		Jun 30, 2007	

No.	Resettlement Tasks	Target	Responsible Agency	Deadline	Status
3.2	Household agreements	49 households	WUCF & WMWC	Sep 30, 2006	
		372 households		Jul 31, 2007	
4.	Detailed Measurement Surveys (DMS)				
4.1	Storm Water Component	Dongxihu 3 Gates	WUCF	Aug 31, 2006	
		Yangsigang, Luojiagang and Changqing	WUCF	May 31, 2007	
4.2	Wastewater Component	Dongxihu	WMWC	Aug 31, 2006	
		Nantaizihu, Caidian WWTP	WMWC	May 31, 2007	
5.	Implementation of Rehabilitation Measures				
5.1	Resettlement training for local officials	4 Districts, sub-districts, WMWC, WUCF	WPMO and ADB	Aug 31, 2006	
5.2	Distribute compensation to affected villages and APs	7villages/ neighborhood	WUCF & WMWC	Sep 15, 2006	
		10 villages		Jun 30, 2007	
5.3	House relocation	219 households	WUCF & WMWC	Nov 30, 2006	
5.4	Implement Livelihood Training programs	180 laborers	District Labor Offices, WPMO	Oct 30, 2006	
		92 laborers		Oct 30, 2007	
6.	Monitoring and Evaluation				
6.1	Baseline surveys & report	7 sub-projects	Monitor	Aug 31, 2006	
6.2	Set up internal supervision	As per RP	WUCF, WMWC & WPMO	Oct 31, 2006	
6.3	Contract external monitor	One	WPMO	May 30, 2006	
6.4	Internal monitoring reports	Quarterly	WUCF, WMWC & WPMO	Oct 15, 2006	1 st Report
6.5	External monitoring reports	3 Semi-annual reports	Monitor	Jan 31, 2007 July 31, 2007 Jan 31, 2008	1 st Report 2 nd Report 3 rd Report
6.6	Annual evaluation reports	2 Annual Reports	Monitor	Jan 31, 2009 Jan 31, 2010	1 st Report 2 nd Report
6.7	Resettlement completion reports	2 Reports (one for each RP)	WUCF, WMWC & WPMO	Jun 30, 2008	
7.	Documentation of Consultation		WUCF, WMWC		Ongoing
8.	Documentation of Grievances		WUCF, WMWC		Ongoing
9.	Flow of Land Compensation and Resettlement Funds (see details in RPs)				
10.	Commencement of Land Acquisition and Civil Works				
10.1	Storm Water Component – 3 Gates		WUCF	Sep 2006	
10.2	Wastewater Component – Dongxihu & Nantaizihu		WMWC	Sep 2006	

WUCF=Wuhan Urban Construction Fund Management Office; WMWC=Wuhan Municipal Wastewater Company; WPMO=Wuhan Project Management Office

*There are 15 affected villages, of which Machi will be affected by both Dongxihu Three Gates Connection and Changqing Pumping Station Expansion

Asian Development Bank

Resettlement Plan

Wastewater Management Component

of

Wuhan Wastewater and Storm Water Project

In the

People's Republic of China

Wuhan ADB Financed Project Management Office
Wuhan Drainage Company

February, 2005

Wuhan Drainage Company
Commitment Letter on the implementation of *Resettlement*
Plan of ADB Financed Wuhan Storm water &Wastewater
Management Project

Asian Development Bank:

Resettlement Plan of Asian Development Bank Financed Wuhan Rainwater and Wastewater Project (hereinafter referred to as *RP*) is compiled with reference to related resettlement regulations of Asian Development Bank and relevant laws and legislations of the Chinese Government. During the execution of the project, we will strictly abide by *RP*.

Wuhan Drainage Company

December, 2005

Abbreviations

APs	Affected Persons
AVs	Affected Villages
Asian Development Bank	ADB
DPs	Displaced Persons
DI	Design Institute
HPG	Hubei Provincial Government
EA	Executive Agency
M&E	Monitoring and Evaluation
PMO	Project Management Office
PRO	Project Resettlement Office
RP	Resettlement Plan
VCs	Village Committees
VGs	Village Groups
WMG	Wuhan Municipal Government

Notes

Currency Unit	-Yuan(CNY)
CNY1.00	=\$0.12
\$1.00	=Y8.1
1 ha	=15mu

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Executive Summary

Wuhan Wastewater Management Component is composed of 5 sub-projects, which are: (1) Wuchang Erlangmiao Wastewater Treatment Plant; (2) Nantaizi Lake Wastewater Treatment Plant (WWTP) Expansion & Collection System; (3) Huangpu Road WWTP Upgrading; (4) Dongxihu Wastewater Collection Systems; (5) Caidian WWTP & Collection Systems. Of which, two sub-projects (Wuchan Erlangmiao WWTP Project and Huangpu Road WWTP Upgrading Project) do not involve land acquisition and resettlement. The others sub-projects need new land acquisition and resettlement.

In order to avoid or minimize land acquisition impacts, close consultation on project site has been made with affected communities/ villages and affected persons during the Feasibility Study (FS) stage, and the best site is recommended by comparison with alternative sites. The Wastewater Management Components will affect 3 districts within the jurisdiction of Wuhan, 5 township (town) or sub-districts, and 6 villages or urban communities with 361 affected persons of 82 families. It will require 253.9mu land permanently, and 337.8mu temporary land and relocate 2335 m² structures.

The RP is based on the Land Administration Law of PRC (2004) and related matching policies, Decision to Deepen Reform and Strictly Enforce Land Administration by the State Council (Document [2004] No.28), and also related policies of Wuhan municipality. Meanwhile, the RP was prepared in compliance with ADB's Policy on Involuntary Resettlement and relevant social safeguard policies. Based on the above policies and through consultation with local governments and APs, the resettlement principles for the sub-Project are established as follows:

The component makes the consolidated compensation rates in accordance with land, output value, land location, agricultural land grade, cultivated land per capita, land supply and demand relations, local economic development level and other factors. Compensation standards (AAOV) for land acquisition of each sub-project are as follows: Hangyang District (Nantaizi Lake Project) 5890 yuan; Dongxihu District (Dongxihu Wastewater Project) 4895 yuan, Caidian District (Caidian Wastewater Project) 3840yuan.

Compensation rates for land acquisition are calculated on the basis of the following standards: compensation for cultivated land shall be paid equivalent to ten times of the compensation base; compensation for garden plot, forest land and other agricultural land, six times of the compensation base; compensation for construction land and unexploited land, six times of the compensation base. The resettlement subsidy standards of the project shall be calculated on the basis as follows: compensation for cultivated land, such as paddy field, dry land, nursery, orchard and etc shall be paid equivalent to fifteen times of the compensation base; compensation for fish pound and forest land, nine times of the compensation base; compensation for pond eight times of the compensation base; for wasteland and house sites, no resettlement subsidy.

Compensation for temporary acquisition of collective land shall be paid according to the following standards: (1) compensation for temporary cultivated land will be calculated by combining land-use years with land compensation base. Compensation for temporary land-use within one year will be calculated according to two years; compensation for temporary land-use above one year (including one year) will be calculated according to three years; (2) compensation for temporary land-use of other yields will be paid according to the standard of adjacent cultivated land; (3) compensation for young crops and attachments to the ground within the temporary land-use area will be paid according to actual loss to all persons.

Compensation for house relocation includes the replacement cost and house base price of the buildings. According to the local regulations of Wuhan, the replacement cost of the project for rural houses are: steel concrete structure 830 yuan/m²; brick masonry structure 570 yuan/m²; brick wood structure 420 yuan/m²; simple structure house 340 yuan/m². Land compensation prices of Wuhan rural relocation houses are divided into three categories according to the stipulated road rings of Wuhan urban overall planning: the first category is the region within the 2nd ring road (including the 2nd ring road), compensation price for this region is 2280 yuan/m²; the 2nd category is within the region between the 2nd ring road and the 3rd ring road (mid-ring line), the compensation price for this region is 1920 yuan/m²; the 3rd region is outside the 3rd ring road (mid-ring line), compensation price for this region is 1500 yuan/m².

The market price of real estate of urban house dismantling and relocation will be evaluated according to the relocated house location, purpose, building area and etc. The confirmation of

structure category, floor area and purpose of the relative house will be confirmed by the project resettlement office together with relevant departments and relocated household on the spot prior to the relocation; for the location price of every house, the relocated household will choose an evaluation company from the three evaluation companies with evaluation qualification recommended by the resettlement office to carry out the evaluation on the house replacement cost and location price.

For houses without licenses, the project owner will pay the owners of houses without licenses the house replacement cost according to the state laws and resettlement policies of Asian Development Bank, the replacement cost shall not be deducted anyway, but no house base compensation price for the houses without licenses will be paid.

Project Resettlement Office will not only provide compensation for requisitioned attachments to the ground and buildings in affected villages, but also will establish resettlement plans suitable for the development of affected villages so as to ensure that affected villagers have all kinds of opportunities to enhance, or at least rehabilitate their original incomes and living standards, on the basis of full consultation and participation, the project plans to perfect the integration of the urban and rural employment service system through the comprehensive renovation works of “villages in city” to provide conditions for the employment transfer of farmers whose land has been requisitioned to towns and cities, strengthen the employment transfer training of agricultural labors, improve the techniques of the farmers, and guide the employment transfer of them to the non-agricultural industries. The land acquisition unit shall provide employment for capable farmers by preferentially recruiting labors of the relocation households if their other conditions are equal. The Project shall, integrated with the comprehensive renovation works of “village in city”, establish the endowment insurance and the minimum social security for farmers losing land so as to guard the long-term subsistence of farmers whose land has been requisitioned.

The component will implement special resettlement and rehabilitation measures in resettlement policies or modes for the affected vulnerable groups: (1) The project establishes the special supporting fund for vulnerable groups with a total amount of 400,000 yuan. During the resettlement, the vulnerable groups can apply for the special supporting fund for vulnerable groups according to the procedures if any production and living difficulties;(2) Vulnerable

groups living in urban and town areas, under direct control with monthly household income per capita below the minimum living security line and relocated residential houses with the building area less than 20 m² (including 20 m²) will be resettled on the basis of 30 m²; if the building area of residential house per capita for the families of vulnerable groups is less than 8 m² and no other residential house, the compensation will be calculated in accordance with a building area of 8 m² per capita, and the extra expenses will be paid with the special supporting fund for vulnerable groups.

For the purpose of smooth implementation of Wuhan Wastewater Management Component resettlement work, Wuhan ADB Financed Project Management Office and resettlement organizations at district level have been set up, which will be responsible for the general plan and coordination of the project resettlement work. The Storm Water and Wastewater Project Management Office and Project Resettlement Office are the subsidiary departments of Wuhan ADB Financed Project Management Office, which is responsible for resettlement works. Resettlement Department of Drainage Company who is the Project implementation organizations will work together with Wuhan Municipal Land Bureau; land bureaus at all levels, land management offices at town levels of relevant sub-projects to implement the detail resettlement works.

The project resettlement office and resettlement offices at every level, together with resettlement consultant organizations, utilize the opportunities of socioeconomic survey and social impact assessment survey to publicize and introduce the basic situations of the project through various modes, consult with various affected persons so as to form a situation with complete information, smooth communication channels and wide consultation. Reduce project implementation resistance and possible adverse impact of the project construction through wide consultation, coordination and communication, which will be benefit to the project construction. Public consultation and the results also provide basis for perfecting Resettlement Plan.

Based on the project implementation schedule, the component will start implementation in the early 2006 and complete in 2008 by stages. Total budget for land acquisition and resettlement is CNY 82,966,000, the full costs of land acquisition for the project have been included in the overall project budget. In the process of resettlement implementation, the resettlement internal

and external monitoring evaluation system will be established. The internal monitoring is organized and performed by the project implementation units; while the external monitoring is implemented by independent monitoring organization with rich expertise and experiences.

The sites of the WWTPs have been determined and the sewer networks have also been planned in the FS stage. It is estimated that there will be no significant change in subprojects sites. *If significant changes are needed during detailed design, the RP should be updated and reviewed by ADB prior to award of civil works contracts.*

1 Project Overview

1-1 Project background

The city of Wuhan is located in the east of the Jiangnan Plain and at the confluence of the Yangtze River and Han River. It is the capital of Hubei Province and a center of economy, science, technology and culture of central China. It is at the middle reaches of Yangtze River, and with many rivers crisscrossing within Wuhan. The Yangtze River crosses over the whole city from the southwest to the northeast, with a river course of 145 km within it. Han River joins the Yangtze River at Hankou, with a river course of 62 km in the city. Besides, another 6 major branches also join the Yangtze River in it. Lakes scatter throughout the city. There are altogether 147 lakes in various sizes, among which 38 are in the urban districts. The total water surface area of the lakes in Wuhan at normal water level is 942.8 km², with the ratio of water surface area 11.1 %, which is the highest among large cities nationwide. This brings Wuhan the fame as “the city of lakes”.

However, in Wuhan City, much wastewater without treatment is directly drained into water areas; the water quality of rivers and lakes in its urban areas is deteriorating in recent years. If this problem is not addressed, it will to a large extent hamper the city's sustainable development. According to statistical data, in 2001, the total amount of wastewater in the Wuhan urban areas was 1.876 billion m³. While there are 4 operating wastewater treatment plants (WWTPs) and their total treatment capacity is 530 million m³ a year, the ratio of treated wastewater was only 28%. The volume of wastewater that went through primary and preliminary treatment was 480 million m³ a year, which account for 91%. It is evident that the existed WWTPs in Wuhan city are inadequate to provide full and effective wastewater treatment. Furthermore the wastewater collection systems are also insufficient. Much wastewater without treatment is eventually drained into Han River and Yangtze River through rivers and lakes in the urban areas. 56% of the rivers and 89 % of the lakes in Wuhan city are polluted. It is estimated that the total amount of wastewater in Wuhan will reach 2.42 billion m³ a year, and the wastewater from the Wujiashan, Jinyinhu, Jinyintan, Jinhe areas that belong to the Dongxihu district (service areas is 96.3 km²) will be collected and treated together with the wastewater from the Changfengnanbeiyuan and Jichanghe areas in Hankou. The total amount

of wastewater in Wuhan that will require treatment will reach 2.834 billion m³ a year.

Hubei Provincial Government (HPG), Wuhan Municipal Government (WMG) and relevant departments are all greatly concerned about the wastewater situation. With a strategy to achieve urban sustainable development, Wuhan desires to apply to Asian Development Bank (ADB) for a loan in order to improve and upgrade the WWTPs, storm water and wastewater collection systems as well as the storm water and wastewater pump stations, and thus to improve the living environment and promote the sustainable development of Wuhan city.

1-2 Project composition

The Wastewater Management Component comprises 5 sub-projects, which are: (1) Wuchang Erlangmiao WWTP; (2) Nantaizi Lake WWTP Expansion and Collection System; (3) Huangpu Road WWTP Upgrading; (4) Dongxihu Wastewater Collection Systems; and (5) Caidian WWTP and Collection Systems. The scope of each sub-project is listed in Table 1-1, and the service areas are shown in Figure 1-1.

Table 1-1 Wuhan Wastewater Management Composition

Sub-project	Location	Scope and description
Wuchang Erlangmiao WWTP Expansion	Hongshan District	(1) WWTP Phase II expansion and upgrading
Hanyang Nantaizi Lake WWTP Expansion and Collection	Hanyang District	(1) Sewers (D800 - 1800) (2) 3 new pump stations with a land requirement of 6.4 mu (3) WWTP Phase II expansion with a land requirement of 139.4 mu
Hankou Huangpu Road WWTP Upgrading	Jiangan District	WWTP Phase II upgrade from pretreatment to secondary treatment
Dongxihu Collection System	Dongxihu District	(1) Sewerage box culvert along Jichang Creek; (2) Jinshan Street trunk sewer, box culvert, 3 pumping stations. The 3 pumping stations have a total land requirement of 24.3 mu. (3) Wujiashan District trunk sewer; (4) Jinyinhu South District trunk sewer.
Caidian WWTP and Collection Systems	Caidian District	(1) One new WWTP, which will have a land requirement of 82.5 mu. (2) Sewers (D1200 - 1800) (3) Daqiao pump stations, which will have a land requirement of 1.1 mu.

Figure 1-1 Service Area of the Wastewater Management Component

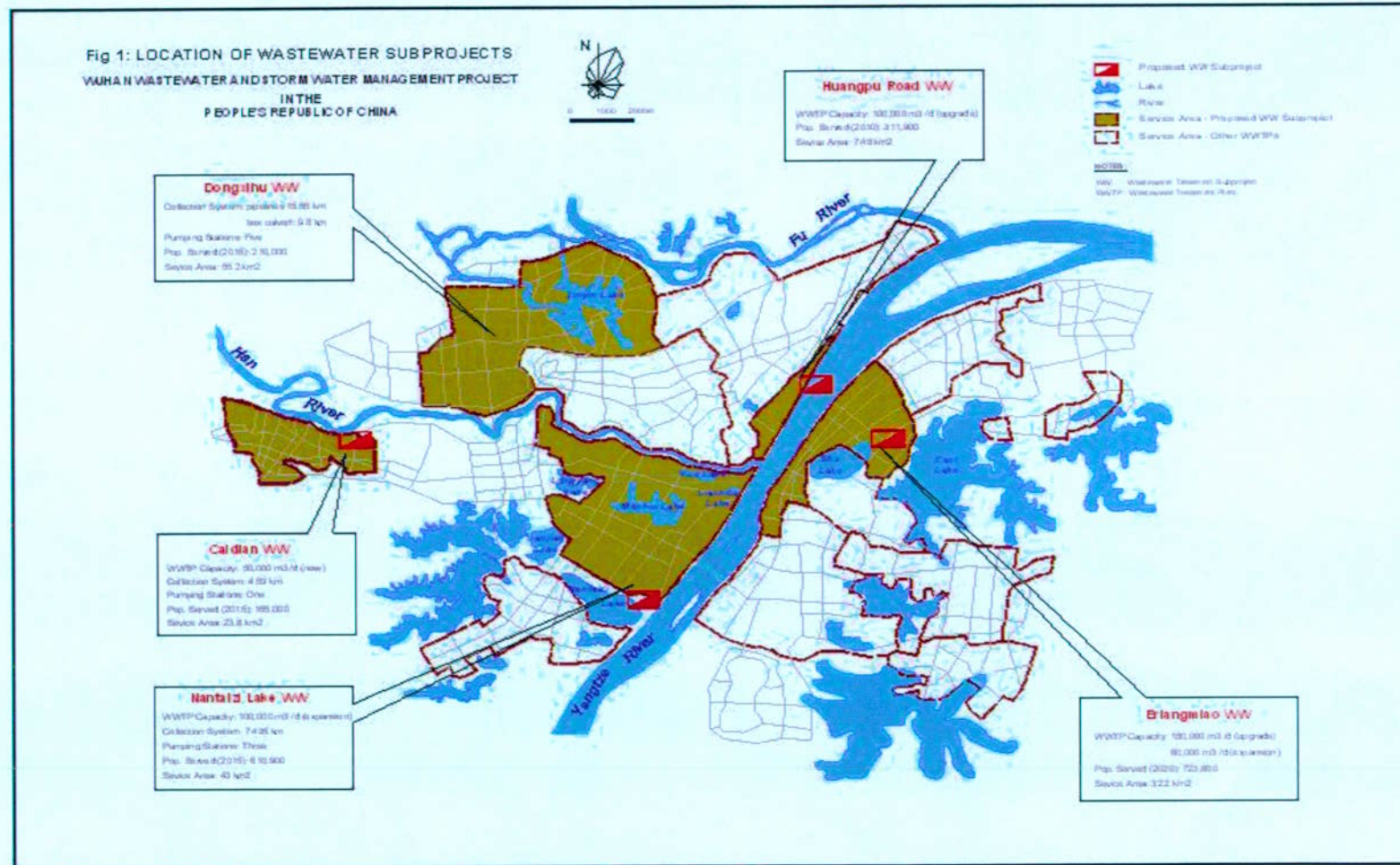
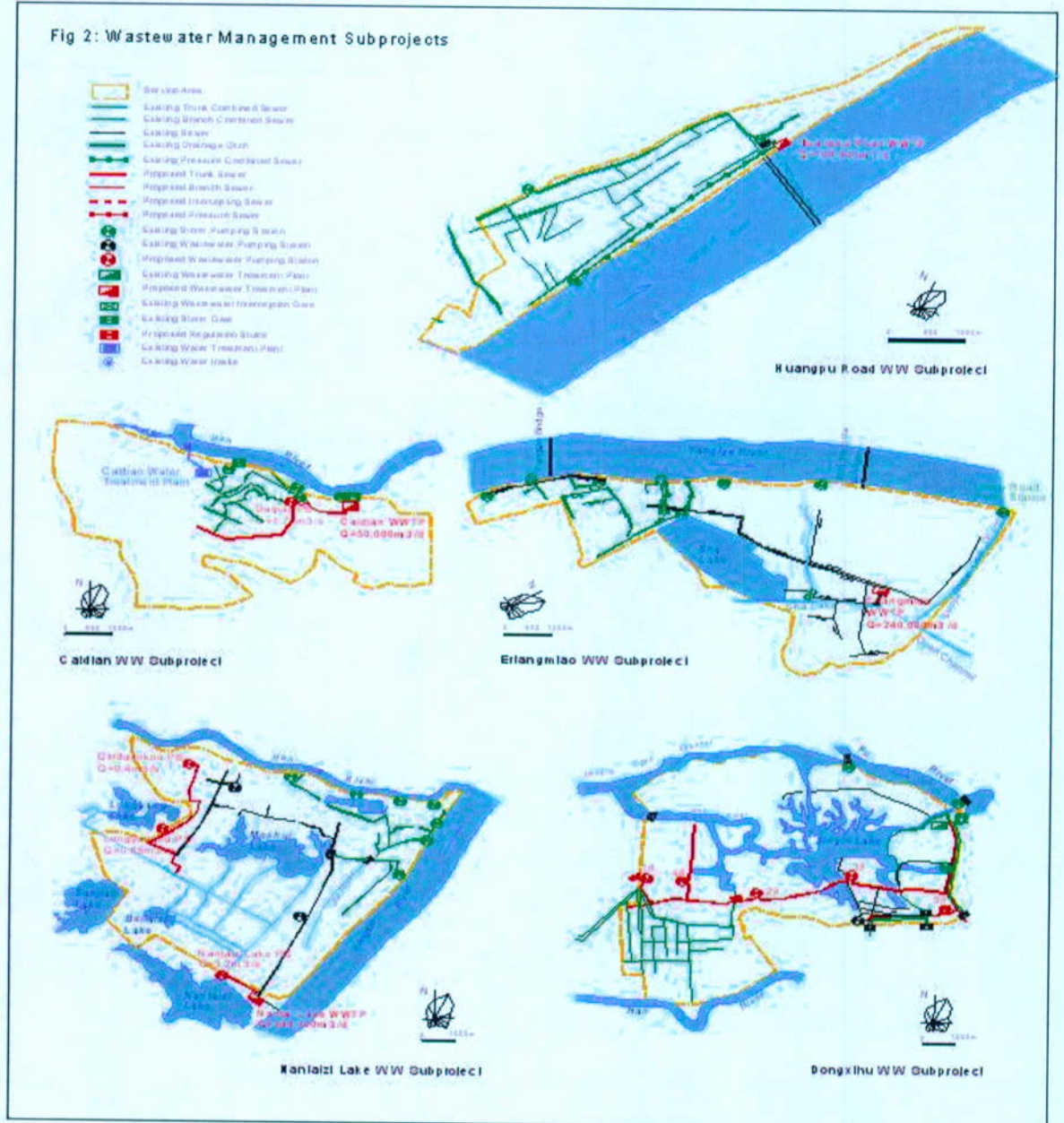


Fig 2: Wastewater Management Subprojects



1-3 Regions benefited from the Project

The Wastewater Management component is a significant project for increasing Wuhan city's wastewater collection and treatment rate, ameliorating urban environment quality, and promoting urban sustainable development. The total service area of the Project is 144 km² (see Table 1-2). After completion of the Project, the wastewater collection systems and treatment capacity in Wuhan will be greatly improved, the environmental pollution will be controlled and urban sustainable development will be promoted.

Table 1-2 Areas Benefited by the Wastewater Management Component

Sub-project	Service range	Benefited regions
Wuchan Erlangmiao Project	32.2 km ²	East of Luojiagang, west to the south of She Hill, south of East Lake, and north of Yanjiang Road.
Nantaizi Lake WWTP Expansion and Collection System	67 km ²	Western areas of Hanyang District, including the old urban districts such as Qilimiao, Erqiao etc, and the new built-up areas like Sixin. The Project will improve the water quality of many lakes in the district.
Huangpu Road WWTP Upgrading	7.48 km ²	The existing wastewater collection systems will serve the Mingsheng Road, Wuhan Guan, Tianjin Road and Huangpu Road areas. The Project will improve the wastewater quality to the required standard before discharging into Yangtze River
Dongxihu Wastewater Collection Systems	55.2 km ²	The collection system will collect the wastewater in the Wujiashan and Jinyin Lake areas, and improve the water quality of Jinyin Lake.
Caidian WWTP and Collection Systems	23.8 km ²	The service areas include Caidian Town and the new development districts east to Caidian Town, reducing urban wastewater pollution into Han River and Lianhua Lake

1-4 Areas directly affected by the Project

All the affected areas including land, housing or public facilities are located within the

Project service area itself.

1-4-1 Range of direct influence from the Project

The areas affected by the Wastewater Management Component involve 3 districts within the jurisdiction of Wuhan, including 1 urban district (Hanyang District) and 2 suburban districts (Dongxihu District and Caidian District). 5 townships or sub-district offices (Yongfeng Township, Jiangdi Township, Administrative Office of Jinyinghu Ecological Park, Jiangjun Road Sub-district Office and Caidian Sub-district Office), and 6 villages or neighborhood committees are also under the influence of the Project (see Table 1-3).

Table 1-3 Administrative Organizations Affected by the Project

No.	Sub-project	District	Township	Village (Neighborhood Committee)
1	Nantaizi Lake WWTP Expansion and Collection System	Hanyang District	Jiangdi Township	Jiangdi Fish Farm
			Yongfeng Township	Hancheng Village, Hnajiang Village and Liaoyuan Village
2	Dongxihu Wastewater Collection Systems	Dongxihu District	Administrative Office of the Jinyinghu Ecological Park	
			Sandian Sub-district Office	
3	Caidian WWTP and Collection Systems	Caidian District	Caidian Sub-district Office	Shiyang Village and Tongxin Village.
	No. of Affected Organizations	3	5	6

1-4-2 Socioeconomic status of affected areas

Wuhan is located in the east of the Jiangnan Plain. It is the capital of Hubei Province, an important industrial production base and traffic and communication hub of the entire country. Wuhan is the largest inland central city. It governs seven central urban districts and six suburban districts. In 2003, Wuhan covered an area of 8,494 km². The total population of the city in 2003 was 7,811,900, which included an agricultural population of 3,033,300 and a non-agricultural population of 4,066,800, with a population density of 920/km². The gross domestic product of the city in 2003 is 166.218 billion.

The commercial activities in Wuhan are increasing and thriving. As a historically well-known large commercial port, Wuhan is also a cradle for modern industry, with a strong industrial foundation. Since the reform and opening up, the economy in Wuhan has gained rapid development. With an increasing overall economic strength, it has developed into a multifunctional metropolis in central China. Especially in recent years, Wuhan's urbanization has been speeding up and investments in infrastructure development have been increasing at a relatively high rate, both of which have laid an excellent foundation for the sustainable development of the city. It can be seen from Table 1-4 that all the districts covered in the Project are under rapid economic development.

Table 1-4 Socioeconomic Development Status of Areas Covered by the Project in 2003

Affected Regions		Caidian District	Hanyang District	Dongxihu District	Wuhan City
Land area (km ²)		1,100.81	108.34	439.19	8,494.41
Registered population (10,000 persons)		47.97	37.76	23.94	781.18
Population density (person/km ²)		436	4,409	545	920
Per capita disposable income of urban population (CNY per year)		8,714	8,391	8,341	8,525
Per capita net income of rural population (CNY per year)		4,960	2,797	3,733	3,497
Total Domestic Product (CNY billion)		7.557	5.748	4.391	166.24
Economic growth rate (%)		13.2	12.2	12.5	11.4
Output structure of industries	Primary industry (%)	22.5	9.2	17.5	5.7
	Secondary industry (%)	36.2	45.2	53.2	44.6
	Tertiary industry (%)	41.3	45.6	29.3	49.7

Source of data: *Wuhan Statistical Yearbook* (2004).

1-4-3 Features of socioeconomic development in affected areas

All of the areas directly affected by the Project are rapid developing zone in recently years.

The features and general information of socioeconomic development in the affected areas are as follows:

(1) General information of the areas affected by the Dongxihu Wastewater Collection Systems

The areas affected by the Dongxihu Wastewater Collection Systems used to be state-owned farms, whose residents were mainly farm workers in the past. With the development of the city in recent years, the farms have undergone administrative system reforms. Some of the farms have been turned into new development zones in Wuhan (e.g. Jinyinhu Ecological Park, Taiwan Businessmen Investment and Development Zone), and some into urban areas (e.g. Jiangjun Road Sub-district Office). The Dongxihu Wastewater Collection Systems Sub-project involves laying wastewater collection pipes along Jinshan Road. The main affected area is the greenbelt at one side of Jinshan Road. In addition to 19.8 mu of land to be acquired permanently, there is another 119.8 mu of land which will be temporarily acquired. When the project construction has been finished, the greenbelt will be reinstated and there will be little negative impact onto local production.

(2) General information of the areas affected by the Nantaizi Lake WWTP and Collection Systems

The areas affected by the Nantaizi Lake WWTP and Collection Systems are Yongfeng Township and Jiangdi Township of the Hanyang District. In the past, these areas were rural or state-owned farms, and most of the residents worked in the agricultural sector. However, with the development of the city, these areas have undergone rapid urbanization and mostly become non-agricultural land. Most of the residents now are employed in non-agricultural sectors. The Nantaizi Lake Wastewater Collection Systems involves pipe laying along existing roads and all lands for the construction would only be temporarily acquired. The pipe laying work will only temporarily affect local residents. The second phase of the Nantaizi Lake WWTP will be expanded based on the design of the first stage of Nantaizi Lake WWTP. This part of the sub-project will occupy some fish-ponds permanently which belongs to Jiangdi Fish Farm (see Figure 1-2).

Figure 1-2 General information of the areas affected by Nantaizi Lake WWTP



(3) General information of the areas affected by the Caidian WWTP and Wastewater Collection Systems

The areas affected by Caidian WWTP and Wastewater Collection Systems are a suburban district. The lands occupied by the WWTP mainly belong to Shiyang Village (see Figure 1-3). Although the areas are adjacent to urban built-up areas and are earmarked to be a new development zone, most of the residents are still employed in the agricultural sectors. However, in recent years, with the rapid expansion of the Caidian urbanized areas, non-agricultural sectors in this area are developing rapidly. Now the area is becoming a newly urbanized area.

Figure 1-3 The area affected by Caidian WWTP



1-5 Measures to minimize land acquisition and resettlement

In accordance with the ADB policy on involuntary resettlement, the WPMO, the IA as well as the design institute (DI) has selected the project site carefully to minimize land acquisition and housing demolition. Meanwhile, all kinds of compensation measures have been prepared for the purpose of minimizing the adverse impact that may result from unavoidable land acquisition and temporary land occupation. For example, the DI has presented two schemes for the selection of the site for Caidian WWTP. After comparison of various factors relating to land acquisition and relocation, environmental impacts, economics, etc, the Jing-Zhu Expressway East option has been selected (see Table 1-5).

Table 1-5 Comparison of options for Caidian WWTP

Option comparison	Jing-Zhu Expressway East scheme (recommended)	Jing-Zhu Expressway West scheme
Land acquisition and relocation	The selected Plant location is on dry land without affecting buildings, satisfying project requirement while minimizing land acquisition and relocation expenses.	Most of the Plant site would be in vegetable farm land. There are also some residential houses and a row of workshops in the south side. The site has been acquired for development into an industrial area. If there were to be a change in land-use, in addition to general land acquisition expenses, additional compensation would have to be made.
Environmental impact	The site is located at the peripheral area of the city, separated by the Jing-Zhu Expressway that will serve as a buffer zone to reduce environmental impact to the urban areas.	Located at the urban fringe of the city, the site would be in the upper winds directions area, and there would be inadequate buffer zone causing greater environmental impact to the urban areas.
Project investment for wastewater collection	Located at the peripheral area of the city, longer trunk sewers and thus higher cost would be incurred to bring the collected sewage to the WWTP. The works would involve 570 m of D1500 mm sewer and the project investment is CNY 2,126,000.	With a more balanced distribution of main wastewater pipelines, it would have optimized the trunk sewer size and thus the construction cost. The works would involve 570 m of D800mm, sewer and the project investment would have been CNY 935,000.

According to the original proposed design scheme, the proposed land acquisition was 268.6 mu, affecting 202 people. Considering that there would be more APs in this scheme who will be affected by land acquisition and house demolition, as a result of the discussion among the design institute, IA and RP-preparing agency for the purpose of minimizing adverse impacts, the current recommended design scheme was made through adjusting the construction sites. The following table presents two alternative considerations in terms of land acquisition and resettlement for site schemes.

Table 1-6 Comparison of Options for each subproject Site Selection

Sub-project	Schemes	Land acquisition		House demolition	
		(mu)	APs (person)	(m ²)	APs (person)
Phase II Erlangmiao WWTP	Option 1	0	0	0	0
	Option 2 (recommended)	0	0	0	0
	Difference	0	0	0	0
Phase II Hanyang Nantaizihu WWTP and Wastewater Collection System	Option 1	151	41	1650	70
	Option 2 (recommended)	146	36	1550	63
	Difference	-5	-5	-100	-7
Phase II Huangpulu WWTP	Option 1	0	0	0	0
	Option 2 (recommended)	0	0	0	0
	Difference	0	0	0	0
Dongxihu Wastewater Collection System	Option 1	32.5	35	450	24
	Option 2 (recommended)	24.3	29	400	0
	Difference	-8.2	-6	-50	-24
Caidian District Wastewater Collection and Treatment System	Option 1	85.1	223	2395	108
	Option 2 (recommended)	83.6	219	385	14
	Difference	-1.5	-4	-2010	-94
Total	Option 1	268.6	299	4495	202
	Option 2 (recommended)	253.9	284	2335	77
	Difference	-14.7	-15	-2160	-125

1-6 Due diligence issues for the associated components

Among the five wastewater sub-projects, land acquisition for Phase II of Huangpulu WWTP was completed in 1998 and that for Phase II of Erlangmiao WWTP was completed in 1999; and the affected persons have been satisfactorily resettled. As such, no new land will need to be acquired for these two sub-projects. Phase II of Nantaizihu WWTP is to be extended along side the existing Phase I plant; land acquisition for the whole plant that was completed in 1999 and all the affected persons have been satisfactorily resettled. The land acquisition of Hanxi WWTP associated with Dongxihu Wastewater Collection System was completed in 1999 and all the affected persons have been satisfactorily resettled. Part of

sewer network of the Caidian District Wastewater Collection and Treatment Sub-project will be constructed with domestic funding¹; the corresponding land acquisition and resettlement will follow the same ADB policies and principles. Please see Table 1-6 for the resettlement requirement of each sub-project.

Table 1-7 Resettlement requirements of relevant sub-projects in the Wastewater Management Component

No.	Sub-project	Location	Land acquisition requirements	Resettlement requirements
1	Phase II Erlangmiao WWTP	Hongshan (urban area)	Land acquisition for the WWTP was completed in 1999; 560 <i>mu</i> of land has been acquired in the Phase I project, and only 180 <i>mu</i> of which has been used. As such, land acquisition has been completed 6 years ago and the affected persons have been satisfactorily resettled.	Not applicable
2	Phase II Hanyang Nantaizihu WWTP and Wastewater Collection System	Hangyang District (urban area)	Permanent land acquisition for the project is 146 <i>mu</i> and temporary land acquisition is 188 <i>mu</i> . Permanent land acquisition for Phase I of Nantaizihu WWTP was 162 <i>mu</i> and temporary land acquisition was 162 <i>mu</i> . Land acquisition in Phase I was completed in 1999 and the affected persons have been satisfactorily resettled.	Not applicable
3	Phase II Huangpulu WWTP	Jiang'An District (urban area)	Project scope is to upgrade the current wastewater treatment technology and no new land acquisition will be required. Land acquisition in Phase I was completed in 1998 and all the affected persons have been satisfactorily resettled.	Not applicable
4	Dongxihu Wastewater Collection System	Dongxihu (sub-urban area)	Permanent land acquisition for the project is 24.3 <i>mu</i> and temporary land acquisition is 119.8 <i>mu</i> . The land acquisition of Hanxi WWTP associated with Dongxihu Wastewater Collection System has been completed before 2000 and all the affected persons have been satisfactorily resettled.	Not applicable
5	Caidian District Wastewater Collection and Treatment System	Caidian District (sub-urban area)	Permanent land acquisition for the project is 83.6 <i>mu</i> and temporary land acquisition is 30 <i>mu</i> . Part of the wastewater collection system is funded with domestic capital.	Relevant projects invested with domestic capital will follow the same ADB policies and principles

1-7 Procedures and schedule for examination and approval of the Project

The procedures for the examination and approval of the Project can be divided into two parts,

¹The sewer network of the Caidian District Wastewater Collection and Treatment Sub-project is to be constructed with domestic, the land acquisition and resettlement impacts and restoration plan are to be prepared and submitted to ADB in internal and external resettlement monitoring and evaluation reports

domestic procedures and ADB procedures. Domestic procedures have presently proceeded smoothly. In 2005 the Development Planning Commission of Wuhan Municipality sent the project proposal report to the Hubei Provincial Development and Reform Commission and requested instructions for examination and approval. On Apr. 15, 2005, the Hubei Provincial Development and Reform Commission gave an official reply, agreeing to the use of ADB loans in the implementation of the Wuhan Wastewater and Storm Water Management Project. The Bureau of Land Resources of Wuhan Municipality has pre-examined the land use plan. Since this component is the key project of Wuhan urban infrastructures, the Land Resources Bureau will give priority to their land use. Currently relevant units of the Project are compiling project Feasibility Study Reports (FSRs), environmental impact assessment report (EIAs), and Resettlement Plans (RPs). The schedule of procedures for the examination and approval of the project is shown in Table 1-8.

Table 1-8 Procedures and schedule of examination and approval of the Project.

Domestic procedures		ADB Procedures	
Time	Procedures for examination and approval	Time	Procedures for examination and approval
Sep.-Dec. 2004	Compilation of project proposal report	May 2005	ADB PPTA tender award
Jan.-Apr. 2005	Official written reply of the Hubei Provincial Development and Reform Commission to project proposal; pre-examination of land use plan of the project by the Bureau of Land Resources of Wuhan Municipality.	Jun-Dec. 2005	Compilation of PPTA preliminary and mid term reports
Jun-Sep. 2005	Compilation of PPTA preliminary and mid term reports; compilation of FSRs, EIAs and RPs.	Nov. 2005	Evaluation by the delegation of ADB
Sep. 2005	Submission of FSRs, EIAs and RPs.	Jan. 2006	Examination and approval of EIAs and RPs
Sep.-Dec. 2005	Evaluation, examination and approval of FSRs, EIAs and RPs.	Feb. 2006	Administration and examination by ADB
Oct. 2005-Jan. 2006	Compilation and submission of project fund utilization report	Apr. 2006	Loan negotiation(s)
Dec. 2005-Feb. 2006	Examination of land use plan by Wuhan Land Resources Bureau.	July 2006	Loan effective.
Mar. 2006	Official written reply to project fund utilization report		

Domestic procedures		ADB Procedures	
Nov. 2005- Mar. 2006	Compilation of preliminary design of the project		
May 2006	Examination and approval of preliminary design of the project		
Sep. 2006	Commencement of project construction		

2 Socioeconomic Survey

2-1 Purpose of the socioeconomic survey

According to ADB requirements on involuntary resettlement, prior to the implementation of project engineering construction a field survey should be carried out on the socioeconomic impacts by the resettlement exercise. The purpose of the survey is to collect full information on the status of the affected persons as well as types and amounts of housing relocation and land acquisition in the areas affected by the Project, to understand the socioeconomic development status of the affected areas so as to provide reference data for the optimization of the engineering design scheme, to provide information for the compilation of RP and the production of the rehabilitation plan, and to provide reference for the independent monitoring organization in monitoring. In the meantime, a large-scale field survey can also provide the affected persons with information on the implementation status and progress of the Project so as to achieve the goal of information disclosure. Opinions and suggestions of the local government departments and affected persons can also be obtained in this way so as to tailor the rehabilitation plan with local reality to ensure the recovery and improvement of the living standard of the affected persons.

2-2 Methodology

The RP follows closely the ADB Handbook on Resettlement, A Guide to Good Practice. The basic approach to understanding the fundamental socio-economic conditions in the project affected areas centers on a careful review of existing city, district, village and household socio-economic data and field visits to each subprojects.

During the course of this study, extensive discussions were held with officials from local governments, districts/townships, villages and selected households with the aim of identifying basic socio-economic status of affected households, poor or minority groups. Special attention was given to seeking the options of village rehabilitation.

Using PRA methodologies and a sample survey (20%) of 20 households in affected villages, in each village, most of affected households were selected to collect substantial data and qualitative information on prevailing socio-economic conditions, project impacts and

potential livelihood restoration options.

2-2-1 Contents of the survey

- Locations, types and areas of all the land acquisitions within the scope of survey
- Locations, types and areas of all the buildings to be relocated within the scope of survey
- Locations, types and numbers of all the attachments to the ground within the scope of survey
- Locations, types and numbers of electric power and communication facilities within the scope of survey and the affected organizations
- Survey of the building structures of all the affected shops and the degree of impact, etc.
- Survey of the building structures of all the affected enterprises, institutions and the degree of impact, etc.
- Public opinions and suggestions of the affected areas by the Project
- Basic status of affected villages within the scope of survey
- Socioeconomic statistical data of the affected areas
- Preliminary resettlement plan and measures of affected villages as well as enterprises and institutions.

2-2-2 Questionnaire forms

In order to obtain the aforesaid information and data, the Center for Resettlement Research of Wuhan University designed special resettlement questionnaires applicable to the Wuhan Wastewater Management Project. Appendix 1 contains the actual questionnaires. These questionnaires can be divided into three categories:

(1) Questionnaires for affected assets

This survey includes:

- Types and amounts of land acquisitions - Form B
- Types and numbers of business buildings (shops and factory buildings) and residential buildings to be relocated - Form C
- Survey of the basic status of affected enterprises and institutions as well as the impacts upon them - Form E
- Types and numbers of affected public infrastructure and attachments to the ground - Form F.

(2) Socioeconomic questionnaires

The survey of socioeconomic background information includes:

- Survey of population of affected households, and genders, ages, domicile natures, marital status and employment status of the household members - Form A1
- Survey of property, income and expenditure of affected households - Form A2
- Survey of public opinions and suggestions - Form D
- Basic status of population, labor force, industrial structure, and farm land etc of affected villages within the scope of survey – Form G
- Survey of vulnerable groups in the affected population - Form H

(3) Other data collected

Statistical data and background information from relevant literatures in affected regions, including statistical yearbooks, annual bulletin data and legislative documents, etc. in recent years, have also been collected.

2-3 Survey organizations

2-3-1 Organizations and personnel participating in the survey

- PRO, resettlement organizations of sub-projects, and village heads or representatives of villagers in affected villages
- Representatives of the DIs (Wuhan Academy of Urban Planning and Design and Wuhan Planning Institute of Municipal Engineering)
- Surveyors from the Center for Resettlement Research of Wuhan University

2-3-2 Division of duties of the organizations

- PRO: in charge of organizing and coordinating the activities of the survey. Organized consultation meetings and monitored the activities of survey.
- Center for Resettlement Research of Wuhan University: responsible for the organization of the survey, design of the survey scheme, organization and training of survey staff, implementation and examination of the survey, compilation of data input program, data examination and verification, statistical and other data analysis, etc.
- District and township local government: provision of professional personnel to participate in the survey and responsible for the organization, coordination and collection of

socioeconomic background information and registered documents; providing guarantees and services necessary for the implementation of the survey

- Wuhan Academy of Urban Planning and Design and Wuhan Planning Institute of Municipal Engineering: demarcating the scope of survey according to engineering design scheme and providing design drawings.

2-4 Implementation of the socioeconomic survey

2-4-1 Composition of survey teams

Five teams carried out this survey in the same period of time, each of which consisted of about five persons. Among them, the one from the PRO was the team leader responsible for the contacts and communications with the local government. Among the 3 persons from the Center for Resettlement Research of Wuhan University, one was the deputy team leader responsible for specific surveys, contacts and communications; and two took charge of the survey registrations as well as examination, verification and logging of the collected questionnaires. The one member from the local resettlement office was an alternate deputy team leader, who in cooperation with the Center for Resettlement Research of Wuhan University took charge of the survey work of the team. The local departments led the ways, and assisted in locating the respondents, and assisting them in completing the questionnaires and collecting the forms promptly, so as to provide statistical data of the local socioeconomic development in recent years.

The respective DI provided one person to be responsible for the provision of design drawings, determination of the demarcation, and the implementation of relevant surveys of material objects.

2-4-2 Pre-test survey

Prior to the formal survey, the Center for Resettlement Research of Wuhan University has carried out a pre-test survey, through which they have checked the thoroughness and practicality of the questionnaires, gave audience to the opinions of the residents, and modified and improved the questionnaires accordingly.

While designing and improving the forms, the Center for Resettlement Research of Wuhan University compiled a survey guide, which introduced in detail the requirements in completing the questionnaires, so as to seek common understandings and consistency in the

field surveys by each of the 5 teams.

2-4-3 Implementation procedures

- (1) Drawing the scope of survey on the 1/2000 topographic maps.
- (2) Field measurement of the land and buildings contained in the scope of survey in the topographic maps, completion of Forms B and C, verification of the affected households and organizations, completing the cover page of the questionnaire, and ascertaining the use of the right type of the questionnaires.
- (3) In the case that the lands occupied or the buildings relocated belonged to family households, completing Form A₁ according to the addresses of the affected households with household as the unit.
- (4) Picking one in every five families to fill up Forms A₂ and D, which were sample questionnaires. Selecting one family member over 15 years old in each family household to provide answers to the two forms.
- (5) Filling up Forms E and F (and discarding Forms A, B, C and D) for occupied lands or buildings belonging to enterprises or institutions
- (6) Completing Forms G and H with township (town, sub-district) as the unit.

2-5 Progress of the socioeconomic survey

In the five ADB financed wastewater sub-projects, only 3 require land acquisition and relocation. These 3 sub-projects are: (1) Nantaizi Lake WWTP Expansion and Collection System Project; (2) Dongxihu Wastewater Collection Systems Project; (3) Caidian WWTP and Collection Systems Project. Due to engineering planning and design, the socioeconomic surveys were carried out in multiple steps.

- From Apr. 29 to May 2, 2005, the Center for Resettlement Research of Wuhan University organized 4 persons to carry out the field socioeconomic survey in the areas affected by the Nantaizi Lake WWTP Expansion Project.
- From Aug. 2 to Aug. 5, 2005, with the help of the PRO and local government, the Center for Resettlement Research of Wuhan University organized 8 persons, which were divided in 2 groups, to conduct the field socioeconomic survey in the areas affected by the Dongxihu Wastewater Collection Systems Project.
- From Aug. 6 to Aug. 9, 2005, with the help of the PRO, the Center for Resettlement Research of Wuhan University organized 8 persons to conduct the field socioeconomic survey

in the areas affected by the Nantaizi Lake Wastewater Collection Systems Project.

- From Aug. 17 to Aug. 20, 2005, with the help of the PRO and Caidian Construction Bureau, the Center for Resettlement Research of Wuhan University organized 7 persons to conduct the socioeconomic surveys in the areas affected by the Caidian WWTP and Collection Systems Project.

The impact analysis and resettlement program of the Project have both been compiled on the basis of the data from the socioeconomic survey and the information collected from the public consultation mentioned above.

3 Project Impacts

In order to understand the impacts of the Wastewater Management Component and according to the requirements of ADB, the Center for Resettlement Research of Wuhan University in coordination with the PRO and DIs, conducted a thorough survey from May 2005 to August 2005 of the types and amounts of land acquisition and relocation in each sub-project as well as the affected families, enterprises, institutions, rural collective economic organizations within the project impact scope, from which the basic information of project impacts was obtained. The information provided reliable data for the compilation of the RP and resettlement schemes.

3-1 Definition of project impacts

The scope of the survey on material objects affected by the Project is determined on the basis of the demarcation plans scope provided by the DIs, mainly including the affected areas by the WWTPs, pump stations, and pipelines. Since the Project is still in the feasibility study stage during the resettlement survey of material objects, the DIs may make further optimization, and the land acquisition data may also be adjusted. The PRO will revise and improve the RP according to the adjusted data. At the same time, any change in the project impacts will be reported to ADB before implementation with explanations for the changes. The RP is also applicable to additional affected persons, enterprises, institutions and villages, etc. Moreover, if significant changes needed during the process of detailed design, the RP should be updated and reviewed by ADB prior to award of civil works contract.

Definition of project impacts:

(1) Permanent occupied lands - all kinds of permanently occupied cultivated lands and non-cultivated lands within the affected area demarcated in the Project. The cultivated lands include paddy fields, dry lands, vegetable fields, ponds, mulberry orchards, fruit orchards, tea gardens and nursery gardens, etc; the non-cultivated lands include barren hills, waste lands, commercial forests, timberlands and house sites, etc.

(2) Temporary occupied lands - all kinds of cultivated lands and non-cultivated lands that

are temporarily occupied during construction and to be reinstated after construction. In this component, the temporary occupied lands are mainly caused by sewer pipes construction.

(3) Relocated buildings - all buildings within the affected area demarcated in the Project, mainly including brick and concrete, brick and tile, earth and wood, and simple houses, etc. According to different natures of ownerships, the buildings are divided into three types: private buildings, village collective buildings, and enterprise and institution buildings. According to the different usages, the buildings are categorized into private residences, shops, and factory buildings etc.

(4) Affected attachments to the ground - attachments to the ground within the affected area demarcated in the Project, mainly including pools, enclosing walls, wells, tombs, fruit trees, terraces, etc.

(5) Affected public facilities - public facilities (e.g. above ground and underground pipelines, communication lines, water supply, drainage and gas pipelines) and public service facilities (e.g. schools, bus stations or community centers, etc.) within the affected area demarcated in the Project.

(6) Affected family households - households whose lands, buildings or attachments to the ground are within the affected area demarcated in the Project or under direct influence of the Project.

(7) Affected communities - communities whose lands, buildings or attachments to the ground are within the affected area demarcated in the Project or under direct influence of the Project.

(8) Affected enterprises and institutions: enterprises and institutions whose lands, buildings or attachments to the ground are within the affected area demarcated in the Project or under direct influence of the Project.

(9) Persons affected by the Project - the population of all the family households affected by the Project.

(10) Licensed houses - houses with full or partial house ownership by building, purchasing or bestowing; or houses without formal house ownership certificates, but with construction documents and warrants approved by various levels of governments and relevant departments.

(11) Unlicensed houses - privately built houses without any relevant certificate issued by real estate departments or land departments. Also temporary buildings constructed after the approval from relevant departments, but whose building service life prescribed by documents

has expired.

(12) Unlicensed shops - privately built houses for business without any relevant certificate issued by real estate departments or land departments. Unlicensed shops in the project also include shops privately reconstructed from residences without business licenses issued by administration of industry and commerce.

(13) Affected employees,- Labors who work in affected shops, enterprises, and institutions are to be affected by land acquisition and house structure demolition.

(14) Floating population - population who has lived or worked in a community for over one year, yet whose household registration has not been moved into the community.

(15) Affected tenants - all persons living in the buildings affected by the Project by lease.

(16) Vulnerable groups - social groups who are vulnerable, lack of adaptability to social changes, and at a disadvantage in the society due to reasons such as lacking social participation ability and social security, disability and poverty, etc. Vulnerable groups mainly include the following types: lonely old people, female single parent families, orphans, poor families, disabled persons, etc.

3-2 Summary of Project Impacts

In the five ADB financed Wastewater Management Component sub-projects, two sub-projects (Wuchan Erlangmiao WWTP Project and Huangpu Road WWTP Upgrading Project) need no land acquisition and relocation and no person is affected or need to be resettled. The other 3 sub-projects need new land acquisition and relocation, there are also affected persons need resettled (Table 3-1).

3 wastewater sub-projects need new land acquisition are distributed in 3 districts in Wuhan, with a total permanent land acquisition of 253.9 *mu* and temporary land acquisition of 337.8 *mu*. 5 townships or sub-district offices, 6 villages or neighborhood committees, 82 family households, and 361 persons are affected. The total area of the relocated buildings is 2,335 m², of which 2,015 m² belong to residence houses , 320 m² belong to non-business buildings of 1 enterprises. There is no shop that needs to be relocated. The summary of project impacts is as shown in Table 3-2, and Table 3-3.

Table 3-1 Impact information of 5 sub-projects

Name of sub-project	Location	General information about land acquisition	Remark
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Name of sub-project	Location	General information about land acquisition	Remark
Wuchan Erlangmiao WWTP Project	Hongshan District	Land acquisition for the project was completed in 1999. 560 <i>mu</i> land has been acquired in Phase I t, while only 180 <i>mu</i> have been used.	No new land acquisition
Nantaizi Lake WWTP Expansion & Collection System	Hanyang District	Permanent land acquisition for the project is 146 <i>mu</i> and temporary land acquisition 188 <i>mu</i> .	Need new land acquisition
Huangpu Road WWTP Upgrading	Jiang An District	Project content is to upgrade the current wastewater treatment technology and no new land acquisition will be required.	No new land acquisition
Dongxihu Wastewater Collection Systems	Dongxihu District	Permanent land acquisition for the project is 24.3 <i>mu</i> and temporary land acquisition 119.8 <i>mu</i> .	Need new land acquisition
Caidian WWTP & Collection Systems	Caidian District	Permanent land acquisition for the project is 83.6 <i>mu</i> and temporary land acquisition 30 <i>mu</i> .	Need new land acquisition

Table 3-2 Summary of land acquisition Impacts

Type			No.
Permanent land occupation	Cultivated land (<i>mu</i>)	State-owned	9
		Collective	225.5
	Non-Cultivated land (<i>mu</i>)	State-owned	15.3
		Collective	4.1
	Total land occupation (<i>mu</i>)	State-owned	24.3
		Collective	229.6
	Total land acquisition (<i>mu</i>)		253.9
	Total affected persons		284
	No. of resettled agricultural labor force ² (laborers)		71
Temporary land occupation	Cultivated land(<i>mu</i>)	State-owned	0
		Collective	20.5
	Non-Cultivated land(<i>mu</i>)	State-owned	258.3
		Collective	59
	Total land occupation (<i>mu</i>)	State-owned	258.3
		Collective	79.5
	Total temporary land occupation		337.8
	Total temporary affected persons		117

² No. of resettled agricultural labor force is calculated by the formula of land laws

Table 3-3 Summary of House demolition Impacts

Type			No.
Total area of affected houses (m ²)	Residential building	Rural	2015
		Urban	0
		Total	2015
	Shops	Common	0
		Unlicensed	0
		Total	0
	Enterprise and institution building	Business	0
		Non-business	320
		Total	320
	Total relocation area		2335
No. of affected family households		14	
No. of affected persons		77	

3-3 Type and amount of land acquisition

According to the survey, the total area of acquired land by the wastewater management component is 597.1 *mu*, of which 253.9 *mu* requires permanently land acquisition (42.9 % of total), and 337.8 *mu* requires temporary land acquisition (57.1 %), as shown in Table 3-4.

3-3-1 Permanent land acquisition

Considering land occupation in each sub-project, Nantaizi Lake Project covers a land area of 334 *mu*, making up 56.4 % of the total occupied area; Dongxihua Wastewater Project 144.1 *mu*, occupying 24.4 % of the total; Caidian Wastewater Project 113.6 *mu*, 19.2 % (see Table 3-4).

In permanent land acquisition, 234.5 *mu* is cultivated land, 92.4 % of the total to be permanently acquired and 19.4 *mu* is non-cultivated land, the remaining 7.6 % of the land to be permanently acquired. Both state-owned land and collective-owned land are affected by land acquisition. According to the survey, 24.3 *mu*, or 9.6 % of the land to be permanently acquired is state-owned land, 229.6 *mu*, or 90.4 % is collective-owned land.

In permanent land acquisition, 146 *mu* or 57.5 % is in Hanyang District, 24.3 *mu* or 9.6 % is in Dongxihu District, 83.6 *mu* or 32.9 % is in Caidian District (Table 3-5).

Permanent land acquisition is caused by the construction of Wastewater treatment plants (WWTP) and pump stations. The total area of permanent land acquisition is 253.9 *mu*, of which 136 *mu* will be acquired for Nantaizi Lake WWTP, 78.7 *mu* for Caidian WWTP, and

another 39.2 *mu* for 9 pump stations. 8 villages or state-owned farms (Hanjiang Village, Hancheng Village, Liaoyuan Village, Jiangdi Fish Farm, of Hangyang District; Sandian Sub-street Administrative Office, Jinyinhu Ecological Park of Dongxihu District; Shiyang Village, Tongxin Village of Caidian District) are affected by the project. According to the Table 3-3 and Table 3-4, no cultivated land will be acquired in Hanjiang Village, Jinyinhu Ecological Park, and Tongxin Village; just a small amount of cultivated land will be acquired in Liaoyuan Village, Hancheng Village, and Sandian Sub-street Administrative Office., The impact degree on these affected villages or farms are below 1.5% (Table 3-6).

Jiangdi Fish Farm (affected by Nantaizi Lake WWTP) and Shiyang Village (affected by Caidian WWTP) are more heavily impacted by the project. According to the Table 3-4, the impact rate in Jiangdi Fish Farm is 10.4%, while the impact rate in Shiyang Village is 10.3%(Table 3-6).

All acquired lands are cultivated and managed by the villagers themselves, and no land is leased to the floating population.

Table 3-4 Type and area of land occupation in sub-projects

Name of subproject	Land ownership	Permanent land occupation (mu)										Temporary land occupation (mu)							Total (mu)
		Cultivated land					Non-cultivated land				Total	Cultivated land			Non-cultivated land			Total	
		Paddy	Dry land	Pond	Fish Pond	Subtotal	Woodland	House site	Waste Land	Subtotal		Paddy	Pond	Subtotal	Green belt or woodland	Existing roads or construction land	Subtotal		
Nantaizi Lake Wastewater Project	State-owned	0	0	0	0	0	0	0	0	0	0	0	0	0	0	113	113	113	113
	Collectively-owned	0	5.5	1.5	136	143	0	0.7	2.3	3	146	13	3	16	5	54	59	75	221
	Total	0	5.5	1.5	136	143	0	0.7	2.3	3	146	13	3	16	5	167	172	188	334
Dongxihu Wastewater Project	State-owned	0	9	0	0	9	15.3	0	0	15.3	24.3	0	0	0	119.8	0	119.8	119.8	144.1
	Collectively-owned	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	9	0	0	9	15.3	0	0	15.3	24.3	0	0	0	119.8	0	119.8	119.8	144.1
Caidian Wastewater Project	State-owned	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25.5	25.5	25.5	25.5
	Collectively-owned	78.7	3.8	0	0	82.5	0.5	0.6	0	1.1	83.6	4.5	0	4.5	0	0	0	4.5	88.1
	Total	78.7	3.8	0	0	82.5	0.5	0.6	0	1.1	83.6	4.5	0	4.5	0	25.5	25.5	30	113.6
Project total land occupation	State-owned	0	9	0	0	9	15.3	0	0	15.3	24.3	0	0	0	119.8	138.5	258.3	258.3	282.6
	Collectively-owned	78.7	9.3	1.5	136	225.5	0.5	1.3	2.3	4.1	229.6	17.5	3	20.5	5	54	59	79.5	309.1
	Total	78.7	13.8	1.5	136	234.5	15.8	1.3	2.3	19.4	253.9	17.5	3	20.5	124.8	192.5	317.3	337.8	591.7

Table 3-5 Type and area of permanently land occupation in affected regions

Name of sub-project	District	Township	Village	Cultivated land					Non-cultivated land				Total (mu)
				Paddy	Dry land	Pond	Fish Pond	Subtotal	Green belt or Woodland	House Site	Existing roads	Subtotal	
Nantaizi Lake Wastewater Project	Hanyang District	Yongfeng Township	Hanjiang	0	0	0	0	0	0	0.5	0	0.5	0.5
			Liaoyuan	0	0	1.5	0	1.5	0	0.2	0	0.2	1.7
			Hancheng	0	1.9	0	0	1.9	0	0	0	0	1.9
		Jiangdi Township	Jiangdi Fish Farm	0	3.6	0	136	139.6	0	0	2.3	2.3	141.9
		Total			0	5.5	1.5	136	143	0	0.7	2.3	3
Dongxihu Wastewater Project	Dongxihu District	Jinyinhu Ecological Park		0	0	0	0	0	12.3	0	0	12.3	12.3
		Sandian Sub-street Administrative Office		0	9	0	0	9	3	0	0	3	12
		Total		0	9	0	0	9	15.3	0	0	15.3	24.3
Caidian Wastewater Project	Caidian District	Caidian Town	Shiyang	78.7	3.8	0	0	82.5	0	0	0	0	82.5
			Tongxing	0	0	0	0	0	0.5	0.6	0	1.1	1.1
		Total			78.7	3.8	0	0	82.5	0.5	0.6	0	1.1
Total area of permanently land occupation				78.7	18.3	1.5	136	234.5	15.8	1.3	2.3	19.4	253.9

Table 3-6 Impact rates of affected villages or farms

Affected villages or farms	Liaoyuan Village	Hanjiang Village	Hancheng Village	Jiangdi Fish Farm	Jinyinhu Ecological Park	Sandian Sub-street	Shiyang Village	Tongxin Village
Cultivated land before acquisition (mu)	100	152	667	1342	2200	8391	800	650
Acquired cultivated land (mu)	1.5	0	1.9	136	0	4.5	82.5	0
Impact rates	1.5%	0%	0.3%	10.4%	0%	0.05%	10.3%	0%

3-3-2 Temporary land use

The temporary land use is mainly caused by wastewater collection system (wastewater sewers and pipes). The total temporary land acquisition is estimated to be 337.8 mu, in which 20.5 mu is cultivated land and 317.3 mu is non-cultivated land (Table 3-7). The affected land types mainly include green belts and roads.

Table 3-7 The types of temporary land use

Sub-project	Affected area by Pipes or sewers	Types of temporary land use	Temporary households and APs	Main impacts of temporary land use	Measures taken to reduce the impact on shops or enterprises
Nantaizi Lake Wastewater Collection System	(i) The existing roads: 5km (ii) The planned roads: 7.3 km	i) Paddy: 13 mu; ii) Ponds: 3 mu; iii) Woodland: 5 mu; iv) Roads or green belt: 167 mu; Total: 172 mu.	100 persons of 21 households will be affected temporarily	i) Shops or residences located beside existing roads(5km) may be affected,. ii) 7.3 km pipes will be paved under planned roads; no shops will be affected.	i) The measures will be taken to avoid the impacts on shops , such as laying pipes during the night; and shortening implementation duration ii) If any shop will be seriously affected , the PMO will compensate to them as contingency items.
Dongxihu Wastewater Collection System	(i) The green belt along Jinshan Roads: 25.35 km	i) Green belt: 119.8 mu	No households and shops will be affected	The pipes will be paved under the green belt along Jingshan Road	i) The PMO will provide full compensation for green belt. The cost has been included in the resettlement budgets
Caidian Wastewater Collection System	i) The existed roads 1.9km; ii) The planned roads about 2.7km	i) Paddy: 4.5 mu; ii) The existing roads 25.5 mu	17 persons of 3 households will be affected temporarily	No shops will be affected	The PMO will compensate the owners of affected lands according to the standards showed in Table 5-6.

3-4 Type, structure and area of house demolition

Total area of relocated buildings in the Wastewater Management Component is 2,335 m², of which 2,075 m² or 88.9 % of is licensed buildings, while 260 m² or 11.1% is unlicensed building or overdue temporary buildings (Table 3-8). The unlicensed building is usually as annexes of the main building and function of storage.

In relocated buildings, the Nantaizi Lake Project requires a relocation of 1,550 m², accounting for 66.4 % of the total, the Dongxihu Wastewater Project 400 m², 17.1 % of the total, and the Caidian Wastewater Project 385 m², 16.5 % (Table 3-8). Except Nantaizi Lake subproject , Dongxihu and Caidian subprojects are located in suburb of Wuhan city.

Considering the structure of the relocated buildings, brick and concrete buildings cover an area of 1,745m², 74.7 % of the total; simple houses 590 m², the remaining 25.3 % (see Table 3-7). According to building use, the relocated buildings in the project include two building types, namely enterprises and institutions, and residences. In this Project, 320 m², or 13.7 % falls under the enterprises and institutions category, 2,015 m² or 86.3 % is residence houses.

Table 3-8 Type and area of relocated buildings in sub-projects

Sub-project	Township	Village	Building use	Ownership	Location Rank	Structure of building (m ²)				Total (m ²)	APs /HH	Structures owned
						Steel concrete	Brick-concrete	Brick-wood	Simple			
Nantaizi Lake Project	Yongfeng Township	Liaoyuan	Rural Residences	Licensed	Second Rank	0	810	0	0	810	17/3	Individual
		Hanjiang	Rural Residences	Licensed	Second Rank	0	480	0	0	480	23/3	Individual
			Rural Residences	Unlicensed	Second Rank	0	70	0	0	70		Individual
	Jiangdi Township	Jiangdi fish farm	Simple House	Unlicensed	Third Rank	0	0	0	190	190	23/5	Individual
	Subtotal					0	1,360	0	190	1,550		
Dongxihu Project	Jiangjun Road	Machi	Rural Residences	Licensed	Suburban	0	0	0	400	400		Village Committee
Caidian Project	Caidian sub-street	Tongxin	Rural Residences	Licensed	Suburban	0	65	0	0	65	2/1	Individual
		Wine Factory	Non-business building of enterprise	Licensed	Suburban	0	320	0	0	320	12/2	village committee
	Subtotal					0	385	0	0	385		
Total relocation of Wastewater Project	Rural Residences			Licensed		0	1,355	0	400	1,755		
				Unlicensed		0	70	0	190	260		
	Non-business building of enterprise			Licensed		0	320	0	0	320		
				Unlicensed		0	0	0	0	0		
	Total area					0	1,745	0	590	2,335		

3-4-1 Residential House Demolition

All relocated residences in the Project are rural residences. The total area of relocated

residences is 2,015 m², of which 1,755 m² is licensed houses, and 260 m² unlicensed houses. In these relocated residences, 810 m² existed in Liaoyuan Village, 550 m² existed in Hancheng Village, and 400 m² existed in Machi Neighborhood.

3-4-2 Enterprises Affected

All sub-projects of the Wastewater Management Component involving land acquisition are located in suburban districts, and the affected land is mainly cultivated land or fishponds. As there is no shop affected by the Project, no shop needs to be relocated due to permanent land acquisition. Only one enterprise named Hongxing Wine Factory, which is located in Tongxing Village, Caidian Sub-street, will be affected by Diaojiao Pump Station expanded, This factory with 320 m² building is a state-owned enterprise. It was closed 5 years ago because of the poor operation , and all employees were provided new jobs by local government in 2000..

3-5 Affected infrastructures and attachments

Since most of the affected areas are located far away from prosperous streets, there are few municipal infrastructures are affected by the Project. For type and number of affected infrastructures and attachments to the ground, see Table 3-9.

Table 3-9 Affected infrastructures and attachments to the ground

Affected regions	No. of power pole	Soil road (m ²)	Enclosing Wall (m ²)	No. of tombs	No. of trees	Phone (set)	Air conditioner (set)	Electric meter (set)
Liaoyuan Village	5	0	150	0	0	6	5	6
Hangjiang Village	3	0	50	0	0	6	3	6
Hancheng Village	4	250	0	2	120	0	0	0
Jiangdi Fish Farm	15	150	0	0	25	0	0	0
Jinyinhu Ecologic Park	0	0	0	0	3,000	0	0	0
Sandian Sub-street Office	0	0	0	0	2,000	0	0	0
Jinyinhu Park	0	0	100	0	300	0	0	0
Xingbang Golf Company	0	0	120	0	400	0	0	0
New Century Golf Company	0	0	140	0	600	0	0	0
Shiyang Village	5	500	0	8	30	0	0	0

Affected regions	No. of power pole	Soil road (m ²)	Enclosing Wall (m ²)	No. of tombs	No. of trees	Phone (set)	Air conditioner (set)	Electric meter (set)
Tongxing Village	3	0	0	0	20	3	0	3
Total	35	900	560	10	6,495	15	8	15

3-6 Affected persons

There are 361 persons of 82 households affected by the Wastewater Management Component. In which 284 persons in 68 households are affected by land acquisition only, 67 persons in 12 households are affected by house relocation only. The Nantaizi Lake sub-project affects 99 persons in 20 households; the Dongxihu sub-project affects 29 persons in 5 households; and the Caidian sub-project affects 233 persons in 57 households (Table 3-10).

Table 3-10 Numbers of households and persons affected by the Project

Sub-project	Village	Affected by land acquisition only		Affected by house relocation only		Total	
		Households	Persons	Households	Persons	Households	Persons
Nantaizi Lake Wastewater Project	Liaoyuan Village	1	3	3	17	4	20
	Hanjiang Village	0	0	3	23	3	23
	Hancheng Village	1	2	0	0	1	2
	Jiangdi Fish Farm	7	31	5	23	12	54
	Subtotal	9	36	11	63	20	99
Dongxihu Wastewater Project	Sandian Sub-Street	5	29	0	0	5	29
Caidian Wastewater Project	Shiyang Village	54	219	0	0	54	219
	Tongxing Village	0	0	3	14	3	14
	Subtotal	54	219	3	14	57	233
Total		68	284	14	67	82	361

The Resettlement Research Center of Wuhan University has conducted socioeconomic survey on the APs and their families of key affected villages. According to survey, 52.8% of the APs are male, 47.2% are female. Considering education level, 14.2% of the APs are illiterate

and semi-illiterate, 38.7% are with elementary school education, 45.3% middle school, and 1.8% college or above. The result of the survey indicated that most of the affected labors of Shiyang Village, Caidian Town are agricultural labors, while the affected labors of Liaoyuan Village, Hanjiang Village, and Jiangdi Fish Farm have been employed in non-agricultural sectors. The APs' socioeconomic conditions in each affected villages are shown in Table 3-11.

Table 3-11 Socioeconomic Conditions of APs

Affected regions	Ratio of sex (%)		Education level (%)				Status of employment (%)		Annual income per Capita (CNY)
	Male	Female	Illiterate	Elementary	Middle school	College and above	Agricultural sector	Non-agricultural sector	
Liaoyuan Village	47.1	52.3	10.5	32.2	52	5.3	0	100	4,200
Hanjiang Village	52.2	47.8	11	33.1	51.7	4.2	34.8	65.2	4,000
Jiangdi Fish Farm	56.5	43.5	8.7	23.4	59.4	8.5	33.3	66.7	5,600
Shiyang Village	51.4	48.6	16.3	42.1	59.6	1.2	82.4	17.6	3,100
Total	52.8	47.2	14.2	38.7	45.3	1.8	78.4	21.6	3,500

3-7 Impacts Degree Analysis

The Hanyang District to be affected by the wastewater management component is an urban district of Wuhan, the affected villages belong to "villages in city". According to Wuhan municipal plan, the most of land in these affected villages has been converted into non-agricultural land; most labor force is now working in non-agricultural sectors. In recent years, similar trend of cultivated land converting to non-agricultural and farmers' moving into non-agricultural sectors has accelerated in the affected villages. As such, land acquisition has little impact on agricultural production. The socioeconomic survey indicates that only Shiyang Village of Caidian Town in Caidian District is comparatively heavier impacted. Other villages are very slightly affected (see Table 3-12).

Table 3-12 Degree of impact in affected areas by land acquisition and house demolition

Affected village (or unit)	Liaoyuan village	Hanjiang Village	Hancheng Village	Jiangdi Fish Farm	Sandian Substreet	Shiyang Village	Tongxin Villages
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Affected village (or unit)		Liaoyuan village	Hanjiang Village	Hancheng Village	Jiangdi Fish Farm	Sandian Substreet	Shiyang Village	Tongxin Villages
Features of village location		Village in city	Village in city	Village in city	State farm	State farm	Suburban village	Suburban village
Cultivated land before land acquisition (mu)		100	152	667	1,342	8,391	800	650
Total population (person)		292	892	1,012	1,221	8,930	2,000	1,400
Agricultural labor force (person)		206	482	579	67	1,682	618	380
Acquired cultivated land (mu)		1.5	0	1.9	139.6	4.5	82.5	0
Affected persons by land acquisition (person)		20	23	2	54	29	219	4
Resettled laborer (person)		0	0	0	7	0	64	0
Impact Rate (%)	Percentage of acquired cultivated land	1.5	0	0.3	10.4	0.05	10.3	0
	Percentage of affected persons	5.8	2.6	0.1	4.4	0.3	11	0.3
	Percentage of resettled labor forces	0	0	0	10.4	0	10.3	0
House Demolition (m2)		810	550	0	190	0	0	385
Affected persons by House demolition (person/household)		17/3	23/3	0/0	23/5	0/0	0/0	14/3

i. Slightly impact Villages

No cultivated land will be acquired in Hanjiang Village, and Tongxin Village; and just a small amount of cultivated land will be acquired in Liaoyuan Village, Hancheng Village, and Sandian Sub-street Administrative Office, The impact rate of these affected villages or farms are below 1.5%.

Liaoyuan Village is located in Hanyang District, it is a typical "village in cities", 80% of the villager is employed in non-agricultural sector now, there is only one pond (1.5 mu), 810m² residential houses and 20 persons of 4 households will be affected by pump station construction and the sewer pipes. Because this public pond is not the income resource of any household, so land acquisition will not affect the villager's income, there is also no labors need resettled, the main resettlement activities is to relocate houses.

In Hanjiang Village of Hanyang District, there are no cultivated land will be acquired by sewer pipes, only 550m² residential houses and 3 households will be affected, and no labors need to be resettled in this village.

In Hancheng Village, only 1.9mu dry land will be acquired by pump station. The land

belongs to the village community, no labors cultivated this land, and it is just a public asset so the main option for this village is to provide satisfied compensation to them.

In Sandian Sub-street, the total acquired land is 9mu, this land is mainly the dry land near the road, and it is public and state-owned land. No labors need to resettle.

In Tongxin Village, there is 0.5mu woodland and 0.6mu houses site will be acquired by pump station, the public woodland belongs to the village community, no household will be affected.

Jiangdi Fish Farm is a state-owned farm, the farm owned 1342mu cultivated lands before land acquisition, the Nantaizi Lake WWTP will acquired their 139.6 mu fish pond, the impact rate is 10.4%, and only 7 laborers are to be affected. Those laborers are formal workers of Jiangdi Fish Farm, wages of them is the same no matter land acquisition or not.

ii. Comparatively heavier impact village

Shiyang Village, located in development zero of Caidian Township, is the relatively heavier affected by the Caidian subproject. According to the survey, the total area of land acquisition is 82.5mu (78.7mu paddy land, 3.8mu dry land) which are cultivated by 56 households, 3 groups will be affected by land acquisitions, in these 3 affected groups, Group 2 is the most heavily affected group, about 75% of cultivated land of Group 2 will be acquired. The annual income loss of the land is about CNY 165,000³ which about 15% of the total incomes of 3 groups.

64 agricultural laborers need to be resettled, the income of these laborers are mainly from non-agricultural activates, the annual income of them is about CNY10000, in which, land loss is about 20%.

3-8 Affected vulnerable groups

3-8-1 Definition of vulnerable groups

Vulnerable groups refer to groups of persons affected by the Project, who are vulnerable and cannot adapt to changes arising out of project construction. Vulnerable groups mainly include the following types:

- Lonely old people: mainly single old people over 65 years old without legal obligor of support.
- Single parent family: family with single householder and underage child (children).

³It is calculated by the actual value of the output.

- Orphan: child under 16 years old without parents.
- Poor family: urban family whose members' average monthly income is below CNY 210; town family whose members' average monthly income is below CNY 158 (the above mentioned families should be with a *Certificate of Guarantee of Subsistence Allowances for Urban Residents in Wuhan*); rural family whose members' a average yearly income is below CNY 800 (with a *Certificate of Guarantee of Subsistence Allowances for Rural Residents* and relevant certificates in districts).
- Disabled person: person whose certain organ or function has been lost or who has disabilities in mental, physical, or body structure, or whose ability to participate in certain activities in normal manners has been lost completely or partly (with a *Certificate of Disabled of People's Republic of China*)

The definition of vulnerable groups is based on the requirements of relevant policies, laws and legislations, the field survey as well as the monitoring and visits in relevant relocation work of this city. During the project implementation, the Resettlement Office will have it confirmed by household survey, neighborhood visit, verification of community neighborhood committee and claiming evidence by letter, etc.

3-8-2 Families of affected vulnerable groups

The survey indicates that in affected persons, 5 households of altogether 11 persons belong to vulnerable groups. Table 3-13 is the list of families of vulnerable groups affected by the project.

Table 3-13 Households of affected vulnerable groups

Sub-project	Village	Name of householder	Household population	Reasons for being Vulnerable	Project impact
Caidian Wastewater Project	Shiyang Village	Xiao Shengxiong	2	Poor family, Low income	Lose land
		Liu Guixia	3	Poor family, Low income	Lose land
		Yu Qun	1	Lonely old people	Lose land
		Liu Xiaobei	3	Poor family, Low income	Lose land
		Cai Meizhi	2	Poor family, Low income	Lose land

3-9 Gender impact assessment

The subprojects construction will change patterns of use of land and cause a range of resettlement effects. Such changes may have different impact on man and woman, so it is necessary to carry out gender impact assessment before resettlement plan is determined. Gender impact assessment is also one of the ways in which gender inequalities can be addressed.

In wuhan, women have landownership and property rights same as man, when the women are divorced or widowed, they still have the right to obtain land or land compensation, with the development, the gender inequity is decreasing. For example, the female education levels of the affected villages have improved considerably during the recently 20 years, the girls' primary enrollment rates are rising faster than boys' enrollment rates and substantially reducing gender gaps in schooling. According to the socioeconomic survey, in 2004, the gross enrollment rates for females in the affected villages have reached 100 percent. The women's labor market position has also been improved, women's labor force participation has risen and the female share of non-agricultural employment has also increased. However, Gender differences in education, work experience, and job characteristics still existed in these affected villages and large gender gaps in earnings persist. In 2004, female employees just earn about 75% of what men earn according to the survey.

The land acquisition has no direct negative influence on women in the short term, but in the long term, land acquisition tends to change the product model and life style, it is an unavoidable trend that the share of non- agricultural employment will increase, more and more labors will move from agricultural sector to non-agricultural sectors. Being less mobile than men, women's universe is more restricted. Hence, they have limited ability to cope with and adjust to new situations and environments. Especially women remain underrepresented in higher paying jobs, including administrative and managerial jobs. The local government and the PMO noted that it is a challenge for women. Strengthening the women's ability and skill in non-agricultural production is also the important task for all resettlement organizations.

4 Laws, Regulations and Policies

The resettlement work in the Wastewater Management Component will be implemented in strict compliance with relevant laws, legislations and policies of the districts where the project is located, of Hubei Province and of People's Republic of China, as well as in complete accordance with ADB principles and policies of involuntary resettlement during the planning and implementation of resettlement work.

4-1 Major relevant laws, regulations and policies

4-1-1 State laws and regulations

The legal basis of the project resettlement plan refers to relevant laws and regulations promulgated and implemented by the Wuhan Municipal Government, Hubei Provincial Government and the Central Government of People's Republic of China.

1. The state-level regulations mainly include:

- (1) *Land Administration Law of the People's Republic of China* (revised in August 28, 2004)
- (2) *Regulations on the Implementation of the Land Administration Law of the People's Republic of China* (December 27, 1998)
- (3) *Administrative Regulations on Urban House Demolition and Relocation* (June 11, 2001)
- (4) *Decision of the State Council on Deepening the Reform on Strict Management to Land* (October 21, 2004)

2. Regulations at ministerial level and Hubei provincial level mainly include:

- (1) *Implementation Measures of Hubei Province on Land Administration* (March 22, 1999)
- (2) *Guiding Opinions of Ministry of Construction on the Assessment of Urban Housing Relocation* (December 1, 2003)
- (3) *Guiding Opinions of Ministry of Land and Resources on Perfection of the Land Acquisition Compensation System* (November 3, 2004)
- (4) *Circular of the People's Government of Hubei Province on Further Strengthening Land*

Acquisition Management in Order to Virtually Protect Lawful Rights and Interests of Farmers Whose Land Has Been Acquired (February 27, 2005)

3. Regulations issued by Wuhan Municipality mainly include:

(1) *Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collective-owned Land* (February 1, 2004)

(2) *Administrative Measures of Wuhan Municipality on Urban House Demolition and Relocation* (March 1, 2002)

(3) *Administrative Measures of Wuhan Municipality on Collective-owned Land Demolition and Relocation* (December 22, 2003)

(4) *Administrative Measures of Wuhan Municipality on City Planning* (July 3, 1991)

(5) *Opinions of Wuhan Municipal Committee of CPC and the People's Government of Wuhan Municipality on Actively Promoting the Comprehensive Reconstruction of "Villages in City"* (September 10, 2004)

4-1-2 ADB Policies on involuntary resettlement

The objectives of the ADB policy on involuntary resettlement are (i) avoid involuntary resettlement wherever feasible; and (ii) minimize resettlement where population displacement is unavoidable, and ensure that displaced people receive assistance, preferably under the project, so that they would be at least as well-off as they would have been in the absence of the project.

For any project that requires relocating people, resettlement should be an integral part of project design and should be dealt with from the earliest stages of the project cycle, taking into account the following basic principles:

- i. Involuntary resettlement should be avoided where feasible.
- ii. Where population displacement is unavoidable, it should be minimized by exploring all viable project options.
- iii. If individuals or a community must lose their land, means of livelihood, social support systems, or way of life in order that a project might proceed, they should be compensated and assisted so that their economic and social future will generally be at least as favorable with the project as without it. Appropriate land, housing, infrastructure, and other compensation, comparable to the without project situation, should be provided to the adversely affected population, including indigenous groups, ethnic minorities who may have usufruct or

customary rights to the land or other resources taken for the project.

iv. Any involuntary resettlement should, as far as possible, be conceived and executed as a part of a development project or program and resettlement plans should be prepared with appropriate time bound actions and budgets. Resettlers should be provided sufficient resources and opportunities to reestablish their homes and livelihoods as soon as possible.

v. The affected people should be fully informed and closely consulted on resettlement and compensation options. Where adversely affected people are particularly vulnerable, resettlement and compensation decisions should be preceded by a social preparation phase to build up the capacity of the vulnerable people to deal with the issues.

vi. Appropriate patterns of social organization should be promoted, and existing social and cultural institutions of resettlers and their hosts should be supported and used to the greatest extent possible. Resettlers should be integrated economically and socially into host communities so that adverse impacts on host communities are minimized. One of the effective ways of achieving this integration may be by extending development benefits to host communities.

vii. The absence of formal legal title to land by some affected groups should not be a bar to compensation. Affected persons entitled to compensation and rehabilitation should be identified and recorded as early as possible, preferably at the project identification stage, in order to prevent an influx of illegal encroachers, squatters, and other nonresidents who wish to take advantage of such benefits. Particular attention should be paid to the needs of the poorest affected persons including those without legal title to assets, female-headed households and other vulnerable groups, such as indigenous peoples, and appropriate assistance provided to help them improve their status.

viii. The full costs of resettlement and compensation, including the costs of social preparation and livelihood programs as well as the incremental benefits over the "without project" situation, should be included in the presentation of project costs and benefits.

ix. To better assure timely availability of required resources and to ensure compliance with involuntary resettlement procedures during implementation, eligible costs of resettlement and compensation may be considered for inclusion in Bank loan financing for the project, if requested.

4-2 Adopted resettlement principles

Although there are some small differences on regulations between resettlement policy of

ADB and domestic laws, the principle to secure the legal rights and interests of resettlers, restore the production and living conditions, restore and increase incomes of displaced persons as soon as possible is the same. Especially since the promulgation of *Decision on Deepening the Reform on Strict Management to Land* (Document 28) by the State Council in 2004, the government further enhanced the protection of the legal rights and interests of farmers whose land is acquired from the aspects of land acquisition compensation rates, resettlement approaches, the process and supervision of land acquisition, etc. The resettlement principles of this project are compiled in conformity with relevant state and local laws and policies and especially on the basis of implementing the latest policies such as Document 28 of the State Council and so on. The main principles chosen according to Document 28 are listed in Table 4-1. The main strategies chosen in the implementation of this Project are as follows.

4-2-1 Compensation policy for permanent acquisition of rural collective land

According to current laws of Wuhan, compensation rate for rural collective land shall be decided equivalent to the average annual production output value of the land in the previous three years. This is too low not only for the land compensation, but also makes a big gap between the compensation rates of adjacent land, which cannot compensate the actual value of the land. The project makes the consolidated compensation rates in accordance with land, output value, land location, agricultural land grade, cultivated land per capita, land supply and demand relations, local economic development level and other factors. Compensation standards (AAOV) for land acquisition of each sub-project are as follows: Hangyang District (Nantaizi Lake Wastewater Sub-project) CNY 5,890; Dongxihu District (Dongxihu Wastewater Sub-project) CNY 4,895; Caidian District (Caidian Wastewater Sub-project) CNY 3,840.

According to *Compensation and Resettlement Methods for Rural Collective-owned Land of Wuhan City*, compensation rates for land acquisition are calculated on the basis of the following standards: compensation for cultivated land shall be paid equivalent to ten times of the compensation base; compensation for garden plot, forest land and other agricultural land, six times of the compensation base; compensation for construction land and unexploited land, six times of the compensation base. The resettlement subsidy standards of the project shall be calculated on the basis as follows: compensation for cultivated land, such as paddy field, dry

land, nursery, orchard and etc shall be paid equivalent to fifteen times of the compensation base; compensation for fish pound and forest land, nine times of the compensation base; compensation for pond eight times of the compensation base; for wasteland and house sites, no resettlement subsidy. The compensation rates for land acquisition of each sub-project are showed in Chapter V.

4-2-2 Compensation policy for temporary acquisition of rural collective land

Compensation for temporary acquisition of collective land shall be paid according to the following standards: (1) households to be affected by temporary land loss consulted and informed; (2) compensation for temporary cultivated land will be calculated by combining land-use years with land compensation base. Compensation for temporary land-use within one year will be calculated according to two years; compensation for temporary land-use above one year (including one year) will be calculated according to three years; (3) compensation for temporary land-use of other yields will be paid according to the standard of adjacent cultivated land; (4) compensation for young crops and attachments to the ground within the temporary land-use area will be paid according to actual loss to all persons.

4-2-3 Compensation policy for state-owned agricultural land

There are two kinds of state-owned land involved in the Wuhan Wastewater component land acquisition: one is the state-owned agricultural land, which consists of mainly state-owned farm land; the other is state-owned construction land, which consists of public roads, state-owned land occupied by private entity. According to the regulations of *Compensation and Resettlement Methods for Rural Collective-owned Land of Wuhan City* and Document No. 450 of *Explanation on Compensation and Resettlement Issues of Using State-owned Agricultural Land for Non-Agricultural Construction Purpose* issued by Wuhan Land Resources Bureau in 2004, compensation rates for state-owned agricultural land, resettlement subsidy standards, young crops and attachments to the ground are executed according to the compensation rates for land acquisition standards of collective-owned land. The compensation price for acquired state-owned construction land of the project shall be assessed by special organization with land-price evaluation qualification, and the compensation rate shall be executed in accordance with the evaluation price recognized by the two parties.

4-2-4 Compensation policy for relocation of rural residential houses

Compensation prices of Wuhan rural relocation houses are decided mainly by the following two factors: one is the house structure, area and purpose; the other is the house location and region. Thus, compensation for house relocation will include the replacement cost and location price of the buildings. According to the local regulations of Wuhan, the replacement cost of the project for rural houses are: steel concrete structure CNY 830 /m²; brick masonry structure CNY 570 /m²; brick wooden structure CNY 420 /m²; simple structure house CNY 340 /m².

Location compensation prices of Wuhan rural relocation houses are divided into three categories according to the stipulated road rings of Wuhan urban overall planning: the first category is the region within the 2nd ring road (including the 2nd ring road), compensation price for this region is CNY 2,280 /m²; the 2nd category is within the region between the 2nd ring road and the Mid (3rd) Ring Road,, the compensation price for this region is CNY 1,920 /m²; the region is outside the Mid Ring Road, compensation price for this region is CNY 1,500 /m².

4-2-5 Compensation policy for relocation of urban residential house

According to the relevant *Regulations on Administration of Urban House Dismantling and Relocation, Implementation Measures of Urban House Dismantling and Relocation of Wuhan and Guidance for Assessment of Urban House Dismantling and Relocation*, the market price of real estate of urban house dismantling and relocation will be evaluated according to the relocated house region, purpose, building area and etc. The confirmation of structure category, floor area and purpose of the relative house will be confirmed by the PRO together with relevant departments and relocated household on the spot prior to the relocation; for the location price of every house, the relocated household will choose an evaluation company from the three evaluation companies with evaluation qualification recommended by the resettlement office to carry out the evaluation on the house replacement cost and location price.

4-2-6 Compensation policy for house relocation in *Mixed Area*

"Mixed Area" refers to urban residential houses and rural residential houses along one

road or within one area. While, in China, current compensation policies for rural houses and urban house are different with different compensation rate, usually the compensation rate of rural residential houses is lower than that of urban residential houses, which leads to implementation difficulties to the resettlement. The compensation rates of the project for rural residential houses in "Mixed Area" will be decided according to the compensation standards for urban residential houses, which will be the "same price for same grade".

4-2-7 Compensation policy for relocation of residential house without license

The residential houses without licenses in the Project refer to houses that have no any relevant licenses or certificates issued by real estate department or land department and built without permission, as well as the temporary buildings built under the permission of relevant department but exceeding the service time limit stipulated by the document. However, houses in the rural area without property registration but living for a long term, and within the regulated standards of the floor area and building area, will not be regarded as houses without licenses.

For houses without licenses, the project owner will pay the owners of houses without licenses the house replacement cost according to the state laws and resettlement policies of ADB, and the replacement cost shall not include depreciation. However, no location compensation price (i.e., land value) for the houses without licenses will be paid.

4-2-8 Policy for house relocation of enterprise and government units

The buildings of enterprises and government units are divided into operational workshops and office buildings and non-operational buildings. Compensation for buildings of enterprises and government units shall be paid according to market evaluation price. If any production loss of the enterprises caused by the project relocation occurs, compensation for stop-production loss will be paid to the enterprises according to the loss degree; if any equipment needs to be relocated, transitional allowance will be paid to the enterprises; if the enterprise production and operation will be stopped due to the project relocation, compensation will be paid for the equipments and assets after evaluation on the enterprise equipments and assets.

4-2-9 Policies for renovation of *Villages in the City* and returned residential buildings of rural house site

According to the current resettlement policy of Wuhan, application for returned residential house site is very difficult for rural residential house relocated in the mid-ring line. For the relocated rural household in the project, the house sites can be arranged for relocation households without other house sites in the village, and the land-use procedure of returned house sites will be examined and determined by the local district government. For the affected villages that have been listed in the comprehensive renovation plan of Wuhan "*Villages in the City*", according to the renovation plan of these areas, the village collectives can build multiplayer residential buildings to resettle the relocated households. The relative taxations and fees, related to returned residential buildings constructed by the rural collective economic organization to resettle the original village residents, will be executed in accordance with relevant policies for peasant housing construction, when implementing project construction of land-use development, municipal infrastructure fares will be exempted; other stipulated fees will be collected according to the lower limit if there is a range, and those that have no range will be collected by half.

4-2-10 Production resettlement policies for agricultural laborer and land-deprived farmers

The project will follow the principles in accordance with the local conditions to arrange the production and life of farmers of land acquisition through multi-channels so as to ensure the long-term living means of agricultural laborers.

Agricultural arrangements will be considered preferentially for land acquisition in rural areas outside the urban planning area, especially the areas with rich resources of cultivated land and potential land resources. The farmers of land acquisition can engage continuously in the agricultural productions due to cultivated land newly increased through rural collective reserved land, contracted land turned in voluntarily by land contractors, readjustment of contracted land and land development adjustment. Laborer arrangements by land adjustment must comply with the relative regulations of *the Law of the Contract for Rural Land*.

On the voluntary premise of farmers, the farmers who lose land can become shareholders with their resettlement subsidy. The rural collective economic organization may sign contract with the farmers so that they can obtain benefit by preferred share.

By comprehensive renovation project of “Villages in the City”, the project shall perfect the employment service system of urban-rural integration, create conditions for the occupation shift of farmers of land acquisition to urban area, enhance employment training of rural laborer force, improve the skill of farmers of land acquisition and lead them to get employed in non-agricultural industries. The land-acquisition unit should employ preferentially farmers of land acquisition under the same conditions so as to provide employment opportunities for farmers with employment capability.

For farmers without land due to land acquisition, the project will combine with the comprehensive renovation project of “Villages in the City” to set up the social pension insurance and minimum living standard security systems for land lost farmers in order to ensure the long-term living means.

4-2-11 Special supporting policy for vulnerable groups

The project establishes the special supporting fund for vulnerable groups with a total amount of CNY 400,000. During the resettlement, the vulnerable groups can apply for the special supporting fund for vulnerable groups according to the procedures if any production and living difficulties, which will be paid under the item of contingencies.

Vulnerable groups living in urban and town areas, owners of private houses and tenants of the self-management houses owned by enterprises or government units and public houses under direct control with monthly household income per capita below the minimum living security line and relocated residential houses with the building area less than 20 m² (including 20 m²) will be resettled on the basis of 30 m²; if the building area of residential house per capita for the families of vulnerable groups is less than 8 m² and no other residential house, the compensation will be calculated in accordance with a building area of 8 m² per capita, and the extra expenses will be paid with the special supporting fund for vulnerable groups.

Table 4-1 Main policies of this project established in compliance with state laws (esp. Document 28)

Article	Document 28	Compensation policies for land acquisition in this Project
Improving land acquisition compensation practice	People's Governments at the county level and above shall adopt practical measures to ensure that the farmers whose land is acquired shall not be made worse off. It should be ensured that land compensation fees, resettlement subsidies and compensation for ground attachments and standing crops and other assistance shall be provided in accordance with applicable laws and regulation in full and in time	The resettlement policy of this Project will be established on the basis of relevant laws and policies in China which include Document 28, <i>Land Administration Law of the People's Republic of China</i> , <i>Regulations on the Implementation of the Land Administration Law of the People's Republic of China</i> , <i>Administrative Regulations on Urban House Demolition and Relocation</i> , <i>Implementation Measures of Hubei Province on Land Administration</i> , <i>Administrative Measures of Wuhan Municipality on Urban House Demolition and Relocation</i> , <i>Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collective-Owned Land</i> , <i>Administrative Measures of Wuhan Municipality on City Planning</i> and involuntary resettlements policy of ADB. The aim of these policies is to ensure the living standard of affected persons could be improved or at least restored to pre-project levels. The project office will pay compensations for acquisition of land, resettlement subsidies and compensations for attachments to the ground and green crops wholly and duly as pursuant to law.
	If the land compensation fees and resettlement subsidies as stipulated by law still cannot be able to maintain the original standards of the land-losing farmers and are not adequate to cover the social insurance costs of the landless farmers, the provincial government shall approve an increase in the resettlement subsidies. If the sum of the land compensation fees and resettlement subsidies has reached the legal upper limit but still cannot maintain the original living standards of the farmers, the local government can provide additional subsidies with the use of revenues from the sales for the use of state land	The land acquisition compensation and resettlement subsidies of this Project could satisfy farmers whose land has been acquired to keep their pre-project living standard for they are 25 times of unified compensation base price in every district. If the compensation is not enough in the implementation, the project office will increase resettlement subsidies in accordance with actual condition. If the summation of the compensation and resettlement subsidies has reached the legal maximum yet still insufficient for the farmers whose land is acquired to keep their pre-project living standard, the people's government of Wuhan could subsidize them by the incomes from the use of state-owned land.

Article	Document 28	Compensation policies for land acquisition in this Project
	The provincial government shall formulate and publicize the standard annual output or location land prices for land acquisition in the cities and counties under the provincial jurisdiction. Land acquisition compensation shall be kept identical for identical quality of land in same locality.	This Project had established the uniform annual production value standard of various regions and the compensation for acquisition of land is the same in one place.
	The full costs of land acquisition for national key development projects shall be included in the overall project budget.	This Project had listed the whole expense of land acquisition in budget.
Properly resettling farmers whose land is acquired	People's Governments at the county level and above shall formulate concrete measures to guarantee the long-term livelihood of the farmers whose land is taken. The farmers shall be given stocks for land-taking projects that have stable revenues. In a prescribed urban zone, the local government shall place the farmers who are made landless because of land acquisition in the urban employment system, and set up a social insurance system for them. If the acquisition of collective land takes place outside the prescribed urban area, the local government shall set aside essential farmland within the administrative area or assign suitable jobs. Resettlement in distant areas should be considered for farmers who can no longer have adequate land to continue farming. The labor and social insurance departments shall cooperate with other relevant departments to provide guidance on the establishment of employment training and social insurance program for land-losing farmers.	The regions where land acquisition of this project takes place are those under rapid urbanization. Residents there are mostly engaged in non-agricultural production and their incomes had mostly come from non-agricultural sectors. The land acquisition area is not large. With a small rate of land acquisition impact, it only puts a small influence on the incomes of residents and production conditions. On the basis of full consultation, the policies for production resettlement in this project are as below (1) the regions affected by Nantaizi Lake wastewater subproject belong to the "villages-in-city" of Wuhan, they will be included in the reconstruction plan of "village-in-city" of Wuhan. (2) Land acquired in Dongxihu Wastewater subproject is mainly state-owned lands belonged to state farm. Displaced persons are mostly employees of the state farms who enjoy basic social security welfare. After land acquisition, the farm will take the responsibility to resettle employees who lose contracted land and provide them new employment, while provide retirement pensions and basic old-age security to employees of retirement age.
Improving land acquisition procedure	In the land acquisition process, attention shall be paid to respecting the ownership of collective land and the land contract of farmers	In the process of land acquisition, project office will establish perfect organic network, learn grievance and complains of resettlers in time and establish complete procedures of them, so as to solve the problems arising in land acquisition duly and protect the legal rights and interests of resettlers.
	The purpose, location, compensation and resettlement sites of the land acquisition shall be announced to the farmers concerned, before the land acquisition proposal is submitted for approval.	The purpose, location, compensation rates and resettlement approaches has already been apprised to farmers whose land is acquired by public consultation.

Article	Document 28	Compensation policies for land acquisition in this Project
	The results of the status survey of the land to be acquired shall be verified with the rural collective and the farmers concerned. If necessary, the land resource department shall organize public hearings according to law. Documentation on information to and verification by the farmers concerned should form an essential part of the land acquisition submission.	Project office, rural collective economic organizations and farmers whose land is acquired will confirm the findings of the land acquisition survey of this project. The relevant materials acknowledged and confirmed by the farmers whose land is acquired will be necessary documents for the report for approval of land acquisition
	A mediation and arbitration mechanism shall be set up or strengthened to resolve disputes arising from land acquisition, so as to protect the legal rights of land-losing farmers and land users.	The coordination and arbitration mechanism for solving disputes on the Project will be established to guarantee the legal rights and interests of the farmers whose land is acquired and the land users.
	All land acquisition proposals, except for special circumstances, shall be made public.	The approved resettlement plan will be apprised to affected persons via public consultation meetings, information manuals and bulletins. Affected persons could also consult the resettlement plan through the internet or in public libraries.
Strengthening supervision and management of the land acquisition process	In case compensation and resettlement is not properly implemented, use of the acquired land shall be prohibited.	If the compensation for acquisition of land and resettlement is not fulfilled, the government of Wuhan municipality and ADB will cease land acquisition process.
	The provincial government shall formulate standards for the distribution of land compensation fees within the rural collective organizations, based on the principle that the land compensation fees shall be used for the farmer households whose land is acquired.	Compensation for acquisition of land will be mainly used on farmers whose land has been acquired. Every village will establish perfect resettlement scheme and compensation distribution methods.
	The rural collective organization shall make the information on the revenues and allocation of the land compensation fees available to its members, and receive their supervision. The agriculture, civil affairs and other departments shall strengthen the supervision over the allocation and use of the land compensation fees within the rural collective organization.	The village will announce the income and expense as well as distribution of compensation for acquisition of land to villagers by villagers meeting and proclamation. The department of audit, agriculture, civil administration and the Women's Federation will supervise distribution and use of the compensation in the village collectives. This project will be also monitored by ADB and the independent monitoring organization.

5 Compensation Rates

The appropriate land acquisition compensation rates for this Project are established in accordance with the latest Chinese laws and policies and principles of the ADB on involuntary resettlement through full consultation with the local government, affected villages APs and affected enterprise.

5-1 Land Acquisition Compensation Rates

The compensations for acquisition of rural collectively owned land shall include land compensations, resettlement subsidies, compensations for attachment to grounds and the young crops, and tax paid to the state.

5-1-1 Compensation rates for rural collectively owned land acquisition

1. Land compensation

According to the *Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collective-owned Land*, the compensation rates of this Project for acquisition of rural collectively owned land are as follows: compensation for acquisition of cultivated land shall be 10 times that of the previous three years AAOV; compensation for non-cultivated land shall be 6 times that of AAOV..

According to current laws of Wuhan, compensation rate for rural collective land shall be decided equivalent to the AAOV of the land in the previous three years. The project makes the consolidated compensation rates in accordance with land, output value, land location, agricultural land grade, cultivated land per capita, land supply and demand relations, local economic development level and other factors. Compensation standards (AAOV) for land acquisition of each sub-project are as follows: Hangyang District (Nantaizi Lake Wastewater sub-project) CNY 5,890; Dongxihu District (Dongxihu Wastewater Sub-project) CNY 4,895; Caidian District (Caidian Wastewater Sub-project) CNY 3,840. The compensation multiples and rates of compensation of the Wastewater Management Component is shown in Table 5-1.

Table 5-1 Land Compensation Rates

Affect regions	Types of land	Paddy	Dry land	Fish pond	Pond	Orchard	Woodland	House Site	Waste land
Caidian District	Compensation standard (CNY)	3,840	3,840	3,840	3,840	3,840	3,840	3,840	3,840
	Compensation multiples	10	10	10	6	10	6	6	6
	Compensation rates (CNY/mu)	38,400	38,400	38,400	23,040	38,400	23,040	23,040	23,040
Hanyang District	Compensation standard (CNY)	5,890	5,890	5,890	5,890	5,890	5,890	5,890	5,890
	Compensation multiples	10	10	10	6	10	6	6	6
	Compensation rates (CNY/mu)	58,900	58,900	58,900	35,340	58,900	35,340	35,340	35,340
Dongxihu District	Compensation standard (CNY)	4,895	4,895	4,895	4,895	4,895	4,895	4,895	4,895
	Compensation multiples	10	10	10	6	10	6	6	6
	Compensation rates (CNY/mu)	48,950	48,950	48,950	29,370	48,950	29,370	29,370	29,370

2 Resettlement subsidies

According to the local regulations of Wuhan City and through consultation between the local government and representatives of the affected persons, the resettlement subsidies for paddy fields and dry lands of this Project is 15 times the average annual output of the acquired land in the three years before acquisition; resettlement subsidies for acquisition of fish ponds and woodlands are 9 times the average annual output of the acquired land in the three years before acquisition; the resettlement subsidies rate for paddy fields and dry lands of this Project adopts 15 times the average annual output of the acquired land in the three years before acquisition. No resettlement subsidies are to be paid for acquisition of house sites, wastelands and other non-productive lands. The resettlement subsidies of this Project are shown in Table 5-2.

Table 5-2 Resettlement Subsidies Rates

Affected regions	Types of land	Paddy	Dry land	Fish pond	Pond	Orchard	Woodland	House Site	Waste land
Caidian District	Compensation standard (CNY)	3,840	3,840	3,840	3,840	3,840	3,840	3,840	3,840
	Compensation multiples	15	15	9	8	15	9	0	0
	Compensation rates (CNY/mu)	57,600	57,600	34,560	30,720	57,600	34,560	0	0
Hanyang District	Compensation standard (CNY)	5,890	5,890	5,890	5,890	5,890	5,890	5,890	5,890
	Compensation multiples	15	15	9	8	15	9	0	0
	Compensation rates (CNY/mu)	88,350	88,350	53,010	47,120	88,350	53,010	0	0
Dongxihu District	Compensation standard (CNY)	4,895	4,895	4,895	4,895	4,895	4,895	4,895	4,895
	Compensation multiples	15	15	9	8	15	9	0	0
	Compensation rates (CNY/mu)	73,425	73,425	44,055	39,160	73,425	44,055	0	0

3 Other fees and taxations for land acquisition

According to the state laws, besides the land compensation fees, resettlement subsidies and compensation for the attachments to the ground and the young crops paid by the construction units who acquire rural collectively owned land, the construction units also have to pay the following fees and taxations: (1) Land use fee upon consideration of new for construction; (2) reclaim fee of cultivated land; (3) fund of water resource construction; (4) occupation fee of cultivated land; (5) fee for new vegetable plots development; (6) management fee of land acquisition; (7) labor cost for excavation of fish ponds: acquisition of fish ponds needs to pay the labor cost for excavation of fish ponds at CNY 3,000/mu. Since the Wastewater Component is part of the Wuhan Municipal infrastructure project, the fee for new vegetable plots development of the Project can be derated according to relevant documents

and regulations. So, the fees and taxes turned in the Wuhan Wastewater Management component do not include the fee for new vegetable plots development. The applicable fees and taxes are shown in Table 5-3.

Table 5-3 Standards for fees and taxes in the Wastewater Management Component

Fees and taxes		Standards			Paid to
		Caidian District	Hanyang District	Dongxihu District	
Land use fee upon consideration of new for construction		CNY 40/m ²	CNY 40/m ²	CNY 40/m ²	Finance Bureau
Reclaim fee of cultivated land		CNY 8,000 /mu	CNY 15,000 /mu	CNY 8,000 /mu	Land Resources Bureau
Fund of water resource construction		CNY 2,000/mu for cultivated land, CNY 1,500/mu for non-cultivated land			Water Resources Bureau
Occupation fee of cultivated land		CNY 10 /m ²	CNY 10 /m ²	CNY 7 /m ²	Finance Bureau
Total taxes and fees paid to Government (CNY/mu)	Cultivated land	50,350	50,350	41,349	
	Non-cultivated land	49,850	49,850	40,849	
Management fee of land acquisition		1.1~3% of the land acquisition fees			Wuhan Land Resources Bureau
Labor cost for excavation of fish ponds		CNY 3,000 /mu			Wuhan Land Resources Bureau

4 Standards of the overall expenses for land acquisition

The standards of the overall expenses for acquisition of rural lands are in Table 5-4. The compensation standards in Table 5-4 exclude the compensations for young corps and attachments to the ground. The compensation rates for young crops and attachments to the ground are shown in Table 5-5.

Table 5-4 Standards of the overall expenses for land acquisition
(Excluding the compensations for young corps)

Unit: CNY/mu

Districts	Types of land	Paddy	Dry land	Fish pond	Pond	Orchard	Woodland	House Site	Waste land
Caidian District	Land compensation	38,400	38,400	38,400	23,040	38,400	23,040	23,040	23,040
	Resettlement subsidy	57,600	57,600	34,560	30,720	57,600	34,560	0	0
	Fees and taxes	41,349	41,349	44,349	41,349	41,349	40,849	40, 49	40,849
	Total land acquisition expenses	137,349	137,349	117,309	95,109	137,349	98,449	63,889	63,889
Hanyang District	Land compensation	58,900	58,900	58,900	35,340	58,900	35,340	35,340	35,340
	Resettlement subsidy	88,350	88,350	53,010	47,120	88,350	53,010	0	0
	Fees and taxes	50,350	50,350	53,350	50,350	50,350	49,850	49,850	49,850
	Total land acquisition expenses	197,600	197,600	165,260	132,810	197,600	138,200	85,190	85,190
Dongxihu District	Land compensation	48,950	48,950	48,950	29,370	48,950	29,370	29,370	29,370
	Resettlement subsidy	73,425	73,425	44,055	39,160	73,425	44,055	0	0
	Fees and taxes	41,349	41,349	44,349	41,349	41,349	40,849	40,849	40,849
	Total land acquisition expenses	163,724	163,724	137,354	109,879	163,724	114,274	70,219	70,219

The compensation of land acquisition is divided into two parts: one part is the land compensation and resettlement subsidies, which will be paid to the APs directly; another part is the fees and taxes, which should be turned into the government. According to the budget (Table 7-1), the total expense of land acquisition is CNY 64, 071,000, in which CNY 51, 860,000 (80.9%) will be paid to the APs, while CNY12, 211, 000 (19.1%) will be turned into the government as fees or Taxes (Table 5-5).

Table 5-5 The amount and percentage of land compensation fund⁴ paid to APs, government and the village communities

Item		Nantaizi Lake Sub-project		Dongxihu Sub-project		Caidian Sub-project		Total	
		Amount (CNY 10,000)	Percentage (%)	Amount (CNY 10,000)	Percentage (%)	Amount (CNY 10,000)	Percentage (%)	Amount (CNY 10,000)	Percentage (%)
Compensation fund for permanent land acquisition	Paid to APs ⁵	55.7	2.3	133.4	41.4	477	41.7	666.1	17.2
	Paid to Village Community	1570.3	65.4	89	27.6	319.3	28.0	1978.6	51.2
	Turned to government	775.7	32.3	99.8	31.0	345.6	30.3	1221.1	31.6
	Subtotal	2401.7	100	322.2	100	1141.9	100	3865.8	100
Compensation fund for temporary land Occupation	Paid to APs	1551.5	100	416.8	100	573	100	2541.3	100
	Paid to Village Community	0	0	0	0	0	0	0	0
	Turned to government	0	0	0	0	0	0	0	0
	Subtotal	1551.5	100	416.8	100	573	100	2541.3	100
Total Compensation fund for land acquisition	Paid to APs	1607.2	40.7	550.2	74.5	1050	61.2	3207.4	50.0
	Paid to Village Community	1570.3	39.7	89	12.0	319.3	18.6	1978.6	30.9
	Turned to government	775.7	19.6	99.8	13.5	345.6	20.2	1221.1	19.1
	Total	3953.2	100	739	100	1714.9	100	6407.1	100

5 Compensation rates for young crops and attachments to the ground

According to the land acquisition compensation rates approved in February 1, 2005, the *Notice of Compensation Rates for the Young Crops and Fish, Attachments to the Ground and Other Facilities in Land Acquisition* of the Price Control Administration of Wuhan Municipality and the Municipal Bureau of Land Resources, the compensation rates for the young crops and fish and attachments to the ground are listed in Table 5-6.

Table 5-6 Compensation rates for young crops and attachments to the ground

Expenses	Types of attachments to the ground	Compensation rates		
		Caidian District	Hangyang District	Dongxihu District
Compensation for young crops	Vegetables (CNY/mu)	890	1,000	890
	Cotton, grain (CNY/mu)	650	780	650
	Fish (CNY/mu)	1100	1100	1100

⁴ It doesn't include the compensation fund for the young crops and ground attachments, which will be paid directly to the APs.

⁵ The resettlement subsidies CNY 720,9000 for 136mu fishponds will be paid to the state-owned farm who is responsible to provide new employments for the affected labors.

Expenses	Types of attachments to the ground		Compensation rates		
			Caidian District	Hangyang District	Dongxihu District
	Fruit trees (CNY/tree)	1-3 years	20	20	20
		3-6 years	50	50	50
		7-10 years	30	40	30
		Over 11 years	25	70	25
	Trees (CNY/tree)	Φ 5-8 cm	25-40	25-40	25-40
		Φ 9-12 cm	45-60	45-60	45-60
		Φ 13-16 cm	65-80	65-80	65-80
		Φ ≥ 17 cm	85	85	85
	Nursery garden (CNY/mu)		5,000	5,000	5,000
Compensation for attachments to the ground	Tombs (CNY each)		500	1,200	500
	Wells (CNY each)		840	840	840
	Fencing (CNY /m ²)		36	36	36
	Terrace (CNY /m ²)		11	11	11
	Gravel road (CNY /m ²)		38	38	38
	Toilets (CNY /m ²)		50	100	50
	Steel-framed sheds (CNY /m ²)		10	20	10

5-1-2 Compensation rates for acquisition of state-owned land

Two types of state-owned land are acquired in the Wastewater Management Component: the first is state-owned cultivated land, which is land of farms run by the state, and most of the land acquisition in the Dongxihu District belongs to this category; the second is state-owned construction land. According to regulations in *Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collectively Owned Land* and the No. 450 Document of 2004 of Wuhan Municipal Bureau of Land Resources, the *Explanations of Certain Issues on Compensation & Resettlement for Non-agricultural Construction Use of Cultivated Land*, the compensation rates for land, resettlement, young crops, and attachments to the ground of state-owned cultivated land are implemented according to those of the acquisition of collectively owned land. Therefore the compensation rates of this Project for acquisition of state-owned cultivated land are as listed in Table 5-1, Table 5-2, Table 5-3, Table 5-4 and Table 5-6. There are two ways for acquiring state-owned construction land: the first is free allocation by administrative; the other is by paid assignment. Professional institutes with qualifications of land price evaluation shall evaluate the costs of paid assignment of state-owned construction

land in this Project, and the compensation rates shall be implemented by mutual agreement of the appraisal price.

5-1-3 Compensation rates for temporary land acquisition

According to the *Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collectively Owned Land*, the compensation fees shall be paid to the APs directly.

(1) Compensation for temporary acquisition of cultivated land shall be the average annual output value for three years with consideration of the duration of temporary losses. Use for less than one year is calculated as two year, and use for more than one year (including one year) is calculated as three year; the compensation rates of temporary acquisition of land of Wuhan Wastewater Management Component are as shown in the Table 5-7.

(2) Reasonable compensations for young crops and attachments on the temporarily acquired land shall be paid to all the persons according to their actual loss. The temporary affected persons will be fully compensated for any lost income, so no need for livelihood restoration.

The IA of each subproject shall be responsible for restoration of the temporary land after completion of the subproject construction. Requirements to return the land in its original state will be included in the civil works contract documents. For those that cannot be recovered, compensation shall be paid according to actual loss, and livelihood support will be available to any APs whose lands cannot be restored

Table 5-7 Compensation rates of temporary use of land

Item		Compensation rates for temporary land use		
District		Hanyang District	Dongxihu District	Caidian District
Duration of temporary land acquisition	Compensation for 1 year (CNY/mu)	11,780	9,790	7,680
	Compensation for more than 1 year (CNY/mu)	17,670	14,685	11,520

5-2 Compensation rates for residential houses

There are 2 factors in determining the compensation rates for residential building

relocation. Firstly, it is the type of structures, floor space and usage of the houses; and secondly it is the location of the houses. The compensation comprises two parts, replacement cost of the building and location-based price of the building.

According to local regulations of Wuhan Municipality, compensation for the location of the affected houses in Wuhan city is divided into three categories according to the overall urban planning of Wuhan: the first category covers areas within the second ring road (including the second ring road), the second category covers areas between the second ring road and the third ring road (the Middle Ring road), and the third category covers areas outside the third ring road (Middle Ring road). According to the regulations, the location classification of areas involved in this Project is as shown in Table 5-8.

Table 5-8 Location classifications of the affected regions

Sub-projects	Affected regions	Location classifications
Nantaizi Lake Wastewater Project	Hanyang District	Category 1 - Liaoyuan Village, Hanjiang Village, and Hancheng Village Category 2- Jiangdi Fish Farm
Caidian Wastewater Project	Caidian District	Suburban District
Dongxihu Wastewater Project	Dongxihu District	Category 3 (Dongxihu District is a district far away from downtown, but location of its land to be acquired is similar to Category 3)

5-2-1 Compensation rates for urban residence

According to the relevant regulations in the *Administrative Regulations on Urban House Demolition and Relocation*, *Administrative Measures of Wuhan Municipality on Urban House Demolition and Relocation*, *Guiding Opinions on the Assessment of Urban Housing Relocation* the price evaluation of the urban houses to be relocated shall be estimated on the basis of such factors as their location, usage, and floor space. Table 5-9 shows the latest price evaluation of houses in Wuhan. The compensation rates are based on the latest evaluation price but appraisal of this component affected houses will be done prior to compensation.

Table 5-9 Current evaluation of urban residence to be relocated

Building structures	Categories of location and compensation (CNY/m ²)			
	Category 1	Category 2	Category 3	Suburban District
Steel and concrete	2580	2230	2030	1230
Brick and concrete	2320	1970	1770	970
Brick and wood	2170	1820	1620	820
Simple houses	2090	1740	1540	740
The affected households are granted with subsidies during the transitional period of relocation; see the subsidy rates in Table 5-13.				

The building structure, floor space, and usage of a house shall be verified and affirmed at site before relocation by the PRO and the departments concerned jointly with the relocated households; the PRO shall provide three qualified evaluation companies for the relocated households to choose. The chosen evaluation company will make evaluation of the resettlement costs and price for location of house. The project owner will pay the related fees of housing evaluation

5-2-2 Compensation rates for rural residence

According to the *Circular on Compensation Rates for the Acquisition of Collective-Owned Land and the Demolition and Relocation of House Sites in Accordance with Their Locations* in Wuhan Municipality, the location of farmers' house in Jiang'an, Jiangnan, Qiaokou, Hangyang, Wuchang, Qingshan, Hongshan District, Wuhan Economic & Technological Development Zone and Wuhan East Lake Hi-tech Development Zone (trusteeship zone included) is divided into three categories according to the overall city planning of Wuhan: the first category covers areas within the second ring road (including the second ring road), the second category covers areas between the second ring road and the third ring road (the Middle Ring Road), and the third category covers areas outside the third ring road (Middle Ring Road). The compensation is calculated at replacement price which can afford new house at the same category.

The compensation rates for Wuhan rural residences on different categories of land in line with the aforesaid policies are as shown in Table 5-10. It shows that the compensation for Wuhan rural residences comprises two parts, the house replacement cost and the location

related compensation. In the event that the rural house has only one storey, the compensation for this house is the relocation cost plus its location related compensation. If the rural house has two stories, the compensation for this house is the house replacement cost plus half of its location related compensation.

Table 5-10 Compensation rates for relocation of rural residence

Price structure	Structures	Categories of location and compensation price (yuan/m ²)			
		Category 1	Category 2	Category 3	Suburban District
House relocation costs	Steel concrete	830	830	830	830
	Brick and concrete	570	570	570	570
	Brick and wood	420	420	420	420
	Simple house	340	340	340	340
House site location compensation price		2,280	1,920	1,500	400
The affected households are granted with subsidies during the transitional period of relocation; see the subsidy rates in Table 5-13.					

5-2-3 Compensation policies for house relocation in *Mixed Area*

A “Mixed Area” refers to an area where both urban residential houses and rural residential houses exist. China’s current compensation policies and compensation rate for relocating rural houses and urban house are different. Usually the compensation for rural residential houses is lower than that for urban residential houses. This leads to difficulties in implementing the resettlement exercise. In this Project, the compensation for rural residential houses in the “Mixed Area” will be to the same as that for urban residential houses (“same price for same grade”).

5-3 Compensation rates for enterprises

Buildings of enterprises and institutions are divided into two categories based on the usage of buildings, the workshops and office buildings for commercial use, and non-commercial houses. The compensation rates for various production buildings and office buildings are shown in Table 5-11.

Table 5-11 Compensation rates for buildings of enterprises and institutions

Types of enterprise & institution buildings	Structures	Categories of location and compensation (CNY/m ²)			
		Category 1	Category 2	Category 3	Suburban District
Buildings for commercial use	Steel concrete	2,880	2,530	2,330	1,530
	Brick and concrete	2,620	2,270	2,070	1,270
	Brick and wood	2,470	2,120	1,920	1,120
	Simple house	2,390	2,040	1,840	1,040
Non-commercial buildings	Steel concrete	2,530	2,180	1,980	1,180
	Brick and concrete	2,270	1,920	1,720	920
	Brick and wood	2,120	1,770	1,570	770
	Simple house	2,040	1,690	1,490	690
If equipment is required to be removed in relocating the buildings of enterprises and institutions, such removal expenses will be compensated. In case commercial losses are caused to the enterprises and institutions, compensations shall be paid according to extent of loss.					

5-4 Compensation for unlicensed buildings

The Project owner shall pay the relocation compensation, without discount, to the owners of unlicensed buildings according to the state laws and the resettlement policies of ADB. However, no compensation related to the building location should be paid for such unlicensed buildings. The compensation rates for unlicensed buildings are shown in Table 5-12.

Table 5-12 Compensation rates for unlicensed buildings

Types of house structure	Steel concrete	Brick and concrete	Brick and wood	Simple house
Compensation (CNY/m ²)	830	570	420	340
Owners of unlicensed buildings shall also obtain subsidies during the transitional period of relocation. See the subsidy rates in Table 5-13.				

5-5 Rates for other compensations and subsidies

5-5-1 Subsidies during the transitional period

Subsidies during the transitional period are compensations for loss of use to the relocated

houses. The users choosing monetary compensation shall have two-month transitional subsidies. Subsidies for users who choose the houses exchange model shall be calculated according to length of the transitional period. In case the transitional period is prolonged because of the Project owner, the Project owner shall pay extra temporary resettlement subsidies to the relocated persons. Temporary resettlement subsidies shall also be paid to the affected persons or tenants who will resettle themselves. Subsidies during the transitional period are shown in Table 5-13.

Table 5-13 Subsidies during the transitional period

Items	Types	Rates	Items	Types	Rates
Removal expenses	≤40 m ²	CNY 300 /household	Transitional subsidies	Residence	CNY 6 / m ² /month
	≤60 m ²	CNY 400 /household		Shops	CNY 20 / m ² /month
	≤80 m ²	CNY 500 /household		Buildings of enterprises and institutions	CNY 15 / m ² /month
	>80 m ²	CNY 600 /household			

5-5-2 Compensation for indoor facilities

Detailed compensation rates for main indoor facilities are shown in Table 5-14.

Table 5-14 Compensation for main indoor facilities

Items	Unit	Compensation (CNY)	Items	Unit	Compensation (CNY)
Water meter	CNY/piece	70	Ammeter	CNY /piece	450
Removal of piped gas installation	CNY/household	1,800	Removal of split unit air-conditioning	CNY /set	200
Removal of cable television	CNY/ household	100	Removal of fixed-line telephones	CNY / household	108

5-5-3 Urban infrastructure facilities

According to the extent of disruption during construction, the Project owner shall reinstate or reconstruct the affected urban infrastructure facilities by the Project after consultation with the owners of these infrastructure facilities.

5-7 Entitlement Matrixes

In accordance with the latest Chinese laws and policies and principles of the ADB on involuntary resettlement, Entitlement Matrixes is formulated and full consultation with the local government, affected villages, APs and affected enterprise. They are all satisfied in the following composition policies and standard.

Table 5-15 summarizes the entitlement matrix for this project component

Type of loss	Impacts of the project	Entitled Persons	Entitlements	Compensation policies
Permanent land acquisition	<p>A total of 253.9 mu land (including 234.5 mu cultivated land) will be acquired by the Project with 68 households or 284 persons being affected.</p> <p>There are slight impacts by land acquisition on Liaoyuan Village, Hanjiang Villages, Hangcheng Village, Tongxin Village (below 1.5%) and Jiangdi Fish Farm, while Shiyang Village are comparatively heavier affected (10%), but the acquired land is not the villagers' main income resources.</p>	<p>Affected villages/groups or affected persons who used land before specified deadline (68 households)</p>	<p>(1) All affected villages/production groups shall obtain land compensations.</p> <p>(2) The APs shall obtain resettlement subsidy and compensation for the young crops directly</p> <p>(3) APs shall receive resettlement subsidies for restoration of their living standard and income; for the land compensation used to build public utilities, invest in profitable projects, etc, the returns or benefits should be shared by all APs.</p> <p>(4) The Village Committee would establish a community development fund, to be controlled and administered by the APs. With some technical assistance from the resettlement agency and monitoring agency, the fund might be invested in development projects. However, any land compensation use plan need to consult with APs, and agreed with the APs</p> <p>(5) Preferential job opportunities shall be offered to APs (women included) priority by PMOs, IAs, local government and village-running enterprises</p> <p>(6) Preferential technical training opportunity shall be offered to APs (women included) by the Project owner.</p>	<p>Land compensation fees</p> <p>(1) Land Compensation base rates before multiplier for of each sub-project:</p> <p>① Hangyang District (Nantaizi Lake Wastewater sub-project) CNY 5,890;</p> <p>② Dongxihu District (Dongxihu Wastewater Sub-project) CNY 4,895;</p> <p>③ Caidian District (Caidian Wastewater Sub-project) CNY 3,840.</p> <p>(2) Land compensation multiplier:</p> <p>① Cultivated land: 10 times.</p> <p>② Garden plots, woodlands and other Cultivated land: 6 times.</p> <p>③ Construction land, unused land: 6 times.</p> <p>The compensation ratio and amount of compensation of the Wastewater Management Component is shown in Table 5-1.</p> <p>Resettlement subsidies</p> <p>(1) Land resettlement subsidies base rates before multiplier is same as land compensation.</p> <p>(2) Land resettlement subsidies multiplier:</p> <p>① Paddy fields and dry lands: 15 times</p> <p>② Fish ponds and woodlands: 9 times</p> <p>The resettlement subsidies for each sub-project are shown in Table 5-2.</p>

Type of loss	Impacts of the project	Entitled Persons	Entitlements	Compensation policies
Residential housing demolition	A total of 2,015 m ² residential housing including 260 m ² unlicensed will be demolished with 77 persons (14 households) The affected houses mainly located in Hanjiang Village and Liaoyuan Village, which is affected by sewers. In these affected buildings, 400 m ² public simple houses that are idle belong to Machi Community, and no households are affected. The 190m ² simple houses located in Jiangdi Farm is just a primitive shelter used for looking after fish temporarily.	Property/house owner (14 households)	(1) The APs may choose options such as cash compensation, economically affordable house or exchange residential buildings. (2) House owners without certificate of title shall receive compensation according to the house replacement price (excluding land price) without any depreciation (3) If APs are not satisfied with the compensation, they may entrust the specialized institution to conduct an assessment of the real estate, the result of which shall be considered as the house relocation compensation rates. (4) House relocation subsistence allowances are paid for the full duration of the period of disruption and re-establishment. (5) Compensation for structures and all other lost assets is paid in full before relocation. (5) Vulnerable groups will be assisted to find suitable housing	(1) Compensation standard for urban residential houses: The compensation for urban residential houses shall be determined according to the evaluation price in real estate market. The PMO shall provide 3 qualified evaluation companies for the relocated households to choose and pay the cost of evaluation. The house evaluation prices in 2005 are shown in Table 5-8. (2) Compensation for rural residential buildings shall be the replacement cost for structures plus the house site location price. ① Replacement cost for structures: Steel and concrete structure: CNY 830/m ² Brick and concrete structure: CNY 570/ m ² Brick and timber structure: CNY 420/ m ² Simple structure: CNY 340/ m ² ② House site location price: Category 1: CNY 2,280/ m ² Category 2: CNY 1 920/ m ² Category 3: CNY 1,500/ m ² Suburban District: CNY 400/ m ² (3) The compensation rates for urban residential houses on different categories of land are shown in Table 5-9. .Compensation for unlicensed buildings The project owner shall pay replacement price to the owner of unlicensed buildings without depreciation, but no house site location price shall be paid for unlicensed buildings. The compensation rates are shown in Table 5-13.
Ground attachments	8 types of ground attachments will be affected	Property owner	All will be compensated at replacement cost in cash	The compensation standards are shown in Table 5-5.

Type of loss	Impacts of the project	Entitled Persons	Entitlements	Compensation policies
Public facilities	Power supply and tap water pipeline	Property owner	(1) All affected property owners will be provided with satisfactory relocated land on the basis of the land area of the structure to be demolished; (2) The demolished structure will be compensated at replacement cost in cash (including compensation for loss of facilities and labor on the basis of replacement cost)	Compensation rate for enterprises and institutions: The buildings of enterprises and institutions are divided into two types that are productive buildings and non-productive buildings. The compensation rates for these two types of buildings are shown in Table 5-12.
Affected enterprises, institutions	An enterprise with 320 m ² of structure to be demolished and no institution/shop will be affected. The affected building is non-productive building; the affected enterprise had stopped to product five years ago. Other firms have employed their workers; no workers need resettlement,	The project owner should pay compensation directly to the owner of the affected building	(1) The affected enterprises can choose cash compensation options. All affected owners who run the business before the announcement of the project construction shall be compensated at the replacement cost even for unlicensed buildings or overstayed temporary buildings. (2) If only part of the business land is affected rather than the whole building structure, the building shall not be demolished in order to avoid its favorable geographic location being disrupted and commercial loss resulting from business interruption. (3) All affected employees, whether permanent, or contracted, shall obtain cash compensation for the income/wage loss resulting from interruption of work.	Loss in net income during the interruption of business of enterprises shall be compensated in cash. The affected enterprises shall also obtain removal subsidies. The standards of removal subsidies are shown in Table 5-14.

Type of loss	Impacts of the project	Entitled Persons	Entitlements	Compensation policies
Income rehabilitation measures	A total of 253.9 mu land (including 234.5 mu cultivated land) will be acquired. The acquired land in Liaoyuan, Hanjiang, Hancheng, Tongxin Village is pond or house sites which is not the income resources of APs, Jiangdi Fish Farm and Shiyang Village's acquired land is the part of incomes resources.	All APs	(1) If collective-owned land is not redistributed, the affected persons will obtain resettlement subsidy and part compensation for land (not less than 80% of total) to restore their income and living standard. Village leaders or local officials should provide guidance for investment (e.g., starting new business, expanding sidelines, etc.) (2) The local government and the PMO will provide employment assistance (i.e., training and job arrangements) for the affected persons in the local enterprises. (3) The project owner will provide preferential employment opportunities for the affected persons and provide technical training prior to the employment. (4) Affected laborers in Jiangdi Fish Farm can get same wages as land acquisition before	(1) Non-land-adjustment income-generating options might be more appropriate to the APs. This kind of income restoration options include i. Small businesses and self-employment; ii. Skill development through training; iii. Preference for APs in project-related employment. iv. Assistance in finding openings in government and private enterprises; v. Establishing a community development fund, to be controlled and administered by the APs. With some technical assistance from the resettlement agency and NGOs, the fund might be invested in development projects. (2) The APs have the right to choose the income restoration options; the income restoration plan must be fully consulted with the APs and must be agreed with the APs.
	Other subsidies	Person affected by physical relocation	Transportation subsidies, such as household articles, salvaging or transporting building materials to the new relocation site will be provided	Movement subsidies: CNY 300-600yuan/household; Transitional subsidies: Residential house: CNY 6/m ² /month; Shop CNY 20/ m ² /month; Enterprise and institution: CNY 15/ m ² /month.
	Special supporting measures for affected vulnerable groups	Affected vulnerable groups, including people in poor, ethnic minority, aged and disabled and families accepting social welfare.	(1) All resettlement programs should consider the women's special needs; the women must be fully informed. (2) CNY 400,000 special supporting fund for the vulnerable groups will be set up (3) The vulnerable groups especially the women have priority to obtain the project-related employment opportunities. (4) Labor support for the vulnerable groups in the house reconstruction will be provided	(1) If the building area of residential house per capita for the families of vulnerable groups is less than 12m ² and no other residential house, the compensation will be calculated in accordance with a building area of 12m ² per capita, and the extra expenses will be paid with the special supporting fund for vulnerable groups. (2) The resettlement offices and local government will establish formal social insurance for the farmers whose cultivated lands had been totally acquired or the disabled labours, so that these resettled labours can obtain sustainable income resources.
Complaints and Grievances	Compensation rate, payment of compensation and relocation measures	The affected persons who lodge a complaint on	(1) Various expenses related to relocation complaints putting forward by the affected persons and management expenses will be exempted.	

Type of loss	Impacts of the project	Entitled Persons	Entitlements	Compensation policies
		land acquisition and relocation matters	(2) Every resettlement office must hire at least one female worker to responsible for women's affairs in the process of resettlement.	

6 Income Restoration Plan

Income restoration is an important component of resettlement where APs have lost their productive base, or other income sources, regardless of whether they have also lost their houses. In order to assist the APs to achieve at least the same level of well-being with the project as without it. The PMO have formulated both short- and long-term strategies for restoring APs income. The short-term income restoration strategies are for immediate assistance during relocation, they include:

- i. Compensation for land, structures, and all other lost assets is paid in full before relocation. In this project, the compensation rates for affected land, structures and other assets are rather high, and the APs are very satisfied with the compensation standards.
- ii. House construction grants and relocation subsistence allowances are paid for the full duration of the period of disruption and re-establishment.
- iii. The PMO will pay the removal allowances for relocation, and will provide temporary or short-term employment in the construction activities at the resettlement or project construction sites.
- iv. The PMO have established a special assistance fund (CNY40, 000) to assist vulnerable groups such as women, the aged, and the disabled.

Income restoration strategies will provide a sustained source of income over a longer period of time and to enable restoration, or better still, improvements in APs standard of living. This chapter mainly focuses on the long-term income restoration strategies.

6-1 Resettlement principles

According to state laws and regulations of the Wuhan Municipal Government, as well as laws, regulations and policy requirements of ADB, the basic resettlement principles of the Project are as follows:

- (1) Provide rational compensation for affected persons to maintain or to improve their current living standards
- (2) Minimize temporary occupation of land and the disruption time
- (3) All legal or illegal affected persons are to be considered to be included in the resettlement and rehabilitation plan scope

(4) If the affected persons' owned land is not enough to make a living, offer alternative employment to provide income sources

(5) Inform all affected persons timely of the relevant qualification requirements, compensation rates and standards, Production rehabilitation plan, and project implementation schedule.

(6) Land acquisition compensation and relocation shall not be implemented before the affected persons indicate their satisfaction with the compensation offer.

(7) Establish a set of highly transparent and efficient system for collecting and dealing with grievances and complaints, so as to ensure the problems happened in the process of resettlement can be resolved in a timely manner.

As to the persons affected by temporary occupation of land, whether their lands are temporarily acquired during the project construction or included in the affected list before the closing date of the last affected details survey implemented by the government, their loss of incomes will be compensated and affected houses relocated according to type and amount of loss. Cultivated land and buildings after the closing date of the last affected details survey implemented by the government will not be entitled to compensation and allowance.

6-2 Income Restoration Plan of affected villages

The project needs to acquire rural collective-owned land, so affected villages and villagers shall be compensated and their production shall be rehabilitated. The PRO will not only provide compensation for acquired attachments to the ground and buildings in affected villages, but will also establish practical production resettlement plans suitable for the development of affected villages so as to ensure that affected villagers have all available opportunities to enhance, or at least rehabilitate their original incomes and living standards, on the basis of full negotiation and according to development status quo and future prospects of the villages.

6-2-1 Income restoration options

After villagers' cultivated land is acquired, farmers will lose some production factors, which will definitely cause adverse effects on production. It is crucial to choose proper production resettlement mode so that the living standards and production conditions will be rehabilitated or even enhanced as soon as possible.

In Wuhan, there are two main types of income restoration program: First, land-based resettlement programs provide resettlers with enough land to regain and build farms and small

rural businesses. Second, nonland-based resettlement strategies include activities such as occupational training, employment, small business and enterprise development for job creation.

The affected villages are located in pre-urban areas; most of the villagers' income comes from non-agricultural sectors, and it is unavoidable trend that the farm land will be turned into non-agricultural land, the formerly agricultural laborers will migrate from agricultural sectors to non-agricultural sectors. So non-land income-generating options might be more appropriate to the APs. The non-land income restoration options include:

- i. Small businesses and self-employment;
- ii. Skill development through training; Skills training program is based on demand of APs and labor market needs. After Skills training, local government will help to recommend them to labor bureau and laborers market management institute.
- iii. Preference for APs in project-related employment. 5,000 temporary employments will be created directly during project construction, the PMO and local government have agreed that these new employment opportunities will be provided to the totaled 421 APs
- iv. Assistance in finding openings in government and private enterprises;
- v. Establishing a community development fund, to be controlled and administered by the APs. With some technical assistance from the PMO and IAs, the fund might be invested in development projects. The affected farmers have the priority to be employed in these development projects; as a result, the APs can earn salary as well as get profits by preferred stock in accordance with their shares.

The evaluation of the degree of impact on villages affected by land acquisition is shown in Table 3-12. The impact rates of each affected village or Farm indicate that the Project land acquisition has very small impact on the villages except for Shiyang Village a. Furthermore, the affected villages or farms are fast-urbanizing areas; agricultural production is no longer the main income source of residents, so the key of a successful production plan for these little affected villages (whose impact rates are below 3%) is to provide enough compensation in a timely manner. In this component, the PMO has adopted a comparatively high compensation rates for land acquisition after fully consultation with APs and local government. The APs are satisfied with the compensation rates. Table 6-1 lists the preliminary income rehabilitation plan of each affected village or Farm, when these affected villages receive land compensation and resettlement subsidies according to the adopted compensation standards, the returns of the compensation can fully make up for their income loss caused by land acquisition.

Table 6-1 income restoration measures and basis of affected villages*

Affected villages by subprojects	Description of affected degree	Income loss	Land compensation obtained		Resettlement options	Major basis for selection of resettlement modes
			Land compensation (CNY)	Resettlement subsidy (CNY)		
Liaoyuan Village (Nantaizi Lake Wastewater Collection Systems)	Acquired cultivated land 1.5 μ and impact rate of land acquisition is 1.5%.	Land acquired is wasted pond of the village and not the income sources of residents, so the land acquisition will not bring income loss for the village.	53,010	70,680	(i)No land adjustment, (ii)Resettlement Subsidy will be paid to APs fully (iii)Develop community public welfare cause with land compensation and improve the community residential environment.	Land acquired is the disused pond of village collective, so no income loss is incurred and no laborer will be resettled.
Hancheng Village (Nantaizi Lake Wastewater Collection Systems)	Acquired cultivated land 1.9 μ and impact rate of land acquisition is 0.3%.	Annual income loss of the land acquisition is about CNY 3800 each year.	111,910	167,865	(i)No land adjustment, (ii)Resettlement Subsidy will be paid to APs fully (iii)Land compensation will be paid to village committee. If the compensation is invested in non-agricultural industry with an average yield above 5% and annual income of CNY 14,000, which can fully make up the income loss due to land acquisition. (iv)Contractual agreements shall be signed with the village committee and APs to confirm APs acceptance of the use of funds and the proposals.	Small quantity of land acquisition and small impact to local residents, after obtaining cash compensation, income loss of land acquisition can be made up completely.
Jiangdi Fish Farm (Nantaizi Lake WWTP)	Acquired pond 136 μ , dry land 3.6 μ , and impact rate of land acquisition is 10.4%. 7 employee are affected	Annual income loss of the land acquisition is about CNY175,600	8,222,440	7,527,420	Affected laborers will get the same wages as before All land compensation and resettlement subsidy will be used in a developing fund for commercial and manufacturing industries established by the State farm, arranging laborer employment. Farm employees will become shareholders or enjoy the social security provided by the village. The current return on investment of the collective-owned enterprise is above 6%, if the land compensation for the village is invested in the non-agricultural enterprise, the annual income at least will be CNY 945,000, which can fully make up the income loss of land acquisition. Contractual agreements shall be signed with the farm and APs to confirm APs acceptance of the use of funds and the proposals.	Fishpond belongs to the state-owned farm and agricultural laborers are employees of the farm. After land acquisition, the farm will be developed into non-agricultural industry and new employment or retirement with pension will be offered to the employees

* The resettlement plan listed in this table is just the preliminary plan to use compensation at the village level based on consultation with part of APs; the amount of compensation may be changed. In this stage, most of villagers think it is too early to discuss the compensation fund use plan. The specific plan will be updated and submitted to ADB before land acquisition.

Shiyang Village (Caidian Wastewater management component)	Acquired pond 82.5 mu and impact rate of land acquisition is 10.3%. 64 laborers are affected	Land acquired is mainly cultivated land and the annual income loss for the village is about CNY 165000.	3,168,000	4,752,000	<p>(i)land adjustment,, if it is required by APs .If the villagers are willing to adjust land after land acquisition, the village committee can use the land compensation and resettlement subsidies to develop commercial or industrial projects after fully consulting with villagers;</p> <p>(ii)Improve the condition and technical level of agricultural production</p> <p>(iii)If on land adjustment , resettlement Subsidy will be paid to APs fully Land compensation for cultivated land will be paid directly to Shiyang Village. The village committee can use the land compensation to develop commercial or industrial projects after fully consulting with villagers; the returns of investment will be shared by all villagers. If no land adjustment will be implemented, all subsidies will be paid directly to the affected households. If compensation is calculated on the basis of 4% yield, the village can obtain income of about CNY 317,000, which can make up the income loss as a result of land acquisition.</p> <p>(iv)Contractual agreements shall be signed with the village committee and APs to confirm APs acceptance of the use of funds and the proposals.</p> <p>(iv)Because the project will start construction in 2007,the detailed compensation fund use plan will be submitted to ADB by M&E prior to the subproject construction</p>	The cultivated land will no longer be the main livelihood of farmers. In addition, the village is located in the new developing area of Caidian; the villagers are more willing to develop non-agricultural industry with land compensation. The non-agricultural income of land compensation can make up the income loss due to land acquisition.
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6-2-2 Income restoration plan for affected agricultural laborers

71 agricultural laborers are affected by the component, of which 7 laborers affected by Nantaizi Lake WWTP belong to Jiangdi Fish Farm of Hangyang District; the other 64 labors affected by Caidian WWTP belong to Shiyang Village of Caidian District. No laborers need to be resettled in Hancheng Village, Liaoyuan Village, Sandian Sub-street Administrative Office, because the land acquisition in these villages is pond or dry land, which are not cultivated and are not the income resources. So only Jiangdi Fish Farm and Shiyang Village need an income restoration plan.

(1) Income restoration plan for Jiangdi Fish Farm

According to socioeconomic survey, Jiangdi Fish Farm is a state-owned farm. The total employees are 579, and now just 7 laborers manage the acquired fishponds. These 7 labors belong to the formal employees of the state-owned farm. They obtain salary (about CNY 800 / month) from the Fish Farm according to their contractions. When the fishponds are acquired, the compensation will be paid to the Fish Farm, and the Fish Farm is responsible to provide new jobs for them, and the wages are same as land acquisition before. According to the survey and fully consultation with the leaders of the Fish Farm, the affected labors and the PMO, the Fish Farm will use the compensation to expanse the storehouse for agricultural products.

(2) Income restoration plan for Shiyang Village

Shiyang Village which has 2000 villagers and 800mu cultivated land is located in the New Development Zone of Caidian District; the net income of the village is CNY 3800, and the income sources mainly come from non-agricultural industries (more than 80%). After 82.5 mu land lose, the APs can choose the options of land adjustment, in village level, thus, the cultivated land per capita will be 0.36 mu, 0.04 lower than that before. After consulting with APs, villages plan to use land compensation and resettlement subsidies, totaled 7.92 million to establish the community development fund, which is managed and controlled by the APs, after fully consulting with villagers and agreed with them, the development fund can be invested in commercial or industrial projects, in such case, the APs will share the profits of the investment. If the affected laborers choice self-employment option, the resettlement subsidies will be paid directly to the APs, they can use the resettlement subsidies to create or operate private shops or small-sized enterprise. Because the project will be implemented in 2007, the specific income restoration options will be prepared and submitted to ADB by the IMO prior to land compensation.

Although the detailed income restoration methods cannot be determined now, but the PMO, local government and the Village are sure that the affected labors will be resettled perfectly and their income will be improved. The key of income restoration support to Shiyang Village is:

i. Provide project-related employments to APs. The WWTP is located in Shiyang Village, according to the social assessment, during the construction period (the duration is over 3 years) of WWTP, about 200 person•year new temporary employments such as paving roads, leveling ground, supplying raw materials will create directly. Consider the indirect effect, the project-related employments such as restaurant service, keeping watch, and other livelihood service will be increased to 300 person•year. These kinds of employments need little skill; it is suitable for the villagers. It is estimated that the annual average income per person can reach CNY10, 000. That means the project-related employments might bring about CNY 3,000,000 to Shiyang Village during 2007 to 2009. Most of resettled labors can be employed in their own village instead of moving into far cities. It not only can improve their income, but also can promote their quality of life.

ii. Improve the condition and technical level of agricultural production. Shiyang Village is located in the pre-urban fringe, in recent years, the population in Caidian District is growing very fast, the demand for vegetables are also increasing rapidly, and the farmers who planted vegetables become wealthy. Although the Shiyang villagers want to plant vegetables, most of them are lack fund and technology, so their cultivated land is still used for crops. According to the survey, the value of output of cropland is only 1/4 of vegetable land. After land acquisition, the Village Community plans to change the cropland into vegetable land; the PMO and local government will provide technical assistance and skill training to them without fee, if the plan have been successfully implemented, the income earned from land will not decrease after land acquisition.

6-2 Skill training for affect Laborers

All the affected areas are located in Wuhan urban or sub-urban areas, with the expansion of Wuhan City; rapid urbanization in these areas is an unavoidable trend. That means more and more laborers will be employed in nonagricultural sectors or migrate into urban areas. The skill and human capital will be the most important wealth for the affected laborers in the future.

The PRO and local government have formulated a skill-training program for the affected laborers (Table 6-2) on the basis of needs of Wuhan labor market. All the affected laborers will be trained without fees; the budget of the training has been included into the resettlement budget of the Project. The PRO and local government will also provide suitable and special skill training to 120 women and 8 poor family members. After Skills training, local government will help to recommend them to labor bureau or laborers marking management institute. As for the investigation of Wuhan labor market, it is easy for them to find the job with about wages of CNY 500-800 per month.

Table 6-2 Skill training plan for affected labors

Training content	Number of labors	Fund budget CNY	Training place	Planned time
Resettlement polices of the Project	20	2,000	Jiangdi Fish Farm	May, 2006
	20	2,000	Hanjiang Village Hanjiang Village Hancheng Village	May, 2006
	20	2,000	Sandian Sub-street Administrative Office	May, 2006
	20	2,000	Jinyinhu Ecological Park	May, 2006
	60	6,000	Shiyang Village	May, 2006
Livelihood Training	71	20,000	Dongxihu Farms Jiangdi Township Caidian Township	Jun, 2006
Skill training	71	20,000	Dongxihu Farms Jiangdi Township Caidian Township	Jul, 2006
Special skill training for the women	120	10,000	Wuhan city	Aug, 2006
Special skill training for the vulnerable groups	8	8,000	Caidian Street Administrative Office	Feb, 2007
Total	410	72,000		

6-3 Rehabilitation measures for relocated households

All relocated residences in this project are rural buildings. The total area of relocation is 2,015 m². In these 1425 for residential purposes, 810 m² of 17 person or 3 families in Liaoyuan Village, 550 m² of 23persons or 3 households in Hangjiang Village and 65 m² of 2 persons or 1 family in Tongxin village , so 42 persons or 7 households needs to be relocated.

400 m² relocated building in Machi Neighborhood is an idle public houses, 190 m² temporary simple houses for 23 persons or 5 households in Jiangdi Fish-Farm is mainly used

for guarding the fish pond . So, In Machi and Jiangdi Fish Farm, no households need to be resettled.

In accordance with the *Administrative Measures of Wuhan Municipality on Collectively Owned Land Demolition and Relocation*, the options of rural relocated households will be different between the areas within the Middle Ring Road and those outside the Middle Ring Road. In those affected villages, Hanjiang and Liaoyuan Village are located within the Middle Ring Road, while Tongxin village are all located in the suburban districts.

6-3-1 Resettlement plan for rural households within the Middle Ring Road

For rural houses located within the Middle Ring Road, about 30 km far away from center of Wuhan, two kinds of resettlement measures are provided for the APs to choice: (i) monetary compensation; (ii) house ownership exchange.

Liaoyuan Village and Hanjiang Village affected by the Project are located within the Middle Ring Road, which are currently listed in the comprehensive renovation plan as “village in city” of Wuhan at present. All these rural relocated households can enjoy the relevant preferential policies for “village in city” comprehensive renewal. The rural relocated households in the “village in city” can choose one of the following relocation options:

(1) House ownership exchange. Liaoyuan Village and Hanjiang Village are listed in the comprehensive renovation plan for “village in city” of Wuhan. In accordance with the renewal plan for these regions, the village committee can build multi-story residences to resettle relocated households in a planned area. While demolishing original villagers’ houses, it is required to first determine the legally constructed area⁶ of each household, register the information in a detailed list and report the information to the district governments for record. The relocated persons are resettled by means of equivalent exchange of property according to the determined legal area and the resettlement criteria established by planning departments. If the determined area is larger than that in the resettlement criteria, the excessive portion will be compensated according to the house replacement cost. The criteria for the house replacement cost in the Project are shown in Table 5-10.

(2) In accordance with the *Opinions on Actively Promoting the Comprehensive Reconstruction of “Villages in City”* of Wuhan, the taxes and fees involved in the returned buildings built by rural collective economic organizations for resettling original villagers will be levied according to the relevant policies for farmers’ individual house construction. During the construction of the Project, municipal infrastructure fee is exempt. Other stipulated fees will be

⁶ Non-legal area will receive house compensation, but not include land value.

charged according to the lower limit in the fee scale. Stipulated fixed fees without a scale will be charged half.

(3) With the consent of the relocated persons, the Project owner may offer monetary resettlement. The monetary compensation is based on the house replacement cost plus the location related price of the house site. For detailed criteria, see Table 5-10. On the basis of the current real estate prices for the affected areas, the compensation is sufficient for the relocated households to purchase alternative commercial residential buildings with the same area and in other locations with similar conditions.

6-3-2 Resettlement plan for rural households outside the Middle Ring Road

For houses outside the Middle Ring Road, three kinds of resettlement measures are provided for the house owners to choose: (i) monetary compensation; (ii) house ownership exchange; (iii) rebuild houses in other house sites.

The affected residence located outside of the Middle Ring Road is only one household that locates in Tongxin Village. The household has selected one site nearby Daqiao Pump Station and decided to rebuild his house, because the compensation standard is rather high in local areas, it is easy for him to rebuild a new house.

6-4 Rehabilitation measures for affected enterprises

There is no shop affected by the Project, and as such no shop requires relocation due to permanent land acquisition. Only one enterprise named Hongxing Wine Factory is affected by the Project, which is located in Tongxing Village, Caidian Sub-street. This factory is a state-owned enterprise. Now all workers go off sentry duty and the factory has stopped production for 5 years. The equipment and buildings of this factory have since left unused. Because this factory is located near Diaqqiao Pump Station, which is planned to be extended, two brick-concrete buildings of the factory will be affected. The floor area requiring relocation is 320 m². These two buildings used to be a warehouse and are used as a temporary dwelling place for workers during 2000-2004. Now with the help of local government, these workers have been employed by other firms, and they had left these buildings. The construction of the Project will also not affect the factory's production or business.

6-5 Restoration measures of vulnerable groups

6-5-1 Restoration principles for vulnerable groups

Resettlement principles for vulnerable groups are as follows:

- Enhance living standard and quality of the group;
- Offer as many options as possible;
- Fully consider the desires and needs of the vulnerable groups;
- Provide care to vulnerable groups continuously to ensure their living conditions has been improved.

6-5-2 Restoration measures for vulnerable groups

According to the socioeconomic survey, only 5 households whose land will be acquired are defined as vulnerable groups, all of them locate in Shiyang Village, Caidian District. Except a elder family, others are poor due to their limited land and lack of technical skill.

The PRO and local government will implement special resettlement and rehabilitation measures for the vulnerable groups to improve their status. The main measures include:

- The PMO has established a special assistance fund for the vulnerable groups with a total amount of CNY 400,000. If the income restoration measures can't safeguard their living level, or the vulnerable groups face risk, they can apply for the special assistance fund through village committee and township, after information disclosure, it will be accepted by PMO and then delivered to APs. Local government and IMO will monitor the use of the fund.

- Provide project-related employment to vulnerable groups, during the period of the construction, about 200 person*year new temporary employments such as paving roads, leveling ground, supplying raw materials will create directly, the vulnerable groups have the priority to obtain these employment opportunities, which are acceptable and workable for them. each poor family will be sure to obtain at least one project-related employment.

- The income of all the poor families mainly depends on their limited land, they have no skill to share non-agricultural employment, and they also have no suitable technology to plant vegetables or flowers that added value is much higher than crops. The PMO and local government have formulated a special livelihood training plan for the vulnerable groups, the aim of the livelihood training program is to provide technology and skill of planting vegetable or flowers to them.

- For land resettlement of rural vulnerable groups, supervise and urge the local village

committees to fully consider the production potential and geographic advantage of the resettled land, to ensure that the villagers below the poverty line will not be affected by land redistribution.

6-5-3 Restoration measures for women livelihood

In the affected villages, Women are largely engaged in the informal sector— working in the fields, or selling produce. Women's economic activities are also an important source of income for households. Land acquisition and dislocation may result in loss of livelihood, adding to women's economic hardships. Therefore, Consideration of gender issues is crucial in the implementation of resettlement and rehabilitation programs. Special needs and requirements of women must be considered and addressed in all program aspects—site selection, site and housing design, provision of civic infrastructure, access to service, provision of land and housing title, payment of compensation, and income restoration. In this component, the main problems that the women faced are how to strengthen their ability to adjust to new environment and their skill about non-agricultural production. The PMO, the local government work with Wuhan Women Association and reprehensive of women, devote to promote gender equity and increase the women's income.

i. Create new employment and livelihood options for women. Choices for exploring alternatives and livelihood options for women are limited because of their low levels of skills, education, and exposure. Planning for occupational and livelihood options for women is crucial. According to the social assessment, more than 5, 000 temporary employments will be created directly during project construction, the PMO and local government have agreed that these new employment opportunities will provided to the totaled 421 APs, in which , the 8 laborers of vulnerable groups especially the 120 women have priority to obtain the employment opportunities.

ii. Ensuring participation of women. The consultation process should include women and ensure that their participation is actively. All resettlement programs should consider the women's special needs; the women must be fully informed. The PROs plan to have separate meetings for women in Caidian District during the resettlement implementation.

iii. The local government and the resettlement offices ensure that the women have landownership and property rights same as man, when the women are divorced or widowed, they still have the right to obtain land or land compensation. The PRO also required that land/house titles and grants should be in the name of both spouses.

iv. Eliminating gender discrimination, encourage women's entrepreneurship. The PMO is seeking ways to establish partnership between local government and Wuhan Women Association, and devotes to enhance the opportunities and quality of lives for women and girls. At first, Female staff should be hired by the resettlement organizations to work with and assist women in all aspects of resettlement activities, including planning and implementation of income restoration programs. Involve women's groups in resettlement planning, management and operations, job creation, and income generation. The second, the local government and the PMO will work with Wuhan Women Association, and devote to eliminate discrimination in the investment climate, encourage women's participation in the formal labor force, and promote private sector investment that will enable women to reach their full potential.

6-6 Compensation and rehabilitation for affected public facilities

During project implementation, the PRO is required to communicate and negotiate with owners of main public facilities, e.g. power lines, telephone lines, roads, greenbelts and various underground facilities, and devise a detailed rehabilitation and reconstruction plan, such that the affected infrastructure will be rehabilitated and reconstructed as soon as possible.

In case of monetary compensation, the PRO will make timely payment and assist in coordinating with the relevant departments to rehabilitate the above mentioned public facilities.

7 Budget and Fund Management

7-1 Expense budget of resettlement

Expenses incurred in acquisition, relocation and resettlement shall be allowed for in the total budget of the component. According to the current price, total budget for land acquisition and resettlement in the Project is CNY 82,966,000. The budget estimate is shown in Table 7-1.

- Land acquisition expenses. It includes all compensation expenses for state-owned land and collective-owned land, including land compensation, resettlement compensation and various taxations. The compensation fund paid to villages, APs or affected institutions (including affected villages and affected enterprises) is CNY 51,860,000, while the taxes and fees turned into government from the project owner are CNY 12,211,000. The total budget cost for land acquisition, including temporary land acquisition, is CNY 64,071,000.

- Compensations for demolished buildings. Total budget expense of compensation for various house expenses of affected persons or institutions is CNY 3,225,000,

- Compensations for young crops and attachments to the ground. Total budget for compensations for affected young crops and attachments to the ground is CNY 492,000.

- Management cost for land acquisition. Management cost is CNY 1,356,000, this cost is calculated at 2 % of the total expenses for land acquisition and relocation.

- Special assistance fund for the Vulnerable Groups. The fund is mainly for providing assistance to the vulnerable groups to rehabilitate their production conditions or providing subsidies to these families whose total house areas are below 20 m². The budget of this fund is CNY 400,000.

- Training Fee. This fee is used to provide livelihood and skill training to the APs, especially to the agricultural laborers who are ready to work in non-agricultural sectors. The staff of the PRO at every level will also be trained, so as to equip them with knowledge in national laws on resettlement and ADB's resettlement policies; the budget of this fee is CNY 500,000.

- Management cost for resettlement and relocation. The total budgeted expense that will be used in the preparation of land acquisition and relocation and daily administration is CNY 2,035,000. This is calculated at 3 % of the total expenses for land acquisition and relocation.

- Compilation expenses for *Resettlement Plan* and monitoring cost. The total expenses used for compiling the RP and retaining independent external monitoring organizations will be CNY 678,000.

- Contingency costs. Contingency costs refer to costs that cannot be predicted in the

process of project implementation. The contingency costs consist of basic prepared fund and price-rise prepared fund. The basic prepared fund is for possible additional funds incurred in the process of project implementation or due to design changes during construction, while the price-rise prepared fund is for possible cost escalation between cost compilation and project implementation. This basic prepared fund is calculated at 10 % of the total expenses for land acquisition and relocation, while the price-rise prepared fund is calculated at 5 % of the total expenses for land acquisition and relocation. Total budget for the costs is CNY 10,174 ,000. Contingency support and a firm commitment by the EA that in such cases, livelihood support as described in the RP will be available to any APs whose lands cannot be restored.

7-2 Flow direction of resettlement funds

The Wastewater Management Component is the key infrastructure project in Wuhan city. According to the construction procedures of infrastructure projects in Wuhan, firstly Wuhan Development and Reform Commission, Wuhan Financial Bureau, and Wuhan Urban Construction Bureau will formulate *Yearly Plan for Wuhan Urban Construction*, and submit the plan to Wuhan Municipal Government for approval. Secondly Wuhan Municipal Government collects investment according to *Yearly Plan for Wuhan Urban Construction* from Wuhan Financial Urban Construction Fund, and loans from commercial banks or development banks. All investments will be gathered together and managed or operated by Wuhan Urban Construction Fund Office (WUCFO). Thirdly the PMO will formulate investment use plan and report to WUCFO according to the schedule of project. After checking the plan, WUCFO pays the compensation directly to the APs, affected villages, and affected enterprises through the bank.

In this project, The Wuhan Drainage Company (WRC) shall be responsible for the payment of compensation; The Resettlement Department of ADB Financed Project Administrative Office shall be responsible for the monitoring and management of resettlement funds. The Resettlement Department of WDC shall be responsible for the examination of the use of resettlement funds. The resettlement fund flow chart and monitoring or checking procedures of fund use are shown in Figure 7-1.

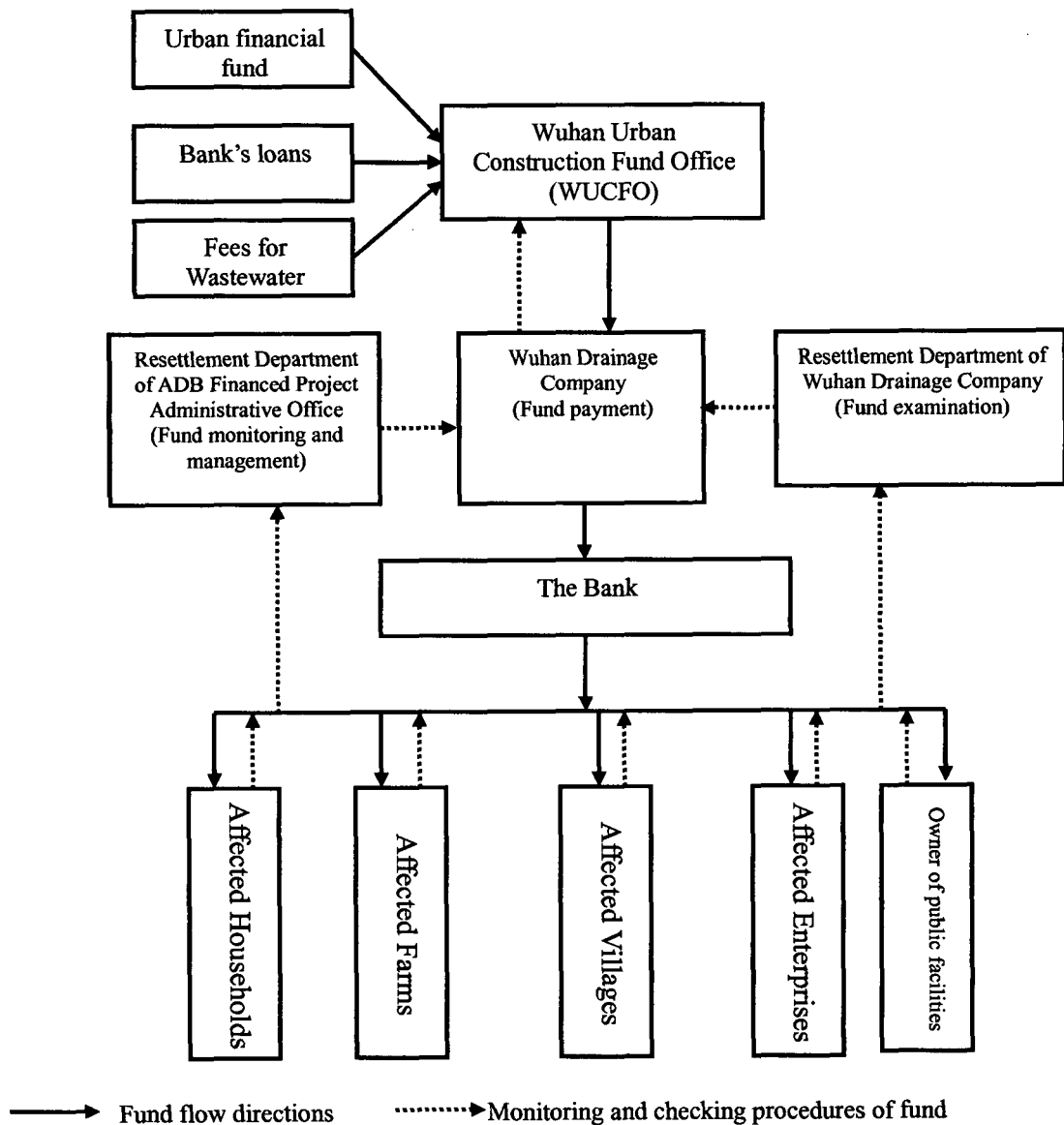
Table 7-1 Resettlement Fund Budget for Wastewater Management Project

NO.	Budget item	Unit	Nantaizi Lake (Hanyang District)				Dongxihu Project (Dongxihu District)				Caidian Project (Caidian District)				Total compensation n (CNY 10,000)
			Qty.	Compensatio n rate (CNY)	Compensation (CNY 10,000)	%	Qty.	Compensatio n rate (CNY)	Compensatio n (CNY 10,000)	%	Qty.	Compensati on (CNY)	Compensation (CNY 10,000)	%	
I	Compensation for permanent land acquisition paid to APs														
1	Paddy	Mu	0	147,250	0.0	0	0	122,375	0.0	0	78.7	96,000	755.5	66.2	755.5
2	Dry land	Mu	5.5	147,250	81.0	3.4	9	122,375	110.1	34.2	3.8	96,000	36.5	3.2	227.6
3	Pond	Mu	1.5	82,460	12.4	0.5	0	68,530	0.0	0	0	53,760	0.0	0	12.4
4	Fishpond	Mu	136	111,910	1,522.0	63.4	0	93,005	0.0	0	0	72,960	0.0	0	1,522
5	Woodland	Mu	0	88,350	0.0	0	15.3	73,425	112.3	34.9	0.5	57,600	2.9	0.2	115.2
6	House site	Mu	0.7	35,340	2.5	0.1	0	29,370	0.0	0	0.6	23,040	1.4	0.1	3.9
8	Wasteland	Mu	2.3	35,340	8.1	0.3	0	29,370	0.0	0	0	23,040	0.0	0	8.1
Total compensation paid APs (1-8)					1,626	67.7			222.4	69.1			796.3	69.7	2,644.7
9	Taxes and fees turned into government				775.7	32.3			99.8	30.9			345.6	30.3	1,221.1
Subtotal (1-9)					2,401.7	100			322.2	100			1,141.9		3,865.8
II	Compensation for temporary land use paid to APs														
10	Paddy	Mu	13	11,780	15.3		0	9,790	0.0		4.5	7,680	3.5		18.8
11	Pond	Mu	3	11,780	3.5		0	9,790	0.0		0	7,680	0.0		3.5
12	Woodland	Mu	5	11,780	5.9		119.8	9,790	117.3		0	7,680	0.0		123.2
13	Collective Wasteland	Mu	54	11,780	63.6		0	9,790	0.0		0	7,680	0.0		63.6
14	State-w-owned Wasteland	Mu	113	11,780	133.1		0	9,790	0.0		25.5	7,680	19.6		152.7
15	Rehabilitation of Green Belt	Mu	4	25,000	10.0		119.8	25,000	299.5		0	25,000	0.0		309.5
16	Road restoration	m²	60,000	220	1,320.0		0	220	0.0		25,000	220	550.0		1870.0
Subtotal (10-16)					1,551.5				416.8				573.0		2541.3
III	Compensation for rural residences with certificates														
17	Reinforcement structure	m²	0	830	0.0		0	830	0.0		0	830	0.0		0.0

NO.	Budget item	Unit	Nantaizi Lake (Hanyang District)				Dongxihu Project (Dongxihu District)				Caidian Project (Caidian District)				Total compensation (CNY 10,000)
			Qty.	Compensation rate (CNY)	Compensation (CNY 10,000)	%	Qty.	Compensation rate (CNY)	Compensation (CNY 10,000)	%	Qty.	Compensation rate (CNY)	Compensation (CNY 10,000)	%	
18	Brick and concrete	m ²	1,290	570	73.5		0	570	0.0		65	570	3.7		77.2
19	Brick and wood structure	m ²	0	420	0.0		0	420	0.0		0	420	0.0		0.0
20	Simple house	m ²	0	340	0.0		400	340	13.6		0	340	0.0		13.6
21	Location Price	m ²	466.9	2,280	106.5		400	1,500	60.0		65	700	4.6		171.0
Subtotal (17-21)					180.0				73.6				8.3		261.8
IV Compensation for residence without certificate															
22	Brick and concrete	m ²	70	570	4.0		0	570	0.0		0	570	0.0		4.0
23	Simple house	m ²	190	340	6.5		0	340	0.0		0	340	0.0		6.5
Subtotal (22-23)					10.5				0.0				0.0		10.5
V Business buildings of enterprises and institutions															
24	Brick and concrete	m ²	0	2,620	0.0		0	2,270	0.0		320	1570	50.2		50.2
VI Compensation for young crops and attachments															
25	Tree	Tree	145	40	0.6		6300	40	25.2		50	40	0.2		26.0
26	Compensation for young crops	Mu	3.4	1,000	0.3		4.5	890	0.4		82.5	890	7.3		8.0
27	Wall	m ²	200	36	0.7		360	36	1.3		0	36	0.0		2.0
28	Soil road	m ²	400	38	1.5		0	38	0.0		500	38	1.9		3.4
29	Power Pole	Pole	27	2,500	6.8		0	2,500	0.0		8	2500	2.0		8.8
30	Telephone	Set	12	108	0.1		0	108	0.0		3	108	0.0		0.2
31	Air conditioner	Set	8	200	0.2		0	200	0.0		0	200	0.0		0.2
32	TV set	Set	12	450	0.5		0	450	0.0		3	450	0.1		0.6
Subtotal (25-32)					10.7				26.9				11.5		49.1
VII Transitional allowance for relocation															
33	Removing fee	Household	11	400	0.4		0	400	0.0		3	400	0.1		0.6

NO.	Budget item	Unit	Nantaizi Lake (Hanyang District)				Dongxihu Project (Dongxihu District)				Caidian Project (Caidian District)				Total compensation (CNY 10,000)
			Qty.	Compensation rate (CNY)	Compensation (CNY 10,000)	%	Qty.	Compensation rate (CNY)	Compensation (CNY 10,000)	%	Qty.	Compensation rate (CNY)	Compensation (CNY 10,000)	%	
34	Transitional allowance for residence	m ²	1,550	6	0.9		400	6	0.2		65	6	0.1		1.3
35	Transitional allowance for units	m ²	0	15	0.0		0	15	0.0		320	15	0.5		0.5
36	Removing fee for indoor facilities	Household	11	928	1.0		0	928	0.0		3	928	0.3		1.3
Subtotal (33-36)					2.3				0.2				1.0		3.7
Total expenses for basic land acquisition and relocation					4,156.7				839.7				1785.9		6782.4
Management expenses for land acquisition (2%)					83.1				16.8				35.7		135.6
Special assistance fund for Vulnerable Groups					10.0				10.0				20.0		40.0
Fee for Training					15.0				15.0				20.0		50.0
Management expenses for resettlement and relocation (3%)					124.7				25.2				53.6		203.5
Expense for resettlement plan and monitoring (1%)					41.6				8.4				17.9		67.8
Contingency (15%)					623.5				126.0				268		1017.4
Total budget					5,054.6				1,041.1				2200.9		8296.6

Figure 7-1 Fund flow chart



7-3 Resettlement fund management

7-3-1 Resettlement fund categories

The resettlement fund refers to the special payment that has been allowed for in the budget for all expenses occurred during the process of land acquisition, relocation and resettlement, which consists the following aspects:

- Basic resettlement expenses. It includes land acquisition, compensation for house expenses, compensation for attachments to the ground and transitional allowance for

relocation and etc.

- Relevant resettlement expenses. It includes house property evaluation cost, cost for training, resettlement monitoring expenses, relocation agent fee of relocation units and etc.

- Resettlement administrative expenses. It mainly includes payments of personnel salary and welfare, purchasing cost for fixed assets, office expenses, dinner party expenses for foreigners, travel transportation expenses, maintenance and communication costs; among which, payment scope of purchasing cost for fixed assets consists of office buildings, office facilities, travel transportation vehicles, communication equipment and other equipment.

- Contingency costs. Contingency costs refer to costs that cannot be predicted in the process of project implementation. The contingency costs consist of physical and price-rise uncertainties. The physical contingency is for possible additional funds incurred in the process of project implementation or due to design changes during construction, while the price-rise contingency is for possible cost escalation between cost compilation and project implementation.

7-3-2 Management of resettlement expenses

The compensation agreement is signed in accordance with the Project's resettlement policies and relevant regulations in land acquisition. For monetary compensation, the agreement should stipulate the compensation amount, payment approach, payment schedule, and responsibility for breach of agreement and other terms agreed by APs. For exchanging property ownership, information of resettlement location, affected areas and description of structures should be stipulated in the agreement.

- In managing the basic resettlement expenses, special bank accounts shall be set up by the PMO for this specific intended purpose only. The PMO has the right to monitor the use of these special funds.

- Basic resettlement expenses must be paid in accordance with the state regulations for land acquisition, relocation and policies in the *Resettlement Plan*, which should not be less than the compensation rate and scope stipulated in the *Resettlement Plan*.

- The Resettlement Office shall be responsible for the examination and approval of the scope, land area and price of land acquisition and relocation, and when the compensation shall be paid. The PMO will be responsible for checking of the data and collection and submission of reports.

- Land compensation (including resettlement compensation, compensation for young

crops and taxes or fees), compensations for house and attachments to the ground, compensations for relocation including removal of indoor facilities, removal cost and transitional allowance, and loss of business shops and enterprises and institutions, will be examined and approved by the resettlement offices. The compensation amount will be rechecked by the PMO before the bank entrusted by the project owner making direct payments to the entitled owners and households.

- The PMO can entrust the professional demolition companies to implement relocation activities. The agency fees will be paid according to the contracts agreed with the PMO.

7-3-3 Annual plan of resettlement expenses

Annual financial plans of the resettlement shall be put forward by resettlement implementation organizations; The PMO will be responsible for making the whole fund-use plan. Annual fund-use plan shall be reported to the PMO before November 20 of every year. Monthly plans shall be reported to the PMO every month before the 20th and the PMO will collect and compile the relative plans to report to the Wuhan Urban Construction Fund Office 5 days after receiving the plans.

Table 7-2 The annual resettlement disbursement plan

Sub-project	Fund use in 2006		Fund use in 2007		Fund use in 2008		Total basic resettlement expenses
	Amount (CNY 10,000)	Percentage (%)	Amount (CNY 10,000)	Percentage (%)	Amount (CNY 10,000)	Percentage (%)	Amount (CNY 10,000)
Nantaizi Lake WWTP	2401.7	100%	0	0	0	0	2401.7
Nantaizi Lake Wastewater Collection System	0	0	1228	70	527	30	1755
Dongxihu Wastewater Collection System	0	0	581.7	69	258	31	839.7
Caidian WWTP	0	0	1153.6	100	0	0	1153.6
Caidian Wastewater Collection System	0	0	0	0	632.3	100	632.3
Total basic resettlement expenses	2401.7	35.4	2963.4	43.7	1417.3	20.9	6782.4

8 Organizations

8-1 Organizations in connection with resettlement work

For the purpose of smooth implementation of Wuhan Wastewater Management Project resettlement work, relevant organizations at every level have been set up, which will be responsible for the general planning and coordination of the project resettlement work. Organizations in connection with the project resettlement work are as follows:

- Wuhan Wastewater and Storm Water Management Project Leading Group. The leading group consists of leaders from Wuhan Municipal Government, Wuhan Municipal Development and Reform Commission, Wuhan Municipal Finance Bureau, Wuhan Water Bureau, Wuhan Construction Commission, Wuhan Urban Plan Bureau (Wuhan Land Resources Management Bureau), Wuhan Drainage Company and other relevant departments and etc.
- Wuhan ADB Financed Project Management Office, The Storm Water and Wastewater Project Management Office and PRO is the subsidiary departments of Wuhan ADB Financed Project Management Office.
- Project implementation organizations: Wuhan Drainage Company.
- Project Resettlement implementation organizations: Resettlement Department of Wuhan ADB Financed Project Management Office, Resettlement Department of Drainage Company, Wuhan Municipal Land Bureau, land bureaus at all levels, land management offices at town levels of relevant sub-projects and relocation companies entrusted by the owners.
- Survey and designing organizations: Wuhan Urban Planning and Design Institute and Wuhan Municipal Engineering Design and Research Institute.
- External Monitoring Organization.

8-2 Responsibilities of all resettlement organizations

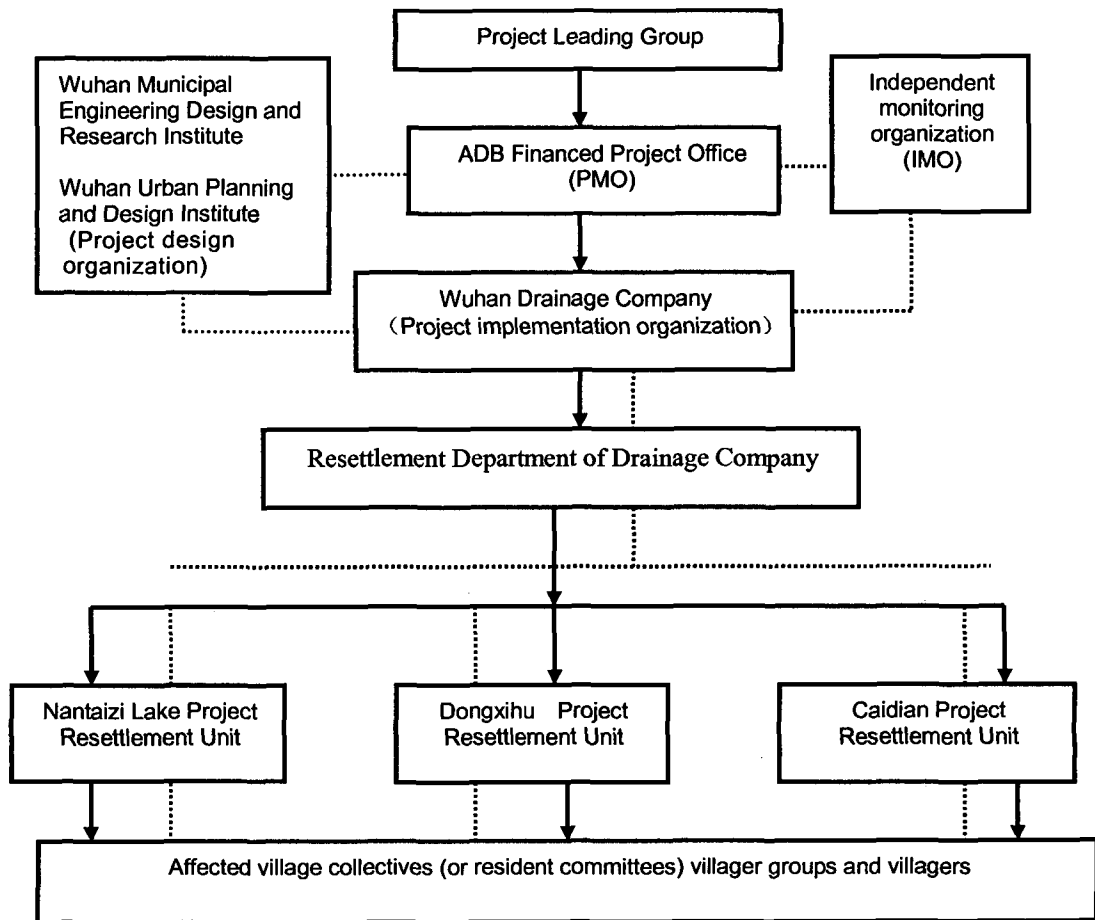
8-2-1 Project leading group

Main responsibilities of the Project Leading Group:

- Coordinate between relevant departments during the project preparation phase
- Make decisions on major project construction and resettlement problems

For organization network, see Figure 8-1.

Figure 8-1 Sketch map of organization networks



8-2-2 Project Management Office

- Decide the land acquisition and relocation and resettlement policies
- Entrust the design units to make project design
- Entrust resettlement consultation, survey and monitoring organizations and organize the compilation of *Resettlement Plan*.
- Be responsible for entrusting the environment impact assessment organization to compile the *Environment Impact Assessment Report*.
- Be responsible for the coordination of land acquisition and relocation, resettlement actions and construction schedule.
- Handle all examination and approval procedures of land acquisition from relevant government departments.

- Monitor payment and use of fund

8-2-3 Project Resettlement Office

- Organize Wuhan Urban Planning and Design Institute and the project resettlement consultation organizations to implement resettlement survey and socioeconomic survey, analyze and handle all survey information;

- Be responsible for the business training of survey data processing with computer for resettlement staffs at different levels of districts and towns.

- Publicly disseminate information on resettlement policies. including resettlement laws and regulations of state and Wuhan, various compensation rates and methods of the project resettlement, rights and obligations of the affected persons, project implementation schedule, etc.

- Organize the compilation of *Resettlement Plan*. According to the relevant laws, regulations and resettlement survey data, on the basis of full consultation with affected families and units, be responsible for the organization of compiling *Resettlement Plan* for the project resettlement.

- Provide business training for resettlement staff at all levels. The main purpose is to let resettlement staffs at all levels to get familiar with resettlement working procedures, know the detailed operation methods, handle various problems in the resettlement and enhance working efficiency.

- Be responsible for organization of detailed relocation implementation and supervision and guidance during the relocation.

- Be responsible for communications and contacts with resettlement experts of ADB and social experts.

- Be responsible for communications and contacts with external monitoring organizations and examination and approval of external monitoring report.

- Handle complaints and coordinate in settling disputes.

- Supervise the implementation of the resettlement plan.

- Carry out internal monitoring on the resettlement work.

8-2-4 Resettlement Department of Wuhan Drainage Company

- Responsible for the construction, operation, maintenance and management of project construction.

- Entrust the relocation companies to implement building demolition.

- Supervise removal activities of Relocation Companies.
- Be responsible for communications and contacts with resettlement offices at all levels and Relocation Companies.
- Coordinate resettlement implementation and construction schedule.

8-2-5 Resettlement Office of sub-projects

- Provide local socioeconomic development information to the PRO, support monitoring and survey of resettlement organizations.
- Be responsible for the implementation of the *Resettlement Plan*.
- Train resettlement staffs at township (street) levels.
- Guide and supervise the resettlement work of PROs at township level.
- Collect and distribute funds for the affected units and individuals and supervise the use of funds.
- Provide quarterly progress reports to the PRO.
- Handle and report complaints to the above levels.
- Check and confirm the vulnerable groups, and submit the name list of the vulnerable groups to PRO.
- Provide skill training to the resettled laborers.

8-2-7 Village committee (or residence committee)

- Check the submitted data of land acquisition, land rights, property rights and land-use right, population and laborer information.
- Participate resettlement survey
- Be responsible for holding public consultation meetings with villagers to consult the fund use plan at village levels or selection of resettlement sites.
- Report to the resettlement organizations at higher level about desires, suggestions and complaints of affected persons.
- Organize and coordinate the building relocation and reconstruction work and provide assistance to the vulnerable families.
- Collect the APs' grievances and appeals and help the Resettlement Office to deal with the problems in the process of resettlement.

8-2-6 Survey design organization

- Determine survey scope and arrange resettlement area.

- Provide drawings to resettlement department and evaluate project impact.
- Coordinate with resettlement departments, register land rights and property rights and rights of use.
- Assist the resettlement departments to compile the *Resettlement Plan*.

8-2-9 Independent monitoring organization

As an independent monitoring department, it is responsible for the monitoring of all aspects of the resettlement work, providing resettlement training service, and submitting regular reports and independent monitoring reports to the PRO and ADB. Detailed responsibilities and tasks will be discussed specially in Chapter XI and Appendix IV.

8-3 Organization staff and equipment

In order to complete land acquisition, relocation and resettlement of the Project, the PMO has selected some staff (at least 40% is female workers) from within the Wuhan Wastewater Drainage Company, Wuhan City Construction Investment Co. Ltd., who are with higher educational background and rich experiences and those who are familiar with ADB policies about involuntary displaced persons, to be responsible for the project resettlement work. The PMO also entrusts independent monitoring organizations and environment impact assessment organizations with rich experiences in implementing ADB project resettlement to provide consultation services. The PMO will allocate vehicles, computers, photocopiers, cameras and communication tools for the staff in accordance with their work requirements. During the project implementation period, special staff that have the relevant experience and are familiar with laws and regulations will be seconded to the PROs at district and township (street offices) levels. For information on staffing at various levels, see Table 8-1.

Table 8-1 Staff information in resettlement organizations

Resettlement organization	Staff (person)	Qualification of staff	Operation period
Project Management Office	4	University degree 40% is female workers	From 2004 to 2008
Project Resettlement Office	6	Junior college degree, 40% is female workers	From 2005 to 2008
Resettlement Department of Wuhan Drainage Company	8	Junior college degree, at least 30% is female workers	From 2005 to 2008
Resettlement Office of Sub-projects	20	Above technical secondary school degree, 40% is female workers	From 2005 to 2008

Resettlement organization	Staff (person)	Qualification of staff	Operation period
Village Committee (Or Residence Committee)	25	Major leaders	From 2005 to 2008
Survey Organization	20	University degree, 50% is female workers	From 2005 to 2006
Independent monitoring organization	6	University degree and above, 50% is female workers	From 2005 to 2008

8-4 Training of staff

For the purpose of enhancing of the resettlement organization staff's understanding of the state policies and regulations of involuntary displaced person resettlement for ADB financed projects, updating their knowledge and concepts and improving their quality, the PRO will organize training and study tours in accordance with their work requirements.

Training contents include mainly state and local policies and regulations on the resettlement, resettlement policies on involuntary displaced persons of ADB, socioeconomic survey method, computer data management knowledge, resettlement implementation steps, fund management method, measures to restore production and living status of affected persons, procedures, methods of handling complaints, etc. Training modes include training conferences, lectures by invited experts; visits to similar projects to exchange experiences with other owner units so as to learn their successful experiences and prevent and avoid similar problems. The PRO has set up the following training plan (see Table 8-2).

Table 8-2 Training Plan

Content	Number	Fund budget (CNY)	Time	Status
Relative regulations and policies of state land acquisition and relocation, policies and principles on involuntary displaced persons of ADB	12	50,000	Jul 2005 Aug 2005	Completed
Socioeconomic survey method and operation and management of relocation survey data	15	60,000	Jun 2005 Aug 2005	Completed
Compilation of fund use plan at village level and supervision management methods	15	60,000	Aug 2005	Completed
Payment procedure of resettlement fund, supervision management and statistics	15	36,000	Dec 2005	Planned
Compilation seminar on <i>Resettlement Plan</i>	6	20,000	Jun 2005	Completed
Inspect resettlement planning experiences of ADB financed projects	6	60,000	Dec 2005	Completed
Inspect resettlement implementation experiences of ADB financed project	6	60,000	Feb 2006	Planned
Internal monitoring method for resettlement work	4	12,000	May 2006	Planned

Detailed methods of handling resettlement coordination	10	70,000	May 2006	Planned
Total	89	428,000		

8-5 Measures to strengthen organization capabilities

- Select staff who have higher business quality, strong organization and coordination capabilities and computer knowledge, to be responsible for the resettlement work and keep the staffing relatively stable. In the resettlement offices, 40% workers should be female, and every resettlement office must hire at least one female worker to responsible for women's affairs in the process of resettlement.

- Strengthen business quality training. Through various training, enable staff in the resettlement organizations at all levels to understand completely the principles, policies and procedures on involuntary resettlement of the state and ADB, and be aware of new policies so as to enhance their working activities.

- Organize staff of resettlement organizations at all levels to visit and inspect similar projects of other places in the country by batches so as to learn their successful resettlement experiences from the similar projects and reduce faults during resettlement process.

- Invite experienced consultation experts and independent monitoring organization, special organizations, local government and affected persons to share their opinions and suggestions.

- Improve office conditions and allocate necessary transportation and communication tools.

- Establish and perfect post responsibility system strictly follow rules and regulations and clearly define responsibilities of individual staff.

- Strengthen communications with relevant departments and organizations, establish good report system and form an organization network for smooth information exchange.

- Enhance political qualities of staff in resettlement offices at all levels, train resettlement staff to endure hardship, be practical and realistic and provide just services for everyone.

9 Public Consultation

The RP was prepared with full consultation and full information sharing with APs. The PROs have publicized and introduced the resettlement policies of the each subproject via socioeconomic survey, social impact assessment survey and other communication and consultation channels. The PMO also has consulted with various affected persons through consultation meetings. Through wide consultation, coordination and communication, related local government, affected villages and APs can fully understand the potential resettlement impacts, resettlement policies, and consider income restoration measures.

9-1 Main methods for public consultation and information disclosure

(1) Media propaganda

The public can participate directly in consultation and can obtain relative project construction and resettlement information through media. The PMO has introduced the project construction and resettlement information via suitable radio, television channels, newspapers and magazines so as to inform the public and improve the project transparency.

(2) Compilation and Distribution of resettlement Information booklet

The PRO has compiled the *Resettlement Information Booklet*, and has distributed them to the affected families or units by 31st Nov. 2005. The booklet mainly introduce the resettlement policies of ADB and municipal government, the project, status of affected families and affected units, resettlement schedules, compensation rates, etc.

(3) Socioeconomic survey

By utilizing the advantage of maximum contacts with the affected persons during the socioeconomic survey, the project construction status, implementation significance and impact of the project, resettlement compensation policies, rates and implementation plans and etc. can be disseminated to the affected persons. Questions of the affected persons can be

answered and their requirements and concerns can be understood.

(4) Public consultation conferences / workshops / meetings

- The PRO periodically organizes official public consultation meetings. Topics, scale and participants of the meetings have arranged in conformity with the relevant requirements. Delegates of vulnerable groups, especially women delegates, will be invited to the meetings. Their attendance will be monitored by an external independent monitoring organization. During FS stage, the APs have invited to express their requirements and suggestions with an intention to satisfy the reasonable requirements of the majority affected persons.

- Public consultation meetings are also held by the independent monitoring organizations. During the implementation process, the independent monitoring organization will hold a public consultation conference every two or three months. They will be targeted at specific groups such as the affected residences, women, special groups, etc. Delegates of vulnerable groups, especially women delegates will be invited to these meetings. The PMO and PRO will send specific persons to participate in the meetings to find out the feelings and desires of the affected persons so as to take their concerns into consideration in the working schedule of PRO and respond to their urgent problems in a timely manner.

Key points of public participation and consultation are:

- Gather desires and suggestions of the affected persons for production arrangements; publicize resettlement policies and production restoration plan to the affected villages, groups, and enterprises; consult opinions and suggestions with the affected persons about production rehabilitation plans.

- Compensation rates for house, land and property loss. The PRO has consulted with the PRO at district levels on compensation rates prior to and during the compilation of the *Resettlement Plan*. After consultation with the affected villages (residence committee) and collective households and enterprises and institutions, considered opinions can be formed. ADB and Wuhan Municipal Government will publicize the final result after the examination and approval.

- Selection house sites for relocation. With the help of engineering design institutes (DIs), the PROs at township levels have consulted with the affected collectives, enterprises and institutions about the rebuilding and relocation selection of house sites.

- Houses, attachments to the ground and property impact situation. During the socioeconomic survey, the DIs, survey implementation organization, affected units and

affected families have checked and jointly agreed to the situation of the affected houses, land, attachments to the ground and properties. During the survey, affected persons have participated directly in completing the questionnaires, which have been checked and signed by the respondents.

9-2 Public consultation plan

Along with the development of construction preparation and implementation work, the PRO and local PROs will hold further public consultations. The major consultation contents are as follows:

- Labor arrangement mode and production rehabilitation measures.
- Detailed opinions of the affected persons on the engineering design. Before construction, local PROs will notify the affected villages and groups of the engineering designs. For aspects that the affected persons have adverse opinions, the PRO will request the DIs to revise and optimize the designs, provided that such revisions satisfy engineering and technical standards.
- Selection of residence relocation sites (at least two options) and reconstruction modes.
- Compensation for relocation households and payment process arrangements.
- How to reduce the degree of impact on peripheral residences to the minimum during construction.
- Other problems of the affected persons, such as indirect effect on productions and living conditions of residences outside the demarcated areas during construction.

For public consultation activities between the PROs at various levels and affected persons that have been held and the public consultation activity to be conducted, see Table 9-1 and Appendix II. According to the work schedule of the PRO, offices at district levels may hold consultation meetings if necessary, and report the information to the PRO. In addition to consultation activities held by the PRO, the monitoring organization will consult independently with the affected persons on other monitoring problems and collect their complaints and suggestions and provide monitoring information to relocation departments at various levels.

Table 9-1 Implementation schedule and plan of public consultation

Main contents	Consultation mode	Time	Implementation organization	Participants	Remarks
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Consult with the affected persons for suggestions of optimized construction design	Public conference On-the-spot survey	2005 June-August	PRO, designing unit and villager committee	All affected persons and stakeholders	Completed
Publicize project impact information to the affected persons, consult with the affected persons of their resettlement desire	Socioeconomic survey	2005 May-August	PRO, Wuhan University	All affected persons	Completed
Consult with local government and unit representative in the affected areas for primary intention of resettlement rehabilitation	Public conference	2005 August	PRO Wuhan University	Local government officials and firm leaders	Completed
Consult with Wuhan urban planning and land management departments for resettlement policies	Consultation	August 2005	Wuhan Land Resources Bureau, PRO and Wuhan University	Wuhan Land Resources Bureau, PRO and Wuhan University	Completed
Provide resettlement information booklets to APs and AVs		Nov 31, 2005	PROs IAs Local government officials township government,	APs AVs	Completed
Provide final <i>Resettlement Plan</i> report to the affected persons	Public meetings	Feb. 2006	PROs, villager committee,	All affected persons	Consult in the library/ offices
Detailed measurement surveys on the affected scope, material property and relocation of land acquisition and relocation	On-the-spot interview with the affected households	Before the implementation of land acquisition and relocation plan	PRO, township government, village committee and removal company	All affected persons	
Publicize the construction process, resettlement compensation scheme to the affected persons	Public and township meetings	Get the loan approval from ADB	Project implementation organization	Stakeholders, beneficiaries and affected persons	
Notify the affected persons about their rights and interests and value and compensation payment date	Public conference	Before the implementation of land acquisition and relocation plan	PRO, township government, village committee and removal company	All affected persons	
Monitor the impact of land acquisition and relocation to the affected persons	Visit families	During the implementation of land acquisition	Wuhan University	Random sampling	

9-3 Consultation approaches for the affected persons during the implementation period

(1) Villager symposiums

Symposiums organized by local governments and resettlement departments; with villager delegates and village leaders are tools to gather key problems that villagers concern the most, their opinions and suggestions on these problems.

(2) Consultation meetings with affected enterprise and workers

Legal person or delegates of enterprise and workers shall be consulted sufficiently on compensation rates to reach decisions. In this component, there is only one enterprises affected by project, and no laborers need to be resettled. The main task in the consultation meeting is to provide enough compensation in time according to the resettlement policies.

(3) Land acquisition and resettlement consultation meetings at district levels

Relocation consultation meetings will be held by city and district level PROs according to the relocation areas concerned. Visits should be organized for the affected persons to view the relocation area, to let them know the status of the relocation sites and the supporting facilities, to provide choices for the affected persons and to consult with them, so as to improve the *Resettlement Plan*. After the relocation meetings, the resettlement staff will make door-to-door interviews with the affected persons to request their signature on the Resettlement Agreement.

(4) Publishing of information of displaced persons

The PRO will publicize in a timely manner the resettlement policies, resettlement criteria and other information to the affected persons through relocation bulletin, media and etc.

After the compilation of the *Resettlement Plan*, copies will be placed in the Hubei Library, Wuhan Library and PROs at district levels for reference.

9-4 Function of independent monitoring organization in the consultation

- Present key problems most concerned by the affected persons (such as compensation rates, laborer arrangements, project implementation timetable and etc.) and report complaints.
- Consult periodically, hold meetings and symposiums with the affected persons.
- Provide opinions and suggestions to resolve the complaints.
- Along with the project development, public consultations between the project owner, affected persons and independent monitoring organization will be recorded by the relocation departments and the related information kept in file.

10 Grievances and Appeals

Resettlement is a complicated task. It is inevitable that the affected persons will have grievances and complaints during the resettlement implementation. For the purposes of guarantee the interests of the affected persons, the PMO will establish a set of highly transparent grievance and complaint collection and dealing procedures which are simple and easy to carry out to objectively, justly and efficiently deal with the grievances and complaints of the mass so as to ensure that the resettlement works goes on smoothly.

10-1 Means of grievance and complaint collection

(1) Finding out grievances of the affected persons from the report of the local resettlement offices, including grievances of the mass, the progress, working measures and existent problems;

(2) All sub-project construction units must submit construction journal to the project owner every week, from which information on whether there is any people affecting the construction can be known;

(3) Problems on land acquisition and relocation coordination discovered by the project owner in field inspection;

(4) Relevant information reflected by the independent monitoring organization;

(5) Letters and calls of the affected persons;

(6) Relevant special problems reflected by the audit and disciplinary inspection divisions;

(7) Special investigation of internal and external monitoring.

10-2 Procedures for complaints and appeals

● Stage I

The affected persons may present their grievances to the village committee or the local resettlement office orally or in a written form. For oral grievances, the village committee or the local PRO must keep a written record and provide a clear reply within two weeks. When it involves serious problems needing to be reported to the PRO at a

higher level, the village committee or the local resettlement office must endeavor to obtain a reply from the PRO at the higher level within two weeks.

- Stage II

In case that reply at Stage I does not satisfy the complainants, the complainants may appeal to the PRO at a higher level within one month after receiving the reply at Stage I. The PRO at the higher level must make a decision within three weeks.

- Stage III

In the event that the affected persons are not satisfied with the reply of the sub-PRO (at district level), they may appeal to the PMO within one month after receiving reply at Stage II. The PMO shall make a reply within four weeks.

- Stage IV

In case that the affected persons are not satisfied with the reply at Stage III, they may appeal to the civil court within 15 days after receiving the reply from the PMO.

10-3 Principles to deal with grievances and complaints

The PMO at each level must conduct field investigation and research about the grievances of the public, and provide objective and just resolutions in line with the principles and standards specified in the state laws and the *Resettlement Plan* after full consideration of the public's opinions and after patient consultation. Complaints beyond their capability of handling must be submitted to the resettlement and relocation divisions at the higher level and they shall lend a hand in the investigation.

The appealed has the right of further appeal on condition that the decision-making institution does not reply within the specified dates.

In the process of resettlement, women may have some special grievances and complaints, so the PMO have planned at least one female worker in every resettlement group to responsible for the women's grievances. The local government and the NGOs such as Civil Administrative Bureau and the Women' Federation will also supervise the resettlement activities and safeguard the APs especially the women's rights.

10-4 Contents and measures of reply

10-4-1 Contents of reply

- A brief of grievances of the complaints

- Results of fact-investigation
- Principles and standards in the relevant state regulations and *Resettlement Plan*
- Resolutions and references
- The complainants have the right to appeal to the PRO at a higher level and the civil court. The project unit shall pay the legal costs.

10-4-2 Measures to reply

- Reply to complaints on exceptional cases shall be delivered to the complainant in written form.
- Reply to complaints that frequently occur shall be made public to the villages or groups the complaints belonged to via holding villagers' meetings or issuing documents.
- Whatever the forms of reply, they must be delivered to the resettlement divisions the complaints belonged to.

10-5 Complaint and appeal resolution reporting

During execution of the *Resettlement Plan*, the acquisition and relocation divisions should keep the complaints and the resolution decisions under registration and good management, and report it to the PRO in written form monthly. The PRO shall look into the complaint resolution records and conditions regularly.

11 Monitoring and Evaluation

According to requirements of the *Resettlement Handbook* of ADB, Wuhan Wastewater Management Project shall establish an internal and external monitoring evaluation system for resettlement during the process of resettlement implementation. The internal monitoring is organized and performed by the project implementation unit; while the external monitoring is implemented by independent monitoring organization with rich expertise and relevant experiences. Monitoring reports prepared by the project management office and the external M&E agency are submitted to ADB for review and comments. The external monitor should not be the same agency that prepared the RP.

11-1 Internal monitoring

11-1-1 Purpose of Internal monitoring

Internal monitoring is a constant internal monitoring on the implementation of the *Resettlement Plan*, which is performed by the proprietor and the resettlement implementation organization with a superincumbent management system in order to have a full, instant and precise control on the resettlement progress, and identifies and solves problems so as to provide basis for decision-making in implementation of resettlement.

The internal monitoring is aimed at regulating and guiding the internal monitoring activities of the proprietor of the ADB financed project, the resettlement implementation organization and other institutions involved in the resettlement to ensure orderly, and effective resettlement monitoring and evaluation and that the land acquisition and relocation is carried out in accordance with the *Resettlement Plan* so that the parties concerned shall be able to have instant control of the resettlement implementation status and the existent problems and be able to solve them on time.

Contents of internal monitoring include: periodic surveys, identification and evaluation of the status of *Resettlement Plan* implementation; precise data collection and data analysis to ensure accurate monitoring findings; scientific, objective and just evaluation of the implementation status of the Resettlement Plan. The PRO will report to the project proprietor and ADB quarterly so that they will be able to get acquainted

with the progress of the project and make scientific policy decisions.

Function of internal monitoring: internal monitoring is an important part of the project management, which is aimed at controlling the resettlement implementation status, by establishing and using the resettlement information management system, collecting, analyzing information on the progress, fund and quality and information related to the resettlement implementation of activities so as to be aware of the existent of possible problems. Internal monitoring also analyzes the causes of problems and provides suggestions for solutions, as necessary, so remedial actions can be taken in an adequate and timely manner.

11-1-2 Internal monitoring implementation procedures

The internal monitoring of the project consists of two stages: the preparatory stage and the implementation stage. The preparatory stage starts with the identification of the project by ADB financed project, through the project preparation, pre-evaluation, and evaluation and ending with approval of the project. The implementation stage starts with implementation of resettlement and ends with the realization of the resettlement objective.

1. The preparatory stage of internal monitoring

When the project is at preparatory stage, the internal monitoring work begins.

The preparations for internal monitoring of the resettlement implementation organizations include:

- Organize training for personnel of the resettlement implementation organization on the resettlement policies and experiences of ADB, the state resettlement policies, Resettlement Plan preparation, resettlement implementation, resettlement monitoring evaluation, etc;
- Employ professional institutions and specialists who will involve in compiling of *Resettlement Plan* and organizing socioeconomic survey.

2. Implementation stage of internal monitoring

The primary tasks of internal monitoring organization at the resettlement implementation stage include:

- Be responsible for the internal monitoring of resettlement activities according to the *Resettlement Plan*;
- Submit a detailed internal monitoring report to ADB every quarterly;

- Timely update of statistics data on resettlement implementation;

11-1-3 Contents of internal monitoring

Primary contents of internal monitoring are as follows:

- Fulfillment of the resettlement policies and compensation rates, which includes mainly establishment and implementation of resettlement policies, actual situation of the compensation rates for various impacts and losses (permanent land acquisition, temporary occupancy of land, relocation of houses, relocation of shops, relocation of enterprises and institutions, relocation of special facilities, etc.). A particular explanation of whether the resettlement is executed in accordance with the *Resettlement Plan* should be added. If there is any change to it, the causes must be accounted for.
- Land acquisition and relocation and resettlement implementation progress, which mainly reflects the project overall schedule and annual plan, progress of the resettlement organization and the staffing, implementation progress of permanent land acquisition in the Project region, temporary occupancy of land, regulation of land in the resettlement regions (including various resettlement land such as land for productive use, house sites, public facilities), implementation progress of acquiring (or allocating) and distribution of them, house relocation progress, reconstruction progress of houses for resettlement, relocation progress, implementation progress of production and development project, public facilities construction progress, special facilities restoring, removing, and reconstructing progress, mines, industrial enterprises and institutions relocation and construction progress, labor employment arrangement progress and progress of other resettlement activities;
- The resettlement budget and the execution, which mainly reflects the amount and time of level-by-level appropriation of the resettlement fund, use and management of the resettlement fund of the resettlement implementation organizations at each level, number of land proprietors (including villages, and groups, etc.) and users and time of use, use and management of the compensation fund for land owned collectively by the village, supervision and audit of use of fund;
- Status of production and employment arrangement for displaced persons, including the major means of rural resettlement (arrangement by land regulation, development of new land, arrangement in enterprises and institutions, and arrangement by finding jobs on their own), population, resettlement employment of relocated enterprises, the vulnerable groups (including women's families, aged families, and the disabled families, etc.), rehabilitation of

land occupied for temporary use, efficiency of resettlement and etc.;

- Reconstruction of displaced persons' house and arrangement of their life, including the ways of resettlement and resettlement destination, arrangement and allocation of house sites, forms of house reconstruction, the work of *water, electricity and road connection and site formation* for the house sites, payment of the compensation funds, the resettlement ways and destination of urban displaced persons, the payment of compensation funds, public facilities (water, electricity, road, communication network), removal and etc.

- Rehabilitation and reconstruction of enterprises and institutions and various special facilities (water resources, power, posts and telecommunications, traffics, transportation, pipes and wires and etc.);

- Complaints, appeals, public participation, consultation, information publication and status of external monitoring, including channels, procedures, and *institution held responsible* of the complaints and appeals, subject matters of complaints and appeals and its dealing, major activities that the public take part in and consult on and the contents and forms of public participation and consultation, implementation efficiency of public participation and consultation, progress and effects of *Resettlement Information Booklet* compiling, publication of the resettlement information and external monitoring evaluation activities;

- Solving the problems related to the resettlement in the memo of ADB supervision missions;

- Offering solutions to the existing problems in resettlement activities;

Table 11-1 Progress Report on Land Acquisition, House Demolition and Resettlement

Unit: _____

Report cut-off date : ____/____/____ (d/m/y)

Date: ____/____/____ (d/m/y)

Items	Unit	Planned Qty.	Completed Qty.	Accumulated Qty.	% of Completion
Permanent land acquisition	mu				
Temporary land occupation	mu				
House demolition	M ²				
Incl.: private house	M ²				
Public (collective) house	M ²				
Land Compensation	RMB 1000 0				
Payment of house demolition	RMB				

Items	Unit	Planned Qty.	Completed Qty.	Accumulated Qty.	% of Completion
compensation	1000				
Reconstruction of private house	M ²				
Reconstruction of public (collective) house	M ²				
APs moving to new house	Pers ons				
APs receiving training	Pers ons				
Job Provision	Pers ons				
Land readjustment	mu				

Prepared by: _____ Signature (In-charge): _____ Seal: _____

Table 11-2 Execution Progress on Funds Utilization

Nanning City _____ (group) _____ (village) _____ (town) **Xixiangtang District.**

Cut-off date: _____ / _____ / _____ (d/m/y)

Date: _____ / _____ / _____ (d/m/y)

Affected institution	Description ⁷	Unit/Qty.	Investment Required (RMB)	Compensation Received in Reporting Period (RMB)	Accumulative Compensation	% of Completion
Village --						
Village --						
Collective						
Household						
Other units						

Prepared by: _____ Signature (In-charge): _____ Seal: _____

11-1-4 Internal monitoring methods

Internal monitoring is superincumbent monitoring of resettlement implementation inside the resettlement implementation organization, which demands an unblocked and superincumbent resettlement implementation information management networks between the project proprietor and the resettlement implementation organizations at each level to follow up and control the progress of resettlement in all regions and implementation of all sub-projects. The resettlement implementation departments at each level report to the leadership from bottom to top the implementation progress, fund and effects of the resettlement through the

⁷ "Description" refers to the construction of village road (qty.), labor training and employment, subsidies to vulnerable groups etc.

information management system for analysis and treatment of the resettlement organization.

The following methods are adopted in the Internal monitoring of the Project based on the project implementation status:

- Standardized statistics report system

The report forms, reflecting the fund appropriation progress and conditions of completion of acquisition and relocation, is a periodical report, which shall be submitted regularly from bottom to top at the end of each month when the funds are appropriated so that the job schedule will be under control.

- Periodic report system

Various forms are adopted to exchange information related to problems in resettlement implementation work between the municipality, district, township and the independent monitoring organization and advices of solution are presented.

- Periodic data gathering

At the beginning of each month, the PRO shall call an acquisition and relocation resettlement coordination conference with participation of the municipal and regional resettlement office, who will reflect back the implementation progress and the existent problems, exchange working experiences and work over the solutions.

- Resettlement inspection

The PRO will perform routine and non-routine field inspections of the resettlement work of the resettlement organization at lower level, solve resettlement problems on the spot and monitor the resettlement schedule and execution status of the resettlement policies.

- Exchange information with the independent monitoring organization

Keep frequent communication and information exchange between the resettlement implementation organization and the external monitoring organization, and take findings and evaluation suggestions of the external monitoring organization as reference basis for internal monitoring.

11-1-5 Internal monitoring organization and staffing

During the implementation of this project, PROs of sub-project will be organized by personnel from relevant government administrative departments, such as the Land Bureau, the Construction Bureau, and responsible for the resettlement work within the project area, and entrust and supervise the house relocation of relocation companies. See the staffing of the resettlement internal monitoring and implementation organizations in Table 11-3.

Table 11-3 Personnel of the internal monitoring implementation organization

Resettlement organization	Personnel at ordinary times	Personnel at peak times
Project Resettlement Office	2	3
Resettlement Department of Wuhan Drainage Company	3	6
Nantaizi Lake resettlement office	11	16
Dongxihu resettlement office	9	11
Caidian resettlement office	9	11

11-1-6 Internal monitoring arrangement and report

Internal monitoring is a continuous process. At least an overall monitoring shall be conducted quarterly. During critical periods of relocation, more frequent monitoring should be conducted.

At the preparatory stage of the project, the internal monitoring organization shall compile internal progress reports half a year for review by the ADB. The formats may vary from project to project and different stages according to requirements of each subproject. After the project starts, detailed half yearly and annual reports shall be compiled based on conditions of the Project, and some special reports maybe needed according to needs of project management. The final resettlement completion report shall be prepared after the completion of project. Internal monitoring reports shall be submitted to the people's government at corresponding level, resettlement implementation organization at higher level and the project owner.

WPMO and IA shall submit internal monitoring reports to ADB quarterly.

11-2 External monitoring

According to resettlement requirements of ADB financed project, during the implementation of resettlement an external monitoring organization that is experienced in resettlement shall be employed to monitor and evaluate the implementation of resettlement and rehabilitation in order to guarantee that the resettlement is executed in compliance with the *Resettlement Plan*.

Independent monitoring aims at providing resettlement evaluation by organizations independent from the government, who will inspect the implementation of the *Resettlement Plan* in broad and long-term views. Independent monitoring will follow up the resettlement activities so as to supervise and evaluate whether the resettlement is implemented according to the following regulations and policies:

- State laws and regulations on resettlement;
- ADB's Policy on Involuntary Resettlement
- *Resettlement Plan*
- Whether the living standard of the affected persons surpasses or at least is restored to that before the acquisition.

11-2-1 External monitoring organization and personnel

In order to ensure smooth completion of external monitoring of the project, professional institutions with rich experiences are to be entrusted to perform the external monitoring by the PMO in March 2006. Factors that should be taken into consideration in selection of external monitoring personnel are mainly: (1) The external monitoring personnel should have similar work experiences, rich experiences in socioeconomic survey, and comprehend the policies of ADB on involuntary resettlement, and have good knowledge of the state and local policies and laws on resettlement. (2) Capability of conducting social survey and research independently with good communication skills and hardworking. (3) An appropriate proportion of female personnel in the external monitoring.

11-2-2 Responsibilities of independent monitoring organization

The independent monitoring organization shall undertake the following tasks:

- Conduct a baseline survey on the standard of living before the resettlement begins so as to master the basic production and living conditions of the affected persons.
- Follow up the resettlement procedures so as to monitor the implementation of resettlement; Collect grievances and complaints of the affected persons, which shall be reported timely to the PRO and local resettlement offices; submit monitoring reports to the resettlement office and ADB.
- Follow up the changes in production and living standard of the affected persons and provide evaluation on the resettlement activities and measures;
- Based on the survey and full consultation with the affected persons, offer constructive

suggestions to the PRO and local resettlement offices, and guarantee the smooth resettlement and rehabilitation of the production and living standard of the affected persons.

11-2-3 Methods and procedures of independent monitoring

The following methods are adopted in resettlement monitoring by the independent monitoring organization:

- On the basis of resettlement survey, establish a database about the conditions of the affected persons and conduct household interviews periodically. The external monitoring organization shall manage the basic conditions of the relocated households dynamically by fully utilizing the socioeconomic survey data and the resettlement information management system established by the project so that the state of the displaced persons will be under control at any moment. Based on the conditions reflected in the database, conducting face-to-face interview with the affected households to give audience to the complaints, grievances and suggestions and publicizing the relevant State policies, requests of ADB and information about the project construction.

The household interview shall be conducted by the external monitoring organization, who shall obtains a list of affected persons and relevant information from the grass-root institutions without accompany of personnel from local resettlement organization or local administrations. The visiting personnel in household interviews should be fixed comparatively for one specific region, namely one fixed person should make repeated visits to the same affected region so that a trusting relationship can be established between the visiting personnel and the affected persons, which will be of benefit to the development of the work.

- Occasional seminars are held with the affected persons in regions where the affected persons are concentrated. The external monitoring organization shall hold seminars in regions where the affected persons are concentrated to hear the opinions of the affected persons on important issues affected by the Project. Such seminars may be formal or informal; the personnel of the grass-roots resettlement organization may or may not be invited to such seminars, depending on the specific conditions of the Project.

- On site observation: Personnel of the external monitoring organization shall visit the resettlement places to inspect the conditions of resettlement.

- Case studies: The exceptional and typical cases in the resettlement exercise shall be studied with great emphasis, and the origins of the problems analyzed to find out the solutions and provide suggestions for discussion.

- Survey by questionnaires: Sampling surveys are conducted to find out the conditions of the rehabilitation of the displaced persons' production and life and their attitudes about the resettlement. The survey result shall be analyzed in a timely manner and the problems shall be resolved, which shall provide references for the resettlement work in the future.

11-2-4 Major contents of independent monitoring

Independent monitoring mainly includes the following contents:

(1) Monitoring of resettlement of affected enterprises and institutions

- The external monitoring organization follows up and monitors the resettlement of enterprises and institutions mainly by on site investigation, telephone follow-up interview and case studying. The contents under monitoring are:

- Whether the land acquisition and relocation are well linked with the resettlement work;
- Whether the commercial losses of enterprises are compensated for;

(2) Monitoring of resettlement of relocated households

The external monitoring organization shall monitor the resettlement of households whose houses are relocated with emphasis. The following aspects of such affected persons shall be monitored with emphasis:

- Whether the compensation price for houses and other attachments to the ground are calculated on the basis of replacement cost;
- Whether the compensation fund are paid in full and in good time;
- Whether house sites for the newly constructed houses are selected by means of consultation;
- Whether the time for relocation is reasonable;
- Whether the transitional and removal expenses are paid;
- Whether the material compensation is discounted;
- Whether the infrastructure in the resettled area such as water, electricity and road have been provided, including information on who will be responsible for the supplying of these facilities and whether the resettled area is easily accessible to clinics and schools?

3. Monitoring of production rehabilitation

With consideration of characteristics of the affected land and its management, the external

monitoring organization shall monitor the following aspects of displaced persons' production rehabilitation with emphasis:

- Whether the compensation rates for all land acquisition are established in accordance with relevant state laws;
- Whether the procedures of land acquisition and compensation are able to guarantee that the affected villages and groups are fully compensated;
- Whether the amount of land acquired, compensation rates and the amount of compensation are made public to the whole village and how they are published;
- In case the land compensation is to be paid to the specific affected persons, then how the payment range has been determined, and whether the land will be redistributed;
- In case of land redistribution, how the land readjustment plan has been determined, whether its determination has been discussed and consulted by the affected persons;
- Whether there is a specific and feasible plan for centralized use of land compensation;
- Whether the determination of the land compensation use plan has taken the opinions of interest related villagers into consideration, and how the use plan of land compensation is finally determined;
- How the benefits from use of land compensation are distributed. How the actual economic benefits of the affected labors are guaranteed.

4. Monitoring of the resettlement organization operation

Monitoring of the resettlement organization performance is mainly done by field interview, and review of the working data and records. The monitoring contents are:

- Whether the staffing of resettlement organization at each level is sufficient for the resettlement work;
- Whether the resettlement organization at each level has the necessary working condition;
- Whether the personnel of the resettlement organization has met with the demands of the resettlement work;
- The resettlement organization personnel training status;
- Internal data management status of the resettlement organizations;

5. Monitoring of resettlement of the vulnerable groups

The vulnerable groups are the particular groups the resettlement organization shall pay

special attention to and also the most vulnerable groups in external monitoring. The external monitoring organization shall follow up and monitor the affected vulnerable groups by door-to-door interviews, questionnaires and case study. Contents of monitoring include mainly:

- What preferential policies are established for the vulnerable groups in the Project;
- Whether the affected urban poor families can afford to buy new houses;
- Whether the rural poor families obtain assistance during the process of house relocation;
- Measures for rehabilitation of production and life of the affected rural poor families.

6. Living standard baseline survey of the affected persons

Before the resettlement starts, the external monitoring organization shall establish the project resettlement base information by conducting sampling surveys, which are done in form of questionnaires. Samples are taken and categorized among all the affected households involved in the socioeconomic surveys at the project preparatory stages. It is primarily decided that 20% of the households affected by land acquisition are sampled, 20% of the households affected by both land acquisition and relocation are sampled, and 50% of the affected enterprises and institutions are sampled. All of the vulnerable groups are surveyed as sample families.

Table 11-4 Sample distribution of living standard baseline survey of displaced persons

Types of samples	Households			Affected enterprise and workers	Vulnerable groups
	Affected by land acquisition only	Affected by relocation only	Affected by both land acquisition and relocation		
Sampling %	20%	20%	20%	50%	100%

Contents of the living standard baseline survey of the affected households include mainly: size of the household, production and operation conditions, building area of house, annual income of the household, employment structure, annual expenditures of the household, traffic conditions, water supply conditions, power supply conditions, dwelling environment, subjective evaluation on the production and living conditions.

7. Monitoring and evaluation on project resettlement efficiency

After the resettlement starts formally, the external monitoring organization shall carry out

tracking monitoring on the resettlement efficiency periodically.

The external monitoring organization shall follow up and investigate the affected households half a year after their resettlement by means of sampling. The questionnaires are applied to find out the affection of resettlement on life and production of the survey respondents so as to evaluate the resettlement efficiency.

Selection of the samples for follow-up survey is under the same principles with that of the living standard baseline survey, and it is better to follow up and survey such samples as in the living standard baseline survey. A database for all samples surveyed should be established to provide basis for sampling of the follow-up survey after the living standard baseline survey is finished. For those survey respondents difficult to follow up due to various reasons, substituted survey respondents should be found in similar affected families in same communities with the clues in the database of the socioeconomic survey at early stage.

Contents of the follow-up survey are well linked with that of the living standard baseline survey for convenience of comparison analysis of the changes in life and production of the household before and after resettlement. Subjective evaluations on the resettlement are also surveyed for reference of resettlement efficiency evaluation.

11-2-5 Reporting system of external monitoring

The external monitoring organization compiles external monitoring reports based on the observation and survey data, which has two purposes: the first is to report the resettlement progress and the existent problems to ADB and the resettlement implementation organization objectively; the second is to give evaluation of the socioeconomic effects of the resettlement and present constructive opinions and advices, consequently improving and perfecting the resettlement. The reporting cycles of the external monitoring organization to ADB and the Project proprietor are as follows:

- The semi-annual external monitoring report about resettlement shall be submitted to ADB and PMO before 30, June every year.
- The annual evaluation report shall be submitted to ADB and PMO before 31, December every year.
- A resettlement completion report will be submitted to ADB and PMO after all resettlement activities have been finished.

Conventional monitoring reports shall at least include the following aspects: (1) monitoring objects; (2) progress of the resettlement work; (3) major monitoring findings of the external

monitoring organization; (4) main problems; (5) basic evaluation opinions and advices of external monitoring.

The reports of external monitoring organization in both English and Chinese shall be submitted to experts of the Project office and ADB simultaneously.

The external monitoring organization's tasks, responsibilities, monitoring indicators, and measures are clearly listed in the TOR of Resettlement Monitoring and Evaluation, which is shown in the Appendix IV.

12 Resettlement Implementation Schedule

12-1 Resettlement implementation schedule

Based on the project implementation schedule, the project will complete in 2011 in stages. The basic schedule principles of land acquisition and relocation schedule are:

- Procedural requirements in accordance with PRC law should be reflected in the implementation schedule.
- Land acquisition should be completed three months before the commencement of the project construction. The specific time should be determined in accordance with the requirements of land acquisition and resettlement work.
- During resettlement, affected persons have the opportunity to participate in detailed operations of the reconstruction location choice, relocation time arrangements and transitional arrangements, etc.
- Before the commencement of the project, the PRO must announce the acquisition area, and accomplish the relevant public participation. The resettlement fund should be deposited in the special account of the PRO one month before the formal relocation.
- All compensations should be given to the property owner completely and directly. No institution and individual may use the property compensation on behalf of the property owner and no discount could be permitted in payout.

The total project implementation schedule plan of land acquisition and resettlement is established in accordance with the progress of land acquisition and resettlement in the project. See *Resettlement Plan Schedule of Wuhan Storm Water Management* in Table 12-1

12-2 Resettlement Schedule Arrangement

The following is the key points of the Resettlement Plan:

- The land acquisition scope is finally determined by construction drawing of each individual project. It shall be done before the start-up of survey and calculation of relocated material objects.
- Before signing compensation and resettlement agreement, survey and calculation of material objects shall be operated by resettlement department and property owner together in accordance with red line drawing of land acquisition.

- Resettlement offices of each district will be established in the preliminary preparation stage of the project. The resettlement offices should organize the social and economic survey with the help of Independent Monitoring Organization (IMO). The survey includes all adverse effects on the relocated households, enterprises & institutions and shops.

- The resettlement offices of districts and city organize and hold a mobilization meeting, which migrant households and relocated units' attendance to publicize relevant policies and resettlement measures on land acquisition, relocation, compensation and resettlement. The announcement of land acquisition will be formally publicized after the mobilization meeting, but before signing the compensation and resettlement agreement.

- The planning arrangement of land acquisition shall be clearly informed to relocated households. The information includes: the analysis and classification of households, enterprises and institutions in relocation scope; the classification of acquired land, buildings and other property; the determination of compensation ratio of land and other property as well as the predetermined relocation schedule. Other information for relocated persons includes: other information channel and how and to which departments a complaint in the implementation of relocation can be lodged. The compensation and resettlement agreement will be completed after the material object measurement. The agreement will come into force after the relocated households and representative of project office sign it together. The agreement signature and validation shall be before the implementation of land acquisition.

- Allowance for the transition period shall be paid to relocated households before the commencement of relocation.

- Affected infrastructure shall be removed or rehabilitated before the commencement of construction project or completed after the accomplishment of project construction as soon as possible so as to minimize the adverse effects of service interrupt.

- Training program for APs shall be made within 6 months after commencement of the project construction.

- The external monitoring shall be initiated within 2 months after the commencement of project construction, and the baseline survey shall be conducted.

- Planning and reconstruction of house resettlement shall be completed before land acquisition and relocation. If it is delayed, transitional arrangements for relocated households should be accomplished before relocation.

- Allowance or assistance in other forms should be given to persons who lose their cultivated land to help them improve or at least restore their original living standard.

Table 12-1 Resettlement Plan Schedule of Wuhan Wastewater Management Component

标识号	Resettlement activity	Duration	Starting	Finishing	2005				2006				2007				2008				2009				2010			
					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	Preparation of the RP	261 d	2005-3-1	2006-2-28																								
2	Establish Project Resettlement Office	24 d	2005-3-1	2005-4-1																								
3	Entrust institution to prepare RP	8 d	2005-4-6	2005-4-15																								
4	Social and Economic survey of resettlement	97 d	2005-4-18	2005-8-30																								
5	Prepare and Compile of RP	233 d	2005-4-8	2006-2-28																								
6	Information Disclosure	424 d	2005-4-20	2006-11-30																								
7	Consult and negotiate with Aps and related government departments	424 d	2005-4-20	2006-11-30																								
8	Disclosure of Draft RPs and Resettlement Information Booklets to Aps	15 d	2005-11-10	2005-11-30																								
9	Land Pre-appraisal	20 d	2006-1-16	2006-2-10																								
10	If required, Disclosure of revised RPs or RIBs to Aps	12 d	2006-2-13	2006-2-28																								
11	Uploading RPs to ADB website	0 d	2006-2-15	2006-2-15																								
12	Distribute WMG approved RPs	22 d	2006-1-30	2006-2-28																								
13	Implementation Stage	1136 d	2006-2-1	2010-5-31																								
14	(1) Nantaizi Lake WWTP	724 d	2006-2-1	2008-10-30																								
15	Conduct detailed measurement surveys	24 d	2006-3-1	2006-4-1																								
16	Prepare detailed village rehabilitation plan	20 d	2006-4-3	2006-4-28																								
17	Sign land acquisition agreement	40 d	2006-3-7	2006-4-28																								
18	Disburse resettlement compensation	80 d	2006-4-3	2006-7-20																								
19	Start the project construction	566 d	2006-9-7	2008-10-30																								
20	Income restoration measures	305 d	2006-4-1	2007-5-30																								
21	Training program	196 d	2006-2-1	2006-10-30																								
22	(2) Nantaizi Lake Wastewater Collection System	786 d	2007-4-2	2010-3-29																								
23	Conduct detailed measurement surveys	35 d	2007-4-2	2007-5-20																								
24	Prepare detailed village rehabilitation plan	53 d	2007-5-21	2007-7-30																								
25	Sign land acquisition agreement	45 d	2007-7-1	2007-8-30																								
26	Disburse resettlement compensation	84 d	2007-7-26	2007-11-20																								
27	Start the project construction	588 d	2008-1-1	2010-3-29																								
28	Relocate to new housing	113 d	2007-4-30	2007-10-1																								

标识号	Resettlement activity	Duration	Starting	Finishing	2005				2006				2007				2008				2009				2010			
					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
29	(3) Caidian WWTP	457 d	2007-4-5	2008-12-28																								
30	Conduct detailed measurement surveys	24 d	2007-5-1	2007-6-1																								
31	Prepare detailed village rehabilitation plan	40 d	2007-5-7	2007-6-28																								
32	Sign land acquisition agreement	32 d	2007-6-29	2007-8-10																								
33	Disburse resettlement compensation	45 d	2007-7-1	2007-8-30																								
34	Start the project construction	347 d	2007-9-4	2008-12-28																								
35	Income restoration measures	221 d	2007-8-10	2008-4-9																								
36	Training program	152 d	2007-4-5	2007-10-31																								
37	(4) Caidian Wastewater Collection System	610 d	2008-2-1	2010-5-31																								
38	Conduct detailed measurement surveys	41 d	2008-2-1	2008-3-28																								
39	Sign land acquisition agreement	45 d	2008-3-29	2008-5-29																								
40	Disburse resettlement compensation	81 d	2008-5-8	2008-8-27																								
41	Start the project construction	456 d	2008-9-1	2010-5-31																								
42	Income restoration measures	535 d	2008-5-15	2010-5-31																								
43	Training program	151 d	2008-4-7	2008-10-30																								
44	(5) Dongxihu Wastewater Collection System	453 d	2006-4-10	2007-12-28																								
45	Conduct detailed measurement surveys	37 d	2006-4-10	2006-5-30																								
46	Prepare detailed village rehabilitation plan	43 d	2006-6-1	2006-7-28																								
47	Sign land acquisition agreement	78 d	2006-6-10	2006-9-26																								
48	Disburse resettlement compensation	35 d	2006-8-3	2006-9-20																								
49	Start the project construction	329 d	2006-9-28	2007-12-28																								
50	Relocate to new housing	61 d	2006-8-7	2006-10-30																								
51	Income restoration measures	324 d	2006-8-7	2007-10-30																								
52	Training program	286 d	2006-5-1	2007-6-1																								
53	Monitoring and Evaluation	1027 d	2006-4-1	2010-2-28																								
54	Baseline survey	570 d	2006-4-1	2008-5-30																								
55	Internal monitoring	985 d	2006-5-2	2010-1-31																								
56	External monitoring and evaluation	1001 d	2006-5-8	2010-2-28																								

Appendix I The Questionnaire Forms of Resettlement Socio-economic Survey

Type of Sub-project: _____

1. Storm-water pump station 2 Storm-water channel 3 Storm-water pipeline

4. Wastewater collection pipeline 5. Wastewater treatment Plant

Name of Sub-project _____

Address: _____ district, county _____ township (town, sub-district)
_____ village (committee) _____ group

Name of householder: _____

Center for Resettlement Research, Wuhan University

July 2005

A₁ Questionnaire on Information of Family Member

No.	For all the family members					Only for members of 15 and above					Remark
	1.Name	2.Relation with householder	3.Gender	4.Age	5.Nationality	6.Educational level	7.Marriage status	8.Occupation of population in work	9. Situation of people out of work		
		1) Householder 2) Spouse 3) Parents 4) Grandparents 5) Children 6) Daughters or Sons in law 7) Grand children 8) Brothers and sisters 9) Others	1) Male 2)Female		1) Han 2)ethnic minorities	1)Illiterate and semi-illiterate 2)Elementary school 3)Middle school 4)Senior middle school 5)Junior college and above	1)Single 2)Married 3)Divorced 4)Widowed 5)Others	1)Workers 2)Laborers engaged in farming, forestry, animal husbandry, and fishery 3)Business person 4)Persons engaged in culture, education, and public health service 5)Persons working in institutions and government organs 6)Others	1) Students 2)Taking care of housework 3) Idle 4) Retired 5) Disabled 6) Others		
1		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
2		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
3		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
4		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
5		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
6		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
7		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
8		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
9		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
10		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
	A1	A2	A3	A4	A5	A6	A7	A8	A9		

A₂ Questionnaire on Economic Condition of Families

No. of air conditioner A10	No. of bicycles _____ A11	3. No. of electric fans _____ <input type="checkbox"/> A12	No. of radio cassette players _____ A13	5. No. of washing machine A14	6. No. of TVs _____ A15
7. No. of computer _____ A16	8. No. of refrigerators _____ A17	9. No. of tractors _____ A18	10. No. of motorcycles _____ A19	11. No. of automobiles _____ A20	12. No. of telephones _____ A21
13. No. of DVDs (VCD) _____ A22	14. Water for living 1) Tap water 2) Well water 3) River and pond water <input type="checkbox"/> A23	15. Electricity for living 1) Ensured 2) Yes, but not ensured <input type="checkbox"/> 3) No _____ A24	16. House type 1) Bungalow 2) Building of 2 or more stories <input type="checkbox"/> A25		
17 from your house to the following place					
Place	Distance (km)	Means of transport	Time (minutes)	Place	Distance (km)
1) Bus station	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> A26	<input type="checkbox"/> A27	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> A28	4) Elementary school	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> A35
2) City or town	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> A29	<input type="checkbox"/> A30	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> A31	5) Middle school	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> A38
3) Market town	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> A32	<input type="checkbox"/> A33	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> A34	6) Hospital	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> . <input type="checkbox"/> A53
18 Average income per capita in 2004 _____ yuan/month <input type="checkbox"/> A43				19 Total Expenditure in 2004 _____ yuan <input type="checkbox"/> A49	
Major sources of income in 2004:				1) Expenditure on production in 2004 _____ yuan <input type="checkbox"/> A50	
Agriculture _____ CNY <input type="checkbox"/> A44				2) Expenditure on consumption in 2004 _____ yuan <input type="checkbox"/> 51	
Industry _____ CNY <input type="checkbox"/> A45					
Commerce _____ yuan <input type="checkbox"/> A46					
Male labor's income _____ yuan <input type="checkbox"/> A47					
Female labor's income _____ yuan <input type="checkbox"/> A48					
20. 1 No. of respondent in table A _____ <input type="checkbox"/> A52				21 4 Current living condition _____ <input type="checkbox"/> A55	
Production condition _____ <input type="checkbox"/> A53				1) very good 2) fine 3) just so 4) bad 5) very bad	
1) very good 2) fine 3) just so so 4) bad 5) very bad				5. Relation with people in the neighborhood _____ <input type="checkbox"/> A56	
3. Economic condition of your family in the village _____ <input type="checkbox"/> A54				1) very good 2) fine 3) just so so 4) bad 5) very bad	
1) upper 2) between upper and medium 3) medium 4) between medium and lower				6. Relation with people in the neighborhood _____ <input type="checkbox"/> A57	
5) lower				1) very good 2) fine 3) just so so 4) bad 5) very bad	

Surveyor signature: _____

Respondent signature: _____

Date of survey: _____

B. Questionnaire on Land Acquisition

Name of sub-project: _____

Address: _____ Production group, _____ Village (Villagers' Committee),
_____ Township (Town, Street) _____ County (District)

Serial Number	Types of Land	Aim of land occupied	Land propriety rights	Types of occupied land	Area (mu)	Number Of PAPs	Remark
01							
02							
03							
04							
05							
06							
07							
08							
09							
10							
11							
12							
13							
14							
15							
16							
Codes for types of land			1 Paddy land 2 Dry land 3 Vegetable Plot 4 Pond 5 Fish Pond 6 Nursery 7 Forest land 8 House site 9 Waste land 10 Other lands				
Codes for aim of land occupied			1 Storm-water Pump Station 2 Storm-water Channel 3 Storm water Pipeline 4 Wastewater Collection Systems 5 Wastewater Pump 6 Wastewater treatment plant				
Codes for land propriety rights			1 State-owned lands 2 Collective lands				
Codes for occupied lands			1 Permanent occupied lands 2 temporary occupied lands				

Unit surveyed (Seal): _____ Surveyor (Signature): _____ Date of survey: _____

C . Questionnaire on Relocated Structures

Name of sub-project _____

Address: Village (Villagers' Committee), _____ Township (Town, Street),

_____ County (District) _____

1 For enterprise or store's buildings

1) Name of the enterprise or store: _____

2) The types of Buildings: a) Buildings with propriety rights certificate
b) Buildings without propriety rights certificate

3) Business Scope: a) commerce b) industry c) public service

4) The propriety rights of the lands: a) state-owned lands b) collective lands

5) the area and structure of the relocated buildings:

a) reinforce-concrete buildings _____ m² b) brick-concrete buildings _____ m²
c) brick-wooden buildings _____ m² d) simple buildings _____ m²

6) The rank of lands: _____

7) The status of the enterprise in 2004: a) number of workers _____ b) average salary
per capita _____ yuan c) net profit _____ yuan or deficit _____ yuan

2 For residence buildings

1) Name of household's head _____

2) Buildings with propriety rights certificate:

a) reinforce-concrete buildings _____ m² b) brick-concrete buildings _____ m²
c) brick-wooden buildings _____ m² d) simple buildings _____ m²

e) The propriety rights of the lands: a) state-owned lands b) collective lands

d) The rank of lands: _____

3) Buildings without propriety rights certificate

a) reinforce-concrete buildings _____ m² b) brick-concrete buildings _____ m²
c) brick-wooden buildings _____ m² d) simple buildings _____ m²

e) The propriety rights of the lands: a) state-owned lands b) collective lands

d) The rank of lands: _____

D. Questionnaire on Public Opinions and Suggestions

1 The serial number in Questionnaire A	<input type="checkbox"/>
2 Do you know the store-water and wastewater management project ? 1) Yes. 2) Yes, but a little. 3) No.	<input type="checkbox"/>
3 Do you agree with this project ? 1) Yes. 2) No. 3) I don't care.	<input type="checkbox"/>
4 What benefits do you think the project will probably bring? (Choose one or above)	<input type="checkbox"/>
1) Better environment	<input type="checkbox"/>
2) Better working conditions	<input type="checkbox"/>
3) Avoid flood	<input type="checkbox"/>
4) Job opportunity	<input type="checkbox"/>
5) Others	<input type="checkbox"/>
5 Do you think what disadvantages the construction will probably bring? (Choose one or several)	<input type="checkbox"/>
1) Inconvenient communication	<input type="checkbox"/>
2) Adverse impact on environment	<input type="checkbox"/>
3) Enlarging the conflict between man and land	<input type="checkbox"/>
4) Other	<input type="checkbox"/>
6 Do you know policies of land acquisition or compensation? 1) Yes. 2) No.	<input type="checkbox"/>
7 What is your opinion or suggestion on the construction work? (Choose one or several)	<input type="checkbox"/>
1) Reducing relocation as much as possible 1) Yes. 2) No.	<input type="checkbox"/>
2) Reducing land acquisition as much as possible 1) Yes. 2) No.	<input type="checkbox"/>
3) Employing local laborers as many as possible 1) Yes. 2) No.	<input type="checkbox"/>
4) Using as much local building material as possible 1) Yes. 2) No.	<input type="checkbox"/>
8 What is your requirement on use of land compensation and laborer resettlement funds?	<input type="checkbox"/>
1) Distribute total funds to affected households, do not readjust lands and displaced persons seek ways to make a living by themselves 1) Yes. 2) No.	<input type="checkbox"/>
2) Collectives use all the funds and readjust lands 1) Yes. 2) No.	<input type="checkbox"/>
3) Distribute a part of the funds to directly or indirectly to affected households and readjust lands 1) Yes. 2) No.	<input type="checkbox"/>
4) Use all the funds as investment of displaced persons, collectives develop enterprises and do not readjust lands. 1) Yes. 2) No.	<input type="checkbox"/>
5) Provide opportunities of non-agricultural production or business 1) Yes. 2) No.	<input type="checkbox"/>
9 What is your preference on house reconstruction?	<input type="checkbox"/>
1) To plan house site and reconstruction uniformly	<input type="checkbox"/>
2) To have monetary compensation and buy houses of your own choice	<input type="checkbox"/>
3) To provide houses large as the relocated houses	<input type="checkbox"/>

Surveyor (signature): _____ Date of survey: _____

E. Questionnaire on Affected Enterprises and Institutions

Address: _____ District (County, City) _____ (Township, Sub-district)

The number of employees (Person) _____

Annual output value (10 thousand yuan) _____

Types	Types of Impact	Quantity
Land: 1 Paddy field 2 Dry land 3 Vegetable plot 4 Pond 5 Fish Pond 6 Nursery 7 House site 8 Forest lands 9 Waste lands 10 Other lands		
Structure: 11 reinforce concrete 12 Brick and concrete 13 Brick and wooden 14 Simple buildings		
Attachment: 15 Level ground 16 Well 17 Enclosing wall 18 Timber 19 fruit tree 20 Other ()		
Description of the unit and impact on the unit:		

Unit surveyed (Seal):

Surveyor (Signature):

Date of survey:

F. Questionnaire on Affected Public Facilities

Address: _____ County (District) _____ (Township, Sub-district)

Serial number	Types of facilities	Quantity	Ownership unit (signature)
01	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
02	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
03	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
04	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
05	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
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20	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	

Surveyor (signature):

Date of survey:

**G. Questionnaire on Socioeconomic
Conditions of Affected Villages**

Address: _____ Village (Villagers' Committee), _____
Township (Town, Sub-district), _____ County (District)

Item	Year			Remark
	2002	2003	2004	
1 Total number of households				
2 Total number of persons (man)				
3 Total number of agricultural labors				
4 Average Income per capita				
5 Total value of output (yuan)				
a) Industry				
b) agriculture				
c) Building trade				
d) Communication & transportation				
e) Commerce				
6 Number of laborers (person)				
a) primary industry				
b) secondary industry				
c) tertiary industry				
7 Paddy fields (mu)				
8 Dry lands (mu)				
9 Vegetable plots (mu)				
10 Ponds (mu)				
11 Nursery (mu)				
12 Forest lands (mu)				
13 Waste lands (mu)				
14 Other lands (mu)				

Unit surveyed (Seal):

Surveyor (Signature):

Date of survey:

H. Questionnaire on Poverty-Stricken Households

Address: _____ Village (Villagers' Committee), _____
Township (Town, Sub-district), _____ County (District)

Name of Householder	Number of family member	Income per capita (yuan /month)	Description of Hardship

Villagers' committee (Seal):

Surveyor (Signature):

Date of survey:

Appendix II Public Consultation Meeting Summary

(Dongxihu District Public Consultation Meeting Summary)

Date: Aug. 17, 2005

Location: Meeting Room of Dongxihu Cultivation Farm

Participants: Huang Nian (Project Office), Yin Jianjun (Hohai University, consultant expert of migration), Cheng Dening (Wuhan University), Hu Qiudu (government coordinator of resettlement in Dongxihu District), Chen Wei (Jinyinhu International Golf Industry Development Co., Ltd.), Xu Yong'an (Dongxihu Cultivation Farm), Zhu Sanqing (Administrative Committee of Jinyinhu Business City), Wang Suixin (Administrative Committee of Jinyinhu Ecological Park), Liu Quanxiang (Wuhan Changqing Drainage Station), Hu hongshan(Wuhan Changqing Drainage Station), Xu Jiaohong (Jinyinhu International Golf Industry Development Co., Ltd.), Zhu Huarong (Neighborhood Committee of Machi Community, Dongxihu Cultivation Farm), Wei Niankai (Neighborhood Committee of Machi Community, Dongxihu Cultivation Farm), Xiao Shizhong (Dongxihu Cultivation Farm).

Meeting summary:

After repeated coordination with affected local governments, enterprises and institutions by Wuhan Urban Construction of Foreign Investment Funded Project Management Office, Wuhan Sewage and Rainwater Management Office, Wuhan Sewage and Storm Water Management Consulting Company (BV Company) and Wuhan University, etc., a public consultation conference was held in Dongxihu District on Aug.17, 2005 with representatives of affected persons as well as enterprises and institutions. The aim of the conference is to introduce the design scheme of the Asian Development Bank financed project, information of land acquisition as well as the planning and policies of resettlement compensation to displaced persons, affected enterprises and institutions timely. The participants had a spirited discussion on several topics as below:

1. Project compositions, engineering design plan, the scope and degree of land acquisition impact, implementation schedule and resettlement compensation policy were introduced to affected persons. Doctor Yin Jianjun, the resettlement expert of Hohai University, introduced the latest involuntary resettlement policies, principles and basic requirements of ADB on the conference; he also put an emphasis on problems, which should be pay attention

to in resettlement. Doctor Cheng Dening of Wuhan University gave an introduction of basic condition of project impact as well as the preliminary planning, policies and measures of resettlement. He also provided engineering planning drawing to each affected institutions to help them obtain more information about project and land acquisition and relocation.

2. According to the drawing provided by Project Office, participants gave a detailed introduction of the basic condition of their institutions as well as influence on production and life of displaced persons project construction may arouse. By the introduction, we realized several important problems we may face in the process of land acquisition of this project: (1) As to the land acquisition problem of Jinyinhu International Golf Development Co., Ltd., members of the cooperation claimed that the new fairway of golf course is under construction near one side of the airport expressway. If new channel is excavated, the new fairway under construction and the standard of golf course may be impacted, thus they hope Project Office and design unit take the problem into account. (2) In the process of land acquisition, Jinyinhu Power Substation should be removed integrally. At the present time, project office had already informed the leader of Dongxihu District Power Company of the matter. Leaders of this company determined to hold a special conference for the resettlement plan.

3. Consult with displaced persons and institutions for their will and suggestions about resettlement. To improve or at least restore the pre-project living standard of displaced persons, it is very important to establish resettlement and restoration plan in accordance with local practical situation. Therefore we listened to opinions and suggestions of displaced persons on resettlement in detail.

(1) Land acquisition and labor force resettlement. Affected region used to be state farm and cultivation farm. The land belongs to state cultivated land, and labor force that work on the land are employees of farm and cultivation farm. Most of the land acquisition belongs to judicial entity; part of which is state-owned land used for construction. Acquisition of this part of land will not influence the production of the enterprises. The project owner got the land mainly by purchasing the state land use right. Other land acquired is state cultivated land, after acquisition of which, production conditions of some labor force will be affected and resettlement needed. Leaders of farm denoted that since the land acquisition area is small and labor forces worked on the land are employees of the farms who enjoy basic social securities. The farms will resettle those employees by compensation in currencies. At the same time, the farm will give priority to some employees for employment in non-agricultural department.

(2) Land compensation rate. Affected persons and local government have already realized the fact that the project is a municipal infrastructure construction project. After completion of the project, the drainage problem and sewage management problem of

Dongxihu District will be greatly solved. Therefore local government has a strong wish of project construction, displaced persons and units have also realized the significance of this project. However, affected persons think Dongxihu District has developed fast in recent years; the land value of it has a potential in appreciation. So the affected local government hopes the land acquisition compensation ratio can be determined as above ten times and labor force resettlement subsidy above fifteen times. Those compensation ratios are comparatively higher ratios in the stipulation of relevant regulations. They believe that could be a great help to the resettlement of affected persons.

(3) Relocation and reconstruction of housing. A staff building of Changqing Drainage Pump Station in Dongxihu District and the office building, dormitory and dinning room etc. of Jinyinhu Power Substation will be removed for project construction. Leaders of Changqing Drainage Pump Station pointed out that the property right of the staff building had already been transferred to the individuals of thirty employee households; each employee has their own opinion on resettlement. In the near future, leaders will consult with each householder to learn their will and take the result of consultation into account in resettlement planning. With regard to the office building, dormitory and dinning room etc. of Jinyinhu Power Substation, leaders of the Power Company claimed the power substation might not be reconstructed and the problem what the removal of demolition aroused can be solved by changing the circuitry of electricity transmission. As for the private residences of Machi Community, which need to be relocated, the residents hope the farm and cultivation farm will provide new house sites and unified planning for them after land acquisition, so that they could reconstruct the new residences themselves after getting land acquisition compensation.

Public Consultation Conference Summary

(Consultation Conference of Compensation Policy)

Date: Aug. 18, 2005

Location: Conference Room of the People's Government of Wuhan Municipality

Participants: Wang Xiaoyun (Project Office), Yu Qingguo (Project Office), Huang Nian (Project Office), Yin Jianjun (BV company, expert consultant of migration), Cheng Dening (Wuhan University), Song Guanghua (Division of Cultivated Land Protection under Bureau of Land Resources of Wuhan Municipality), Wang Lin (Division of House Demolition and Relocation under Bureau of Urban Planning of Wuhan Municipality).

Conference summary: To get a better understanding of land acquisition policy and resettlement compensation policy of Wuhan Municipality, Doctor Yin Jianjun, the expert of resettlement and Doctor Cheng Dening of Wuhan University hoped that the Project Office could invite the leading officials of government departments long responsible for land acquisition and relocation management of Wuhan Municipality to attend the special consultation conference of land acquisition policy. Therefore the special seminar of land acquisition and relocation and resettlement compensation policy of Wuhan Municipality was held by Project Office in Aug.18, 2005. The leading officials of Bureau of Land Resources and Bureau of Urban Planning of Wuhan Municipality were invited to the seminar.

On the conference Doctor Yin Jianjun firstly introduced some new principles and policies of Asian Development Bank on involuntary resettlement and analyzed some differences on the resettlement between China and ADB. Later, the participants emphasized some problems of resettlement policy and consult these problems with the leading officials of government managerial department.

(1) Classification criteria of house sites in collective-owned land acquired in the project and the location-based price. Song Guanghua (Division of Cultivated Land Protection under Bureau of Land Resource of Wuhan Municipality) introduced relevant stipulation of Decree No.148 of the People's Government of Wuhan Municipality. As stipulated in the document, compensation rate of house site location should be determined according to different locations. The housing location is divided into three categories in accordance with the overall planning of ring road of Wuhan municipality: the first category is the section within the second ring road (the second ring road included), the second is the section between the second ring road and the third ring road (Middle Ring), and the third is the section outside the third ring road (Middle Ring).

(2) Compensation of unlicensed houses. Land acquisition area of this project involves many "villages-in-city" in which many unlicensed private houses exist. For the compensation of those houses, the People's Government of Wuhan Municipality promulgated *Circular of*

Opinions on Dealing with Issues Left over from History of Collective-Owned Land Acquisition Compensation on Aug. 30, 2004. As the circular stipulated, houses constructed before Dec.31, 1986 without registration of property rights and legal approved documents should be demolished, the relocation compensation is 95% of the summation of the location compensation of house sites and the replacement cost. Houses constructed between Jan. 1, 1987 and Dec. 31, 1998 should be removed; the resettlement compensation is 85% of the summation of the location compensation of house sites and the replacement cost.

(3) Fees paid to the higher level for land acquisition. Mr. Song Guanghua, Division of Cultivated Land Protection under Bureau of Land Resource of Wuhan Municipality introduced that there are still some fees need to be paid to the higher level for land acquisition in Wuhan Municipality. According to state laws, besides land compensation, resettlement subsidy, compensation for attachments to the ground and green crops; construction unit that has acquired rural collective-owned land should also hand in other taxation and fees, which include (1) use fee for additional construction land; (2) reclamation fee of cultivated land; (3) fund for water works; (4) tax on occupation of cultivated land; (5) development fee for new vegetable fields ;(6) management fee of land acquisition; (7) labor cost of fish pond excavation. As Wuhan Rainwater and Wastewater Project belongs to municipal infrastructure project, the development fee for new vegetable fields in Wuhan Storm Water Management can be derated in accordance with relevant documents, laws and regulations.

(4) The resettlement and compensation policy of state cultivated land. Land acquisition of this project involved state farms. For the acquisition of state cultivated land, Bureau of Land Resource of Wuhan Municipality made concrete stipulation in Document No.450. The rate of compensation for acquisition of state agricultural land, resettlement subsidy as well as compensation for land attachments and green crops will be executed in accordance with *Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collective-owned Land*, the No.149 Decree of the People's Government of Wuhan Municipality.

(5) Support policy for vulnerable groups. Leaders of Bureau of Land Resources of Wuhan Municipality pointed out that no special support policy for vulnerable groups exists in Wuhan at present, but according to practical situation, special preference will be given to vulnerable groups in practical operation. Now the only preferential policy for vulnerable groups is embodied in *Administrative Measures of Wuhan Municipality on Urban House Demolition and Relocation*. The measures stipulated that if the acquired residential housing of private house owners and tenants of house under direct management of the housing administrative department or under management of the unit itself has a building area of less than 20 m² (20 m² included), the compensation will be calculated as 25 m², if the area is between 20 m² and 30 m², the compensation will be calculated as 30 m².

Summary of Public Consultation Meeting

(Resettlement Consultation Conference of Caidian District)

Date: September 17, 2005

Place: Meeting Room of Caidian District Construction Bureau

Participants: Wan Yongsheng (Project Office), Yu Qingguo (Resettlement Consultation Expert), Hou Xiaoyan (Environment Consultation Expert), General Manager Chen (Junbang Environmental Protection Company), Cheng Dening (Wuhan University), Xiao Shengjian (Representative of Shiyang Villagers of Caidian District), Li Jianping (Head of Daqiao Pump Station), Zhou Shouqi (Secretary of Daqiao Pump Station), Zhang Shouli (Representative of Shiyang Farmers), Hu Xiaole (Secretary of Shiyang Village), Cao Xiangyuan (Accountant of Shiyang Village), Cai Mingliang (Caidian Street Office), Yi Yaolin (Red Star Wine Factory).

Summary of the meeting:

For the purpose of project information publicity to the affected persons, understanding the project resettlement policy for the affected persons and learning the willing and suggestion of the affected persons, the Resettlement and Public Consultation Conference of Environment Impact on Caidian Wastewater Treatment Project was hold by the Project Office in the conference room of Caidian District Construction Bureau on September 17, 2005, the compilation unit of environment impact evaluation report (Junbang Environmental Protection Company), together with compilation unit of Resettlement Plan (Wuhan University) and environment consultation experts of BV Company and resettlement consultation experts took part in the conference. Representatives of the affected villages and affected enterprises and government units expressed their opinions. The summary of conference is recorded as follows:

(1) Publicize the relative information of project resettlement and environment impact to the affected units and villages and groups. Firstly, Mr. Wan Yongsheng of the Project Office introduced information of project structure, project significance and project construction schedule and etc. to the representatives of the affected persons, then Mr. Chen of Junbang Environmental Protection Company introduced the environment impact to the local residents and possible measures, finally Cheng Dening of Wuhan University introduced the relocation situation of the project and compensation policy for resettlement.

(2) Opinions of the affected persons to environment impact. The representatives of the

affected persons indicate that, along with the economic development and improving of income levels of the people, the local residents pay more attention to environment protection and the environment protection awareness of villagers is enhancing gradually. According to the introduction, the project construction may generate noise pollution and odor pollution to the local area. Odor pollution range in the down wind of the wastewater treatment plant is about 200m and in the upper wind between 50-70m. For the environment protection project, the villagers are active and agree the construction of the wastewater treatment plant. However, at the same time, they hope that the project adopts advanced equipment and technology with low noise so as to reduce the adverse effect to the local residents and environment.

(3) Issues of the project resettlement and land compensation. The affected persons pointed out that the project needs more than 80mu of the cultivated land of Shiyang Village, in addition, Daqiao Pump Station will be expanded and one of the wasted workshops of Red Star Wine Factory will be removed as well, as a result, land acquisition for the project is concentrated in Shiyang Village, secretary of Shiyang Village has put forward the following requests and suggestions for the resettlement.

First of all, villagers support and agree the construction of wastewater treatment plan. The local villagers think generally that the project construction is favorable for the local environment from the long-term point of view. As long as the land compensation policies follow the state laws and regulations of Wuhan, and land acquisition and resettlement activities are handled in accordance with the relevant documents of the government, the villagers will have no different opinions and the land acquisition and relocation can be carried out smoothly without difficulties.

Secondly, since the second round of land contract of Caidian District, it will keep unchanged for 30 years according to the state policy, and the village collective has no flexible land now; so, the villages and groups will no longer make land adjustment after land acquisition, the compensation and resettlement subsidy will be paid to the contracted households so as to find jobs on their own. For Shiyang Village belongs to the new developing area of Caidian, most of the local laborers have been employed in other places or the local non-agricultural departments, thus the agricultural income only accounts for 1/3 in that of the local villagers. So, after land acquisition, as long as they can obtain corresponding compensation, incomes obtained from non-agricultural departments are sufficient for making up their loss, which is the most favorite resettlement mode for the local villagers. Moreover,

according to the latest policy of Caidian District, the government will provide basic social security for the farmers lost land so as to ensure their benefits and rights.

Thirdly, there are more than 600*mu* lake surface in Shiyang Village, which has been contracted to the local villagers for aquatic breeding. The villagers hope non-pollution to the lake surface after the completion of the wastewater treatment plant. Moreover, they hope the project construction will not destroy the original local drainage channels, roads and pump station for the convenience of villagers' traveling.

Appendix III Resettlement Booklet of Wuhan Wastewater Management Component

Dear _____:

The construction of Wastewater and Storm Water Management, a key project of Wuhan, will affect your family (unit). The booklet is distributed to inform you on the basic status of the project, relevant land acquisition and relocation policies of the state and the impacts on your family.

1. General information of the project

Wuhan Wastewater Management Component is an ADB financed project aimed at environment regulation. The project would overcome problem of declining water quality in the rivers and lakes in urban areas due to severe shortage of discharging capacity of existing pump stations in Wuhan, waterlog in urban areas of flood season, direct discharge of urban sewage to water bodies nearby without appropriate treatment by means of establishing (expanding) wastewater treatment plant, wastewater (rainwater) pump station and comprehensive regulation of existing rainwater and wastewater drainage channels and box culverts in Wuhan. Completion of the project would substantially improve the eco-environment of Wuhan and promote an overall socioeconomic development of areas along the lines of the project and even of the entire region.

2. Relevant Land Acquisition and Relocation Laws, Regulations and Compensation Rates

Relevant land acquisition, relocation and compensation policies are as follows:

Category	Rates for land acquisition compensations and resettlement subsidies
1. Permanent Land Acquisition	Paddy fields, vegetable fields, pond and fish pond ____yuan per <i>mu</i> ; dry land, commercial forests and timberlands ____yuan per <i>mu</i> ; wasteland and other unprofitable land ____yuan per <i>mu</i> .
2. Temporary Land Use	Calculate according to compensation rate per land-use year in various locations.
3. Compensation for Young Crops	Paddy fields and vegetable fields ____yuan per <i>mu</i> , dry land ____yuan per <i>mu</i> .
4. Resettlement Compensation	Compensate ____yuan per resettled agricultural person.
5. Houses	Brick and concrete ____yuan per m ² , brick and wood ____yuan per m ² , earth and wood ____yuan per m ² , simple ____yuan per m ² . Plus suitable compensation for removes and loss of working time.
6. Attachments to the Ground	Terrace ____yuan/m ² , well ____yuan/well, enclosing wall ____yuan/m, tomb ____yuan/tomb, big timber tree ____yuan/tree, small timber tree ____yuan/tree, tree with fruits ____yuan/tree, trees without fruits ____yuan/tree.
7. Professional Infrastructure	Compensate according to specific replacement cost or negotiated price of facility.

The compensation rate of land acquisition and relocation is determined on the basis of sufficient survey, with reference to involuntary resettlement principle of Asian Development Bank as well as state laws and regulations, and aimed to restore and improve living standard of affected persons in short period after resettlement.

3. Rights and obligations of affected objects

(1) Rights of affected objects

Get all kinds of deserved compensation in complete conformity with the above compensation rates; reflect opinion and suggestions to land acquisition and relocation offices or PROs of village committee, town, township, district progressively, specific contents of which including base number of compensation quantity, compensation rate, time of compensation payment, site selection for house reconstruction, etc. various resettlement offices must reply to complaints of affected objects and problems subordinate resettlement office reflects within 15 days.

(2) Obligation of affected objects

- Actively cooperate with implement of state project.
- New buildings shall not be constructed within scope of resettlement survey, otherwise compensation fund will be canceled.
- Demolish buildings within the red-line scope of project planning.

6. Assistance to vulnerable families

Vulnerable families would get assistance as listed below:

- Fund assistance. Village would distribute subsidies for hardship in the process of house relocation.
- Labor assistance. Village would provide labor assistance in house relocation and reconstruction.
- Relieve compulsory work of the labor forces of the year.
- Give them priority in site selection for house reconstruction and location of plantation in redistribution.

7. Organizations of land acquisition and relocation

Municipal organization of land acquisition and relocation:

Land Acquisition and Relocation Office of Wuhan Wastewater and Storm Water Management

Address: Postal code: Tel:

County, district organization of land acquisition and relocation:

Resettlement Office of Hongshan District

Address: Postal code: Tel:

Resettlement Office of Hanyang District

Address: Postal code: Tel:

Resettlement Office of Caidian District

Address: Postal code: Tel:

Resettlement Office of Dongxihu District

Address: Postal code: Tel:

External monitoring organization: Center for Resettlement Research, Wuhan University

Address: Luojiashan, Wuchang, Wuhan Postal code: 430072 Tel:

027-68752611

8. Right of interpretation of the booklet

The right of interpretation of the booklet belongs to the Resettlement Office of Wuhan Wastewater and Storm Water Management.

Thank you for supporting the state key project!

Resettlement Office
of Wuhan Wastewater and Storm Water Management Project

Appendix IV Related Articles of Relevant Regulations

1 Abstract of state laws and regulations on land acquisition compensation

(1) *Land Administration Law of the People's Republic of China*

- The state may make expropriation or acquisition on land according to law for public interests, but shall give compensations accordingly.

- All units and individuals shall use land in strict compliance with the purposes of use defined in the overall plans for land utilization. Any change to be lawfully made in land ownership, in the right to the use of land or in the purpose of use of land shall be registered.

- Where land for agriculture is to be used for construction purposes, the formalities of examination and approval shall be gone through for the conversion of use.

- Land acquisition shall be compensated for on the basis of its original purpose of use. Compensation for acquired cultivated land shall include compensation for land, resettlement subsidies and attachments and young crops, and young fish on the acquired land. Compensation for acquisition of cultivated land shall be 6 to 10 times the average output value of the acquired land for three years preceding such acquisition. Resettlement subsidies for acquisition of cultivated land shall be calculated according to agricultural population needing to be resettled, which is calculated by dividing the amount of required cultivated land by the average amount of the original cultivated land per person of the unit the land of which is acquired. The standard resettlement subsidies to be divided among members of the agricultural population shall be 4 to 6 times the average output value of acquired cultivated land for the three years preceding such acquisition.

- Once a plan for compensation and resettlement subsidies for the acquired land is decided on, the local people's government concerned shall make it known to the public and solicit comments and suggestions from the collective economical organizations, the land of which is acquired, and the affected farmers.

- The rural collective economical organizations, the land of which is acquired, shall accept supervision by making it known to its members the income and expenses of the compensation

received for land acquisition. The compensation and other charges paid to the unit for its land acquired are forbidden to be embezzled or be misappropriated.

- A construction unit that wishes to use State-owned land shall get it by such means of compensation as assignment. However, land to be used for the following purposes may be allocated with the approval of a people's government at or above the county level.

- (1) For state organs or military purposes;
- (2) For urban infrastructure projects or public welfare undertakings;
- (3) For major energy, communications, water conservancy and other infrastructure projects supported by the state; and
- (4) Other purposes as provided for by laws or administrative regulations.

(2) Regulations on the Implementation of the Land Administration Law of the People's Republic of China

- The competent departments of land administration of people's governments above the county level should, in conjunction with the departments concerned at the same level, evaluate land grades in accordance with the standards for land grade evaluation. Results of local land grade evaluation should be made public in society upon examination and verification of people's government at the corresponding level and approval of the competent department of land administration at the next higher level. Adjustment in land grades shall be made once every six years in accordance with the state of national economic and social development.

- Municipal or county people's government shall, upon approval of the land provision plan, issue a certificate of approval for land for construction for the construction unit. In the case of paid-for use of state-owned land, the competent department of land administration of municipal or county people's government shall conclude a contract on the paid-for use of state-owned land with the land user; in the case of appropriation for use of state-owned land, the competent department of land administration shall verify and issue a certificate of decision on the appropriation of state-owned land.

- Payment of various expenses for land acquisition should be affected in full within 3 months starting from the date of approval of the land acquisition and resettlement plan.

- Funds earmarked for land acquisition resettlement subsidy must be used for the designated purpose and shall not be diverted to any other purpose. For persons required to be resettled by the rural collective economic organization, payment of the resettlement subsidy shall be made to the rural collective economic organization to be administered and used by the

rural collective economic organization; where resettlement is to be arranged by other units, the resettlement subsidy shall be paid to the resettlement units; where no unified resettlement is required, the resettlement subsidy shall be given to the individuals to be resettled or used for the payment of insurance premium for the resettled persons on gaining the consent of the resettled persons.

(3) *Administrative Regulations on Urban House Demolition and Relocation of the State Council*

- The parties that demolish and relocate houses shall make compensation for the parties whose houses have been demolished according to these Regulations. No compensation shall be made for buildings built in violation of rules and temporary buildings beyond the approved time limit.

- The demolition and relocation compensation may adopt means of compensation in currencies or the exchange of ownership of houses. The parties whose houses have been demolished may select the compensation means.

- The amount of compensation in currencies shall be determined by the estimated price of the real estate market according to the sectors, purposes, floor area, and so on of the demolished houses.

- If the means of exchange of ownership of houses is adopted, the parties that demolish and relocate houses and the parties whose houses have been demolished shall calculate the compensation amount of the demolished houses and the price of the exchanged houses, and settle the balance of the exchange of ownership according to Article 24 of these Regulations.

- The parties that demolish and relocate houses shall provide houses that accord with the national quality and safety standards to be used for the relocation.

- The parties that demolish and relocate houses shall pay the removal allowances to the parties whose houses will be demolished or the tenants of these houses. During the transition, if the parties whose houses have been demolished or the tenants of these houses arrange their residences by themselves, the parties that demolish and relocate houses shall pay the temporary relocation allowances. If the parties whose houses have been demolished or the tenants of these houses have the temporary houses used during the resettlement process provided by the parties that demolish and relocate houses, the parties that demolish and relocate houses shall not pay the temporary relocation allowances.

- The parties that demolish and relocate houses, if causing production or business

stoppage due to demolishing and relocating non-residential houses, shall pay appropriate compensation.

(4) *Decision of the State Council on Deepening the Reform on Strict Management to Land*

- Perfect land acquisition compensation measures. Local people's governments at or above county level shall take practical measures to guard the farmers whose land has been acquired against the decrease in living standards resulting from land acquisition. Land compensations, resettlement subsidies and compensations for attachments to the ground and young crops shall be paid promptly at full amount in accordance with law. The people's governments of provinces, autonomous regions and municipalities directly under the Central Government shall assent to the increase of resettlement subsidies to the farmers landless due to land acquisitions, whose original living standards cannot be maintained or social security fees cannot be afforded after being paid land acquisition compensations and resettlement subsidies according to current laws and regulations. In case the total amount of land acquisition compensations and resettlement subsidies reach the legal maximum, yet is still insufficient for the farmers whose land is acquired to retain their original living standards, the local people's government may make up for it by incomes from the use of state-owned land.

- Properly resettle the farmers whose land is acquired. Local people's governments at or above county level shall enact specific measures to guarantee the long-term livelihood of the farmers whose land is acquired. For projects with stable benefits, the farmers may buy a share via the lawfully authorized rights of construction land usage. The local people's government within the city planning districts shall bring the farmers whose land is acquired under the employment system for cities and towns and establish the social security system; in acquisition of land owned by farmers collectively outside the city planning districts, the local people's government shall be obligatory to remain necessary land for the farmers to cultivate or arrange for them corresponding jobs. Farmers landless without basic production and living conditions shall be removed and resettled to another place.

- Complete land acquisition procedures. Farmers' collective ownership of land and contractual operation right of land shall be guaranteed during the process of land acquisition. Prior to the report of land acquisition to higher authorities for examination and approval, the purpose, location, compensation rates for land acquisition and the resettlement arrangements shall be made public to the farmers with land to be acquired. The country collective economic

organizations and farmers must confirm the investigation results of the status of the acquired land. If necessary, the Ministry of Land and Resources shall organize the hearing of witnesses according to relevant regulations. The relevant materials acknowledged and confirmed by the farmers whose land is to be acquired shall be deemed as the essential materials for report for approval of land acquisition. The establishment and perfection of the coordination and arbitration system for solving disputes on land acquisition compensations and resettlements shall be quickened so as to defend the lawful rights and interests of the farmers whose land is acquired and the land users. The proceedings of land acquisition shall be made public after approval except for exceptional cases.

2 Abstract of local regulations

(1) Administrative Measures of Wuhan Municipality on Urban House Demolition and Relocation

- The administrative departments in charge of house demolition and relocation shall make public the proceedings such as the parties that demolish and relocate houses, the scopes of demolition and relocation, time limit of demolition and relocation, and so on covered in the house demolition and relocation license by means of public announcement of house demolition and relocation while issuing the house demolition and relocation licenses.

- In case of demolition and relocation of houses under direct management of the housing administrative department (**HDM**) or under management of the unit itself (**HMU**) and private houses (**PH**), the remover shall sign the demolition and relocation compensation agreement with the relocation household in written form according to the Measures. For compensation in currencies, the amount of compensation, type of payment, time limits of payment and removal, liabilities for breach of contract, and other matters the parties concerned consider necessary to be covenanted shall be specified in the agreement. For compensations by means of exchange of property rights, an agreement shall be signed concerning proceedings including the location, floor area of the house for resettlement, and the settlement of price difference.

- The remover shall pay compensations to the relocation household in accordance with *the Regulations* and the Measures. No compensation shall be made for buildings built in violation of rules and temporary buildings beyond the approved time limit. Compensation shall be made for temporary buildings within the approved time limit according to the resettlement price and service life of the buildings.

- The demolition and relocation compensation may adopt means of compensation in currencies or the exchange of ownership of houses. Unless otherwise specified in the Measures, the relocation household may select the compensation means.

- The amount of compensation in currencies shall be determined according to the estimated unit price in real estate market (price for per m² of the floor area, similarly hereinafter) and the floor area of the house demolished.

The market unit price of houses to be demolished shall be given by the real estate appraisal institutions with corresponding qualifications. The market unit price of houses to be demolished shall be determined on the basis of the location, purpose, structure, depreciation, etc. of the houses to be demolished.

The class of location of the house to be demolished shall be determined according to the land use classification published by the municipal government.

- HDMs that are transformed from residential houses into non-residential uses shall be deemed as residential houses and appropriate compensation for the building area of operation shall be paid.

- The remover shall pay removal allowances to the relocation households or the tenants of these houses. During the transition, if the relocation households or the tenants of these houses arrange their residences by themselves, the remover shall pay temporary relocation allowances. If the relocation households or the tenants of these houses have the temporary houses used during the resettlement process provided by the remover, the remover shall not pay temporary relocation allowances. The transition period cannot exceed two years.

- The remover shall pay compensations for such non-residential buildings relocated as those for commercial purposes and production according to the following regulations:

(I) The expenses on equipment transportation and installation shall be calculated according to the costs of goods transportation and equipment installation specified by the state and the municipality.

(II) Compensations for equipments that cannot be restored to its normal running shall be determined by deducting the depreciation charges from its purchase price.

(III) In case of production or business stoppage arising from the demolition and relocation of non-residential houses and exchange of house property rights are adopted, compensation shall be made as 6 times that of their average salary in the previous year, to the personnel on the payroll who directly take part in production or operation within the scopes of relocation.

(2) Administrative Measures of Wuhan Municipality on Collective-Owned Land Demolition and Relocation

- The relocation households who live within the Middle Ring Road may choose compensation in currencies or by means of exchange of house property rights for demolition and relocation of their dwelling houses. If conditions permit, after approved by law, the country collective economic organization may arrange the resettlement for them by building the multi-layer dwelling collectively; application for examination and approval of house site resettlement may be made in case the need for agricultural production and the cultivated land per capita reaching or exceeding that of the cultivated land per capita of the whole city is assured and comply with conditions of approval of house sites.

The relocation households who live beyond the Middle Ring Road may choose compensation in currencies, by means of exchange of house property rights or setting of another house site for demolition and relocation of their dwelling houses. If conditions permit, the country collective economic organization may make concentrated and unified resettlement according to the farmers' community pattern.

- The remover shall pay compensation to those who choose compensation in currencies. The amount of compensation shall be determined according to the replacement cost of the demolished house and the location of house sites. The standards for building replacement cost are established by the Municipal price administrative department jointly with the department of real estate.

Compensation for house sites with different locations is determined according to their location. The location of house sites in Jiang'an, Jianghan, Qiaokou, Hanyang, Wuchang, Qingshan, Hongshan, Wuhan Economic & Technological Development Zone and Wuhan East Lake Hi-tech Development Zone are divided into three categories according to the overall city planning of Wuhan: the first category covers areas within the second ring road (including the second ring road), the second category covers areas between the second ring road and the third ring road (the Middle Ring Road), and the third category covers areas outside the third ring road (Middle Ring Road). The Municipal price administrative department jointly with the department of real estate establishes the specific rates for compensation.

The compensation rates for house sites in different locations in Dongxihu, Hannan, Caidian, Jiangxia, Xinzhou and Huangpi are made by their respective people's government, which shall be submitted to the Municipal price administrative department and land

administrative department for approval.

- For demolition and relocation of residential houses, the remover shall make compensation for and resettlement of relocation households according to the standard of arranging one house site for one household. The floor area, building area of the relocated houses for compensation calculation shall be determined according to the area ratified within the law. In case the floor area of the demolished house is less than 60m², and the relocation household has no other residence within the city, the floor area of the demolished house shall be deemed as 60m².

(3) Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collective-Owned Land

- The compensation for land acquisition shall be paid according to the following standards:

(I) Compensation for acquisition of cultivated land shall be 10 times that of the average annual output value of the acquired land of the previous three years before acquisition.

(II) Compensation for acquisition of garden plots; woodlands and other cultivated land shall be 6 times that of the average annual output value of the neighboring cultivated land of the previous three years.

(III) Compensation for acquisition of construction land, unused land shall be 6 times that of the average annual output value of the neighboring cultivated land of the previous three years.

- Compensation for the young crops in the acquisitioned land product value of which can be calculated shall be paid according to its product value. No compensation for those that can be harvested shall be paid. For those that cannot be harvested, the compensation shall be that of the product value of one harvest season. Reasonable compensations shall be paid for the young crops product value of which cannot be calculated.

- The farm irrigation and electromechanical irrigation and drainage facilities, power, broadcasting, and communication facilities and other attachments which can be removed shall be removed by the property right unit with the removing expenses being paid by the land user; for those that cannot be removed, the land user shall pay compensations according to the replacement costs.

- The compensation for lawfully approved temporary use of collective-owned land should be paid to the rural collective economic organization according to the following regulations:

(I) Compensation for temporary use of cultivated land shall be 3 times that of the average annual output value of the previous three years with consideration of length of land use. Land use of less than one year shall be calculated on the basis of two years, and that of more than one year (including one year) shall be calculated on the basis of three years.

(II) Compensation for temporary use of other productive land shall be the average annual output value of its neighboring cultivated land of the previous three years multiplied by length of land use.

Compensations for the young crops and attachments to the ground within the scope of temporary land use shall be paid to their owners according to the actual losses.

(4) Circular on Compensation Rates for the Acquisition of Collective-Owned Land and the Demolition and Relocation of House Sites in Accordance with Their Locations

- Locations of peasant house sites (trusteeship zone included) within Jiang'an, Jianghan, Qiaokou, Hanyang, Wuchang, Qingshan, Hongshan districts and Wuhan Economic and Technological Development Zone and Wuhan East Lake High-tech Development Zone are divided into three categories according to the overall city planning of Wuhan: the first category covers areas within the second ring road (including the second ring road), the second category covers areas between the second ring road and the third ring road (the Middle Ring Road), and the third category covers areas outside the third ring road (the third ring road included). The compensation is the product of the determined legal floor area of the building and the house site location compensation rate. Among them, the house site location compensation rate of the first category is CNY 2,280 /m², the second is CNY 1,920 /m², and the third is CNY 1,500 /m².

- The house site locations and compensation rates in Dongxihu, Hannan, Caidian, Jiangxia, Xinzhou and Huangpi districts (the trusteeship of the development zone excluded) shall be formulated by district governments and submitted to city bureau of price administration and bureau of land resources for approval.

(5) Opinions of Wuhan Municipal Committee of CPC and the People's Government of Wuhan Municipality on Actively Promoting the Comprehensive Reconstruction of "Villages in City"

- In the process of comprehensive reconstruction of "village-in-city", the registered permanent agricultural residences of villagers could be reregistered as permanent urban

residences free of charge according to relevant state and provincial regulations.

- After finishing the reformation of collective economic organizations of “villages-in-city” and changing the permanent agricultural residences of the villagers into urban residences, the villagers’ committees should be replaced by community neighborhood committees as stipulated in *Organic Law on the Villagers’ Committee in the People’s Republic of China* and *Organic Law on the Urban Residents’ Committee in the People’s Republic of China*.

- The economic entity established after reformation should give priority to relocated village labor forces on employment, encourage and guide them in finding jobs by themselves and start their own business. The unemployed relocated village labor forces who long for employment shall be granted Preferential Certificate of Re-Employment and enjoy relevant preferential policies. Relevant departments and district governments shall provide special skill training for labor forces with both ability and will to work; the expense of training is paid under the special financial fund at city and district levels.

- In the reconstruction of “village-in-city”, the legal floor area of each demolished house should be confirmed, registered and filed. The mover shall make resettlements by means of equal replacement on the basis of the confirmed area and resettlement rate established by the department of planning. Should the confirmed area go beyond the rate, the excessive part shall be compensated on the basis of housing replacement cost.

- With the consent of the relocation household, the remover may make settlement in cash.

- To make a rational use of land and reduce the intensity of exploitation, commercial houses may be properly constructed in the returned area in accordance with control detailed planning as well as the application of the relocation household. In this case, the relocation household shall be resettled by substituting the building area of commercial houses with residential areas at a certain ratio.

- Relevant taxation and fees involved in the construction and resettlement of returned house of the former villagers shall be implemented in accordance with related policies for individual building construction of farmers. During the construction of land exploitation and utilization projects, the auxiliary expense of infrastructure will not be charged; other payable stipulated fees, if rated, shall be charged at the lower limit; otherwise, it shall be charged in half.

3 Involuntary Resettlement Policy and Social Safeguard Strategy of ADB

(1) Involuntary Resettlement Policy of ADB

ADB released its involuntary resettlement policy in 1995, and after that was the publication of *Handbook on Resettlement: a Guide to Good Practice*, both of which provide systematic policy basis and practical operation guide for the resettlement of ADB financed projects.

The main targets and principles of ADB involuntary resettlement policy are:

- Avoid involuntary resettlement wherever feasible
- Explore all viable project options and minimize resettlement if population displacement is unavoidable.
- If population displacement is unavoidable, they should be compensated and assisted so that their economic and social future will generally be at least as favorable with the project as without it
- The affected people should be fully informed and closely consulted on resettlement and compensation options
- Existing social and cultural institutions of resettlers and their hosts should be supported and used to the greatest extent possible. Resettlers should be integrated economically and socially into host communities
- The Policy also specifies that lack of formal legal title to land is not a bar to compensation and other assistance. Appropriate assistance should be provided to address the needs of the poorest affected persons such as female-headed households, and other vulnerable groups such as indigenous groups and ethnic minorities, helps them improve their status.
- Any involuntary resettlement should, as far as possible, be conceived and executed as a part of a development project or program
- The full costs of resettlement and compensation should be included in the presentation of Project costs and benefits
- Eligible costs of resettlement and compensation may be considered for inclusion in Bank loan financing for the project, if requested.

In order to materialize above-mentioned principles and the target of resettlement policy, ADB has required following practical measures to be taken:

- Involuntary resettlement should be avoided when feasible and minimized if it is

unavoidable by selecting viable project options.

- In the stage of initial social assessment, the number of resettlers should be identified as much as possible, and the advisable outline of work should be established in feasibility study of project preparation technical assistance.

- Resettlement shall be deemed as a part of all projects including department project, private department project, cooperatively financed project and the loan project of development financial institutions.

- All the people concerned especially all affected persons and vulnerable groups of them in particular should participate in the Project planning and implementation.

- All and any losses of any affected persons, including those without formal legal title to land, shall be compensated for according to replacement costs,.

- When the removal of housing is needed, consult with affected persons and community of resettlement region, make removal schemes to ensure the living standard of displaced persons could be restored.

- When people are going to lose income and livelihood, proper restoration projects should be established for the purpose of improving or at least restoring production condition.

- When affected persons are vulnerable groups or resettlement will strain social relations, a preparation process should be provided for affected persons to adjust to society changes.

(2) Social Safeguard Strategy of ADB

This social safeguard strategy is issued by ADB for the purpose of virtually protecting the vulnerable groups in the process of resettlement. It has five basic components as follows:

- Labor market policies and programs designed to improve working conditions and promote the flexible and efficient operation of labor markets

- Social insurance programs to cushion the risks associated with unemployment, ill health, disability, work-related injury and old age

- Social assistance and pension systems for the most vulnerable groups with no other means of adequate support, including single mothers, the homeless, or physically or mentally challenged people

- Micro and area-based schemes to enhance the security level of vulnerable groups including those born disabled, including micro-insurance, agricultural insurance, social funds and programs to manage natural disasters

- Child protection to ensure the healthy and productive development of children

Meanwhile it is required in the social protection strategy of ADB that the enterprises and commercial workers affected by the projects should be minimized as far as possible.

Appendix V TOR of Resettlement M&E

A. Objectives

1. The external monitoring and evaluation (M&E) undertaken by an qualified institution independent to the WPMO, IAs and resettlement implementation agencies is to monitor and evaluate whether the target of the land requisition, resettlement and relocation activities are realized. Through this process, evaluation opinions and recommendations will be put forward on the resettlement, housing relocation and restoration of the resettler's living standards. Through M&E, systems will be adopted to identify problems, formulate remedial measures and take follow-up actions in a timely manner to ensure good implementation of resettlement.
2. The external monitoring and evaluation institution (Monitor) will report independently to the WPMO and ADB. It will conduct follow-up investigations, monitoring and evaluation of the resettlement activities according to the RP and provide advice for decision-making and mitigation measures.

B. Scope of Work

3. According to the WPMO's initial arrangements, an experienced independent organization will be entrusted to carry out the external M&E activities. The institute will (i) provide technical assistance and training for the Project Resettlement Office (PRO), (ii) assist with the finalization of Village compensation allocation and utilization (rehabilitation) plan (iii) conduct monitoring investigations of resettlement implementation in accordance with RP requirements, (iv) evaluate living standards of the APs to determine adequacy of restoration, and (v) prepare and submit M&E reports to WPMO and ADB as stipulated in Section F.

C. Main Indicators to be Monitored and Evaluated

4. The main Indicators for Monitoring include three aspects: (i) Progress: including preparation, implementation of land requisition, housing relocation and resettlement; (ii) Quality: including civil construction quality and degree of resettlers' satisfaction; and (iii) Investment: including allocation and use of funds. Main Indicators for Evaluation include:

- (i) Economic conditions: household economic development before and after resettlement, including assets, production materials, subsistence materials, income, etc.
- (ii) Environmental conditions: living environment before and after resettlement, including traffic, culture and education, sanitation, commercial service facilities, etc.
- (iii) Employment: change in employment, including employment rate, assistance to the different APs, especially the vulnerable APs, such as vulnerable families, etc.
- (iii) Development in community: local economy in resettlement host sites, environmental development, neighborhood relation, and public opinions after resettlement.
- (iv) Conditions of Vulnerable Groups: including before and after situations of poor households, disabled, elderly, children, women, etc.

D. Monitoring and Evaluation Measures

5. Monitoring and evaluation will be performed on the basis of the survey data provided by the survey design institution and resettlement implementation institutions. With an overall understanding of the situation, the evaluation will be performed by sample surveys, key informant interviews and rapid rural appraisal techniques. Typical samples, including resettled

households, affected villages/communities will be selected to establish an evaluation index system for different types of APs. Referring to the updated research output on living quality both in China and abroad, the indexes will be non-dimensionally treated, and the survey results will be analyzed and the computation results evaluated and compared. In addition to typical samples, there will also be focused investigation of vulnerable groups.

6. Generally, the external monitoring and evaluation institution will carry out the following work.

(1) Survey of resettlers' living standards

7. A base-line survey will be conducted for this project, including the collection of selected samples of the base-line living standards of the resettlers. (The preliminary samples will be randomly collected). The living standard will be investigated once a year to monitor the variation in the resettlers' living standards. The necessary data can be obtained by periodical survey, random interview and site visits, based on which statistical analysis and evaluation are performed. There will also be targeted surveys of vulnerable groups.

8. The survey comprises various indicators of living standards. Some of the indicators will be used for weighing the dynamic variation of living standards before and after the land requisition and resettlement. The selected indicators will be checked to see whether they are reasonable in reflecting the actual production and living levels in the base-line survey and are subject to modification according to the actual conditions, so as to guarantee the message obtained reflects the quality and quantity of the real situation.

Sampling scale is as below table 1.

Table 1 Sample distribution of living standard baseline survey of displaced persons

Types of samples	Households			Shops and enterprises and institutions	Vulnerable groups
	Affected by land acquisition only	Affected by relocation only	Affected by both land acquisition and relocation		
Sampling proportion	20%	20%	20%	50%	100%
Estimated Households	102	104	115	43/19	7
Surveyed Households	20	21	23	21/10	7

(2) Providing Training

9. A training program and budgets for resettlement units has been prepared and included in each RP (see Table 8-2). The Monitor will assist to arrange for the training and participate in the training. In particular, one training similar will be arranged with the cooperation of ADB resettlement specialist, prior to the project resettlement process.

(3) Providing guidance to finalize Village compensation allocation and utilization (rehabilitation) plans

10. Preliminary plans have been included in RPs based on the initial consultation and participation during the PPTA stage. The Monitor will follow-up the formulation and finalization of these plans for the 15 affected villages (7 plans prepared for Storm Water component and 8 plans for Wastewater component. For seriously affected villages (5 were identified), guidance should be provided where required to formulate viable plans and ensure adequate participation and acceptance of the plans by the APs and host villages. The finalized plans should be submitted to WPMO and ADB prior to the payment of land compensation.

(3) Holding Public Consultation

11. The independent monitoring and evaluation institution will participate in the public consultation conferences held by the villages and townships. By this method, the institution can evaluate the effectiveness of the public participation and the cooperative attitude of the resettlers towards the RP implementation. Such activities will be conducted during and after the resettlement implementation.

(4) Gathering Resettlers' Opinions

12. The independent monitoring and evaluation institution will often interview the district's resettlement offices and villagers to know the opinions collected from the resettlers and interview the resettlers who have grievances. The institution will report the opinions and suggestions from affected individuals and collectives to the Project Resettlement Office, and provide advice for improvement, so that the resettlement implementation can be more smooth and effective.

(5) Other Responsibilities

13. The Monitor will monitor and provide advice to the PRO for the following activities in the process of implementation:

- (i) House demolition and rehabilitation,
- (ii) Production arrangement and rehabilitation (and use of funds),
- (iii) Support to vulnerable groups,
- (iv) Relocation of private-owned shops, enterprises and institutes
- (v) Re-construction of special facilities,
- (vi) Payment and amount of the compensation,
- (vii) Resettlers' transfer,
- (viii) Employment of laborers,
- (ix) Training,
- (x) Schedule of the items above mentioned,
- (xi) Organizational efficiency for the resettlement,
- (xii) Use of compensation of the collective-owned land
- (xiii) Resettlers' incomes, expenditures, and assets
- (xiv) Employment of the surplus laborers and income increase of them
- (xv) Village compensation allocation and utilization (rehabilitation) plans.

E. Working Processes

- (i) Preparation of monitoring and evaluating outline,
- (ii) Identify computer software for monitoring and evaluating of the resettlement,
- (iii) Drafting the investigation outline, survey forms, and record cards for sample villages and sample households,
- (iv) Design of the village and household social-economic and opinion surveys, Carry out base-line surveys,

- (v) Establishing the information system for monitoring and evaluation
Investigation for monitoring
 - Community socio-economic survey
 - Resettlement implementation institutions
 - Village / community survey
 - Household survey
 - Survey for other affected objects
- (vi) Sorting of monitoring information and establishment of database Comparison analysis.

F. Monitoring and Evaluation Report Arrangement

- (i) A baseline survey(s) shall be carried out by independent monitoring agency before land acquisition or demolition.
- (ii) The semi-annual external monitoring report shall be submitted to ADB and WPMO during the project implementation at six month intervals.
- (iii) The annual evaluation report shall be submitted to ADB and PMO during the project implementation, commencing one year after completion of relocation. This evaluation will be done at least twice, or until incomes have been fully restored. The final evaluation report should provide an overall assessment of resettlement.

Asian Development Bank

Resettlement Plan

Storm Water Management Component

of

Wuhan Wastewater and Storm Water Management Project

In the

People's Republic of China

Wuhan ADB Financed Project Management Office
Wuhan Urban Construction Fund Office

February, 2006

Wuhan Urban Construction Fund Office

Commitment Letter on the implementation of *Resettlement Plan* of Asian Development Bank Financed Wuhan Storm Water and Wastewater Management Project

Asian Development Bank:

Resettlement Plan of Asian Development Bank Financed Wuhan Rainwater and Wastewater Project (hereinafter referred to as *RP*) is compiled with reference to related resettlement regulations of Asian Development Bank and relevant laws and legislations of the Chinese Government. During the execution of the project, we will strictly abide by *RP*.

Wuhan Urban Construction Fund Office

December 2005

Abbreviations

APs	Affected Persons
AVs	Affected Villages
ADB	Asian Development Bank
DPs	Displaced Persons
DI	Design Institute
HPG	Hubei Provincial Government
M&E	Monitoring and Evaluation
PMO	Project Management Office
RP	Resettlement Plan
VCs	Village Committees
VGs	Village Groups
WMG	Wuhan Municipal Government

Notes

Currency Unit - Yuan(CNY)

CNY1.00 = \$0.12

\$1.00 = CNY8.10

1 ha = 15mu

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Executive Summary

Wuhan Storm Water Management Component composed of four sub-projects, which are: (1) Luojiagang Dredging and Luojia Road Pump Station Expansion Project; (2) Yangsigang Drainage and Pump Station Project; (3) Three Gates Connection Project; (4) Changqing Pump Station Expansion Project. The affected area of Wuhan Storm Water Management Component involves 3 districts, 5 towns (streets) and 10 villages (neighborhood committees). There are 1438 persons of 339 families affected (221 persons of 45 families are affected by permanent land acquisition, and 1217 persons of 294 households are affected by house demolition), 19 affected shops of 81 persons and 42 affected enterprises and institutions of 241 persons. The components will start to be constructed in 2006, and put into operation in 2008. The project IA is Wuhan Urban Construction Fund Office.

In order to avoid or minimize land acquisition impacts, close consultation on project site has been made with affected communities/ villages and affected persons during the Feasibility Study (FS) stage, and the best site is recommended by comparison with alternative sites. The Storm Water Management Project permanently occupies a land area of 684.4 mu , temporary occupies a land area of 52.9 mu . Total area of relocated buildings in Storm Water Management Project is 66746.85m². The relocated buildings in the project are divided into three types, namely shops, enterprises and institutions, and residences. The relocated rural residence houses cover 32623m², The relocated urban residence houses cover 4650m²; 19 shops are affected by the project, in which 13 (6842 m²) are common shops and 6 (4070 m²) are unlicensed shops. There are 29 enterprises and institutions affected by Storm Water Management Project. The total relocated floor area is 18561.85m².

The RP is based on the Land Administration Law of PRC (2004) and related matching policies, Decision to Deepen Reform and Strictly Enforce Land Administration by the State Council (Document [2004] No.28), and also related policies of Wuhan municipality. Meanwhile, the RP was prepared in compliance with ADB's Policy on Involuntary Resettlement and OMF2 policies. Based on the above policies and through consultation with local governments and APs, the resettlement principles for the sub-Project are established as follows:

The project makes the consolidated compensation rates in accordance with land, output

value, land location, agricultural land grade, cultivated land per capita, land supply and demand relations, local economic development level and other factors. Compensation standards(AAOV) land acquisition of each sub-project are as follows: Hongshan District (Luojiagang Project) CNY 6,416; Hangyang District (Yangsigang Project) CNY 5,890; Dongxihu District (Three-gate Connection and Changqing Pump Station Project) CNY 4,895. compensation rates for land acquisition are calculated on the basis of the following standards: Land compensation for cultivated land shall be paid equivalent to ten times of the compensation base; compensation for garden plot, forest land and other agricultural land, six times of the compensation base; compensation for construction land and unexploited land, six times of the compensation base. The resettlement subsidy standards of the project shall be calculated on the basis as follows: compensation for cultivated land, such as paddy field, dry land, nursery, orchard and etc shall be paid equivalent to fifteen times of the compensation base; compensation for fish pond and forest land, nine times of the compensation base; compensation for pond eight times of the compensation base; for wasteland and house sites, no resettlement subsidy. Please refer to Chapter V for compensation rate for land acquisition of each sub-project.

Compensation for temporary acquisition of collective land shall be paid according to the following standards: (1) compensation for temporary cultivated land will be calculated by combining land-use years with land compensation base. Compensation for temporary land-use within one year will be calculated according to two years; compensation for temporary land-use above one year (including one year) will be calculated according to three years; (2) compensation for temporary land-use of other yields will be paid according to the standard of adjacent cultivated land; (3) compensation for young crops and attachments to the ground within the temporary land-use area will be paid according to actual loss to all persons.

Compensation for house relocation will include the replacement cost and location price of the buildings. According to the local regulations of Wuhan, the replacement cost of the project for rural houses are: steel concrete structure 830 yuan/m²; brick masonry structure 570 yuan/m²; brick wood structure 420 yuan/m²; simple structure house 340 yuan/m². Location based compensation prices of Wuhan rural relocation houses are divided into three categories according to the stipulated road rings of Wuhan urban overall planning: the first category is the region within the 2nd ring road (including the 2nd ring road), compensation price for this region is 2280 yuan/m²; the 2nd category is within the region between the 2nd ring road and the 3rd ring road (mid-ring line), the compensation price for this region is 1920 yuan/m²; the 3rd region is

outside the 3rd ring road (mid-ring line), compensation price for this region is 1500 yuan/m².

The market price of real estate of urban house dismantling and relocation will be evaluated according to the relocated house location, purpose, building area and conditions . The confirmation of structure category, floor area and purpose of the relative house will be confirmed by the project resettlement office together with relevant departments and relocated household on the spot prior to the relocation; for the location price of every house, the relocated household will choose an evaluation company from the three evaluation companies with evaluation qualification recommended by the resettlement office to carry out the evaluation on the house replacement cost and location price.

For houses without licenses, the project owner will pay the owners of houses without licenses the house replacement cost according to the state laws and resettlement policies of Asian Development Bank. The replacement cost shall not be deducted anyway, but no location based compensation price for the houses without licenses will be paid.

Project Resettlement Office will not only provide compensation for requisitioned attachments to the ground and buildings in affected villages, but also will establish practical production resettlement plans suitable for the development of affected villages so as to ensure that affected villagers have all kinds of opportunities to enhance, or at least rehabilitate their original incomes and living standards, on the basis of full negotiation and according to development status quo and future prospects of the villages. The project plans to perfect the integration of the urban and rural employment service system through the comprehensive renovation works of "villages in city" to provide conditions for the employment transfer of farmers whose land has been requisitioned to towns and cities, strengthen the employment transfer training of agricultural labors, improve the techniques of the farmers, and guide the employment transfer of them to the non-agricultural industries. The land acquisition unit shall provide employment for capable farmers by preferentially recruiting labors of the relocation households. The Project shall, integrated with the comprehensive renovation works of "village in city", establish the endowment insurance and the minimum social security for farmers losing land so as to guard the long-term subsistence of farmers whose land has been mostly requisitioned.

The project will implement special resettlement and rehabilitation measures for the affected vulnerable groups: (1) The project establishes the special supporting fund for vulnerable groups with a total amount of CNY 1,500,000. During the resettlement, the vulnerable groups can apply for the special supporting fund for vulnerable groups according to

the procedures if any production and living difficulties;(2) Vulnerable groups living in urban and town areas, under direct control with monthly household income per capita below the minimum living security line and relocated residential houses with the building area less than 20 m² (including 20 m²) will be resettled on the basis of 30 m²; if the building area of residential house per capita for the families of vulnerable groups is less than 8 m² and no other residential house, the compensation will be calculated in accordance with a building area of 8 m² per capita, and the extra expenses will be paid with the special supporting fund for vulnerable groups.

Expenses occurred during the process of land acquisition and relocation and resettlement shall be arranged in the total budget of the project. According to the current price, total budget of the project for land acquisition and resettlement is CNY 268, 350,000(\$3.6million).

According to requirements of *Resettlement Handbook* of Asian Development Bank, Wuhan Storm Water Management Component shall establish the resettlement internal and external monitoring evaluation system during the process of resettlement implementation. The internal monitoring is organized and performed by the project implementation unit; while the external monitoring is implemented by independent monitoring organization with rich expertise and experiences.

The sites of each subproject have been determined carefully and the networks have also been planned in FS stage, it is believed no significant changes in subprojects sites will be made. Should significant changes needed during the process of detailed design, the RP should be updated by IAs and reviewed by ADB prior to award of civil works contract.

1 Project Overview

1-1 Project background

The city of Wuhan is located in the east of the Jiangnan Plain and at the confluence of the Yangtze River and Han River. It is the capital of Hubei Province and a center of economy, science technology and culture of central China. It is at the middle reaches of Yangtze River, and many rivers crisscrossing within Wuhan. The Yangtze River crosses over the whole city from the southwest to the northeast, with a river course of 145km within it. Han River joins the Yangtze River at Hankou, with a river course of 62km in the city. Besides, another 6 major branches also join the Yangtze River in it. Lakes scatter throughout the city. There are altogether 147 lakes in various sizes, among which 38 are in the urban districts. The total water surface area of the lakes in Wuhan at normal water level is 942.8 km², with the ratio of water surface area 11.1%, which is the highest among those of large cities nationwide. This brings Wuhan the fame as “the city of lakes”.

The ground elevations of the urban areas in Wuhan are normally between 20 and 28m, and those of the built-up areas are mostly between 21 and 24m, below the ordinary flood level of the Yangtze River. The average precipitation for many years in Wuhan is 1230.8mm. With a maximum annual precipitation of 2057.9mm, and a minimum of 730.4mm, the precipitation is quite abundant. In the flood season, rainwater collects according to the natural landforms, and drains into rivers through pipe culverts, sewers and pump stations. Apart from the proportion of rainwater stored by lakes, a great deal of rainwater has to be drained into rivers via pump stations. Since the rainy period and the flood season occur in the same period in Wuhan, the pumping drainage capacity of pump stations plays a significant role for rainwater drainage in the urban area.

At present, the construction of drainage facilities is lagging behind the development of the city, the pumping drainage capacity of current pump stations are gravely insufficient, and along with the rapid expansion of the city, a large number of lakes have been filled up for land reclamation, incurring the ever shrinkage of the lake size intra city. These are all causes which disable the storm water in a number of regions in Wuhan from prompt draining in the flood season, and lead to severe water logging and great adverse impacts to the lives of the local people.

Hubei Provincial Government (HPG), Wuhan Municipal Government (WMG) and relevant departments are all greatly concerned at the storm water situation. With a strategy to achieve urban sustainable development, Wuhan desires to apply to Asian Development Bank (ADB) for loan in order to improve, storm water collecting systems as well as storm water pump stations, and thus to improve the living environment and promote the sustainable development of Wuhan city.

1-2 Project composition

The Storm Water Management Component comprises 4 sub-projects, which are: (1) Luojiagang Canal and Luoja Road Pump Station Expansion Project (Luojiagang Sub-project); (2) Yangsigang Pump Station and Storm Water Box Culvert Project (Yangsigang Sub-project); (3) Three Gates Connection Project (Three Gates Sub-project); (4) Changqing Pump Station Expansion Project (Changqing Sub-project). These projects are distributed in Hongshan District, Hanyang District and Dongxihu District. The scope of each sub-project is listed in Table 1-1, and the service areas are shown in Figure 1-1.

Table 1-1 The Storm Water Management Component Composition

Sub-project	Location	Scope and description
Luojiagang Canal Expansion and Luoja Road Pump Station Expansion	Hongshan District	1) Luoja Road Pump Station Expansion which will acquired 19.4 <i>mu</i> land permanently. 2) 9.1 km open canal will be expensed, and 188.7 <i>mu</i> land will be acquired permanently.
Yangsigang Pump Station and Storm Water Box Culvert	Hanyang District	1) A new pump station will be built, 2) 3.24 km storm water box culverts will be built. 3) 34.8 <i>mu</i> land will be acquired permanently.
Donxihu Three Gates Connection	Dongxihu District	1) 2.38 km storm box culverts from Xindun Damp to Jinkou Damp will be built 2) 1.1 km open canal from Jinkou Damp to Huangjiadawan will be expensed. 3) Construction of new open canal 4.34 km, expansion of previous canal 4.47 km. 4) A total of 422.6 <i>mu</i> land will be acquired permanently by this sub-project.
Changqing Pump Station Expansion	Dongxihu District	18.9 <i>mu</i> land will be acquired permanently by Pump Station Expansion.

1-3 Regions benefited from the Project

The Storm Water Management Component is a significant project for improving Wuhan's urban drainage facility levels, reducing the hazard degree of water logging, ameliorating urban environment quality, and promoting urban sustainable development. The total service areas of the Project are 82.94km² (see Table 1-2). After completion of the Project, the drainage systems in these areas will be greatly improved, water logging problems in Changfengnanbeiyuan of Western Hankou District, in Jichanghe Area, Wujiashan and Jinyinhui of Dongxihu District, Luojialu of Wuchang District, and Yinwuzhou of Hanyang District will be solved effectively, and the production conditions and living environment will be bettered and economic losses reduced.

Table 1-2 Areas benefited from the Storm Water Management Component

Sub-projects	Service area	Benefited areas
Luojiagang Sub-project	22.57 km ²	Storm water catchments range: west to Linjiang Avenue, east to Qinghua Road (Zhongbei Road extension line), south to Yangyaun, north to No.4 Jianshe Road. Water logging problems in Xujiapeng, Yujiatou, Renjia Road, Xudong Road, etc. can be solved. This project can also lead the water of the East Lake into the Yangtze River.
Yangsigang Sub-project	3.67 km ²	Storm catchments range: east to the Yangtze River, west to Lanjiangdi Road, north to Hongjian Road, south to Xinwuli. Water logging problems in Yingwuzhou, which is the newly built area specializing in industry and warehouse storage, can be solved.
Three Gates Sub-project	54.5 km ²	Storm water catchments range: east to Hanxi Road and Zhanggonghengdi, west to Etouwan, south to Hanjiangdi, north to Zhanggongdi. The water drainage problem in Changfengnanbeiyuan (the new industrial zone) can be solved.
Changqing Sub-project	500.2 km ²	To improve the pumping drainage capacity of Changqing Pump Station, solve the waterlogging problem in Jichanghe, and achieve the separation of rainwater and wastewater in this area.

Figure 1-1 Service areas of the Storm Water Management Component

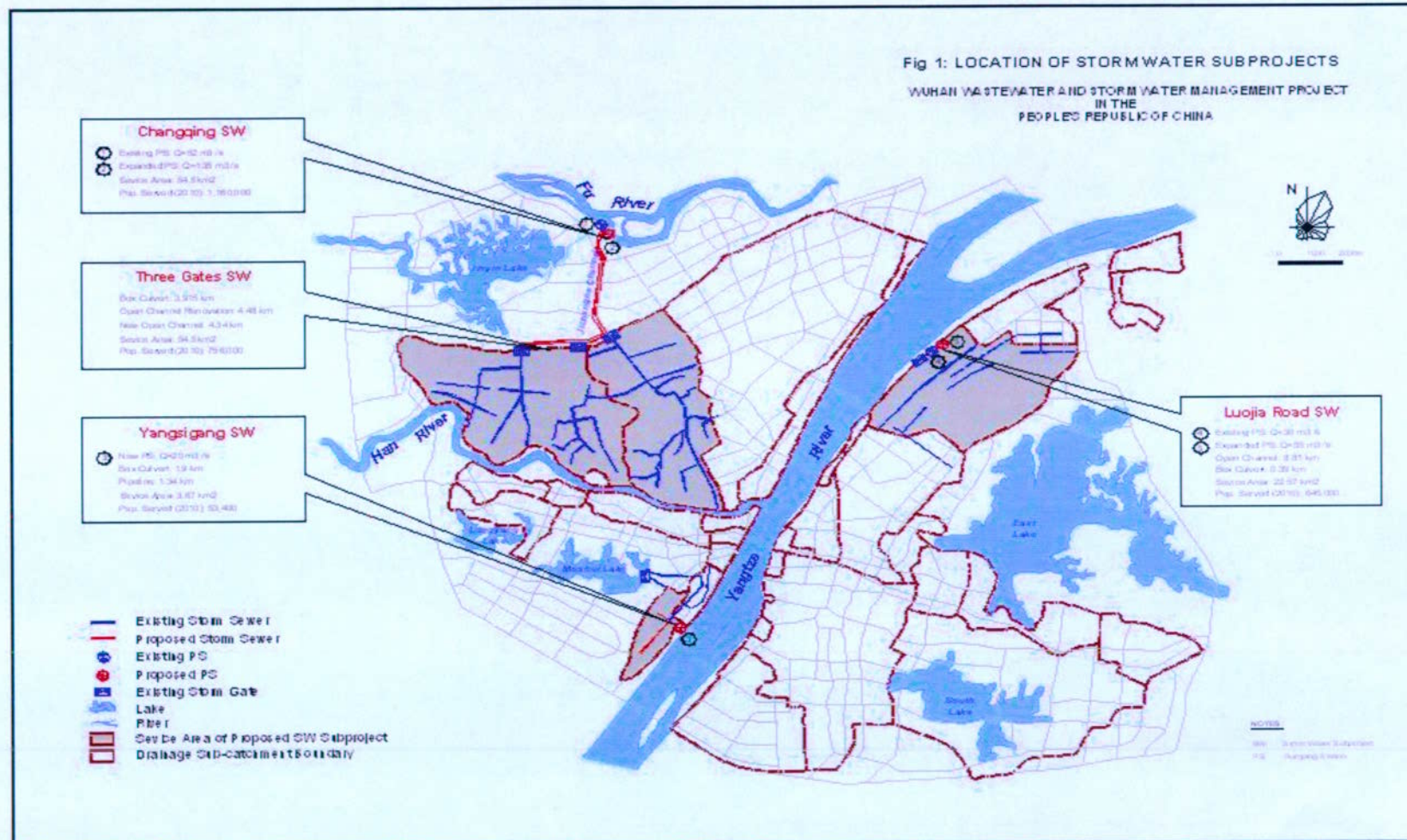
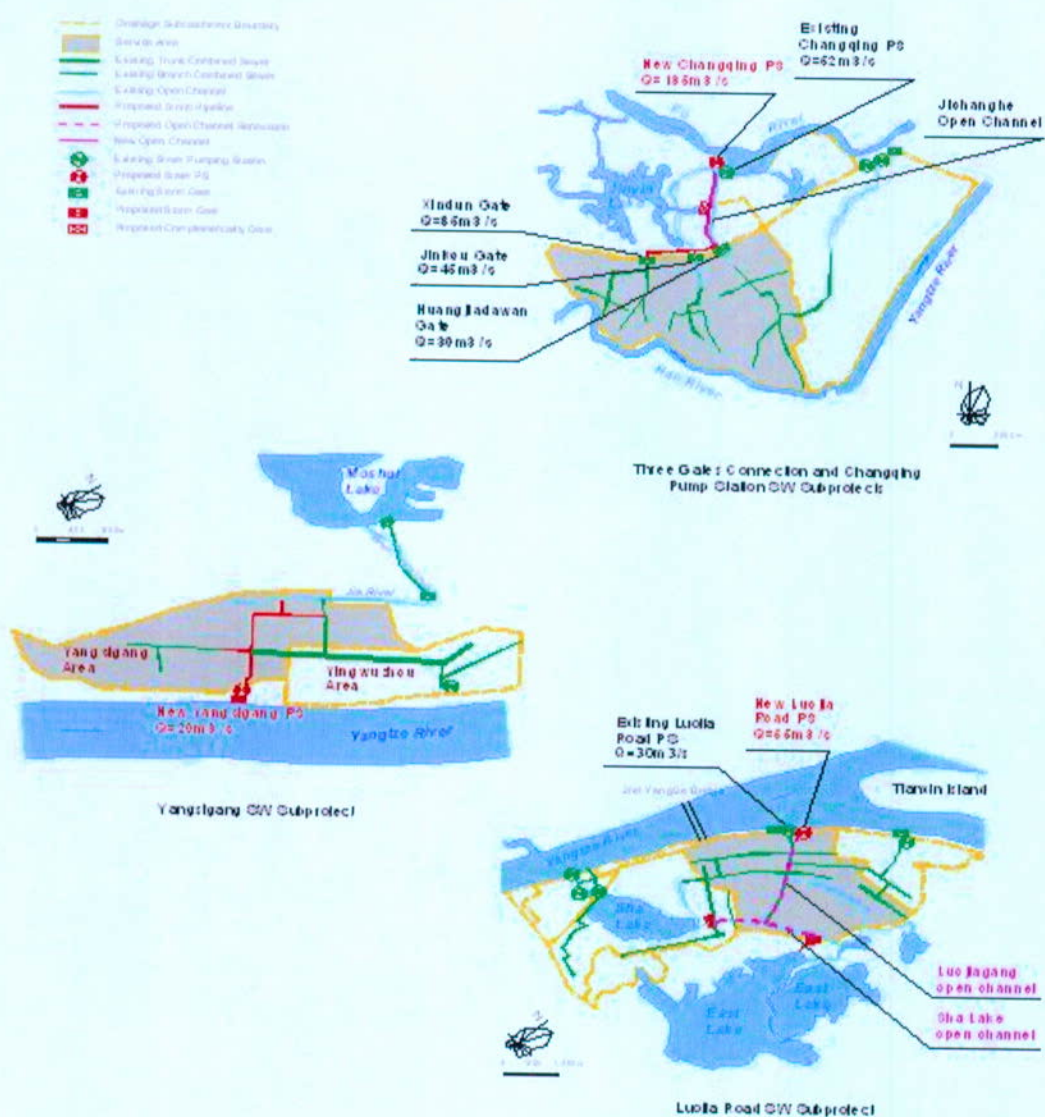


Fig 2: Storm Water Management Subprojects



1-4 Areas Regions directly affected by the Project

All the affected areas including land, housing or public facilities are located within the Project service areas.

1-4-1 Areas directly affected by the Project

The areas affected by the storm water management component involve 3 districts (Hongshan District, Hanyang District and Dongxihu District) within the jurisdiction of Wuhan, including 2 urban districts (Hongshan District and Hanyang District) and 1 suburban district (Dongxihu District). 5 townships or sub-district offices (Heping Township, Jiangdi Township, Administrative Office of Jinyinghu Ecological Park, Administrative Committee of Taiwan Businessmen Investment & Development Zone, and Jiangjun Road Sub-district Office), and 10 villages or neighborhood committees are also affected by the project (see Table 1-3).

Table 1-3 Administrative Organizations Affected by the Project

No.	Sub-project	District	Township	Village (Neighborhood Committee)
1	Luojiagang Sub-project	Hongshan District	Heping Township	Heping Village, Tuanjie Village, Yujiatou Village, Chailin Village
2	Yangsigang Sub-project	Hanyang District	Jiangdi Township	Qianjin Village, Xiangyang Village, Taishan Village
3	Three Gates Connection Sub-project	Dongxihu District	Administrative Office of the Jinyinghu Ecological Park	No. 2 Jinkou Village, No. 13 Jinkou Village
			Administrative Committee of Taiwan Businessmen Investment & Development Zone	
4	Changqing Pump Station Expansion Sub-project	Dongxihu District	Jiangjun Road Sub-district Administrative Office	Machi Neighborhood Committee
5	No. of affected organizations	3	5	10

1-4-2 Socioeconomic status of affected areas

Wuhan is located in the east of the Jiangnan Plain. It is the capital of Hubei Province, an

important industrial production base and traffic and communication hub of the entire country. Wuhan is the largest inland central city in China. It governs seven central urban districts and six suburban districts. In 2003, Wuhan covered an area of 8,494 km². The total population of the city was 7,811,900, which included an agricultural population of 3,033,300 and a non-agricultural population of 4,066,800, with a population density of 920/km². The gross domestic product of the city in 2003 is CNY 166.218 billion.

The commercial activities in Wuhan are increasing and thriving. As a historically well-known large commercial port, Wuhan is also a cradle for modern industry, with a strong industrial foundation. Since the reform and opening up, the economy in Wuhan has gained rapid development. With an increasing overall economic strength, it has developed into a multifunctional metropolis in central China. Especially in recent years, Wuhan's urbanization has been speeding up, and investments in infrastructures development have been increasing at a relatively high rate, both of which have laid an excellent foundation for the sustainable development of the city. It can be seen from Table 1-4 that all the districts covered in the Project are under rapid economic development.

Table 1-4 Socioeconomic Development Status of Areas Covered by the Project in 2003

Affected areas		Hongshan District	Hanyang District	Dongxihu District	Wuhan City
Land area (km ²)		509.00	108.34	439.19	8,494.41
Registered population (person)		729,493	377,642	239,431	7,811,855
Population density (person/km ²)		1,433	4,409	545	920
Annual per capita disposable income of urban population (CNY)		8,714	8,391	8,341	8,525
Annual per capita net income of rural population (CNY)		4,960	2,797	3,733	3,497
Total Domestic Product (CNY billion)		7.557	5.748	4.391	166.24
Economic growth rate (%)		12.1	12.2	12.5	11.4
Structure of output value	Primary industry (%)	10.8	9.2	17.5	5.7
	Secondary industry (%)	38.8	45.2	53.2	44.6
	Tertiary industry (%)	50.4	45.6	29.3	49.7

Source of data: *Wuhan Statistical Yearbook* (2004).

1-4-3 Features of socioeconomic development in affected areas

The areas affected by the Storm Water Management Project include 2 urban districts (Hongshan District, Hanyang District) and 1 suburban district. All of the areas directly affected by the Project are not the urbanized districts of Wuhan, but newly urbanizing ones.

(1) General information of the areas affected by the Luojiagang Sub-project

Heping Township of Hongshan District affected by the Luojiagang Sub-project is a typical “village in city” of Wuhan. Ten years ago, these areas still belonged to the rural areas, with most of the residents belonging to rural residents. However, with the rapid expansion of Wuhan city, these areas have undergone rapid urbanization; most of the residents are employed in nonagricultural sectors, while cultivated land in these areas has also been turned into non-cultivated land rapidly. In view of landscape, these areas have become new built-up areas, but with regard to administrative system, the rural township management system is still in use, which makes them the typical “villages in city” of Wuhan. Most of the buildings affected by the Luojiagang Sub-project are tatty buildings along the sides of the open canal as shown in Figure 1-2.



Figure 1-2 the areas affected by the Luojiagang open canal expansion

(2) General information of the areas affected by the Yangsigang Sub-project

Jiangdi Township of Hanyang District affected by the Yangsigang Sub-project is also a “village in city” in Wuhan city. Besides housing relocation by the construction of new pump station, no

other houses will be affected. From Figure 1-3, we can see that the storm water box culvert is mainly laid under the middle of the planned road, with preferable planning control, the construction of rainwater box culvert will not lead to large scale relocations of housing, and thus the Project will only have a temporary impact on the residents in these areas.



Figure 1-3 the areas affected by Yangsigang storm water box culverts

(3) General information of the areas affected by Three Gates Sub-project and Changqing Sub-project

The areas affected by Three Gates sub-project and Changqing Sub-project used to be state-owned farms, whose residents were mainly farm workers in the past. With the development of the city in recent years, the farms have undergone administrative system reforms; Some part of the state-owned farms has been turned into new development zones in Wuhan (e.g. Jinyinhu Ecological Park, Taiwan Businessmen Investment & Development Zone), and some has been turned into urban district (e.g. Jiangjun Road Sub-District Office). The land acquisition by the Project mainly involves ponds and wasteland along both sides of the open canal, no houses need to be relocated, and the Project also has limited impact on local agricultural production (Figure 1-4).



Figure 1-4 the areas affected by Three Gates Connection Project

1-5 Measures to reduce land acquisition and relocation

The main construction contents of Luojiagang Sub-project, Three Gates Connection Sub-project and Changqing Sub-project are expansion of the existing canals or pump stations according to the Urban Planning of Wuhan City, so to a great extent, the sites of the projects is determinate, and no alternative design schemes should be compared or selected. The issue of design scheme comparison and selection only existed in Yangsigang Pump Station Sub-project. In order to minimize land acquisition and relocation, the Project Resettlement Office (PRO) and the engineering design unit (DI) had a close cooperation. On the basis of investigation, they have constantly optimized the design scheme so as to minimize the land acquisition and relocation. The following measures and activities have been adopted to minimize the resettlement.

(1) During the alternative comparison and selection stage, the DI has considered fully the resettlement factors and selected optimized locations for the pump stations and pipe network. For instance, according to the initial design scheme for Yangsigang Pump Station, the station would be built within the port of Hanyang Port Company. With a floor area of 18,500m², the pump station would directly affect the production of Hanyang Port Company, an enterprise with

approx. 2000 employees in service and nearly 3000 retirees. When the facts were realized through investigation, the PRO sent a prompt feedback to the DI. And as required by the project owner, the DI selected another site. The new site of pump station is at the back dike of Xinwuli, which is about 100m further than the original site in the west, and has successfully avoided affecting the production of Hanyang Port Company.

(2) During the process of socioeconomic survey, through site visits and public consultations, the survey team has accepted opinions and suggestions of government officials in the affected area and representatives of affected persons, and provided feedback of these opinions and suggestions to the DI who has then optimized the design to minimize relocation of some key infrastructures and buildings. In the design stage, public consultation will be carried out so as to further optimize the design and reduce the resettlement.

(3) During the project implementation stage, the key infrastructures or buildings can be avoided by technology (for example pipe jacking method) and management innovations. For instance, in the Three Gates Connection Project in Dongxihu District, many large power tower bases are located along the sides of the channel to be expanded, and the relocation of which may cost a large sum of money. The DI and PMO decided to avoid removing these large power tower bases via the innovations in technology. In the process of project construction, project management capability will also be strengthened to minimize the adverse impact on the peripheral inhabitants.

1-6 Resettlement Review of Associated components

In the Storm Water Management Component, the constructions of Yangsigang and Changqing Pump Station Project are all included in the ADB financed project without associated components. In Three Gates Connection Sub-project, The open canal expansion between these three gates is financed by ADB, while the construction of three gates is financed by domestic investment, which is the associated component of the Project. According to the survey, the construction of these three gates had begun in December 20, 2005. The affected village by the subproject is Huojiadun Village in Jiangnan District. 18 persons of 4 households were affected and 496.5 m² residential buildings were relocated, and 4.5 mu wasteland and 0.5 mu house site were acquired. All the relocated houses were compensated according to *Compensation and Resettlement measures of Wuhan Municipality for Collective-owned Land Acquisition*. That means the compensation rate for house relocation in this project is comprised by replacement price of the structures and house base price. The

replacement price is shown as follows: Steel-concrete structure: CNY 830/m²; Brick-concrete structure: CNY 570/m²; Brick-wood structure: CNY 420/m²; Simple house: CNY 340/m². The house site location price is CNY 1920/m². Now all the resettlement activities have been completed successfully, all APs are satisfied with the compensation rates and the resettlement policies.

1-7 Procedures and schedules for examination and approval of the Project

The procedures for the examination and approval of the Project can be divided into two parts, domestic procedures and ADB procedures (Table 1-6).

Domestic procedures have proceeded smoothly. In 2005, Development Planning Commission of Wuhan Municipality sent the project proposal report to Hubei Provincial Development and Reform Commission and requested instructions for examination and approval. On Apr. 15, 2005, The Hubei Provincial Development and Reform Commission gave an official reply, agreeing to the use of ADB loans in the implementation of the Wuhan Wastewater and Storm Water Management Component. The Bureau of Land Resources of Wuhan Municipality has pre-examined the land use plan. Since this project is the key project of Wuhan urban infrastructures, the Land Resources Bureau will give the project priority in the annual land use plan. Currently relevant units of the Project are compiling project Feasibility Study Report (FSRs), environmental impact assessment report (EIAs), and Resettlement Plan (RPs). The schedule of procedures for the examination and approval of the Project is shown in Table 1-6.

Table 1-6 Procedures and schedule of examination and approval of the Project

Domestic procedures		ADB Procedures	
Time	Procedures for examination and approval	Time	Procedures for examination and approval
Sep.-Dec. 2004	Compilation of project proposal report	May 2005	ADB PPTA tender award
Jan.-Apr. 2005	Official written reply of the Hubei Provincial Development and Reform Commission to project proposal; pre-examination of land use plan of the project by the Bureau of Land Resources of Wuhan Municipality.	Jun-Dec. 2005	Compilation of PPTA preliminary and mid term reports

Domestic procedures		ADB Procedures	
Jun-Sep. 2005	Compilation of PPTA preliminary and mid term reports; compilation of FSRs, EIAs and RPs.	Nov. 2005	Evaluation by the delegation of ADB
Sep. 2005	Submission of FSRs, EIAs and RPs.	Jan. 2006	Examination and approval of EIAs and RPs
Sep.-Dec. 2005	Evaluation, examination and approval of FSRs, EIAs and RPs.	Feb. 2006	Administration and examination by ADB
Oct. 2005-Jan. 2006	Compilation and submission of project fund utilization report	Apr. 2006	Loan negotiation(s)
Nov. 2005- Feb.2006	Information Disclosure	July 2006	Loan effective.
Dec. 2005-Feb. 2006	Examination of land use plan by Wuhan Land Resources Bureau.		
Mar. 2006	Official written reply to project fund utilization report		
Nov. 2005- Mar. 2006	Compilation of preliminary design of the project		
Mar. 2006-May 2006	Examination and approval of preliminary design of the project		
June. 2005	Affected people approval of land use plans		
July. 2006	Start to payment of compensation		
Sep. 2006	Commencement of 3 Gates Subproject construction		

2 Socioeconomic Survey

2-1 Purpose of the socioeconomic survey

According to ADB requirements on involuntary resettlement, prior to the implementation of project engineering construction a field survey should be carried out on the socioeconomic impacts by the resettlement exercise. The purpose of the survey is to collect full information on the status of the affected persons as well as types and amounts of housing relocation and land acquisition in the areas affected by the Project, to understand the socioeconomic development status of the affected areas so as to provide reference data for the optimization of the engineering design scheme, to provide information for the compilation of RP and the production of the rehabilitation plan, and to provide reference for the independent monitoring organization in monitoring. In the meantime, a large-scale field survey can also provide the affected persons with information on the implementation status and progress of the Project so as to achieve the goal of information disclosure. Opinions and suggestions of the local government departments and affected persons can also be obtained in this way so as to tailor the rehabilitation plan with local reality to ensure the recovery and improvement of the living standard of the affected persons.

2-2 Methodology

The RP follows closely the ADB Handbook on Resettlement, A Guide to Good Practice. The basic approach to understanding the fundamental socio-economic conditions in the project affected areas centers on a careful review of existing city, district, village and household socio-economic data and field visits to each subprojects.

During the course of this study, extensive discussions were held with officials from local governments, districts/townships, villages and selected households with the aim of identifying basic socio-economic status of affected households, poor or minority groups. Special attention was given to seeking the options of village rehabilitation.

Using PRA methodologies and a sample survey (20%) of 339 households in affected villages, in each village, most of affected households were selected to collect substantial data and qualitative information on prevailing socio-economic conditions, project impacts and

potential livelihood restoration options.

Scope and contents of the socioeconomic survey

The scope of the socioeconomic survey was determined on the basis of the demarcation plan for the Storm Water Management Component provided by the Wuhan Academy of Urban Planning and Design. All the land, housing, infrastructure and any ground features within demarcated area have been rated, and the owners of titles (including judicial titles and natural persons) have been interviewed.

2-2-1 Contents of the survey

- Locations, types and areas of all the land acquisitions within the scope of survey
- Locations, types and areas of all the buildings to be relocated within the scope of survey
- Locations, types and numbers of all the attachments to the ground within the scope of survey
- Locations, types and numbers of electric power and communication facilities within the scope of survey and the affected organizations
- Survey of the building structures of all the affected shops and the degree of impact, etc
- Survey of the building structures of all the affected enterprises and institutions and the degree of impact, etc
- Public opinions and suggestions of the affected areas by the Project
- Basic status of affected villages within the scope of survey
- Socioeconomic statistical data of the affected areas
- Preliminary resettlement plan and production rehabilitation measures of affected villages as well as enterprises and institutions

2-2-2 Questionnaire Forms

In order to obtain the aforesaid information and data, the Center for Resettlement Research of Wuhan University designed special resettlement questionnaires applicable to the Wuhan Storm Water Management Component. Appendix 1 contains the actual questionnaires. These questionnaires can be divided into three categories:

(1) Questionnaires for affected assets

This survey includes:

- Types and amounts of land acquisitions - Form B

- Types and numbers of business buildings (shops and factory buildings) and residential buildings to be relocated - Form C

- Survey of the basic status of affected enterprises and institutions as well as the impacts upon them - Form E

- Types and numbers of the affected public infrastructures and the ground attachments- Form F

(2) Socioeconomic questionnaires

The survey of socioeconomic background information includes:

- Survey of population of affected households, and genders, ages, domicile natures, marital status and employment status of the household members - Form A1

- Survey of property, income and expenditure of affected households - Form A2

- Survey of public opinions and suggestions - Form D

- Basic status of population, labor force, industrial structure, and farm land etc of affected villages within the scope of survey – Form G

- Survey of vulnerable groups in the affected population - Form H

(3) Other data collected

Statistical data and background information from relevant literatures in affected regions, including statistical yearbooks, annual bulletin data and legislative documents, etc. in recent years, have also been collected.

2-3 Survey organizations

2-3-1 Organizations and personnel participating in the survey

- PRO, resettlement organizations of sub-projects, and village heads or representatives of villagers in affected villages

- Representatives of the DIs (Wuhan Academy of Urban Planning and Design and Wuhan Planning Institute of Municipal Engineering)

- Surveyors from the Center for Resettlement Research of Wuhan University

2-3-2 Division of duties of the organizations

- PRO: in charge of organizing and coordinating the activities of the survey. Organized consultation meetings and monitored the activities of survey.

- Center for Resettlement Research of Wuhan University: responsible for the organization

of the survey, design of the survey scheme, organization and training of survey staff, implementation and examination of the survey, compilation of data input program, data examination and verification, statistical and other data analysis, etc.

- District and township local government: provision of professional personnel to participate in the survey and responsible for the overall organization, coordination and collection of socioeconomic background information and registered documents; providing guarantees and services necessary for the implementation of the survey

- Wuhan Academy of Urban Planning and Design and Wuhan Planning Institute of Municipal Engineering: demarcating the scope of survey according to engineering design scheme and providing design drawings.

2-4 Implementation of the socioeconomic survey

2-4-1 Composition of survey teams

Five survey teams carried out this survey in the same period of time, each of which consisted of about five persons. Among them, the one from the PRO was the team leader responsible for the contacts and communications with the local government. Among the 3 persons from the Center for Resettlement Research of Wuhan University, one was the deputy team leader responsible for specific surveys, contacts and communications; and two took charge of the survey registrations as well as examination, verification and logging of the collected questionnaires. The one member from the local resettlement office was an alternate deputy team leader, who in cooperation with the Center for Resettlement Research of Wuhan University took charge of the survey work of the team. The local departments led the ways, and assisted in locating the respondents, and assisting them in completing the questionnaires and collecting the forms promptly, so as to provide statistical data of the local socioeconomic development in recent years.

The DI provided one person to be responsible for the provision of design drawings, determination of the demarcation, and the implementation of relevant surveys of material objects.

2-4-2 Pre-test survey

Prior to the formal survey, the Center for Resettlement Research of Wuhan University has carried out a Pre-test survey, through which they have checked the thoroughness and practicality of the questionnaires, gave audience to the opinions of the residents, and modified

and improved the questionnaires accordingly.

While designing and improving the forms, the Center for Resettlement Research of Wuhan University compiled a survey guide, which introduced in detail the requirements in completing the questionnaires, so as to seek common understandings and consistency in the field surveys by each of the 5 teams.

2-4-3 Implementation procedures

(1) Drawing the scope of survey on the 1/2000 topographic maps.

(2) Field measurement of the land and buildings contained in the scope of survey in the topographic maps, completion of Forms B and C, verification of the affected households and organizations, completing the cover page of the questionnaire, and ascertaining the use of the right type of the questionnaires.

(3) In the case that the lands acquired or the buildings relocated belonged to family households, completing Form A₁ according to the addresses of the affected households with household as the unit.

(4) Picking one in every five families to fill up Forms A₂ and D which were sample questionnaires. Selecting one family member over 15 years old in each family household to provide answers to the two forms.

(5) Filling up Forms E and F (and discarding Forms A, B, C and D) for acquired lands or buildings belonging to enterprises or institutions

(6) Completing Forms G and H with township (town, sub-district) as the unit.

2-5 Progress of the socioeconomic survey

Due to engineering planning and design, the socioeconomic surveys of the four sub-projects in storm water management project were carried out in multiple steps.

- From Apr. 26 to May 4, 2005, the Center for Resettlement Research of Wuhan University organized 20 persons, which were divided in 5 teams, to carry out the field socioeconomic survey in the affected areas by the Luojaxiang Sub-Project.

- From May 3 to May 6, 2005, the Center for Resettlement Research of Wuhan University organized 6 persons, which were divided in 2 groups, to implement the field socioeconomic survey in the areas affected by the Yangsigang Project in Hanyang District. Later, in order to avoid affecting the production of Hanyang Port Company, the design scheme was optimized and the site of pump station was reselected. On Aug. 3, 2005, Wuhan University again

organized 7 persons to carry out the supplementary survey of the land acquisition and relocation for the new site of pump station.

- From Aug. 1 to Aug. 3, 2005, the Center for Resettlement Research of Wuhan University organized 7 persons, which were divided in 2 survey teams, to implement the socioeconomic surveys in the areas affected by the Three Gates Connection Project in Dongxihu District and the Changqing Pump Station Expansion Project respectively.

The impact analysis and resettlement program of the Project have both been compiled on the basis of the data from the socioeconomic survey and the information collected from the public consultation mentioned above.

3 Project Impacts

In order to understand the impacts of the Storm Water Management Component and according to the requirements of ADB, from May 2002 to August 2002, the Center for Resettlement Research of Wuhan University, in coordination with the PRO and DIs conducted a thorough survey about the types and amounts of land acquisition and relocation in each sub-project as well as the affected families, enterprises, institutions, rural collective economic organizations within the project impact scope, from which the basic information of project impacts was obtained. The information provided basic data for the compilation of *Resettlement Plan* and resettlement schemes. Moreover, The RP is based on feasibility design, if significant changes needed during the process of detailed design, the RP should be updated by IAs and reviewed by ADB prior to award of civil works contract.

3-1 Definition of project impacts

The scope of the survey on material objects affected by the Project is determined on the basis of the demarcation plans scope provided by the DIs, mainly including the affected areas by the storm pump stations, channels and box culverts. Since the Project is still in the feasibility study stage during the resettlement survey of material objects, the DIs may make further optimization, and the land acquisition data may also be adjusted. The PRO will revise and improve the RP according to the adjusted data. At the same time, any change in the project impacts will be reported to ADB before implementation with explanations for the changes. The RP is also applicable to additional affected persons, enterprises, institutions and villages, etc.

Definition of project impacts:

(1) Permanent acquired lands - all kinds of permanently acquired cultivated lands and non-cultivated lands within the affected area demarcated in the Project. The cultivated lands include paddy fields, dry lands, vegetable fields, ponds, mulberry orchards, fruit orchards, tea gardens and nursery gardens, etc; the non-cultivated lands include barren hills, waste lands, commercial forests, timberlands and house sites, etc.

(2) Temporary acquired lands - all kinds of cultivated lands and non-cultivated lands that are temporarily acquired during construction and to be reinstated after construction. In this

project, the temporary acquired lands are caused mainly by the project construction.

(3) Relocated buildings - all buildings within the affected area demarcated in the Project, mainly including brick and concrete, brick and tile, earth and wood, and simple houses, etc. According to different natures of ownerships, the buildings are divided into three types: private buildings, village collective buildings, and enterprise and institution buildings. According to the different usages, the buildings are categorized into private residences, shops, and factory buildings etc.

(4) Affected attachments to the ground - attachments to the ground within the affected area demarcated in the Project, mainly including pools, enclosing walls, wells, tombs, fruit trees, terraces, etc.

(5) Affected public facilities - public facilities (e.g. above ground and underground pipelines, communication lines, water supply, drainage and gas pipelines) and public service facilities (e.g. schools, bus stations or community centers, etc.) within the affected area demarcated in the Project.

(6) Affected family households - households whose lands, buildings or attachments to the ground are within the affected area demarcated in the Project or under direct influence of the Project.

(7) Affected communities - communities whose lands, buildings or attachments to the ground are within the affected area demarcated in the Project or under direct influence of the Project.

(8) Affected enterprises and institutions: enterprises and institutions whose lands, buildings or attachments to the ground are within the affected area demarcated in the Project or under direct influence of the Project.

(9) Persons affected by the Project - the population of all the family households affected by the Project.

(10) Licensed houses - houses with full or partial house ownership by building, purchasing or bestowing; or houses without formal house ownership certificates, but with construction documents and warrants approved by various levels of governments and relevant departments.

(11) Unlicensed houses - privately built houses without any relevant certificate issued by real estate departments or land departments. Also temporary buildings constructed after the approval from relevant departments, but whose building service life prescribed by documents has expired.

(12) Unlicensed shops - privately built houses for business without any relevant certificate issued by real estate departments or land departments. Unlicensed shops in the project also include shops privately reconstructed from residences without business licenses issued by administration of industry and commerce.

(13) Affected Workers - Labors who work and earn salary from the affected shops, enterprises, and institutions according to formal or informal contracts.

(14) Floating population - population who has lived or worked in a community for over one year, yet whose household registration has not been moved into the community.

(15) Affected tenants - all persons living in the buildings affected by the Project by lease.

(16) Vulnerable groups - social groups who are vulnerable, lack of adaptability to social changes, and at a disadvantage in the society due to reasons such as lacking social participation ability and social security, disability and poverty, etc. Vulnerable groups mainly include the following types: lonely old people, female single parent families, orphans, poor families, disabled persons, etc.

3-2 Summary of Project Impacts

4 rainwater sub-projects are distributed in 3 districts in Wuhan, the total land acquisition is 737.7 mu , in which permanent land acquisition is 684.4 mu , temporary land use is 52.9 mu . 5 townships or sub-district offices, 10 villages or neighborhood committees are affected by the Project. In the APs, 1438 persons belong to 339 affected family households (221 persons of 45 households are affected by permanent land acquisition, 1217 persons of 294 households are affected by house relocation), 81 persons belong to 19 affected shops, and 241 persons belong to 42 affected enterprises or institutions (only 29 affected enterprise or institutions need relocate buildings). The total area of the relocated building is 66,746.85 m^2 , in which 37,273 m^2 belong to residence houses, 10,912 m^2 belong to 19 shops and 18,561.85 m^2 belong to 29 enterprises and institutions. The number of the affected agricultural labors is 195, which is calculated by the formula in the national laws of land management, while the number of agricultural labors actually cultivate the acquired cultivated lands is 30. The summary of project impacts is shown in Table 3-1 and Table 3-2.

Table 3-1 Summary of land acquisition Impacts

Type			No.
Permanent land occupation	Cultivated land (mu)	State-owned	155.9
		Collective	167.4
	Non-Cultivated land (mu)	State-owned	311.9
		Collective	49.2
	Total land occupation (mu)	State-owned	467.8
		Collective	216.6
	Total of land acquisition (mu)		684.4
	Total of affected persons		221
	No. of resettled agricultural laborers ¹ (laborers)		195
Temporary land occupation	No. of actually affected agricultural laborers ²		30
	Cultivated land(mu)	State-owned	5
		Collective	28
	Non-Cultivated land(mu)	State-owned	17.6
		Collective	2.3
	Total land occupation (mu)	State-owned	22.6
		Collective	30.3
	Total of temporary land occupation		52.9
	Total of temporary affected persons		58

Table 3-2 Summary of House demolition Impacts

Type			No.
Total area of affected houses (m ²)	Residential building	Rural	32623
		Urban	4650
		Total	37273
	Shops	Common	6842
		Unlicensed	4070
		Total	10912
	Enterprise and institution building	Business	18312
		Non-business	250
		Total	18562
	Total relocation area		66747
	No. of affected family households		294
	No. of affected persons		1217
	No. of affected Enterprises and institutions		42
	No. of affected shops		19

¹ No. of resettled agricultural labor force is calculated by the formula of land laws

² The actually affected agricultural labors are those labors who are cultivating the acquired lands now.

3-3 Type and amount of land acquisition and impact analysis

The land acquisition is divided into two types: permanent land acquisition and temporary land use. In the total 737.3 mu land acquisition, Most of them (684.4mu) belong to permanent land acquisition, yet still some other lands (52.9 mu) need to be acquired temporarily during the project construction. The amount and detailed types of land acquisition are shown in Table 3-5 and 3-6.

3-3-1 Permanent land acquisition

According to the survey, the total area of permanent land acquisition by the Storm Water Management Project is 684.4mu, in which 323.3mu (47.2%) is cultivated land, 361.1mu (42.8%) is non-cultivated land. The acquired cultivated land includes 111.5mu dry lands, 179.6 mu ponds, 7.3 mu fishponds, 4.5 mu nursery gardens, and 20.4mu orchards. The acquired non-cultivated land includes woodlands 199.7mu, house sites 29.6mu and wastelands 131.8mu.

Considering land ownership, land in China is divided into two types, i.e. urban state-owned land and rural collective-owned land. The affected areas by the Project belong to typical Chinese “village in city”, where part of the land still belong to collective-owned land, yet as they have been urbanized, quite a lot of the land in the affected villages has turned into state-owned land. Thus there are both state-owned land and collective-owned land in the affected areas. The survey result indicates that, in the permanent land acquisition, state-owned land covers 467.8mu, accounting for 68.4%; collective-owned land 216.6mu, accounting for 31.6%. The type and amount of each sub-project and affected village is showed in Table 3-3.

Table 3-3 The amount of Permanent land acquisition

District	Township	Village	Permanent land acquisition (mu)			Affected households	Affected persons	Affected agricultural labors
			Cultivated land	Non-cultivated land	Total			
Hongshan District	Heping Township	State-owned	0	24.1	24.1	0	0	0
		Heping Village	89.8	101.8	101.8	5	34	10
		Tuanjie Village ¹	48.2	67	67	1	6	0
		Yujiatou	5.8	15.2	15.2	1	5	2
	Total		143.8	208.1	208.1	7	45	12

¹ All villagers of Tuanjie Villager have been changed from villager to citizen; the acquired lands are public ponds and dry lands that no labor cultivated now.

District	Township	Village	Permanent land acquisition (mu)			Affected households	Affected persons	Affected agricultural labors
			Cultivated land	Non-cultivated land	Total			
Hanyang District	Jiangdi Township	State-owned	0	2.2	2.2	0	0	0
		Xiangyang Village	23.5	0.5	24	21	89	5
		Qianjin Village	0.1	8.5	8.6	0	0	0
	Total		23.6	11.2	34.8	21	89	5
Dongxihu District	Jinyinhu Ecological Park	Ecological Park	59	65.3	124.3	5	29	6
		No. 2 Jinkou Village	11	0.5	11.5	1	5	1
		No. 13Jinkou Village	7	32.6	39.6	1	6	1
	Development Zone	State-owned	4.6	19.6	24.2	0	0	0
	Golf	State-owned	0	83.4	83.4	0	0	0
	Jiangjun Road	State-owned	32.7	49.6	82.3	0	0	0
		Machi	41.6	15.7	57.3	10	47	5
	Total		155.9	266.7	422.6	17	87	13
Project total			323.3	361.1	684.4	45	221	30

3-3-2 Temporary land use

The temporary land use is mainly caused by the project construction during open channel expansion, partly by storm box culverts construction. The total temporary land acquisition is 52.9 mu, in which 33mu (62.4%) is cultivated land, 19.9 mu (37.6%) is non-cultivated land. 58 persons of 14 households will be affected temporarily by Yangsigang Sub-project. No shop will be affected by temporary land use (Table 3-4). The temporary occupied land is not the income resource for anybody; the main impact is the 14 households' living condition will be affected due to the project construction.

Table 3-4 The types of temporary land use

Sub-project	Cause	Types and amount (mu)	Temporary households and APs	Main impact	Measures taken to reduce the impact
Luojiagang	Temporary land use will be needed for the project construction during channel expansion	1) Ponds 10.5; 2) Dry land 8.6 3) Wood land 1.5 4) Roads 3.4	No households and shops will be affected	The temporary land use is mainly land that nobody cultivates now; it will not impact on the local shops' business or the residents' living and income. The duration of land occupation is less than one year	The PMO provides compensation funds in time according to the adopted compensation standards
Yangsigang	Temporary land use will be needed for the project construction during open channel expansion; Some roads will be temporarily acquired when box culverts are laid under the planned roads.	1) Ponds 8.9; 2) Roads 10	58 persons of 14 households will be temporarily affected by construction. No shops will be affected.	It will impact the local residents' living temporarily, but no shops will be affected and no income loss. The duration of land occupation is about 3 month.	The project owner will consult with local residents and take measures to minimize the impact. If any shop will be seriously affected, the PMO will compensate to them as contingency items.

Sub-project	Cause	Types and amount (mu)	Temporary households and APs	Main impact	Measures taken to reduce the impact
Three Gates Connection	Expanding the existing channel need temporary land use	1) Ponds 3; 2) Dry land 2; 3) Wood land 5	No households and shops will be affected	The temporary land use is mainly land that nobody cultivates now; it will not impact on the local shops' business or the residents' living. The duration of land occupation is less than one year. Nobody's income will be affected.	The PMO provides compensation funds in time according to the adopted compensation standards
Changqing Sub-project		No temporary land use	No persons affected	No impact	No

Table 3-5 Type and amount of land acquisition in sub-projects

Name of subproject	Land ownership	Permanent land acquisition (mu)											Temporary land use (mu)					Total (mu)
		Cultivated land						Non-cultivated land				Total	Cultivated land		Non-cultivated land		Subtotal	
		Dry land	Pond	Fish Pond	Nursery Garden	Orchard	Subtotal	Woodland	House site	Wasteland	Subtotal		Pond	Dry land	Woodland	Road		
Luojiagang	State-owned	0	0	0	0	0	0	5.8	5.2	13.1	24.1	24.1	0	0	1.5	2.1	3.6	27.7
	Collective-owned	49.4	68.9	2.4	4.5	18.6	143.8	0	17.9	22.3	40.2	184.0	10.5	8.6	0	1.3	20.4	204.4
	Total	49.4	68.9	2.4	4.5	18.6	143.8	5.8	23.1	35.4	64.3	208.1	10.5	8.6	1.5	3.4	24	232.1
Yangsigang	State-owned	0	0	0	0	0	0	0	2.2	0	2.2	2.2	0	0	0	9	9	11.2
	Collective-owned	0.1	21.7	0	0	1.8	23.6	0	1.5	7.5	9.0	32.6	8.9	0	0	1	9.9	42.5
	Total	0.1	21.7	0	0	1.8	23.6	0	3.7	7.5	11.2	34.8	8.9	0	0	10	18.9	53.7
Three Gates Connection	State-owned	62	89	4.9	0	0	155.9	175.6	2.2	88.9	266.7	422.6	3	2	5	0	10	432.6
	Collective-owned	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	62	89	4.9	0	0	155.9	175.6	2.2	88.9	266.7	422.6	3	2	5	0	10	432.6
Changqing Pump Station	State-owned	0	0	0	0	0	0	18.3	0.6	0	18.9	18.9	0	0	0	0	0	18.9
	Collective-owned	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	18.3	0.6	0	18.9	18.9	0	0	0	0	0	18.9
Project total land acquisition	State-owned	62	89	4.9	0	0	155.9	199.7	10.2	102	311.9	467.8	3	2	6.5	11.1	22.6	490.4
	Collective-owned	49.5	90.6	2.4	4.5	20.4	167.4	0	19.4	29.8	49.2	216.6	19.4	8.6	0	2.3	30.3	246.9
	Total	111.5	179.6	7.3	4.5	20.4	323.3	199.7	29.6	131.8	361.1	684.4	22.4	10.6	6.5	13.4	52.9	737.3

Table 3-6 Type and amount of land acquisition in affected areas

District	Townshi p	Village	Permanent land acquisition (mu)											Temporary land use (mu)					Total (mu)
			Cultivated land						Non-cultivated land				Total	Cultivated land		Non-cultivated land		Subtotal	
			Dry land	Pond	Fish Pon d	Nurser y Garden	Orchar d	Subtota l	Woodlan d	Hous e site	Wastela nd	Subtota l		Pond	Dry lan d	Woodla nd	Road		
Hongsh an District	Heping Townshi p	State-ow ned	0	0	0	0	0	0	5.8	5.2	13.1	24.1	24.1	0	0	1.5	2.1	3.6	27.7
		Heping Village	34.8	31.8	2.4	2.2	18.6	89.8	0	9.7	2.3	12	101.8	2.3	6.5	0	1.3	10.1	111.9
		Tuanjie Village	10.5	36.2	0	1.5	0	48.2	0	6.5	12.3	18.8	67	8.2	2.1	0	0	10.3	77.3
		Yujiatou	4.1	0.9	0	0.8	0	5.8	0	1.7	7.7	9.4	15.2	0	0	0	0	0	15.2
	Total		49.4	68.9	2.4	4.5	18.6	143.8	5.8	23.1	35.4	64.3	208.1	10.5	8.6	1.5	3.4	24	232.1
Hanyan g District	Jiangdi Townshi p	State-ow ned	0	0	0	0	0	0	0	2.2	0	2.2	2.2	0	0	0	10	10	12.2
		Xiangyan g Village	0	21.7	0	0	1.8	23.5	0	0	0.5	0.5	24	8.9	0	0	0	8.9	32.9
		Qianjin Village	0.1	0	0	0	0	0.1	0	1.5	7	8.5	8.6	0	0	0	0	0	8.6
	Total		0.1	21.7	0	0	1.8	23.6	0	3.7	7.5	11.2	34.8	8.9	0	0	10	18.9	53.7
Dongxih u District	Jinyinhu Ecologic al Park	Ecologica l Park	33	21.1	4.9	0	0	59	29.4	0	35.9	65.3	124.3	2	1	2	0	5	129.3
		No. 2 Jinkou Village	11	0	0	0	0	11	0	0.5	0	0.5	11.5	0	0	0	0	0	11.5
		No. 13Jinkou Village	7	0	0	0	0	7	32.6	0	0	32.6	39.6	0	0	0	0	0	39.6
	Develop ment Zone	State-ow ned	2.6	2	0	0	0	4.6	6.4	0	13.2	19.6	24.2	0	0	0	0	0	24.2
	Golf	State-ow ned	0	0	0	0	0	0	83.4	0	0	83.4	83.4	0	0	0	0	0	83.4
	Jiangjun Road	State-ow ned	2.4	30.3	0	0	0	32.7	12.4	0.4	36.8	49.6	82.3	0	0	1	0	1	83.3
		Machi	6	35.6	0	0	0	41.6	11.4	1.3	3	15.7	57.3	1	1	2	0	4	61.3
	Total		62	89	4.9	0	0	155.9	175.6	2.2	88.9	266.7	422.6	3	2	5	0	10	432.6
Project total		111. 5	179. 6	7.3	4.5	20.4	323.3	199.7	29	131.8	361.1	684.4	22.4	10. 6	6.5	13.4	52.9	737.3	

3-3-3 Impacts Degree Analysis

The affected Hongshan District and Hanyang District belong to “villages in city”. Most of land in these villages has been converted into non-agricultural land in 2003; most agriculture laborers is now working in non-agricultural activities, their income have mainly depended on non-agricultural income (Table 3-7). In recent years, similar trend of cultivated land converting to non-agricultural and farmers’ moving into non-agricultural sectors has been accelerated in the affected villages. The impact analysis shows that the land acquisition has slight impact on the villages’ income (Table 3-7 and Table 3-8).

Table 3-7 the income resources of the affected villages and the impact by land acquisition

The affected Villages	The income level and its resource of the APs in 2004					The income loss by land acquisition (CNY 10,000)	The impact rate (%)
	Agricultural sector		No agricultural sectors		Total income (CNY10, 000)		
	Amount (CNY10 000)	Percentage (%)	Amount (CNY10, 000)	Percentage (%)			
Heping	96.5	10	868.3	90	964.8	47	4.9
Tuanjie	29.8	6	466.2	94	496	15	3.0
Yujiatou	54.1	8	622.4	92	676.5	5	0.7
Xiangyang	89.3	15	505.8	85	595.1	1	0.2
Qianjin	28.5	12	209.1	88	237.6	0.5	0.2
Ecological Park	338.4	20	1353.6	80	1692	28	1.6
Machi	82.5	19	352	81	434.5	6	1.3
Total	719.1	14	4377.4	86	5096.5	102.5	2.0

Table 3-8 Impact rates of affected villages or farms

Affected villages or institutions	Heping Village	Tuanjie Community	Yujiatou Village	Xiangyang Village	Qianjin Village	Ecological Park	Machi Community
Total population (person)	2144	800	1109	1566	432	4700	1278
Cultivated land before acquisition (mu)	814	780	225	650	26	2600	495
Acquired cultivated land (mu)	89.8	48.2	5.8	23.5	0.1	77	41.6
Impact rates of cultivated land acquisition (%)	11	6.2	2.6	3.6	0	3	8.4
No. of resettled agricultural labors calculated by the formula in laws.	72	0	14	30	0	59	20
No. of agricultural labors actually cultivate the acquired cultivated lands	10	0	2	5	0	8	5

Many acquired land belongs to collective ponds or dry land, so the impact rate on households is also slighter than that of the whole village. For example, the Luojiagang Subproject is to expand the existing channels, the acquired land in Heping Village, Tuanjie Village and Yujiatou Village is defined as collective ponds or dry land, which is not being used for plantation and aquiculture purposes; the land impact rate on the households is below 5%, which is very slightly. The number of affected households in Xiangyang Village (21 households) is the largest among the affected villages, but most of them are impacted slightly (Table 3-9). One household in Jingyinhu Ecological Park and another household in Machi are comparatively more heavily impacted (the impact rate is 10%~20%), while the acquired land belongs to state-owned land, and all affected farmers are the formal employees of the state-owned farm, when the cultivated-land is acquired, the state-owned farm will provide new jobs for the affected employees, their salaries are same as before.

Table 3-9 the impact degree on affected households

The affected Villages	Annual Net Income per person (CNY/YEAR)	The number of affected households	The impact rates				
			Above 30%	20%-30%	10%-20%	5%-10%	Below 5%
Heping	4500	5	0	0	0	0	5
Tuanjie	6200	1	0	0	0	0	1
Yujiatou	6100	1	0	0	0	0	1
Xiangyang	3800	21	0	0	0	3	18
Qianjin	5500	0	0	0	0	0	0
Ecological Park	3600	7	0	0	1	2	5
Machi	3400	10	0	0	1	3	6
Total		45	0	0	2	8	35

3-4 Type, structure and area of relocated buildings

The type and area of relocated buildings in the Storm Water Management Component are showed in Table 3-10.

Table 3-10 Type and area of relocated buildings in sub-projects

Project	Building use	Ownership	Location rank	Building structure and area (m ²)				
				Steel-concrete	Brick-concrete	Brick-wood	Simple	Total
Luojiagang	Shops	Licensed	Second	60	6,615	0	0	6,675
		Unlicensed	Second	0	1,130	2,660	280	4,070
	Enterprises and institutions	Licensed	Second	200	14,057	1,100	0	15,357
		Unlicensed	Second	0	0	250	0	250

Project	Building use		Ownership	Location rank	Building structure and area (m ²)				
					Steel-concrete	Brick-concrete	Brick-wood	Simple	Total
	Residences	Rural	Licensed	Second	0	21,123	1,430	0	22,553
			Unlicensed	Second	0	0	580	2,605	3,185
		Urban	Licensed	Second	0	2,550	0	0	2,550
			Unlicensed	Second	0	0	0	0	0
	Total				260	45,475	6,020	2,885	54,640
Yangsigang	Shops		Licensed	First rank	167	0	0	0	167
	Enterprises and institutions		Licensed	First rank	0	2,230	0	0	2,230
	Residences	Rural	Licensed	First rank	0	5,378	0	0	5,378
			Unlicensed	First rank	0	0	112	0	112
		Urban	Licensed	First rank	0	0	0	0	0
			Unlicensed	First rank	0	0	0	600	600
	Total				167	7,608	112	600	8,487
Three Gates Connection	Residences	Rural	Licensed	Suburban	0	1311	84	0	1395
		Urban	Licensed	Suburban	0	0	0	0	0
	Enterprises and institutions		Licensed	Suburban	325.65	399.2	0	0	724.85
	Total				325.65	1,710.2	84	0	2,119.85
Changqing Pump Station	Residences	Urban	Licensed	Suburban	0	1,500	0	0	1,500
	Total				0	1,500	0	0	1,500
Total	Shops		Licensed		227	6,615	0	0	6,842
			Unlicensed		0	1,130	2,660	280	4,070
	Enterprises and institutions		Licensed		525.65	166,86.2	1100	0	18,311.8
			Unlicensed		0	0	250	0	250
	Residences	Rural	Licensed		0	27,812	1,514	0	29,326
			Unlicensed		0	0	692	2,605	3,297
		Urban	Licensed		0	4,050	0	0	4,050
			Unlicensed		0	0	0	600	600
	Total				752.65	56,293.2	6,216	3,485	66,746.8

Total area of relocated buildings in Storm Water Management Project is 66746.85m². In relocated buildings, 54,640m² or 81.9% of the total relocation belong to the Luojiagang Sub-project; 8,487m², 12.7% of the total belongs to the Yangsigang Sub-project; 2,119.85m², 3.2% belong to the Three Gates Connection Sub-project; and 1,500m², 2.2% belong to the Changqing Pump Station Sub-project.

In relocated buildings, steel-concrete buildings cover an area of 752.65m², occupying 1.1% of the total relocation; brick-concrete buildings 56,293.2m², 84.3% of the total; brick-wood buildings 6,216m², 9.4%; simple houses 3,485m², 5.2% (Table 3-10).

The relocation involves 3 districts, 54,640m² or 81.9% of the total relocation belong to Hongshan District; 8,487m² or 12.7% belong to Hanyang District; the remaining 3,619.85m², 5.4% belong to Dongxihu District (Table 3-11).

Table 3-11 Type and area of relocated buildings in affected areas

District	Township	Village	Location rank	Building structure (m ²)				Total (m ²)
				Steel concrete	Brick and concrete	Brick and wood	Simple	

Hongshan District	Heping Township	Enterprises and institutions	Second rank	60	4,710	1,100	0	5,870
		Tuanjie Village	Second rank	0	15,545	2,660	250	18,455
		Heping Village	Second rank	0	17,120	2010	2,215	21,345
		Yujiatou Village	Second rank	200	4,930	250	420	5,800
		Chailin Village	Second rank	0	3170	0	0	3170
		Total	Second rank	260	45,475	6,020	2,885	54,640
Hanyang District	Jiangdi Township	Qianjin Village	First rank	167	7,608	112	0	7,887
	Hanyang Port Company		First rank	0	0	0	600	600
	Total		First rank	167	7,608	112	600	8,487
Dongxihu District	Ecological Park	No.2 Jinkou Village	Suburban district	0	220	0	0	220
	Jiangjun Road	Machi Neighborhood Committee	Suburban district	0	1,091	84	0	1,175
	Jinyinhu Power Station		Suburban district	325.65	399.2	0	0	724.85
	Changqing Pump Station		Suburban district	0	1,500	0	0	1,500
	Total		Suburban	325.65	3,210.2	84	0	3,619.85
Project total				752.65	56,293.2	6,216	3,485	66,746.85

According to the use of building, the relocated buildings in the Project are divided into three types, namely shops, enterprises and institutions, and residences. The following is the analysis of the Project impacts on the three types of buildings.

3-4-1 Type and area of relocated residence houses

According to the nature of the house site property, the relocated residences houses in the project are divided into rural residence and urban residence. The relocated rural residence houses cover 32,623 m², and 1036 persons of 247 households are affected, the relocated urban residence houses cover 4,650 m² and 181 persons of 47 households are affected. The structure and type of residence houses relocated in the Project are listed in Table 3-12.

Table 3-12 Type and area of relocated residence houses

Project	Building type	Ownership	Location rank	Building structure and area (m ²)					Affected	
				Steel-concrete	Brick-concrete	Brick-wood	Simple houses	Total	Household	Persons
Luojiagang	Rural	Licensed	Second rank	0	21,123	1,430	0	22,553	218	914
		Unlicensed	Second rank	0	0	580	2,605	3,185		
	Urban	Licensed	Second rank	0	2,550	0	0	2,550	18	78
		Unlicensed	Second rank	0	0	0	0	0		

Project	Buildin g type	Ownership	Location rank	Building structure and area (m ²)					Affected	
				Steel- concrete	Brick- concrete	Brick- wood	Simple houses	Total	Household	Persons
	Total			0	23,673	2,010	2,605	28,288	236	992
Yangsigang	Rural	Licensed	First rank	0	5,378	0	0	5,378	17	86
		Unlicensed	First rank	0	0	112	0	112		
	Urban	Licensed	First rank	0	0	0	0	0	5	23
		Unlicensed	First rank	0	0	0	600	600		
	Total			0	5,378	112	600	6,090	23	109
Three Gates Connection	Rural	Licensed	Suburba n district	0	1,311	84	0	1,395	11	36
	Urban	Licensed	Suburba n district	0	0	0	0	0	0	0
	Total			0	1,311	84	0	1,395	11	36
Changqing Pump Station	Urban	Licensed	Suburba n district	0	1,500	0	0	1,500	24	80
	Rural	Licensed	Suburba n district	0	0	0	0	0	0	0
	Total			0	1,500	0	0	1,500	24	80
Summary of relocated residence	Rural	Licensed		0	27,812	1,514	0	29,326	247	1036
		Unlicensed		0	0	692	2,605	3,297		
	Urban	Licensed		0	4,050	0	0	4,050	47	181
		Unlicensed		0	0	0	600	600		
	Total			0	31,864	2,206	3,205	37,273	294	1217

3-4-2 Affected shops

19 shops are affected by the Project, in which 13 are common shops and 6 are unlicensed shops. These unlicensed shops include shops without legal business licenses, or shops whose business places located in the unlicensed buildings or the expired temporary buildings. The Project survey indicates that shops with a total area of 10,192 m² are relocated, in which 6,842m² (67.1%) are common shops and 4,070m² (32.9%) are unlicensed shops. These shops are mainly concentrated in the areas affected by the Luojiagang Sub-project. For the status of the affected shops, see Table 3-13.

Table 3-13 Area of relocated shops of different types

Serial number	Shop name	Shop	Building structure type and area (m ²)				Total (m ²)
			Steel-concrete	Brick-concrete	Brick-wood	Simple	
1	Guihua Decoration Company	Common	60	250	0	0	310
2	China Unicom Xudong Road Business Hall	Common	0	300	0	0	300
3	Emperor International Decoration Company	Common	0	200	0	0	200
4	Smoke and Wine Shop	Common	0	45	0	0	45
5	Tieji Materials Company	Common	0	890	0	0	890

Serial number	Shop name	Shop	Building structure type and area (m ²)				Total (m ²)
			Steel-concrete	Brick-concrete	Brick-wood	Simple	
6	Tuanjie Trading Group	Common	0	1,500	0	0	1,500
7	Mercury Composite Materials Company	Common	0	600	0	0	600
8	Xinglong Hostel	Common	0	780	0	0	780
9	Heping Village Subsidiary Food Store	Common	0	400	0	0	400
10	Zhongxing Company of Xinhui Group	Common	0	650	0	0	650
11	Wuhan Xinhui Discarded Automobile Company	Common	0	700	0	0	700
12	Wangda Industrial Co., Ltd.	Common	0	300	0	0	300
13	Qianjin Swimming Recreation Center	Common	167	0	0	0	167
Total areas of the affected common shops (1-13)		Common	227	6,615	0	0	6,842
14	Junk Market of Tieji Materials Company	Unlicensed	0	700	150	0	850
15	Yujiatou Village Store	Unlicensed	0	150	0	0	150
16	Bean Curd Workshop	Unlicensed	0	0	110	0	110
17	Heping Village Grocery Store	Unlicensed	0	280	0	0	280
18	Tieji Bamboo and Wood Market	Unlicensed	0	0	2,400	0	2,400
19	Zhenhua Guangda Trading Co., Ltd.	Unlicensed	0	0	0	280	280
Total areas of the affected unlicensed (14-19)		Unlicensed	0	1,130	2,660	280	4,070
Total shop relocation (1-19)			227	7,745	2,660	280	10,912

3-4-3 Affected enterprises and institutions

According to the survey, there are 42 enterprises and institutions affected by the Storm Water Management Component, but only 29 enterprises or institutions need relocation, the total relocated floor area is 18,561.85m², in which 18,311.85 m² belong to productive buildings and 250 m² belong to non-productive buildings. The types and areas of each relocated enterprise and institution buildings are showed in Table 3-14. These enterprises are mainly furniture factories in the areas affected by the Luojiagang Sub-project, most of which are small private enterprises with poor equipment and dilapidated factory buildings. Only Jinyinhu Power Station in Dongxihu District will be wholly relocated in large scale.

Table 3-14 Type and area of affected enterprises and institutions buildings

Number	Name of enterprises and institutions	Type	Building structure and area (m ²)				Total (m ²)
			Steel-concrete	Brick-concrete	Brick-wood	Simple	
1	Hongsheng Plastic Steel Doors and Windows Factory	Licensed	0	250	0	0	250
2	Hongda Academy Furniture Factory	Licensed	0	1,100	0	0	1,100
3	Wuchang Taide Hardware	Licensed	0	0	1100	0	1,100

Number	Name of enterprises and institutions	Type	Building structure and area (m ²)				Total (m ²)
			Steel-concrete	Brick-concrete	Brick-wood	Simple	
	Factory						
4	Oasis Nail Factory	Licensed	0	550	0	0	550
5	Zhipeng Furniture Factory	Licensed	0	400	0	0	400
6	Yonghua Furniture Factory	Licensed	0	400	0	0	400
7	Wuhan Aijia Real Estate Company	Licensed	0	460	0	0	460
8	Provincial 1st Construction Company	Licensed	0	750	0	0	750
9	Zhenxing Furniture Factory	Licensed	0	500	0	0	500
10	Yonghua Timber Mill	Licensed	0	400	0	0	400
11	Wanyu Furniture Factory	Licensed	0	450	0	0	450
12	Yujiatou Sofa Accessories Factory	Licensed	0	200	0	0	200
13	Wuhan Huitao Commercial Concrete Co., Ltd.	Licensed	0	400	0	0	400
14	Wuhan Yulong Concrete Co., Ltd.	Licensed	0	320	0	0	320
15	Brothers Paint Factory	Licensed	0	480	0	0	480
16	Wuhan Jingang Furniture Co., Ltd.	Licensed	0	2,000	0	0	2,000
17	Tieji Group	Licensed	0	877	0	0	877
18	Yujiatou Police Service Office	Licensed	0	500	0	0	500
19	Luoja Road Drainage Station	Licensed	0	900	0	0	900
20	Tiansheng Furniture Factory	Licensed	0	800	0	0	800
21	Shishui Timber Processing Mill	Licensed	0	120	0	0	120
22	Hongshan Lianxing Wooden Chair Factory	Licensed	200	100	0	0	300
23	Wuchang Brothers Furniture Factory	Licensed	0	300	0	0	300
24	Xingda Furniture Factory	Licensed	0	300	0	0	300
25	Jinxin Furniture Manufacturing Co. Ltd	Licensed	0	1500	0	0	1500
26	Shangtaizi Storehouse	Unlicensed	0	0	250	0	250
27	Qianjin Group	Licensed	0	2,000	0	0	2,000
28	Qianjin Village Salon Art Kindergarten	Licensed	0	230	0	0	230
29	Jinyinhu Power Station	Licensed	325.65	399.2	0	0	724.85
Relocated enterprises and institutions buildings		Licensed	525.65	16,686.2	1100	0	18,311.85
		Unlicensed	0	0	250	0	250
		Total	525.65	16,686.2	1350	0	18,561.85

3-5 Affected infrastructures and attachments

The Storm Water Management Component mainly widens the existing channels and expands pump stations, most of the affected areas located far away from busiest section of streets; so few infrastructures are affected by the Project. The types and numbers of the affected infrastructures and attachments are shown in Table 3-15.

Table 3-15 the affected infrastructures and attachments to the ground

Sub-project	Terrace (m ²)	Macadam (m ²)	No. of wells	Enclosing Wall (m)	No. of tombs	No. of trees	No. of fruit trees	Phone (set)	Air conditioner (set)	Electric meter (set)
Luojiagang	5633	6000	6	1644	2	837	729	25	21	22
	713	0	0	0	0	0	0	30	26	30
	820	0	1	0	0	5000	0	12	11	10
Yangsigang	450	4000	0	350	2	32	21	17	14	13
Three Gates Connection	0	0	0	500	0	42	0	0	0	0
	0	0	0	300	0	54	0	0	0	0
	0	0	0	0	0	320	0	0	0	0
	3000	6000	3	500	0	6000	200	23	9	23
	2000	0	1	150	0	100	0	4	4	6
Changqing Pump Station	60	0	0	0	0	32	0	24	24	24
Total	12676	16000	11	3444	4	12417	950	175	108	128

3-6 Affected persons and their socioeconomic status

The Storm Water Management Component involves 3 districts, 5 townships (or street administrative offices) and 10 villages (or neighborhood committees). There are 1,438 persons of 339 families affected by the Project, involving 900 persons (129 families) with household registrations and 538 floating population (119 families). There are also 19 shops (81 persons) and 42 enterprises and institutions (241 persons) are affected (see Table 3-16). Most of the affected floating populations are tenants of the relocated buildings; the affected floating population and tenants mainly live in Hongshan District and Hanyang District. Since Dongxihu District is a suburban district with few relocated residences, there is no floating population and tenants affected by the Project.

Table 3-16 Numbers of the affected persons

Sub-project	Affected Families				Affected shops		Affected enterprises or institutions		Total	
	Registered population		Floating population		No. of Shops	Persons	No. of enterprises or institutions	Persons	No. of units	Persons
	Households	Persons	Households	Persons						
Luojiagang	129	522	114	515	18	73	36	208	297	1318

Sub-project	Affected Families				Affected shops		Affected enterprises or institutions		Total	
	Registered population		Floating population		No. of Shops	Persons	No. of enterprises or institutions	Persons	No. of units	Persons
	Households	Persons	Households	Persons						
Yangsigang	38	175	5	23	1	8	2	10	46	216
Three Gates Connection	29	123	0	0	0	0	2	8	31	131
Changqing Pump Station	24	80	0	0	0	0	2	15	26	95
Total	220	900	119	538	19	81	42	241	400	1760

The Resettlement Research Center of Wuhan University had conduct socioeconomic survey on the APs and their families of the key affected villages. According to survey, 51% of the APs are male, 49% are female. Considering education level, 13.2% of the APs are illiterate and semi-illiterate, 32.1% are elementary school, 52.3% middle school, and 2.4% college or above. The result of survey indicated that most of the agricultural labors have been employed in non-agricultural sectors. In these affected villages, Tuanjie Village, Yujiatou Village of Hongshan District and Qianjin Village of Hanyang District are considerably wealthy "villages in city"; their income is some high in China. The APs' socioeconomic conditions in each affected villages are shown in Table 3-17.

Table 3-17 Socioeconomic Conditions of the APs

Affected Village	Ratio of sex (%)		Education level (%)				Status of employment (%)		Annual income per capita (CNY)
	Male	Female	Illiterate	Elementary	Middle school	College and above	Agricultural sector	Non-agricultural sector	
Heping	48	52	12.5	34.5	50.1	2.9	40.8	59.2	4500
Tuanjie	53	47	10.6	31.4	54.3	3.7	31.6	68.4	6200
Yujiatou	47.8	52.2	13.2	33.2	51.1	2.5	35.8	64.2	6100
Xiangyan	51	49	15.5	34.5	48.7	1.3	41	59	3800
Qianjin	52.5	47.5	14.2	27.4	55.9	2.5	17.8	82.2	5500
Jinyinhu Ecological Park	51	49	12.4	28.9	56.9	1.8	55	45	3600
Machi Neiborhood Committee	48	52	15.8	30.2	52.8	1.2	74	26	3400
All APs	51	49	13.2	32.1	52.3	2.4	37	63	5200

3-7 Affected vulnerable groups

3-7-1 Definition of the vulnerable groups

The vulnerable groups refer to groups of persons affected by the Project, who are vulnerable and cannot adapt to changes arising out of project construction. Vulnerable groups mainly include the following types:

- Lonely old people: mainly single old people over 65 years old without legal obligor of support
- Single parent family: family with single householder and underage child (children).
- Orphan: child under 16 years old without parents.
- Poor family: urban family whose members' average monthly income is below CNY 210; town family whose members' average monthly income is below CNY 158 (the above mentioned families should be with a *Certificate of Guarantee of Subsistence Allowances for Urban Residents in Wuhan*); rural family whose members' average yearly income is below CNY 800 (with a *Certificate of Guarantee of Subsistence Allowances for Rural Residents* and relevant certificates in districts).
- Disabled person: The person whose certain organ or function has been lost or whose ability to participate in certain activities in normal manners has been lost completely or partly (with a *Certificate of Disabled of People's Republic of China*)

The definition of the vulnerable groups is based on the requirements of relevant policies, laws and legislations, the field survey as well as the monitoring and visits in relevant relocation work of this city. During the project implementation, the Resettlement Office will have it confirmed by household survey, neighborhood visit, verification of community neighborhood committee and claiming evidence by letter, etc.

3-7-2 Affected families of the vulnerable groups

The survey indicates that in affected persons, 2 families of altogether 7 persons belong to the vulnerable groups; this number is provided by the head of the affected village, during the project resettlement implementation, the PRO will definite the vulnerable groups again according to the adopted rules above, the amount of the affected vulnerable groups' families maybe add. Table 3-18 is the list of the affected vulnerable groups collected from the survey.

Table 3-18 Affected families of the vulnerable groups

Sub-project	Village	Name of householder	Family population	Cause of being vulnerable groups
Luojiagang	Heping Village	Li Guisheng	6	Poor family
	Tuanjie Village	Chen Bingfu	1	Lonely and old people

3-8 Gender impact assessment

In Wuhan, women have landownership and property rights same as man, when the women are divorced or widowed, they still have the right to obtain land or land compensation, with the development, the gender inequity in these affected areas is decreasing. For example, the female education levels of the affected villages have improved considerably during the recently 20 years, the girls' primary enrollment rates are rising faster than boys' enrollment rates and substantially reducing gender gaps in schooling. According to the socioeconomic survey, in 2004, the gross enrollment rates for females in the affected villages have reached 100 percent. The women's labor market position has also been improved, women's labor force participation has risen and the female share of non-agricultural employment has also increased. However, Gender differences in education, work experience, and job characteristics still existed in these affected villages and large gender gaps in earnings persist. In 2004, female employees just earn about 70% of what men earn according to the survey.

In the 1438 affected persons, 705 affected persons (49%) are female persons, The land acquisition has no direct negative influence on women in the short term, but in the long term, land acquisition tends to change the product model and life style, it is an unavoidable trend that the share of non- agricultural employment will increase, more and more labors will move from agricultural sector to non-agricultural sectors. Being less mobile than men, women's universe is more restricted. Hence, they have limited ability to cope with and adjust to new situations and environments. Especially women remain underrepresented in higher paying jobs, including administrative and managerial jobs. The local government and the PMO noted that it is a challenge for women. Strengthening the women's ability and skill in non-agricultural production is also the important task for all resettlement organizations.

4 Laws, Regulations and Policies

The resettlement work in the Strom Water Management Component will be implemented in strict compliance with relevant laws, legislations and policies of the districts where the project is located, of Hubei Province and of People's Republic of China, as well as in complete accordance with ADB principles and policies of involuntary resettlement during the planning and implementation of resettlement work.

4-1 Major relevant laws, regulations and policies

4-1-1 State laws and regulations

The legal basis of *Resettlement Plan* refers to relevant laws and regulations promulgated and implemented by the Wuhan Municipal Government, Hubei Provincial Government and the Central Government of People's Republic of China.

1. The state-level regulations mainly include:

- (1) *Land Administration Law of the People's Republic of China* (revised in August 28, 2004)
- (2) *Regulations on the Implementation of the Land Administration Law of the People's Republic of China* (December 27, 1998)
- (3) *Administrative Regulations on Urban House Demolition and Relocation* (June 11, 2001)
- (4) *Decision of the State Council on Deepening the Reform on Strict Management to Land* (October 21, 2004)

2. Regulations at ministerial level and Hubei provincial level mainly include:

- (1) *Implementation Measures of Hubei Province on Land Administration* (March 22, 1999)
- (2) *Guiding Opinions of Ministry of Construction on the Assessment of Urban Housing Relocation* (December 1, 2003)
- (3) *Guiding Opinions of Ministry of Land and Resources on Perfection of the Land Acquisition Compensation System* (November 3, 2004)
- (4) *Circular of the People's Government of Hubei Province on Further Strengthening Land Acquisition Management in Order to Virtually Protect Lawful Rights and Interests of Farmers*

Whose Land Has Been Acquired (February 27, 2005)

3. Regulations issued by Wuhan Municipality mainly include:

(1) *Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collective-owned Land* (February 1, 2004)

(2) *Administrative Measures of Wuhan Municipality on Urban House Demolition and Relocation* (March 1, 2002)

(3) *Administrative Measures of Wuhan Municipality on Collective-owned Land Demolition and Relocation* (December 22, 2003)

(4) *Administrative Measures of Wuhan Municipality on City Planning* (July 3, 1991)

(5) *Opinions of Wuhan Municipal Committee of CPC and the People's Government of Wuhan Municipality on Actively Promoting the Comprehensive Reconstruction of "Villages in City"* (September 10, 2004)

4-1-2 ADB Policies on involuntary resettlement

The objectives of the ADB policy of OMF2 are (i) avoid involuntary resettlement wherever feasible; and (ii) minimize resettlement where population displacement is unavoidable, and ensure that displaced people receive assistance, preferably under the project, so that they would be at least as well-off as they would have been in the absence of the project.

For any project that requires relocating people, resettlement should be an integral part of project design and should be dealt with from the earliest stages of the project cycle, taking into account the following basic principles:

- i. Involuntary resettlement should be avoided where feasible.
- ii. Where population displacement is unavoidable, it should be minimized by exploring all viable project options.
- iii. If individuals or a community must lose their land, means of livelihood, social support systems, or way of life in order that a project might proceed, they should be compensated and assisted so that their economic and social future will generally be at least as favorable with the project as without it. Appropriate land, housing, infrastructure, and other compensation, comparable to the without project situation, should be provided to the adversely affected population, including indigenous groups, ethnic minorities who may have usufruct or customary rights to the land or other resources taken for the project.
- iv. Any involuntary resettlement should, as far as possible, be conceived and executed as a part of a development project or program and resettlement plans should be prepared with

appropriate time bound actions and budgets. Resettlers should be provided sufficient resources and opportunities to reestablish their homes and livelihoods as soon as possible.

v. The affected people should be fully informed and closely consulted on resettlement and compensation options. Where adversely affected people are particularly vulnerable, resettlement and compensation decisions should be preceded by a social preparation phase to build up the capacity of the vulnerable people to deal with the issues.

vi. Appropriate patterns of social organization should be promoted, and existing social and cultural institutions of resettlers and their hosts should be supported and used to the greatest extent possible. Resettlers should be integrated economically and socially into host communities so that adverse impacts on host communities are minimized. One of the effective ways of achieving this integration may be by extending development benefits to host communities.

vii. The absence of formal legal title to land by some affected groups should not be a bar to compensation. Affected persons entitled to compensation and rehabilitation should be identified and recorded as early as possible, preferably at the project identification stage, in order to prevent an influx of illegal encroachers, squatters, and other nonresidents who wish to take advantage of such benefits. Particular attention should be paid to the needs of the poorest affected persons including those without legal title to assets, female-headed households and other vulnerable groups, such as indigenous peoples, and appropriate assistance provided to help them improve their status.

viii. The full costs of resettlement and compensation, including the costs of social preparation and livelihood programs as well as the incremental benefits over the "without project" situation, should be included in the presentation of project costs and benefits.

ix. To better assure timely availability of required resources and to ensure compliance with involuntary resettlement procedures during implementation, eligible costs of resettlement and compensation may be considered for inclusion in Bank loan financing for the project, if requested.

4-2 Adopted resettlement policies

Although there are some small differences on regulations between resettlement policy of ADB and domestic laws, the principle to secure the legal rights and interests of the APs, restore their production and living conditions, restore and increase incomes of displaced

persons as soon as possible is the same. Especially since the promulgation of *Decision on Deepening the Reform on Strict Management to Land* (Document 28) by the State Council in 2004, the government further enhanced the protection of the legal rights and interests of farmers whose land is acquired from the aspects of land acquisition compensation rates, resettlement approaches, the process and supervision of land acquisition, etc. The resettlement principles of this project are compiled in conformity with relevant state and local laws and policies and especially on the basis of implementing the latest policies such as Document 28 of the State Council and so on. The main principles chosen according to Document 28 are listed in Table 4-1. The main policies adopted in the implementation of this Project are as follows.

4-2-1 Compensation policy for permanent acquisition of rural collective land

According to current laws of Wuhan, compensation rate for rural collective land shall be decided equivalent to the average annual production output value of the land in the previous three years. This is too low not only for the land compensation, but also makes a big gap between the compensation rates of adjacent land, which cannot compensate the actual value of the land. The project makes the consolidated compensation rates in accordance with land, output value, land location, agricultural land grade, cultivated land per capita, land supply and demand relations, local economic development level and other factors. Compensation Standards (AAOV) for land acquisition of each sub-projects are as follows: Hongshan District (Luojiagang Sub-project) CNY 6416; Hangyang District (Yangsigang Sub-project) CNY 5,890; Dongxihu District (Three Gates Connections and Changqing Pump Station Sub-project) CNY 4,895.

According to *Compensation and Resettlement Methods for Rural Collective-owned Land of Wuhan City*, compensation rates for land acquisition are calculated on the basis of the following standards: compensation for cultivated land shall be paid equivalent to ten times of the compensation base; compensation for garden plot, forest land and other agricultural land, six times of the compensation base; compensation for construction land and unexploited land, six times of the compensation base. The resettlement subsidy standards of the project shall be calculated on the basis as follows: compensation for cultivated land, such as paddy field, dry land, nursery, orchard and etc shall be paid equivalent to fifteen times of the compensation base; compensation for fish pound and forest land, nine times of the compensation base; compensation for pond eight times of the compensation base; for wasteland and house sites,

no resettlement subsidy. The compensation rates for land acquisition of each sub-project are showed in Chapter 5.

The value of land located in the urbanized areas (such as “village in city” areas) no long depends on their agricultural output, but mainly depends on the commercial value of their location, so it is not reasonable to compensate this type of rural land acquisition according to the standard of wasteland. The PMO agrees that the land without output located in urbanized areas (mainly located in “village in city” areas) affected by the Project will be compensated according to the standard of the cultivated land.

4-2-2 Compensation policy for temporary acquisition of rural collective land

Compensation for temporary acquisition of collective land shall be paid according to the following standards: (1) households to be affected by temporary land loss consulted and informed (2) compensation for temporary cultivated land will be calculated by combining land-use years with land compensation base. Compensation for temporary land-use within one year will be calculated according to two years; compensation for temporary land-use above one year (including one year) will be calculated according to three years; (3) compensation for temporary land-use of other yields will be paid according to the standard of adjacent cultivated land; (4) compensation for young crops and attachments to the ground within the temporary land-use area will be paid according to actual loss to all persons.

4-2-3 Compensation policy for state-owned agricultural land

There are two kinds of state-owned land involved in the Storm Water Management component land acquisition: one is the state-owned agricultural land, which consists of mainly state-owned farm land; the other is state-owned construction land, which consists of public roads, state-owned land occupied by private entity. According to the regulations of *Compensation and Resettlement Methods for Rural Collective-owned Land of Wuhan City* and Document No. 450 of *Explanation on Compensation and Resettlement Issues of Using State-owned Agricultural Land for Non-Agricultural Construction Purpose* issued by Wuhan Land Resources Bureau in 2004, compensation rates for state-owned agricultural land, resettlement subsidy standards, young crops and attachments to the ground are executed according to the compensation rates for land acquisition standards of collective-owned land. The compensation price for acquired state-owned construction land of the project shall be assessed by special organization with land-price evaluation qualification, and the compensation rate shall be executed in accordance with the evaluation price recognized by

the two parties.

4-2-4 Compensation policy for relocation of rural residential houses

Compensation prices of Wuhan rural relocation houses are decided mainly by the following two factors: one is the house structure, area and purpose; the other is the house location and region. Thus, compensation for house relocation will include the replacement cost and location price of the buildings. According to the local regulations of Wuhan, the replacement cost of the project for rural houses are: steel concrete structure CNY 830 /m²; brick masonry structure CNY 570 /m²; brick wooden structure CNY 420 /m²; simple structure house CNY 340 /m².

Location compensation prices of Wuhan rural relocation houses are divided into three categories according to the stipulated road rings of Wuhan urban overall planning: the first category is the region within the 2nd ring road (including the 2nd ring road), compensation price for this region is CNY 2,280 /m²; the 2nd category is within the region between the 2nd ring road and the 3rd ring road (mid-ring line), the compensation price for this region is CNY 1,920 /m²; the 3rd region is outside the 3rd ring road (mid-ring line), compensation price for this region is CNY 1,500 /m².

4-2-5 Compensation policy for relocation of urban residential house

According to the relevant *Regulations on Administration of Urban House Dismantling and Relocation, Implementation Measures of Urban House Dismantling and Relocation of Wuhan* and *Guidance for Assessment of Urban House Dismantling and Relocation*, the market price of real estate of urban house dismantling and relocation will be evaluated according to the relocated house region, purpose, building area and etc. The confirmation of structure category, floor area and purpose of the relative house will be confirmed by the PRO together with relevant departments and relocated household on the spot prior to the relocation; for the location price of every house, the relocated household will choose an evaluation company from the three evaluation companies with evaluation qualification recommended by the resettlement office to carry out the evaluation on the house replacement cost and location price.

4-2-6 Compensation policy for house relocation in *Mixed Area*

"Mixed Area" refers to urban residential houses and rural residential houses along one road or within one area. While, in China, current compensation policies for rural houses and

urban house are different with different compensation rate, usually the compensation rate of rural residential houses is lower than that of urban residential houses, which leads to implementation difficulties to the resettlement. The compensation rates of the project for rural residential houses in "Mixed Area" will be decided according to the compensation standards for urban residential houses, which will be the "same price for same grade land".

4-2-7 Compensation policy for the relocation of residential house without license

The residential houses without licenses in the Project refer to houses that have no any relevant licenses or certificates issued by real estate department or land department and built without permission, as well as the temporary buildings built under the permission of relevant department but exceeding the service time limit stipulated by the document. However, houses in the rural area without property registration but living for a long term, and within the regulated standards of the floor area and building area, will not be regarded as houses without licenses.

For houses without licenses, the project owner will pay the owners of houses without licenses the house replacement cost according to the state laws and resettlement policies of ADB, the replacement cost shall not include depreciation anyway, but no location compensation price and land value for the houses without licenses will be paid.

4-2-8 Compensation policy for shop relocation

The compensation rate for shops engaging in commercial business that have been approved by the planning department and industrial and commercial department will be evaluated in accordance with the house structure and location commercial value. During the shop relocation, if any operation loss occurs, compensation for operation loss will be paid on the basis of the degree of operation loss of the shop.

For shops without relevant certificates issued by real estate department or land department, shops built privately or shops without licenses issued by industrial and commercial department and shops without licenses and renovated privately from residential houses, the project will determine in accordance with the evaluation price of the shop multiplying scale coefficient: shops operate from before December 31, 1991, the scale coefficient is 70 %; shops operate from between January 1, 1992 to December 31, 1996, scale coefficient is 60 %; shops operate from between January 1, 1997 to February 29, 2002, scale coefficient is 50 %; shops operate after March 2, 2002, after being paid according to the residential compensation rate, CNY 600 /m² compensation will be paid according to the

operating building area.

4-2-9 Policy for house relocation of enterprise and government units

The buildings of enterprises and government units are divided into operational workshops and office buildings and non-operational buildings. Compensation for buildings of enterprises and government units shall be paid according to market evaluation price. If any production loss of the enterprises caused by the project relocation occurs, compensation for stop-production loss will be paid to the enterprises according to the loss degree; if any equipment needs to be relocated, transitional allowance will be paid to the enterprises; if the enterprise production and operation will be stopped due to the project relocation, compensation will be paid for the equipments and assets after evaluation on the enterprise equipments and assets.

4-2-10 Policies for renovation of *Villages in the City* and returned residential buildings of rural house site

According to the current resettlement policy of Wuhan, application for returned residential house site is very difficult for rural residential house relocated in the mid-ring line. For the relocated rural household in the project, the house sites can be arranged for relocation households without other house sites in the village, and the land-use procedure of returned house sites will be examined and determined by the local district government. For the affected villages that have been listed in the comprehensive renovation plan of Wuhan "*Villages in the City*", according to the renovation plan of these areas, the village collectives can build multiplayer residential buildings to resettle the relocated households. The relative taxations and fees, related to returned residential buildings constructed by the rural collective economic organization to resettle the original village residents, will be executed in accordance with relevant policies for peasant housing construction, when implementing project construction of land-use development, municipal infrastructure fares will be exempted; other stipulated fees will be collected according to the lower limit if there is a range, and those that have no range will be collected by half.

4-2-11 Production resettlement policies for the affected agricultural laborers and land-deprived farmers

The project will follow the principles in accordance with the local conditions to arrange the production and life of farmers of land acquisition through multi-channels so as to ensure the long-term living means of agricultural laborers.

Agricultural arrangements will be considered preferentially for land acquisition in rural areas outside the urban planning area, especially the areas with rich resources of cultivated land and potential land resources. The farmers of land acquisition can engage continuously in the agricultural productions due to cultivated land newly increased through rural collective reserved land, contracted land turned in voluntarily by land contractors, readjustment of contracted land and land development adjustment. Laborer arrangements by land adjustment must comply with the relative regulations of *the Law of the Contract for Rural Land*.

On the voluntary premise of farmers, the farmers of land acquisition can become shareholders with their resettlement subsidy. The rural collective economic organization may sign contract with the farmers so that they can obtain benefit by preferred share.

By comprehensive renovation project of "Villages in the City", the project shall perfect the employment service system of urban-rural integration, create conditions for the occupation shift of farmers of land acquisition to urban area, enhance employment training of rural laborer force, improve the skill of farmers of land acquisition and lead them to get employed in non-agricultural industries. The land-acquisition unit should employ preferentially farmers of land acquisition under the same conditions so as to provide employment opportunities for farmers with employment capability.

For farmers without land due to land acquisition, the project will combine with the comprehensive renovation project of "Villages in the City" to set up the social pension insurance and minimum living standard security systems for farmers lost land in order to ensure the long-term living means of farmers of land acquisition.

4-2-12 Special supporting policy for the vulnerable groups

The project establishes the special supporting fund for the vulnerable groups with a total amount of CNY 1,500,000. During the resettlement, the venerable groups can apply for the special supporting fund for the venerable groups according to the procedures if any production and living difficulties, which will be paid under the item of contingencies.

If the building area of residential house per capita for the affected families of venerable groups is less than 12 m² and no other residential house, the compensation will be calculated in accordance with a building area of 12 m² per capita, and the extra expenses will be paid with the special supporting fund for the venerable groups.

4-2-13 Resettlement policy for floating population and tenants

Although the floating population and tenants is not the owner of the real estate, however,

since their production and livelihood are affected by the relocation, they have the rights to obtain compensation accordingly as well. First of all, if tenants or floating population had to remove due to the project relocation, they can obtain relocation transitional allowance. Secondly, if the lease agreements of the floating population are not yet expired, the floating population or tenants can obtain relevant compensation in accordance with the lease agreements, which will be paid by the project owner.

Table 4-1 Main policies of this project established in compliance with state laws (esp. Document 28)

Article	Document 28	Compensation policies for land acquisition in this project
Improving land acquisition compensation practice	People's Governments at the county level and above shall adopt practical measures to ensure that the farmers whose land is acquired shall not be made worse off. It should be ensured that land compensation fees, resettlement subsidies and compensation for ground attachments and standing crops shall be provided in accordance to applicable laws and regulation in full and in time	The resettlement policy of this project will be established on the basis of relevant laws and policies in China which include Document 28, <i>Land Administration Law of the People's Republic of China</i> , <i>Regulations on the Implementation of the Land Administration Law of the People's Republic of China</i> , <i>Administrative Regulations on Urban House Demolition and Relocation</i> , <i>Implementation Measures of Hubei Province on Land Administration</i> , <i>Administrative Measures of Wuhan Municipality on Urban House Demolition and Relocation</i> , <i>Compensation and Resettlement Measures of Wuhan Municipality for Requisition of Collective-Owned Land</i> , <i>Administrative Measures of Wuhan Municipality on City Planning</i> and involuntary resettlements policy of ADB. The aim of these policies is to ensure the living standard of affected persons could be improved or at least restored to pre-project levels. The project office will pay compensations for requisition of land, resettlement subsidies and compensations for attachments to the ground and green crops wholly and duly as pursuant to law.
	If the land compensation fees and resettlement subsidies as stipulated by law still cannot be able to maintain the original standards of the land-losing farmers and are not adequate to cover the income restoration or social insurance costs of the landless farmers, the provincial government shall approve an increase in the resettlement subsidies. If the sum of the land compensation fees and resettlement subsidies has reached the legal upper limit but still cannot maintain the original living standards of the farmers, the local government can provide additional subsidies with the use of revenues from the sales for the use of state land	Land acquisition compensation and resettlement subsidies of this project should satisfy farmers whose land has been requisitioned to keep their pre-project living standard for they are 25 times of unified compensation base price in every district. If the compensation is not enough in the implementation, the project office will increase resettlement subsidies in accordance with actual condition. If the summation of the compensation and resettlement subsidies has reached the legal maximum yet still insufficient for the farmers whose land is requisitioned to keep their pre-project living standard, the people's government of Wuhan could subsidize them by the incomes from the use of state-owned land.
	The provincial government shall formulate and publicize the standard annual output or location land prices for land acquisition in the cities and counties under the provincial jurisdiction. Land acquisition compensation shall be kept identical for identical quality of land in same locality.	This project had established the uniform annual production value standard for every affected areas and the compensation for requisition of land is the same in one place.

Article	Document 28	Compensation policies for land acquisition in this project
	The full costs of land acquisition for national key development projects shall be included in the overall project budget.	This project had listed the whole expense of land acquisition in budget.
Properly resettling farmers whose land is acquired	People's Governments at the county level and above shall formulate concrete measures to guarantee the long-term livelihood of the farmers whose land is taken. The farmers shall be given stocks for land-taking projects that have stable revenues. In a prescribed urban zone, the local government shall place the farmers who are made landless because of land acquisition in the urban employment system, and set up a social insurance system for them. If the acquisition of collective land takes place outside the prescribed urban area, the local government shall set aside essential farmland within the administrative area or assign suitable jobs. Resettlement in distant areas should be considered for farmers who can no longer have adequate land to continue farming. The labor and social insurance departments shall cooperate with other relevant departments to provide guidance on the establishment of employment training and social insurance program for land-losing farmers.	The regions where land acquisition of this project takes place are those under rapid urbanization. Residents there are mostly engaged in non-agricultural production and their incomes had mostly come from non-agricultural sectors. The land acquisition area is not big. With a small rate of land acquisition impact, it only puts a small influence on the incomes of residents and production conditions. On the basis of full consultation, the policies for production resettlement in this project are as below (1) the regions affected by Luojiagan Project and Yangsigang Project belong to the "villages-in-city" of Wuhan, they will be included in the reconstruction plan of "village-in-city" of Wuhan. (2) Land requisitioned in Three Gates Connection Project and Changing Pump Station Project is mainly government property of state farm. Displaced persons are mostly employees of the farms who enjoy basic social security welfare. After land acquisition, the farm will take the responsibility to resettle employees who lose contracted land and find them new employment, while provides retirement pensions and basic old-age security to employees of retirement age.
Improving land acquisition procedure	In the land acquisition process, attention shall be paid to respecting the ownership of collective land and the land contract of farmers	In the process of land acquisition, project office will establish perfect organic network, learn grievance and complains of APs in time and establish complete procedures of them, so as to solve the problems arising in land acquisition duly and protect the legal rights and interests of the APs.
	The purpose, location, compensation and resettlement sites of the land acquisition shall be announced to the farmers concerned, before the land acquisition proposal is submitted for approval.	The purpose, location, compensation rates and resettlement approaches has already been apprised to farmers whose land is requisitioned by public consultation.

Article	Document 28	Compensation policies for land acquisition in this project
	The results of the status survey of the land to be acquired shall be verified with the rural collective and the farmers concerned. If necessary, the land resource department shall organize public hearings according to law. Documentation on information to and verification by the farmers concerned should form an essential part of the land acquisition submission.	Project office, rural collective economic organizations and farmers whose land is requisitioned will confirm the findings of the land acquisition survey of this project. The relevant materials acknowledged and confirmed by the farmers whose land is requisitioned will be necessary documents for the report for approval of land acquisition.
	A mediation and arbitration mechanism shall be set up or strengthened to resolve disputes arising from land acquisition, so as to protect the legal rights of land-losing farmers and land users.	The coordination and arbitration mechanism for solving disputes on the project will be established to guarantee the legal rights and interests of the farmers whose land is requisitioned and the land users.
	All land acquisition proposals, except for special circumstances, shall be made public.	The approved resettlement plan will be apprised to affected persons via public consultation meetings, information manuals and bulletins. Affected persons could also consult the resettlement plan through the internet, local government offices or in public libraries.
Strengthening supervision and management of the land acquisition process	In case compensation and resettlement is not properly implemented, use of the acquired land shall be prohibited.	If the compensation for requisition of land and resettlement is not fulfilled, the government of Wuhan municipality and ADB will cease land acquisition process.
	The provincial government shall formulate standards for the distribution of land compensation fees within the rural collective organizations, based on the principle that the land compensation fees shall be used for the farmer households whose land is acquired.	Compensation for requisition of land will be mainly used on farmers whose land has been requisitioned. The seriously affected villages will establish resettlement funds use plan and compensation distribution methods.
	The rural collective organization shall make the information on the revenues and allocation of the land compensation fees available to its members, and receive their supervision. The agriculture, civil affairs and other departments shall strengthen the supervision over the allocation and use of the land compensation fees within the rural collective organization.	The village will announce the income and expense as well as distribution of compensation for requisition of land to villagers by villagers meeting and proclamation. The department of audit, agriculture, civil administration and the Women's Federation will supervise distribution and use of the compensation in the village collectives. This project will be also monitored by ADB and the independent monitoring organization.

5 Compensation Rates

The appropriate land acquisition compensation rates for this Project is established in accordance with the latest Chinese laws and policies and principles of the ADB on involuntary resettlement through full consultation with the local government, affected villages APs and affected enterprise.

5-1 Land requisition compensation rates

The compensations for acquisition of rural collectively owned land shall include land compensations, resettlement subsidies, compensations for attachment to grounds and the young crops, and tax paid to the state.

5-1-1 Compensation rates for rural collective-owned land acquisition

(1) Land compensation

According to the *Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collective-owned Land*, the compensation rates of this Project for acquisition of rural collectively owned land are as follows: compensation for acquisition of cultivated land shall be 10 times that of previous three years (AAOV); compensation for acquisition of non-cultivated land shall be 6 times that of

According to current laws of Wuhan, compensation rate for rural collective land shall be decided equivalent to the AAOV. The project makes the consolidated compensation rates in accordance with land, output value, land location, agricultural land grade, cultivated land per capita, land supply and demand relations, local economic development level and other factors. Compensation base rates before multiplier for land acquisition of each sub-project are as follows: Hongshan District (Luojiagang Sub-Project) CNY 6416; Hangyang District (Yangsigang Sub-project) CNY 5890; Dongxihu District (Three-gate Connection and Changqing Pump Station Sub-Project) CNY 4895. The compensation ratios and amount of compensation of the Storm Water Management Component are shown in Table 5-1.

Table 5-1 Land Compensation Rates

Affected regions	Types of land	Dry land	Fish pond	Pond	Nursery Garden	Orchard	Woodland	House Site	Wasteland
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Hongshan District	Compensation calculation base (CNY)	6416	6416	6416	6416	6416	6416	6416	6416
	Compensation ratio	10	10	6	10	10	6	6	6
	Compensation rates (CNY/mu)	64160	64160	38496	64160	64160	38496	38496	38496
Hanyang District	Compensation calculation base (CNY)	5890	5890	5890	5890	5890	5890	5890	5890
	Compensation ratio	10	10	6	10	10	6	6	6
	Compensation rates (CNY/mu)	58900	58900	35340	58900	58900	35340	35340	35340
Dongxihu District	Compensation calculation base (CNY)	4895	4895	4895	4895	4895	4895	4895	4895
	Compensation ratio	10	10	6	10	10	6	6	6
	Compensation rates (CNY/mu)	48950	48950	29370	48950	48950	29370	29370	29370

(2) Resettlement subsidies

According to the local regulations of Wuhan City and through consultation between the local government and representatives of the affected persons, the resettlement subsidies for paddy fields and dry lands of this Project is 15 times the average annual output of the acquired land in the three years before acquisition; resettlement subsidies for acquisition of fish ponds and woodlands are 9 times the average annual output of the acquired land in the three years before acquisition; the resettlement subsidies rate for paddy fields and dry lands of this Project adopts 15 times the average annual output of the acquired land in the three years before acquisition. No resettlement subsidies are to be paid for acquisition of house sites, wastelands and other non-productive lands. The resettlement subsidies of this Project are shown in Table 5-2.

Table 5-2 Resettlement Subsidies Rates

District	Types of land	Dry land	Fish pond	Pond	Nursery Garden	Orchard	Woodland	House Site	Wasteland
Hongshan District	Compensation calculation base (CNY)	6416	6416	6416	6416	6416	6416	6416	6416
	Compensation ratio	15	9	8	15	15	9	0	0

	Compensation rates (CNY/mu)	96240	57744	51328	96240	96240	57744	0	0
Hanyang District	Compensation calculation base (CNY)	5890	5890	5890	5890	5890	5890	5890	5890
	Compensation ratio	15	9	8	15	15	9	0	0
	Compensation rates (CNY/mu)	88350	53010	47120	88350	88350	53010	0	0
Dongxihu District	Compensation calculation base (CNY)	4895	4895	4895	4895	4895	4895	4895	4895
	Compensation ratio	15	9	8	15	15	9	0	0
	Compensation rates (CNY/mu)	73425	44055	39160	73425	73425	44055	0	0

(3) Other fees and taxations for land acquisition

According to the state laws, besides the land compensation fees, resettlement subsidies and compensation for the attachments to the ground and the young crops paid by the construction units who acquire rural collectively owned land, the construction units also have to pay the following fees and taxations: (1) Land use fee upon consideration of new for construction; (2) reclaim fee of cultivated land (Land Resources Bureau will use these fee to recover lost lands); (3) fund of water resource construction; (4) occupation fee of cultivated land; (5) fee for new vegetable plots development; (6) management fee of land acquisition; (7) labor cost for excavation of fishponds: acquisition of fish ponds needs to pay the labor cost for excavation of fish ponds at CNY 3,000/mu.

Since the Storm Water Management Component is part of the key Municipal infrastructure project, the fee for new vegetable plots development of the Project can be exempted according to relevant documents and regulations. So, the fees and taxes turned into the government in the Storm Water Management Component do not include the fee for new vegetable plots development. The applicable fees and taxes are shown in Table 5-3.

Table 5-3 Standards for fees and taxes turned into the government

Fees and taxes	Standards			Paid to
	Hongshan District	Hanyang District	Dongxihu District	

Land use fee upon consideration of new for construction		CNY 40 /m ²	CNY 40 /m ²	CNY 40 /m ²	Finance Bureau
Reclaim fee of cultivated land		CNY 15,000 /mu	CNY 15,000 /mu	CNY 8,000/mu	Land Resources Bureau
Fund of water resource construction		CNY 2000/mu for cultivated land, CNY 1500/mu for non-cultivated land			Water Resources Bureau
Occupation fee of cultivated land		CNY 10 /m ²	CNY 10 /m ²	CNY 7 /m ²	Finance Bureau
Total taxes and fees above all turned into the government (CNY/mu)	Cultivated land	50350	50350	41349	
	Non-cultivated land	49850	49850	40849	
Management fee of land acquisition		1.1~3% of the land acquisition fees			Land Resources Bureau
Labor cost for excavation of fish ponds		CNY 3000/mu			Land Resources Bureau

(4) Standards of the overall expenses for land acquisition

The standards of the overall expenses for acquisition of rural lands are in Table 5-4. The compensation standards in Table 5-4 exclude the compensations for young crops and attachments to the ground. The compensation rates for young crops and attachments to the ground are shown in Table 5-5.

(5) Compensation rates for young crops and attachments to the ground

According to the land acquisition compensation rates approved in February 1, 2005, the *Notice of Compensation Rates for the Young Crops and Fish, Attachments to the Ground and Other Facilities in Land Acquisition* of the Price Control Administration of Wuhan Municipality and the Municipal Bureau of Land Resources, the compensation rates for the young crops and fish and attachments to the ground are listed in Table 5-5.

Table 5-4 Standards of the overall expenses for land acquisition
(Excluding the compensations for young crops)

Unit: CNY/mu

Districts	Types of land	Dry land	Fish pond	Pond	Nursery garden	Orchard	Woodland	House site	Waste land
Hongshan	Land compensations	64160	64160	38496	64160	64160	38496	38496	38496

District (Luojiagang)	Resettlement subsidies	96240	57744	51328	96240	96240	57744	0	0
	Fees and taxes	50350	53350	50350	50350	50350	49850	49850	49850
	Total acquisition expenses	210750	175254	140174	210750	210750	146090	88346	88346
Hangyang District (Yangsigang)	Land compensations	58900	58900	35340	58900	58900	35340	35340	35340
	Resettlement subsidies	88350	53010	47120	88350	88350	53010	0	0
	Fees and taxes	50350	53350	50350	50350	50350	49850	49850	49850
	Total acquisition expenses	197600	165260	132810	197600	197600	138200	85190	85190
Dongxihu District (Three Gates Connection) (Changqing)	Land compensations	48950	48950	29370	48950	48950	29370	29370	29370
	Resettlement subsidies	73425	44055	39160	73425	73425	44055	0	0
	Fees and taxes	41349	44349	41349	41349	41349	40849	40849	40849
	Total acquisition expenses	163724	137354	109879	163724	163724	114274	70219	70219

Table 5-5 Compensation rates for young crops and attachments to the ground

Expenses	Types of attachments to the ground		Compensation rates		
			Hongshan District	Hangyang District	Dongxihu District
Compensation for young crops	Vegetables (CNY/mu)		1,000	1,000	890
	Cotton, grain (CNY/mu)		780	780	650
	Fish (CNY/mu)		1100	1100	1100
	Fruit trees (CNY/tree)	1-3 years	20	20	20
		3-6 years	50	50	50
		7-10 years	40	40	30
		Over 11 years	70	70	25
	Trees (CNY/tree)	Φ 5-8 cm	25-40	25-40	25-40
		Φ 9-12 cm	45-60	45-60	45-60
		Φ 13-16 cm	65-80	65-80	65-80
		Φ ≥ 17 cm	85	85	85
	Nursery garden (CNY/mu)		5,000	5,000	5,000
Compensation for attachments to the ground	Tombs (CNY each)		1,200	1,200	500
	Wells (CNY each)		840	840	840
	Fencing (CNY /m ²)		36	36	36
	Terrace (CNY /m ²)		11	11	11
	Gravel road (CNY /m ²)		38	38	38
	Toilets (CNY /m ²)		100	100	50
	Steel-framed sheds (CNY /m ²)		20	20	10

5-1-2 Compensation rates for acquisition of state-owned land

Two types of state-owned land are acquired in the Wastewater Management Component: the first is state-owned cultivated land, which is land of farms run by the state, and most of the land acquisition in the Dongxihu District belongs to this category; the second is state-owned construction land. According to regulations in *Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collectively Owned Land* and the No. 450 Document of 2004 of Wuhan Municipal Bureau of Land Resources, the *Explanations of Certain Issues on Compensation & Resettlement for Non-agricultural Construction Use of Cultivated Land*, the compensation rates for land, resettlement, young crops, and attachments to the ground of state-owned cultivated land are implemented according to those of the acquisition of collectively owned land. Therefore the compensation rates of this Project for acquisition of state-owned cultivated land are as listed in Table 5-1, Table 5-2, Table 5-3, Table 5-4 and Table 5-5. There are two ways for acquiring state-owned construction land: the first is free allocation by administrative; the other is by paid assignment. Professional institutes with qualifications of land price evaluation shall evaluate the costs of paid assignment of state-owned construction land in this Project, and the compensation rates shall be implemented by mutual agreement of the appraisal price.

5-1-3 Compensation rates for temporary land use

According to the *Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collectively Owned Land*, the compensation fees shall be paid to the APs directly.

(1) Compensation for temporary acquisition of cultivated land shall be the average annual output value for three years with consideration of the duration of temporary losses. Use for less than one year is calculated as two year, and use for more than one year (including one year) is calculated as three year; the compensation rates of temporary acquisition are as shown in the Table 5-6.

(2) Reasonable compensations for young crops and attachments on the temporarily acquired land shall be paid to all the persons according to their actual loss. The temporary affected persons will be fully compensated for any lost income, so no need for livelihood restoration.

The IA of each subproject shall be responsible for restoration of the temporarily land after completion of the subproject construction. Requirements to return the land in its original state

will be included in the civil works contract documents. For those that cannot be recovered, compensation shall be paid according to actual loss and livelihood support will be available to any APs whose lands cannot be restored.

Table 5-6 Compensation rates of temporary land use

District		Hanyang District	Dongxihu District	Hongshan District
Duration of temporary land use	Compensation for 1 year (CNY/mu)	11,780	9,790	12832
	Compensation for more than 1 year (CNY/mu)	17,670	14,685	19248

5-2 Compensation rates for residential houses

There are 2 factors in determining the compensation rates for residential building relocation. Firstly, it is the type of structures, floor space and usage of the houses; and secondly it is the location of the houses. The compensation comprises two parts, replacement cost of the building and location-based price of the building.

According to local regulations of Wuhan Municipality, compensation for the location of the affected houses in Wuhan city is divided into three categories according to the overall urban planning of Wuhan: the first category covers areas within the second ring road (including the second ring road), the second category covers areas between the second ring road and the third ring road (the Middle Ring road), and the third category covers areas outside the third ring road (Middle Ring road). According to the regulations, the location classification of areas involved in this Project is as shown in Table 5-7.

Table 5-7 Location classifications of the affected regions

Sub-projects	Affected regions	Location classifications
Luoja Road	Hongshan District	Category 2: Heping Village, Tuanjie Village, Yujiatou Village, Chailin Village
Yangsigang	Hanyang District	Category 1: Xiangyang Village, Qianjin Village
Three Gates Connection	Dongxihu District	Category 3: The Ecological Park, Machi Community (Dongxihu District is suburban district, but location of its land to be requisitioned is similar to category three so that it is classified as category three.)
Changqing Pump Station	Dongxihu District	

5-2-1 Compensation rates for urban residence

According to the relevant regulations in the *Administrative Regulations on Urban House Demolition and Relocation*, *Administrative Measures of Wuhan Municipality on Urban House Demolition and Relocation*, *Guiding Opinions on the Assessment of Urban Housing Relocation* the price evaluation of the urban houses to be relocated shall be estimated on the basis of such factors as their location, usage, and floor space, it is.

Table 5-8 shows the latest price evaluation of houses in Wuhan. The compensation rates are based on the latest evaluation price and they are equivalent to replacement value by ADB's policy (see Table 5-9). The appraisal of the component-affected houses will be done prior to compensation.

Table 5-8 Current evaluation prices of relocated urban residence

Building structures	Categories of location and price (CNY /m ²)								
	Category 1			Category 2			Category 3		
	Compensation rates	Average price of new house in 2005		Compensation rates	Average price of new house in 2005		Compensation rates	Average price of new house in 2005	
Steel and concrete	2580	Above 3000	17%	2230	Above 3000	14%	2030	Above 2500	6%
		2500-3000	66%		2500-3000	56%		2000-2500	23%
		2000-2500	15%		2000-2500	25%		1500-2000	46%
		Below 2000	2%		Below 2000	5%		Below 1500	25%
Brick and concrete	2320	Above 3000	11%	1970	Above 3000	8%	1770	Above 2500	5%
		2500-3000	32%		2500-3000	27%		2000-2500	21%
		2000-2500	47%		2000-2500	48%		1500-2000	48%
		Below 2000	10%		Below 2000	17%		Below 1500	26%
Brick and wood	2170	1900-2300		1820	1500-2000		1620	1400-1700	
Simple houses	2090	1500-2100		1740	1300-1800		1540	1200-1600	

The relocation households are granted with subsidies during the transitional period of relocation; see the subsidy rates in Table 5-14.

The building structure, floor space, and usage of a house shall be verified and affirmed at site before relocation by the PRO and the departments concerned jointly with the relocated households; the PRO shall provide three qualified evaluation companies for the relocated households to choose. The chosen evaluation company will make evaluation of the resettlement costs and price for location of house. The PRO will pay the cost of evaluation.

5-2-2 Compensation rates for relocation of rural residence

According to the *Circular on Compensation Rates for the Acquisition of Collective-Owned Land and the Demolition and Relocation of House Sites in Accordance with Their Locations* in

Wuhan Municipality, the location of farmers' house in Jiang'an, Jianghan, Qiaokou, Hangyang, Wuchang, Qingshan, Hongshan District, Wuhan Economic & Technological Development Zone and Wuhan East Lake Hi-tech Development Zone (trusteeship zone included) is divided into three categories according to the overall city planning of Wuhan: the first category covers areas within the second ring road (including the second ring road), the second category covers areas between the second ring road and the third ring road (the Middle Ring road), and the third category covers areas outside the third ring road (Middle Ring road).

The compensation rates for Wuhan rural residences on different categories of land are as shown in Table 5-9. It shows that the compensation for Wuhan rural residences comprises two parts, the house replacement cost and the location compensation (land value). The compensation is calculated by replacement price that can afford new house at the same category. In the event that the rural house has only one story, the compensation for this house is the relocation cost plus its location related compensation. If the rural house has two stories, the compensation for this house is the house replacement cost plus half of its location related compensation.

Table 5-9 Compensation rates for relocation of rural residence

Price structure	Structures	Ranks of location districts and compensation price (CNY/m ²)		
		Category 1 (Yangsigang)	Category 2 (Luojiagang)	Category 3 (Three-Gates Connection and Changqing Pump Station)
House relocation costs	Steel concrete	830	830	830
	Brick and concrete	570	570	570
	Brick and wood	420	420	420
	Simple house	340	340	340
House site location compensation price		2280	1920	1500
The relocation households are granted with subsidies during the transitional period of relocation; see the subsidy rates in Table 5-14.				

5-2-3 Compensation policies for house relocation in *Mixed Area*

A "Mixed Area" refers to an area where both urban residential houses and rural residential houses exist. China's current compensation policies and compensation rate for relocating rural

houses and urban house are different. Usually the compensation for rural residential houses is lower than that for urban residential houses. This leads to difficulties in implementing the resettlement exercise. In this Project, the compensation for rural residential houses in the "Mixed Area" will be to the same as that for urban residential houses ("same price for same grade land").

5-2-4 Compensation rates for shops

The relocated shops are divided into two categories, the common shops and unlicensed shops. The common shops are those running business with approval of the Planning Department, while the unlicensed shops are those without approval of the Planning Department. The latter are without business licenses or have been converted from private dwelling houses without prior permission.

Although most of the affected shops are located in small markets in village rather than in thriving commercial center, while the compensation for shops is based on the compensation standards for shops located in the central commercial district (see Table 5-10), which is much higher and it is sufficient and very easy to buy a same shop in these affected areas. The shop owners are very satisfied with the compensation rates.

Table 5-10 Compensation rates for the common shops

Structures	Categories of location and compensation price (CNY/m ²)		
	Category one (Yangsigang)	Category two (Luojiagang)	Category three (Three-Gates Connection and Changqing Pump Station)
Steel concrete	4330	3630	3030
Brick and concrete	4070	3370	2770
Brick and wood	3920	3220	2620
Simple house	3840	3140	2540
The affected shops shall obtain subsidies for moving and relocation during the transitional period of relocation; see the subsidy rates in Table 5-14. In case the relocation causes commercial loss to the shop owners, compensations shall be paid according to extent of loss.			

According to the local laws and polices, the unlicensed shops will be paid another CNY 600 / m² after being paid according to the residential compensation rate. While in the suburban district, the compensation standard is already rather high and the APs are satisfied, but not for APs in urban district. It is unfair to compensate them based on an universal

schedule. In consideration of business good wills on shops been establishment longer their compensation should be higher than those shops been recently open for business. Therefore the PMO and local government have agreed to compensate these unlicensed shops in accordance with their period of business establishment with different compensation schedules. For unlicensed shops started operation prior to December 31, 1991, the coefficient is 70%. For unlicensed shops started operation from between January 1, 1992 and December 31, 1996, the coefficient is 60%. For unlicensed shops started operation from between January 1, 1997 and February 29, 2002, the coefficient is 50%. For unlicensed shops started operation after March 2, 2002, they will be paid another CNY 600 / m² after being paid according to the residential compensation rate.

In the suburban districts, all unlicensed shops regardless of when they started operation will be paid another CNY 600 / m² according to the operating building area after being paid according to the residential compensation rate.

Table 5-11 Compensation rates for unlicensed shops

Types of unlicensed shops	Structures of buildings	Categories of location and compensation price (CNY/m ²)		
		Category one (Yangsigang)	Category two (Luojiagang)	Category three (Three Gates Connection and Changqing Pump Station)
Unlicensed Shops operate from before December 31, 1991	Steel concrete	3031	2541	2121
	Brick and concrete	2849	2359	1939
	Brick and wood	2744	2254	1834
	Simple house	2688	2198	1778
Unlicensed shops operate from between January 1, 1992 to December 31, 1996	Steel concrete	2598	2178	1818
	Brick and concrete	2442	2022	1662
	Brick and wood	2352	1932	1572
	Simple house	2304	1884	1524
Unlicensed shops operate from between January 1, 1997 to February 29, 2002,	Steel concrete	2165	1815	1515
	Brick and concrete	2035	1685	1385
	Brick and wood	1960	1610	1310
	Simple house	1920	1570	1270
Unlicensed shops operate after March 2, 2002,	Steel concrete	1430	1430	1430
	Brick and concrete	1170	1170	1170

Types of unlicensed shops	Structures of buildings	Categories of location and compensation price (CNY/m ²)		
		Category one (Yangsigan)	Category two (Luojiagan)	Category three (Three Gates Connection and Changqing Pump Station)
	Brick and wood	1020	1020	1020
	Simple house	940	940	940
The affected shops shall obtain subsidies for moving and relocation during the transitional period of relocation; see the subsidy rates in Table 5-14. In case the relocation causes commercial loss to the shop owners, compensations shall be paid according to extent of loss.				

5-2-5 Compensation rates for buildings of enterprises and institutions

Buildings of enterprises and institutions are divided into two categories, the workshops and office buildings for commercial use, and non-commercial houses. Since the construction specifications and economic returns of these two types of buildings are different, the compensation rates are also not the same. The compensation rates for various production buildings and office buildings are shown in Table 5-12.

Table 5-12 Compensation rates for buildings of enterprises and institutions

Types of enterprise and institution buildings	Structures	Categories of location and compensation price (CNY/m ²)		
		Category one	Category two	Category three (Including Dongxihu District)
Buildings for commercial use	Steel concrete	2880	2530	2330
	Brick and concrete	2620	2270	2070
	Brick and wood	2470	2120	1920
	Simple house	2390	2040	1840
Non-commercial buildings	Steel concrete	2530	2180	1980
	Brick and concrete	2270	1920	1720
	Brick and wood	2120	1770	1570
	Simple house	2040	1690	1490
If there are equipments needing to be removed, while relocating buildings of enterprises and institutions, the project owner shall pay the removal expenses. In case commercial losses are caused on the part of the enterprises and institutions, compensate according to extent of loss.				

5-2-6 Compensation for unlicensed buildings

The Project owner shall pay the relocation compensation, without discount, to the owners of unlicensed buildings according to the state laws and the resettlement policies of ADB. However, no compensation related to the building location should be paid for such unlicensed

buildings. The compensation rates for unlicensed buildings are shown in Table 5-13.

Table 5-13 Compensation rates for unlicensed buildings

Types of house structure	Steel concrete	Brick and concrete	Brick and wood	Simple house
Compensation rates (CNY/m ²)	830	570	420	340
Owners of unlicensed buildings shall also obtain subsidies for moving and during the transitional period of relocation. See the subsidy rates in Table 5-14.				

5-3 Rates for other compensations and subsidies

5-3-1 Subsidies during the transitional period

Subsidies during the transitional period are compensations for loss of use to the relocated houses. According to the local polices the owners of relocated houses who choose monetary compensation shall have two-month transitional subsidies. Subsidies for those who choose exchange-houses-resettlement model shall be calculated according to the actually length of transitional period. In case the transitional period is prolonged because of the Project owner, the Project owner shall pay extra temporary resettlement subsidies to the relocated persons. Temporary resettlement subsidies shall also be paid to the affected persons or tenants who will resettle themselves. Subsidies during the transitional period are shown in Table 5-14.

Table 5-14 Subsidies during the transitional period

Items	Types	Rates	Items	Types	Rates
Removal expenses	≤40 m ²	CNY 300 /household	Transitional subsidies	Residence	CNY 6 / m ² /month
	≤60 m ²	CNY 400 /household		Shops	CNY 20 / m ² /month
	≤80 m ²	CNY 500 /household		Buildings of enterprises and institutions	CNY 15 / m ² /month
	>80 m ²	CNY 600 /household			
The compensation rates are determined according to local laws such as <i>Administrative Measures of Wuhan Municipality on Urban House demolition and Relocation</i> .					

5-3-2 Compensation for indoor facilities

The compensation rates for main indoor facilities are the actually cost to move these facilities in 2005. These standards are determined by the Price Management Bureau. The

detailed compensation rates for main indoor facilities are shown in Table 5-15.

Table 5-15 Compensation for main indoor facilities

Items	Unit	Rates (CNY)	Items	Unit	Rates (CNY)
Water meter	CNY/piece	70	Ammeter	CNY /piece	450
Removal of pipe gas	CNY /household	1800	Removal of split type air-conditioning	CNY /set	200
Removal of cable television	CNY / household	100	Removal of fixed-line telephones	CNY / household	108

5-3-3 Urban infrastructure facilities

According to the extent of disruption during construction, the Project owner shall reinstate or reconstruct the affected urban infrastructure facilities by the Project after consultation with the owners of these infrastructure facilities.

5-7 Entitlement Matrixes

In accordance with the latest Chinese laws and policies and principles of the ADB on involuntary resettlement, Entitlement Matrixes is formulated and full consultation with the local government, affected villages, APs and affected enterprise. They are all satisfied in the following composition policies and standard.

Table 5-16 summarizes the entitlement matrix for the Storm Water Management component

Type of loss	Impacts of the project	Entitled Persons	Entitlements	Compensation policies
Permanent land acquisition	A total of 684.4 mu land (including 323.3 mu cultivated land) will be acquired by the Project with 45 households or 209 persons being affected ¹ The affected villages belong to "villages in city". Most land in these affected villages has been converted into non-agricultural land; most labour force is now working in non-agricultural sectors, their income have mainly depended on non-agricultural sectors. the land acquisition has little impact on their income.	Affected villages/ groups or affected persons who used land before specified deadline	(1) All affected villages/production groups shall obtain land compensations. (2) The APs shall obtain resettlement subsidy and compensation for the young crops directly (3) APs shall receive resettlement subsidies for restoration of their living standard and income; for the land compensation used to build public utilities, invest in profitable projects, etc, the returns or benefits should be shared by all APs. (4) The Village Committee would establish a community development fund, to be controlled and administered by the APs. With some technical assistance from the resettlement agency and monitoring agency, the fund might be invested in development projects. However, any land compensation use plan need to consult with APs, and agreed with the APs (5) Preferential job opportunities shall be offered to APs (women included) priority by PMOs, IAs, local government and village-running enterprises (6) Preferential technical training opportunity shall be offered to APs (women included) by the Project owner.	Land compensation fee (1) Land Compensation base rates before multiplier for of each sub-project: ① Hangyang District (Yangsigang Sub-project) CNY 5,890; ② Dongxihu District (Three Gates Connection and Changqing Sub-project) CNY 4,895; ③ Hongshan District (Luojiagang Sub-project) CNY 6,416. (2) Land compensation multiplier: ① Cultivated land: 10 times. ② Garden plots, woodlands and other Cultivated land: 6 times. ③ Construction land, unused land: 6 times. The compensation ratio and amount of compensation of the Wastewater Management Component is shown in Table 5-1. Resettlement subsidies (1) Land resettlement subsidies base rates before multiplier is same as land compensation. (2) Land resettlement subsidies multiplier: ① Paddy fields and dry lands: 15 times ② Fish ponds and woodlands: 9 times The resettlement subsidies for each sub-project are shown in Table 5-2.
Temporary land acquisition	The total temporary land acquisition is 52.9 mu, in which 33mu (62.4%) is cultivated land, 19.9 mu (37.6%) is non-cultivated land. 58 persons of 14 households will be affected temporarily. No shop will be affected by temporary land use. The temporary occupied land is not the income resource for anybody; the main impact is the 14 households' living condition will be affected due to the project construction.	The households and persons affected by temporary land acquisition.	(1) All affected villages/production groups and persons shall obtain compensations. (2) Compensations for young crops and attachments on the temporarily acquired land shall be paid to the persons (3) The land user shall be responsible for rehabilitation of the temporarily acquired land after completion of the project construction.	The compensation rates for temporary land acquisition are shown in Table 5-6.

¹ The affected households and persons don't include the affected households and persons who lost their houses site.

Type of loss	Impacts of the project	Entitled Persons	Entitlements	Compensation policies
Residential housing demolition	A total of 3,7237 m ² residential housing including 3897 m ² unlicensed will be demolished with 1217 persons (294 households)	Property/house owner	<p>(1) The APs may choose options such as cash compensation, economically affordable house or exchange residential buildings.</p> <p>(2) House owners without certificate of title shall receive compensation according to the house replacement price (excluding land price) without any depreciation</p> <p>(3) If APs are not satisfied with the compensation, they may entrust the specialized institution to conduct an assessment of the real estate, the result of which shall be considered as the house relocation compensation rates.</p> <p>(4) House relocation subsistence allowances are paid for the full duration of the period of disruption and re-establishment.</p> <p>(5) Compensation for structures and all other lost assets is paid in full before relocation.</p> <p>(5) Vulnerable groups will be assisted to find suitable housing</p>	<p>(1) Compensation standard for urban residential houses: The compensation for urban residential houses shall be determined according to the evaluation price in real estate market. The PMO shall provide 3 qualified evaluation companies for the relocated households to choose and pay the cost of evaluation. The house evaluation prices in 2005 are shown in Table 5-8.</p> <p>(2) Compensation for rural residential buildings shall be the replacement cost for structures plus the house site location price.</p> <p>① Replacement cost for structures: Steel and concrete structure: CNY 830/m²; Brick and concrete structure: CNY 570/ m²; Brick and timber structure: CNY 420/ m²; Simple structure: CNY 340/ m²</p> <p>② House site location price: Category 1: CNY 2,280/ m²; Category 2: CNY 1 920/ m²; Category 3: CNY 1,500/ m²</p> <p>(3) The compensation rates for urban residential houses on different categories of land are shown in Table 5-9.</p> <p>(4) Compensation for unlicensed buildings The project owner shall pay replace price to the owner of unlicensed buildings without depreciation, but no house site location price shall be paid for unlicensed buildings. The compensation rates are shown in Table 5-13</p>
		Tenants/ floating population	<p>(1) All tenants have the rights to ask for transitional subsidies and removal subsidies.</p> <p>(2) Terms and conditions in the amended tenancy agreement are the same with the agreement before replacement.</p> <p>(3) All affected persons, whoever the leasehold belongs to, including the floating population, shall obtain removal subsidies.</p>	<p>The affected tenants will obtain transitional subsidies and removal subsidies.</p> <p>Transitional subsidies and removal subsidies are shown in Table 5-14.</p> <p>The local government and PRO will provide assistance to the affected tenants to find new accommodation</p>
Ground attachments	7 types of ground attachments will be affected	Property owner	All will be compensated at replacement cost in cash	The compensation standards are shown in Table 5-5.
Public facilities	Power supply and tap water pipeline	Property owner	<p>(1) All affected property owners will be provided with satisfactory relocated land on the basis of the land area of the structure to be demolished;</p> <p>(2) The demolished structure will be compensated at replacement cost in cash (including compensation for loss of facilities and labor on the basis of replacement cost)</p>	<p>Compensation rate for enterprises and institutions: The buildings of enterprises and institutions are divided into two types that are productive buildings and non-productive buildings. The compensation rates for these two types of buildings are shown in Table 5-12.</p>

Type of loss	Impacts of the project	Entitled Persons	Entitlements	Compensation policies
Affected shops	19 shops with 10192 m ² are affected, in which 13 shops with 6842 m ² are common shops and 6 shops with 4070 m ² are unlicensed shops. Most of the affected shops are not located in a thriving commercial center, but located in the village or simple bazaar, all the affected unlicensed shops are the small shops operated in the unlicensed houses or temporary buildings.	The project owner should paid compensation directly to the owner of the affected shops	(1) The affected shops can choose cash compensation. All affected owners who run the business before the announcement of the project construction shall be compensated at the replacement cost even for unlicensed buildings or overstayed temporary buildings. (2) All affected employees, whether permanent, or contracted, shall obtain cash compensation for the income/wage loss resulting from interruption of work.	(1) The compensation rates for the common shops are shown in the Table 5-10. (2) The compensation rates for the unlicensed shops is in accordance with the evaluation of the shops multiplied by a certain coefficient.: 1) Started operation prior to December 31, 1991, the coefficient is 70%. 2) Started operation from between January 1, 1992 and December 31, 1996, the coefficient is 60%. 3) Started operation from between January 1, 1997 and February 29, 2002, the coefficient is 50%. 4) Started operation after March 2, 2002, they will be paid another CNY 600 / m ² after being paid according to the residential compensation rate. The compensation rates are shown in Table 5-11.
Affected enterprises, institutions	29 enterprises (among 42 affected enterprises), with 18,561.85 m ² structure will be demolished. The relocated productive buildings are 18311.85 m ² , the relocated non-productive buildings are 250m ² . These enterprises are mainly furniture factories in the areas affected by the Luojiagang Sub-project, most of which are small private enterprises with poor equipment and dilapidated factory buildings. Only Jinyinhu Power Station in Dongxihu District will be wholly relocated in large scale.	The project owner should paid compensation directly to the owner of the affected buildings	(1) The affected enterprises can choose cash compensation. All affected owners who run the business before the announcement of the project construction shall be compensated at the replacement cost even for unlicensed buildings or overstayed temporary buildings. (2) If only part of the business land is affected rather than the whole building structure, the building shall not be demolished in order to avoid its favorable geographic location being disrupted and commercial loss resulting from business interruption. (3) All affected employees, whether permanent, or contracted, shall obtain cash compensation for the income/wage loss resulting from interruption of work.	(1) The construction specifications and economic returns of productive and non-productive buildings are different, the compensation rates are also not the same. The compensation rates for various production buildings and office buildings are shown in Table 5-12. (2) Loss in net income during the interruption of business of enterprises shall be compensated in cash. The affected enterprises shall also obtain removal subsidies. The standards of removal subsidies are shown in Table 5-14.

Type of loss	Impacts of the project	Entitled Persons	Entitlements	Compensation policies
Income rehabilitation measures	A total of 684.4 mu land (including 323.3 mu cultivated land) will be acquired by the Project, the acquired cultivated lands is not the main income resources, the income loss is little, only 30 labors need to resettled.	All APs	(1) The affected persons will obtain resettlement subsidy and to restore their income and living standard. (2) The local government will provide employment assistance (i.e., training and job arrangements) for the affected persons in the local enterprises. (3) The project owner will provide preferential employment opportunities for the affected persons and provide technical training prior to the employment. (4) Affected laborers in state-owned farm can get same wages as land acquisition before	(1) Non-land-adjustment income-generating options might be more appropriate to the APs. This kind of income restoration options include i. Small businesses and self-employment; ii. Skill development through training; iii. Preference for APs in project-related employment. iv. Assistance in finding openings in government and private enterprises; v. Establishing a community development fund, to be controlled and administered by the APs. With some technical assistance from the resettlement agency and NGOs, the fund might be invested in development projects. (2) The APs have the right to choose the income restoration options; the income restoration plan must be fully consulted with the APs and must be agreed with the APs.
	Other subsidies	Person affected by physical relocation	Transportation subsidies, such as household articles, salvaging or transporting building materials to the new relocation site will be provided	Movement subsidies: CNY 300-600/household; Transitional subsidies: Residential house: CNY 6/m ² /month; Shop CNY 20/ m ² /month; Enterprise and institution: CNY 15/ m ² /month.
	Special supporting measures for affected vulnerable groups	Affected vulnerable groups, including peoples in poor, ethnic minority, aged and disabled and families accepting social welfare.	(1) Lowest cost rented housing for families in hardship will be provided; (2) CNY 1,500,000 special fund for the vulnerable groups have been set up (3) All resettlement programs should consider the women's special needs; the women must be fully informed. (4) The vulnerable groups especially the women have priority to obtain the project-related employment opportunities. (5) Labor support for the vulnerable groups in the house reconstruction will be provided	(1) If the building area of residential house per capita for the families of vulnerable groups is less than 12m ² and no other residential house, the compensation will be calculated in accordance with a building area of 12 m ² per capita, and the extra expenses will be paid with the special supporting fund for vulnerable groups. (2) The resettlement offices and local government will establish formal social insurance for the farms whose cultivated lands had been totally acquired or the disabled labours, so that these resettled labours can obtain sustainable income resources.
Complaints and Grievances	Compensation rate, payment of compensation and relocation measures	The affected persons who lodge a complaint on land acquisition and relocation matters	(1) Various expenses related to relocation complaints putting forward by the affected persons and management expenses will be exempted. (2) Every resettlement office must hire at least one female worker to responsible for women's affairs in the process of resettlement.	

6 Income Restoration Plan

Income restoration is an important component of resettlement where APs have lost their productive base, or other income sources, regardless of whether they have also lost their houses. In order to assist the APs to achieve at least the same level of well-being with the project as without it. The PMO have formulated both short- and long-term strategies for restoring APs income. The income restoration strategies are for immediate assistance during relocation, they include:

i. Compensation for land, structures, and all other lost assets is paid in full before relocation. In this project, the compensation rates for affected land, structures and other assets are rather high, and the APs are very satisfied with the compensation standards.

ii. House construction grants and relocation subsistence allowances are paid for the full duration of the period of disruption and re-establishment.

iii. The PMO will pay the removal allowances for relocation, and will provide temporary or short-term employment in the construction activities at the resettlement or project construction sites.

iv. The PMO have established a special assistance fund to assist vulnerable groups such as women, the aged, and the disabled.

Income restoration strategies will provide a sustained source of income over a longer period of time and to enable restoration, or better still, improvements in APs standard of living. This chapter mainly focuses on the long-term income restoration strategies.

6-1 Resettlement principles

According to state laws and regulations of the Wuhan Municipal Government, as well as laws, regulations and policy requirements of ADB, the basic resettlement principles of the Project are as follows:

(1) Provide rational compensation for affected persons to maintain or to improve their current living standards

(2) Minimize temporary occupation of land and the disruption time

(3) All legal or illegal affected persons are to be considered to be included in the resettlement and rehabilitation plan scope

(4) If the affected persons' owned land is not enough to make a living, offer alternative employment to provide income sources

(5) Inform all affected persons timely of the relevant qualification requirements, compensation rates and standards, Production rehabilitation plan, and project implementation schedule.

(6) Land acquisition compensation and relocation shall not be implemented before the affected persons indicate their satisfaction with the compensation offer.

(7) Establish a set of highly transparent and efficient system for collecting and dealing with grievances and complaints, so as to ensure the problems happened in the process of resettlement can be resolved in a timely manner.

As to the persons affected by temporary occupation of land, whether their lands are temporarily acquired during the project construction or included in the affected list before the closing date of the last affected details survey implemented by the government, their loss of incomes will be compensated and affected houses relocated according to type and amount of loss. Cultivated land and buildings after the closing date of the last affected details survey implemented by the government will not be entitled to compensation and allowance.

6-2 Income Restoration Plan of affected villages

The project needs to acquire rural collective-owned land, so affected villages and villagers shall be compensated and their production shall be rehabilitated. The PRO will not only provide compensation for acquired attachments to the ground and buildings in affected villages, but will also establish practical production resettlement plans suitable for the development of affected villages so as to ensure that affected villagers have all available opportunities to enhance, or at least rehabilitate their original incomes and living standards, on the basis of full negotiation and according to development status quo and future prospects of the villages.

6-2-1 Income restoration options

After villagers' cultivated land is acquired, farmers will lose some production factors, which will definitely cause adverse effects on production. It is crucial to choose proper production resettlement mode so that the living standards and production conditions will be rehabilitated or even enhanced as soon as possible.

In Wuhan, there are two main types of income restoration program: First, land-based

resettlement programs provide resettlers with enough land to regain and build farms and small rural businesses. Second, nonland-based resettlement strategies include activities such as occupational training, employment, small business and enterprise development for job creation.

The affected villages are located in urban areas; most of the villagers' income comes from non-agricultural sectors, and it is unavoidable trend that the farm land will be turned into non-agricultural land, the formerly agricultural laborers will migrate from agricultural sectors to non-agricultural sectors. So non-land income-generating options might be more appropriate to the APs. The non-land income restoration options include:

- i. Small businesses and self-employment;
- ii. Skill development through training; Skills training program is based on demand of APs and labor market needs. After Skills training, local government will help to recommend them to labor bureau and laborers market management institute.
- iii. Preference for APs in project-related employment. 5,000 temporary employments will be created directly during project construction, the PMO and local government have agreed that these new employment opportunities will be provided to the affected laborers.
- iv. Assistance in finding openings in government and private enterprises;
- v. Establishing a community development fund, to be controlled and administered by the APs. With some technical assistance from the PMO and IAs, the fund might be invested in development projects, The affected farmers have the priority to be employed in these development projects; as a result, the APs can earn salary as well as get profits by preferred stock in accordance with their shares.

The land acquisition has very little impact on the villages. Furthermore, the affected villages or farms are fast-urbanizing areas; agricultural production is no longer the main income source of residents, so the key of a successful production plan for these little affected villages (whose impact rates are below 4%) is to provide enough compensation. In this component, the PMO has adopted a comparatively high compensation rates for land acquisition after fully consultation with APs and local government. The APs are satisfied with the compensation rates. Table 6-2 lists the preliminary income rehabilitation plan of each affected village, when these affected villages receive land compensation and resettlement subsidies according to the adopted compensation standards, the returns of the compensation can fully make up for their income loss caused by land acquisition.

Table 6-1 affected village's income rehabilitation plan*

Affected villages/ Sub-project	Summary of impact degree	Income loss	Available land compensation fund		Income rehabilitation plans	Main basis for resettlement plan selection
			Land compensation (CNY)	Subsidies (CNY)		
Heping Village (Luojiagang Sub-project)	Requisition 89.8mu Cultivated land and 12mu non-cultivated land. Most are dry lands and ponds, impact percentage of land acquisition is 11%	In the requisitioned cultivated land in the village, there are 31.8 mu ponds, which are not the main income source of residents; maximum annual income loss caused by land acquisition is CNY 470,000.	540,7000	721,4000	(1) No land redistribution needed, because the impact is very small and most labors have been employed in non-agricultural sectors. (2) Resettlement Subsidy will be paid to APs fully (3) Use land compensation funds to develop non-agricultural industries, arrange the labor force to work in village-run enterprises. Farmers whose land is requisitioned become shareholders and receive dividends, as well as enjoy social security provided by the village collective and the enterprises. Currently, the return on investment of the village enterprises is always fixed at 5~8%. Even according to minimum return on investment, the annual profit of using land compensation fund of the village is CNY640, 000, which can fully compensate for the income loss caused by land acquisition.	With urban development in recent years, non-agricultural industries of the village have developed fast. Most residents work in non-agricultural industries, there are lots of non-agricultural job opportunities, the affected persons are more willing to work in non-agricultural departments.
Tuanjie Village (Luojiagang Sub-project)	Requisition 48.2mu cultivated land and 18.8mu non-cultivated land. 36.2mu ponds in requisitioned land. Impact percentage of land acquisition is 6.2%	In the requisitioned cultivated land in the village, there are 36.2mu ponds, which are not the main income source of residents; maximum annual income loss caused by land acquisition is CNY150, 000.	288,7000	301,3000	(1) No land redistribution needed, because the impact is very small and most labors have been employed in non-agricultural sectors. (2) Resettlement Subsidy will be paid to APs fully. (3) The village collective plans all land compensation funds as a whole to develop commercial and manufacturing enterprises, arrange employment for the villagers. The villagers become shareholders and receive dividends, or enjoy social security provided by the village. The village is adjacent to Xudong Road Business District, the village collective set up a lot of business shops, e.g. furniture city. The return on investment of the village collective non-agricultural enterprises is over 8%, all land compensation funds of the village are invested in village collective enterprises, the annual profit is at least CNY480, 000, which can fully compensate for the income loss caused by land acquisition.	The labor force of the village are all non-agricultural, the village has evolved into Tuanjie Community. No agricultural labor force needs to be resettled. Moreover, the village is located in business district; the residents have lots of nearby non-agricultural job opportunities.
Yujiatou Village (Luojiagang Sub-project)	Requisition 5.8mu cultivated land and 15.2mu non-cultivated land. Impact percentage of land acquisition is very small.	Annual income loss of the village caused by land acquisition is approximately CNY50, 000.	71,1000	51,8000	(1) No land redistribution needed, because the impact is very small and most labors have been employed in non-agricultural sectors. (2) Resettlement Subsidy will be paid to APs fully. (3) Use all land compensation funds as the development fund for commercial and manufacturing enterprises of the village, arranges employment for the labor force, the villagers become shareholder and receive dividends, or enjoy social security provided by the village. The return on investment of the village collective enterprises is over 5%, the land compensation funds of the village are invested in village collective enterprises, the annual profit is as least CNY60, 000, which can fully compensate for the income loss caused by land acquisition.	Non-agricultural industries of the village have developed fast in recent years. Most residents work in non-agricultural industries, there are lots of non-agricultural job opportunities, the affected persons are more willing to work in non-agricultural departments.

* The resettlement plan listed in this table is just the preliminary plan to use compensation at the village level based on consultation with part of APs; the amount of compensation may be changed. In this stage, most of villagers think it is too early to discuss the compensation fund use plan. The specific plan will be updated before land acquisition.

Affected villages/ Sub-project	Summary of impact degree	Income loss	Available land compensation fund		Income rehabilitation plans	Main basis for resettlement plan selection
			Land compensation (CNY)	Subsidies (CNY)		
Xiangyang Village (yangsigang Sub-project)	Requisition 23.5mu cultivated land, including 21.7mu fishponds. Impact percentage of land acquisition is very small.	The requisitioned lands in the village are mainly abandoned ponds. Annual income loss of the village caused by land acquisition is approximately CNY10, 000.	891,000	1,182,000	(1) No land redistribution needed, because the impact is very small. (2) all the land subsidies and land compensation are directly paid to the owners of ponds and the compensation fund for land acquisition is used to promote village collective public welfare. Even the compensation fund is calculated according to the rate of return of 4% or so; the village can earn profit of CNY83, 000, which can fully compensate for the income loss caused by land acquisition.	Most requisitioned ponds in the village are fallow ponds, which are not the income sources of their owners.
Qianjin Village (yangsigang Sub-project)	Requisition 0.1mu land, which doesn't affect production.	Income loss of the village caused by land acquisition is merely CNY5000.	306,000	62,000	(1) No land redistribution needed. All the land subsidies and land compensation are directly paid to the APs. The annual profit of the compensation is at least CNY7, 000.	The village founded Qianjin Group; the villagers are the shareholders of the group. Little land acquisition and no need to resettle labor force.
Ecological Park (Three Gates Connections and Changqing Pump Station)	Occupy 59 mu-cultivated lands; impact percentage of land acquisition is 3%.	Income loss of the village caused by land acquisition is approximately CNY280, 000.	4,393,000	4760,000	(1) No land redistribution. The acquired lands are state-owned lands, the affected labors are the formal employees of farm. (2) Ecological park plans the land compensation and resettlement fee as a whole and invests them in agriculture or non-agricultural industries. Ecological park is responsible for rearranging jobs or providing social security for the contractors. Currently, the rate of return of agricultural investment by Ecological park is at least 4%, the annual profit of using the land compensation and resettlement subsidy is at least CNY366, 000, which can fully compensate for the income loss caused by land acquisition. (3) Affected laborers in state-owned farm can get same wages as land acquisition before	Ecological park used to be a state farm, the contractors used to be the farm employees. The land is state-owned. Ecological park is responsible for arranging new jobs for the employees.
Machi Neighborhood Committee (Three Gates Connections and Changqing Pump Station)	Occupy 41.6 mu cultivated land; impact percentage of land acquisition is 8.4%.	The requisitioned lands in the village are mainly ponds. Annual income loss of the village caused by land acquisition is approximately CNY60, 000.	1,800,000	2,337,000	(1) No land redistribution. The acquired lands are state-owned lands, the affected labors are the formal employees of farm. (2) Machi Neighborhood Committee (Farm) plans the land compensation and resettlement fee as a whole and invests them in agriculture or non-agricultural industries. Machi Neighborhood Committee is responsible for rearranging jobs or providing social security for the contractors. The return on investment of the land compensation and resettlement subsidy is calculated as 3%, the annual profit is at least CNY125, 000, which can fully compensate for the income loss caused by land acquisition. (3) Affected laborers in state-owned farm can get same wages as land acquisition before	The neighborhood committee used to be a state farm, the contractors used to be the farm employees. The land is state-owned. The farm is responsible for arranging new jobs for the employees whose land is requisitioned.

1) The affected regions in Luojiagang Sub-project and Yangsigang Sub-project (Heping Village, Tuanjie Village, Yujiatou Village, Xiangyang Village, and Qianjin Village) belong to typical "village in city" in Wuhan; most of cultivated land in these areas has been changed into urban construction land. A lot of village collectives use a large sum of compensation from land acquisition for many years to establish lots of industrial and commercial entities. Some villages have begun to set up enterprise groups, e.g. Tuanjie Group and Qianjin Group, the villagers not only become employees in the enterprise groups, but also every villager is a shareholder in the enterprise groups.

Wuhan is carrying out a development program "village in city " and village lands are being reclassified as non-agriculture land. These villages are allowed to keep portions of land (computed as 300m² land per household, half of the land can be used as commercial purpose) for commercial use. The increased land value can directly benefit to APs. For example, in the Yujiatou Village, Tuanjie Village, and Heping Village, the villages committees have built many warehouse and stores and most of them are leased for furniture manufacturing and retailing purposes; As matter of fact these areas have become the biggest furniture centers in Wuhan. Consequently, every villager receives their share of CNY 6000-10000 /year as a shareholder. This kind of supplemental income is one of the stable income restoration resources for them (Table 6-2).

Table 6-2 The affected "Villages in City"

The name of affected villages	The main enterprises which have been setup before land acquisition	The returns the villagers have received now	The methods of land compensation use	The estimated returns or benefits to the APs
Heping Village	Heping Village is located nearby the East Lake Park which is a famous scenic spot, the Village committee have setup about 30 enterprises or markets	Every villager can receive CNY 6,000 as a shareholder every year.	(1) All resettlement subsidies paid to the APs, (2) Land compensation will be used to improve their public facilities.	(1) The APs have the priority right to obtain project-related employment opportunities (2) The APs can use resettlement subsidies to create small private enterprises (3) The living conditions will be improved.
Tuanjie Village	Wuhan Tuanjie Group Co. LIT has been set up in 1987, the registered capital is CNY 229,368,000, it is the biggest shareholder of Wuhan Shopping mall, and owned 10 companies such as Xujiapeng Hotel, Haomeijia super market, Tuanjie Mechanical and Electrical Products Market, and so on,	Every villager can receive CNY10,000 as a shareholder every year.	(1) All resettlement subsidies paid to the APs, (2) Land compensation will be invested in Tuanjie Group, the APs share returns according to their shareholders	(1) The APs can increase their shareholders (2) The APs have the priority right to be employed in the development projects and project-related sectors.
Yujiatou Village	Yujiatou Group has been set up in 1993; it owned Heping Great Furniture World, Jinxing Furniture Center, and Nanfang Furniture Market. Their leased areas have been beyond 200,000 m ²	Every villager can receive CNY 7,000 as a shareholder every year.	(1) All resettlement subsidies paid to the APs, (2) Land compensation will be invested in Yujiatou Group, the APs share returns according to their shareholders	(1) The APs can increase their shareholders (2) The APs have the priority right to be employed in the development projects and project-related sectors.

However, any land compensation use plan need to consult with APs, and agreed with the APs though the villager's meeting, legal provisions are also available to protect the APs' rights by the agreement. The PMO and Independent Monitoring Organization will also monitor the use of funds and efficiency of investment.

2) In Dongxihu District, all affected regions (Jinyinhu Ecological Park and Machi Neighborhood Committee) used to be state farms, where farm employees were engaged in agricultural production. Considering development status of affected regions and desires of affected persons, the land in all affected regions will not be redistributed any more after the land acquisition, but the farms will mainly develop non-agricultural industries and arrange labor force to work in non-agricultural departments. The detailed plan to resettle the labors is discussed in section 6-2-3.

6-2-2 Plan for the affected agricultural laborers

Calculated by the formula in the national land laws, the total number of the affected agricultural laborers is 195, in which 72 laborers belong to Heping Village, 14 laborers belong to Yujiatou Village, 30 laborers belong to Xiangyang Village, 59 laborers belong to the Ecological Park, and 20 belong to Machi Neighborhood Committee. However, As we know, The affected areas by the Project are the rapid urbanizing areas, where most of the laborers have been employed in non-agricultural sectors, and the average area of cultivated land per capita in these villages is very low, so the number of the affected agricultural laborers calculated by the formula in the national land laws are much more than actually affected laborers. In fact, according to the survey, just 30 labors (10 laborers belong to Heping Village, 2 labors belong to Yujiatou Village, 5 laborers belong to Xiangyang Village, 8 laborers belong to the Ecological Park, and 5 laborers belong to Machi Neighborhood Committee) are cultivating the acquired land now. So it is not a serious problem to resettle the agricultural labors in the villages affected by the Storm Water Management Component.

The PRO will, based on local conditions, arrange the production and life for the farmers whose land has been acquired by multiple means so that the long-term living standard of agricultural labors will be guaranteed.

1) Heping Village, Yujiatou Village, Xiangyang Village and Qianjin Village all are "Villages in City", from 2004, Wuhan Municipal Government started to implement a plan to renew these "Villages in City". According to this plan, all the residents in these villages will be changed from

villagers to citizens, and land resources comprehensive improvement will be implemented in these villages. In China, the rural land can not been used for non-agricultural propose, Due to the "Villages in City" renew plan, all villagers will be changed to "citizens", and the whole land can be used for commercial or industrial projects according to the Urban Planning. The village then can used their land to set up enterprises. The value of their land will be much higher than before, and all villagers can receive benefits. That means certain areas will be delineated to build the residential houses, and remain areas will be used for commercial or industrial projects according to the Urban Planning. The affected villages plan to make the resettlement activities integrate into the village renewal plan. When their lands are acquired by the Project, the village committees can receive compensation according to the adopted policies. The land compensation and subsidies will be invested in the non-agricultural sectors owned by the village, such as supermarket, bazaar or industrial factories. Now the areas affected by Luojiagang Sub-project and Yangsigang Sub-project are become business zones, many shops and enterprises have been set up in Heping Village, Yujiatou Village, and Qianjin Village, Xiangyang Village in recent years, it is not difficult to resettle the affected labors. In fact, when the agricultural labors are employed in the non-agricultural sectors, their incomes are much higher than before, so the APs are satisfied with this resettlement method.

2) The Ecological Park and Machi Neighborhood Committee belong to state-owned farm, only 8 labors in the Ecological Park and 5 labors in Machi Neighborhood Committee need to resettle. In the recent years, many industrial or commercial projects have been constructed in this area, the employment opportunities increasing fast, and the Ecological Park have became one of new development zone, the state-owned farm have owned many companies. The leaders of the farm promise to provide new jobs in farm-owned companies for the affected labors if their cultivated land is acquired and their wages are same as land acquisition before (about 1200yuan). Because the labors are the formal employees of the farm, when they are retired, they can receive retirement pension about 600-800 yuan/month.

6-3 Skill training for affected laborers

All the affected areas by the Project are located in Wuhan urban or sub-urban areas, with the expansion of Wuhan city; rapid urbanization in these areas is an unavoidable trend. That means more and more laborers will be employed in nonagricultural sectors or migrate into urban areas. The skill and human capital will be the most important wealth for the affected

laborers in the future. The PRO and local government have formulated a skill training program for the affected laborers on the basis of needs of Wuhan labor market (Table 6-3). All the affected laborers will be trained without fees; the budget of the training has been included into the resettlement budget of the Project. The PRO and local government will also provide suitable and special skill training to all affected female laborers (253 laborers). After Skills training, local government will help to recommend them to labor bureau or laborers marking management institute. As for the investigation of Wuhan labor market, it is easy for them to find the job with about wages of CNY 500-800 per month.

Table 6-3 Skill-training plan for affected laborers

Training content	Number of labors	Fund budget CNY	Training place	Planned time
Knowledge about Resettlement polices	50	5,000	Heping, Tuanjie, and Yujiatou Village	May, 2006
	50	5,000	Xiangyang, Qianjin Village	May, 2006
	30	3,000	The Ecological Park	May, 2006
	30	3,000	Machi Community	May, 2006
Livelihood Training	165	30,000	Hongshan Township Jiangdi Township Jiangjun Road	May, 2006
Skill training	165	30,000	Hongshan Township Jiangdi Township Jiangjun Road	Jun, 2006
Special skill training for the women	253	27,000	Wuhan city	Jul, 2006
Special skill training for the vulnerable groups	20	20,000	Wuhan city	Feb, 2007
Total	555	123,000		

6-4 Resettlement of rural relocated households

The total area of relocated rural residences with certificates in the project is 29326m², of which 22553m² (76.9%) are affected by Luojiagang Sub-project, 5378m²(18.3%) by Yangsigang Sub-project, 1395m² (4.8%) by Three Gates Connection and Changqing Pump Station Project. 3297m² belong to the dismantled rural residences without certificates, including 3185m² in Luojiagang Sub-project Relocation and 112m² in Yangjiagang Sub-project Relocation.

In accordance with the *Administrative Measures of Wuhan Municipality on Collective-owned Land Demolition and Relocation*, the options of rural relocated households will be

different between the areas within the Middle-Ring and outside the Middle-Ring.

6-4-1 Resettlement plan for rural households within the Middle-Ring

For rural houses located in the Middle-Ring, about 30 km far away from center of Wuhan, two kinds of resettlement measures are provided for the APs to choice: (i) monetary compensation; (ii) house ownership exchange.

Heping Village, Tuanjie Village, Yujiatou Village, Xiangyang Village and Qianjin Village affected by the project are located in the middle ring, which are listed in the comprehensive renovation plan for “village in city” of Wuhan at present. All these rural relocated households can enjoy the relevant preferential policies for “village in city” comprehensive renovation. The rural relocated households in the range of “village in city” can choose the following relocation modes:

(1) House ownership exchange. Heping Village, Tuanjie Village, Yujiatou Village, Xiangyang Village and Qianjin Village are all listed in the comprehensive renovation plan for “village in city” of Wuhan. In accordance with the renovation plan for these regions, village collectives will centrally built multi-story residences to resettle relocated households in compliance according to unified planning. While dismantling original villagers' houses, first determine legal building area of each household, register in detailed lists and report to district governments for the record. The relocated persons are resettled by means of equivalent exchange according to the determined legal area and the resettlement criteria established by planning departments. If the determined area is larger than that in the resettlement criteria, the excessive part will be compensated according to house replacement cost. For the criteria for the house replacement cost of the project, see Table 5-9.

(2) In accordance with *Opinions on Actively Promoting the Comprehensive Reconstruction of “Villages in City”* of Wuhan, the taxes and fees involved in the returned buildings built by rural collective economic organizations for resettling original villagers will be implemented according to the relevant policies for farmers' individual house construction. During the project construction of land development, municipal infrastructure matching fee is exempt; other stipulated fees with range will be charged according to the lower limit, stipulated fees without range will be charged half.

(3) With the consent of relocated persons, the APs can adopt monetary resettlement. The criteria for monetary compensation are house replacement cost plus location price of house site. On the basis of real estate prices in current affected regions, the relocated households who get compensation can afford commercial residential buildings with the same

area and in similar locations.

6-4-2 Resettlement plan for rural households outside the Middle-Ring

For houses outside the Middle Ring, three kinds of resettlement measures are provided for the house owners to choose: (i) monetary compensation; (ii) house ownership exchange; (iii) rebuild houses in other house sites.

Because the residences out of the middle ring requisitioned by the project are mainly the dwellings of farm workers of Machi Neighborhood Committee, according to social economic survey and public advisory opinions, most of the relocated households of the Neighborhood Committee agree to build new residences in new house sites after being compensated. The leaders of farm have selected an area as the house site to build residences houses according to the master plan of the farm. Because the compensation criteria are relatively high for suburban residents, they can surely build new dwellings with better structure after getting the house compensation fund.

6-5 Rehabilitation of urban relocated households

The total area of urban relocated residences in the project is 4650m² (urban residence without certifications cover 600m², and certificated urban residence cover 4050m²), of which Luojiagang Sub-project relocation of 2550m² covers 54.8%, Yangsigang Sub-project relocation of 600m² covers 12.9%, Three Gates Connection and Changqing Pump Station Project relocation of 1500m² covers 32.3%.

The project will resettle the affected urban families in the following ways:

(1) Affordable housing resettlement

Affordable housing is a guarantee policy commercial residence, with preferential policies provided by the government, administratively allocated land, reduction and exemption of administrative and institutional fees, infrastructure out of the community constructed by the government, and limited house types, areas, buyers and prices. Because the government reduces and exempts the relevant taxes and charges of leasehold of land and building construction, the price of affordable housing is 10~20% lower than that of similar commercial housing, which greatly alleviates the burden of house purchase for low-income families.

In order to resettle relocated households better, the project owner will list house purchase of relocated households in *Wuhan Affordable Housing Plan*. All the relocated households

whose income is low are qualified to buy affordable housing. Moreover, Wuhan Municipality will provide proportional affordable housing for the resettlement of poor persons affected by the project in construction investment plan and credit guide plan for economic housing sent down annually.

At present, there are 1.4 million m² affordable housing that are being built or will be built in Wuhan. In April 2005, Wuhan Municipal Government added 1 million m² affordable housing. The urban relocated households affected by the project can choose to buy nearby affordable housing listed in Table 6-4 among 21 affordable housing construction projects publicized by Wuhan City in 2005.

Table 6-4 Affordable houses newly built in 2005 available for relocated households

No.	Project name	Project address	Development and construction unit	Distance from affected villages	Total planned area (10,000m ²)
1	Phase IV of Biyuan Community	No. 42 Yejing Avenue	Tianshun Real Estate Development Co., Ltd.	3 km	5.1
2	Wuchang Jiangnan Garden	Fangji Road, Yangyuan Street	Wuhan Hongchang Investment Co., Ltd.	4 km	5.75
3	Wuchang Huifeng Garden	Fengshou Village	Hubei Huidong Real Estate Co., Ltd.	2 km	4
4	Wutaizha Community	Wutaizha	Wuhan Xingcheng Real Estate Development Co., Ltd.	2 km	2.5
5	Wuchang Jinxiu Garden	No. 7 Tieji Road, Yangyuan Street	Development Company of Jiangnan Industrial Group	3 km	9
6	Wuchang Jiaxin Garden	Qinyuan Road, Xujiapeng Street	Guoli Real Estate Development Company	4 km	7.9
7	Wuchang Jiayun Community	Special No.1 Fengshou Village	Hubei Huidong Real Estate Co., Ltd.	5 km	5
8	Wuchang Lihua Garden	Tieji Village, Yujiatou	Zhongshan Real Estate Development Company	1 km	5
9	Fukanghua	Gusaoshu	Fuqiang Real Estate Company of Wuhan Construction Engineering (Group) Co., Ltd.	3 km	0.52
10	Hanyang Liujin Garden	Qinduankou	Real Estate Company of Hanyang District	2 km	14
11	Hanyang Longjiang House Garden	No.40 Longjiang Village, Hanyang District	Headquarters of Wuhan New Area	2 km	15
12	Tianshun Garden	Changfeng Village, Changfeng Township	Guangshun Group Stock Co., Ltd.	3 km	25

(2) Cheap rented housing resettlement

Cheap rented housing is economic housing, built by Wuhan Municipal Government to improve housing conditions of families affected by the project which have small dwelling space and lead a hard life without income or other income sources. This resettlement mode is mainly applicable for very poor families whose relocation area is less than 30m² without any other

house.

If there are families who need to apply for cheap rented housing settlement, the project office will negotiate with government departments and provide them with cheap rented housing after qualification approval.

(3) Nearby second-hand house resettlement

After the relocated households get relocation compensation, they can buy second-hand houses in the original community or in nearby communities according to their economic conditions. Second-hand house resettlement increases selection opportunities for relocated households, and the affected persons can select second-hand houses in suitable locations with suitable areas according to their own requirements without additional burdens. Furthermore, since it is not remote relocation, it is relatively easy to melt into the native residents in the reception area; work, transportation, going to school and seeing a doctor will not be affected. It is a good resettlement means. Project Resettlement Office will manage and publish the resource information of second-hand houses, fully respect the wills of relocated persons, provide lots of second-hand houses in all urban districts for the free selection of relocated persons, and reduce or exempt second hand house transaction taxes and fees at the same time.

(4) Monetary compensation resettlement

According to social and economic survey statistics, part of households is willing to receive monetary compensation, and the project owner will monetarily compensate these affected persons according to monetary compensation resettlement policies and criteria. It offers more choices for resident families, especially for those households who plan to use their savings to buy new houses and improve housing conditions in the near future. Monetary relocation resettlement will offer more independent choices to select new resettlement houses for affected persons, especially those with better family economic conditions who can select the most satisfactory houses in the market on the basis of their economic status to improve inhabited environment and housing quality.

3 months before the commencement of project construction, on the basis of full negotiation with the affected residents, Project Resettlement Office will sign the *Monetary Resettlement Agreement for House Relocation* with the affected residents. From the day of signing the agreement, Project Resettlement Office will directly pay the resettlement money to the relocated persons in 15 days.

Since reform and opening, Wuhan real estate has developed very fast; however, its commercial housing price is lower, and in comparison with other similar domestic metropolis, the commercial housing price in Wuhan is the lowest. Though commercial housing price in Wuhan has increased relatively fast in recent years, it is still in lower price level among similar domestic metropolises. Considering the current commercial housing price, unit price below CNY1600/m² covers 13.4%, CNY1600~2400/m² covers 35.3%, CNY2400~3200/m² covers 34.8%, over CNY3200/m² covers 16.5%. According to the compensation criteria of the project, the relocated households can surely afford commercial housing of middle price in the market after getting monetary compensation.

6-6 Rehabilitation of affected shops

There are 19 shops affected by the project, including 13 common shops and 6 shops without certificates. According to survey, total relocated shops covers 10192 m², including common shops of 6842m² and buildings without certificates of 4070m².

Project Resettlement Office will provide the following optional resettlement modes for the affected shops. The relocated households can freely choose resettlement mode according to their own conditions and wills.

(1) Resettled in affordable housing communities or rebuilt communities

All newly built affordable housing is equipped with service facilities and commercial shops. For shops in residential communities, because community population is relatively concentrated and community location is far from large stores, small shops enjoy better commercial opportunities. So, it is relatively suitable for resettlement of affected shops. Because many affected persons are mixed households of residence and business, their places of residence coincide with their places of business in case of resettlement in community. Project Resettlement Office will give priority to sell or rent houses in newly built affordable housing communities to the relocated households so that they can continue their business operations.

Most shops affected by the project belong to Heping Village, Tuanjie Village and Yujiatou Village of Hongshan Township. According to the policies for “village in city” comprehensive renovation of Wuhan, the villages which belong to “village in city” renovation can properly build commercial buildings within returned land range in accordance with controlled detailed planning and applications of the relocated persons, and replace commercial housing building area with residential area according in certain proportion to resettle relocated persons. Heping

Village and Tuanjie Village, affected by the project, are planning to build a concentrated community, the shops in the community will be given priority to be rented or sold to current shop owners.

(2) Resettled nearby newly built commercial and professional markets

Wuhan is one of “Four Famous Towns” in Chinese history, which has a trading tradition and convenient conditions since ancient times. In recent years, with urban construction and economic development in Wuhan, lots of professional markets have developed fast, which form market groups throughout the three towns of Wuhan. According to statistics, 62 professional markets have been built by now in Jiangnan District, which is located in the central zone of Wuhan. These professional markets with brisk trade and fast development are ideal places for commercial operation. The PMO will resettle some recoated business shops in professional markets so as to increase scale of operation, keep or enhance income levels. It is a relatively ideal resettlement mode for business shops. City Resettlement Office publicizes most updated information of shop markets to the displaced persons through media so that the displaced persons can independently choose places and items of business.

(3) Monetary compensation resettlement

According to social and economic survey, part of the affected shop owners demands monetary compensation so that they can voluntarily close business, change professions, independently choose new shop locations, etc. The PRO adopts monetary resettlement for these shops and directly pays relocation monetary compensation; the workers shall be employed by the boss or be paid according to the contacts.

Since the affected regions are along the channels far from commercial streets instead of busy commercial areas, many shops in these areas are reconstructed from residential houses, or temporarily built. The business scope of these shops is mainly daily necessities of cigarettes, wines and food, etc. These shops generally adopt monetary compensation resettlement, i.e. shop owners are directly monetarily compensated to independently choose to close business or reopen business in new locations. Attached houses or storehouses instead of business houses are relocated in some affected shops; monetary resettlement mode will be applicable for these affected shops. For resettlement mode of each shop, see Table 6-5.

Table 6-5 Resettlement plan for affected shops

No.	Shop name	Shop/ Workers	Summary of impact degree	Resettlement mode
1	Guihua Decoration Company	Common/ 5 workers	Production operations not affected, relocate houses of 310m ²	Monetary compensation, continue business
2	China Unicom Xudong Road Business Hall	Common 2 workers	Business affected, relocate houses of 300 m ²	Monetary compensation, rebuild in other places
3	Emperor International Decoration Company	Common/ 2workers	Production operations not affected, relocate houses of 200 m ²	Monetary compensation, continue business
4	Smoke and Wine Fair Price Supermarket	Common/ 1 worker	Production operations affected, relocate houses of 45 m ²	Monetary compensation, run business in other rented houses
5	Tieji Materials Company	Common/ 6 workers	Production operations not affected, relocate houses of 890 m ²	Monetary compensation, close the market
6	Tuanjie Trading Group Company	Common/ 10workers	Production operations affected, relocate houses of 1500 m ²	Monetary compensation, continue business
7	Mercury Composite Materials Company	Common/ 6workers	Production operations partly affected, relocate houses of 600 m ²	Monetary compensation, continue business
8	Xinglong Hostel	Common/ 9 workers	Production operations slightly affected, relocate houses of 780 m ²	Monetary compensation, continue business
9	Heping Village Non-staple Food Store	Common/ 2 workers	Business affected, relocate houses of 400 m ²	Monetary compensation, close the store
10	Zhongxing Company of Xinhua Group	Common/ 5 workers	Production not affected, relocate house of 650 m ²	Monetary compensation, continue business
11	Wuhan Xinhui Discarded Automobile Company	Common/ 6 workers	Production partly affected, relocate houses of 700 m ²	Monetary compensation, continue business
12	Wangda Industrial Co., Ltd.	Common/ 2 workers	Production not affected, relocate house of 300 m ²	Monetary compensation, continue business
13	Qianjin Swimming Recreation Center	Common/ 1 workers	Business partly affected, relocate houses of 167 m ²	Monetary compensation, continue business
14	Junk Market of Tieji Materials Company	Without certificate/ 3 workers	Business affected, relocate houses of 850 m ²	Monetary compensation, close the market
15	Yujiatou Village Store	Without certificate/ 1 workers	Business affected, relocate houses of 150 m ²	Monetary compensation, close the store
16	Bean Curd Workshop	Without certificate/ 1 workers	Business affected, relocate houses of 110 m ²	Monetary compensation, run business in other rented houses
17	Heping Village Grocery Store	Without certificate/ 1 workers	Business affected, relocate houses of 280 m ²	Monetary compensation, run business in other rented houses
18	Tieji Bamboo and Wood Market	Without certificate/ 7workers	Business affected, relocate houses of 2400 m ²	Monetary compensation, close the market
19	Zhenhua Guangda Trading Co., Ltd.	Without certificate/ 3 workers	Business affected, relocate houses of 280 m ²	Monetary compensation, continue business

6-7 Rehabilitation of affected enterprises and institutions

According to the survey, 29 enterprises and institutions (with the relocated area of 18561.85m²) are affected by the Storm Water Management Component. Most of these enterprises are private enterprises with poor equipment and dilapidated factory buildings. Only Jinyinhu Power Station in Dongxihu District needs be wholly relocated in large scale.

The affected enterprises and institutions can choose the following resettlement modes:

(1) Monetary compensation resettlement

Most of land acquisition in the project belongs to linear land acquisition; there are no large enterprises and institutions within the land acquisition scope due to urban planning control, most of the affected ones are non-business buildings of enterprises and institutions. Moreover, land acquisition generally partly affects enterprises and institutions and doesn't relocate main production equipments and main factory buildings of enterprises and institutions. Consequently, limited land acquisition will not greatly affect the overall operation of these enterprises and institutions.

The attachments (e.g. gatehouses and courtyard walls) of these enterprises and institutions are most likely to be affected, it is unnecessary to relocate an entire enterprise or institution to other places. So, direct monetary compensation is generally adopted in resettlement, and enterprises and institutions independently decide whether to rebuild or not. Project Resettlement Office will offer transition fee or compensation for loss of working time for the enterprises and institutions affected by the project construction.

(2) Relocation in other places

Resettlement Office will resettle the enterprises or institutions by relocation and reconstruction, whose main production equipments and production operations buildings (e.g. factory buildings) need to be relocated. Resettlement Office, the affected enterprises, Urban Planning Bureau and other relevant government departments determine relocation and reconstruction sites. These enterprises, which will be relocated and reconstructed, will be listed in the relocation plan for urban enterprises, uniformly implemented and rationally designed. The resettlement plan for enterprises and institutions is shown in Table 6-6.

In order to minimize the loss of the affected shops, enterprises and institutions during the relocation, Resettlement Office will take the following measures:

- The remover and the local government shall inform the relocated enterprises of detailed relocation and resettlement plan and get approval 3 months in advance;

Table 6-6 Resettlement plan for affected enterprises and institutions

No.	Names of enterprises & institutions	Summary of impact degree	Affected staff and Contract workers	Resettlement mode
1	Hongsheng Plastic Steel Doors and Windows Factory	Dismantle primitive houses of 250 m ²	1	Monetary compensation, run business in other rented houses
2	Hongda Academy Furniture Factory	Dismantle primitive houses of 1100 m ²	2	Monetary compensation, run business in other rented houses
3	Wuchang Taida Hardware Factory	Dismantle primitive houses of 1100 m ²	2	Monetary compensation, run business in other rented houses

No.	Names of enterprises & institutions	Summary of impact degree	Affected staff and Contract workers	Resettlement mode
4	Oasis Nail Factory	Dismantle primitive houses of 550 m ²	1	Monetary compensation, run business in other rented houses
5	Zhipeng Furniture Factory	Dismantle primitive houses of 400 m ²	2	Monetary compensation, run business in other rented houses
6	Yonghua Furniture Factory	Dismantle primitive houses of 400m ²	0	Monetary compensation, run business in other rented houses
7	Aijia Real Estate Company	Business not affected, dismantle houses of 460 m ²	1	Monetary compensation, run business in other rented houses
8	Provincial 1st Construction Company	Production not affected, dismantle buildings of 750 m ²	0	Monetary compensation
9	Zhenxing Furniture Factory	Dismantle primitive houses of 500 m ²	1	Monetary compensation, run business in other rented houses
10	Yonghua Timber Mill	Dismantle primitive houses of 400 m ²	2	Monetary compensation, run business in other rented houses
11	Wanyu Furniture Factory	Dismantle primitive houses of 450 m ²	2	Monetary compensation, run business in other rented houses
12	Yujiatou Sofa Accessories Factory	Dismantle primitive houses of 200 m ²	0	Monetary compensation, run business in other rented houses
13	Wuhan Huitao Commercial Concrete Co., Ltd.	Production not affected, dismantle houses of 400 m ²	0	Monetary compensation
14	Wuhan Yulong Concrete Co., Ltd.	Production partly affected, dismantle primitive houses of 320 m ²	2	Monetary compensation
15	Brothers Paint Factory	Production partly affected, dismantle primitive houses of 480 m ²	2	Monetary compensation
16	Wuhan Jingang Furniture Co., Ltd.	Production affected, dismantle houses of 2000 m ²	4	Monetary compensation
17	Tieji Group	Dismantle buildings of 877 m ²	2	Monetary compensation
18	Yujiatou Police Service Office	Dismantle office buildings of 500 m ²	0	Monetary compensation, reconstruct office buildings in other places
19	Luojia Road Drainage Station	Dismantle office buildings and dorms of 900 m ²	0	Newly build office buildings and dorms after pump station expansion
20	Tiansheng Furniture Factory	Production partly affected, dismantle primitive houses of 80 m ²	1	Monetary compensation, run business in other rented houses
21	Shishui Timber Processing Mill	Production partly affected, dismantle primitive houses of 120 m ²	2	Monetary compensation, run business in other rented houses
22	Hongshan Lianxing Wooden Chair Factory	Production partly affected, dismantle houses of 300 m ²	2	Monetary compensation, run business in other rented houses
23	Wuchang Brothers Furniture Factory	Production partly affected, dismantle primitive houses of 300 m ²	2	Monetary compensation, run business in other rented houses
24	Xingda Furniture Factory	Production partly affected, dismantle primitive houses of 300 m ²	3	Monetary compensation, run business in other rented houses
25	Jinxin Furniture Manufacturing Co., Ltd.	Production affected, dismantle primitive houses of 1500 m ²	2	Monetary compensation, run business in other rented houses
26	Shangtaizi Storehouse	Production partly affected, dismantle primitive houses of 250 m ²	1	Monetary compensation, No reconstruction
27	Qianjin Group	Dismantle abandoned houses of 2000 m ²	2	Monetary compensation, No reconstruction of bankrupt factories
28	Qianjin Village Salon Art Kindergarten	Partly affected, dismantle attachments of 230 m ²	1	Monetary compensation
29	Jinyinhu Power Station	Wholly dismantle, dismantle houses of 724.85m ²	2	Monetary compensation, renovation of power network, no reconstruction

- Compensate the affected enterprises for the relocated buildings and other various attachments according to replacement cost;

- Compensate for operating loss and workers' loss of working time caused by enterprise relocation;

- Compensate the affected institutions for the relocated buildings and other various attachments according to replacement cost, and choose suitable time for relocation lest normal working order in these units is affected;

- Resettlement of affected enterprises and institutions will be implemented on the basis of negotiation;

- No affected workers will lose his/her job if the affected enterprises are still running. Although most of the enterprises just are affected partly by the Project, they will continue to run and product in other place, 95 percent of the affected labor will not lose their jobs due to the Project construction. If the enterprises owner plans to stop production, the local government and the PRO will require the boss to pay compensation to their workers according to the national laws.

6-8 Rehabilitation of floating population and tenants

In the affected persons, 538 persons of 119 households belong to floating population, they lived in the relocated houses but worked in other places, their income and work will not be affected by house relocation. According to the survey, there are sufficient houses to rent in these affected areas so it is easy for the floating population to rent another houses. These floating population and tenants, although not the owner of the house, also have the right to be correspondingly compensated once their production operations and lives are affected.

1) Tenants or floating population, who has to be relocated, will get moving and relocation transition compensation fee as other residents.

2) The project owner will inform floating population and tenants of relocation information 3 months in advance so that floating population and tenants prepare for relocation and have enough time to rent new residences.

3) If the lease contracts for floating population have not expired, floating population or tenants will be correspondingly compensated in accordance with the lease contract, the compensation fee will be paid by the project owner.

The project owner will also work together with local governments to provide timely information about rented houses for floating populations and tenants, so as to let the floating populations and tenants have more freedom to select houses.

6-9 Restoration measures of the vulnerable groups

6-9-1 Resettlement principles for vulnerable groups

Resettlement principles for vulnerable groups are as follows:

- Enhance living standard and quality of the group;
- Offer more optional solutions as possible;
- Fully consider the wills and needs of the groups and attach more importance during implementation;
- Care for vulnerable groups continuously to ensure their living improvement.

6-9-2 Restoration Measures for the vulnerable groups

The survey indicates that in affected persons, 2 families of altogether 7 persons belong to the vulnerable groups; this number is provided by the head of the affected village, during the project resettlement implementation, the PRO will definite the vulnerable groups again according to the adopted rules above, the amount of the affected vulnerable groups families maybe add.

The project will implement special resettlement and rehabilitation measures in resettlement policies o for the affected vulnerable groups.

- The Project establishes a special fund with a total amount of CNY 1,500,000 to assist the vulnerable groups. It is a prepared fund to safeguard the vulnerable groups' living level. If the income restoration measures can't safeguard their living level, or the vulnerable groups face risk, they can apply for the special assistance fund through village committee and township, after information disclosure, it will be accepted by PMO and then delivered to APs. Local government and IMO will monitor the use of the fund.

- Provide project-related employment to vulnerable groups, during the period of the construction, about 1500 person•year new temporary employments such as paving roads, leveling ground, supplying raw materials will create directly, the vulnerable groups have the priority to obtain these employment opportunities, which are acceptable and workable for them. Each poor family will be sure to obtain at least one project-related employment.

- If the building area of residential house per capita for the families of vulnerable groups is less than 12 m² and no other residential house, the compensation will be calculated in accordance with a building area of 12 m² per capita, and the extra expenses will be paid with the special supporting fund for vulnerable groups.

- the main problems that the vulnerable groups faced are how to strengthen their ability to

adjust to new environment and their skill about non-agricultural production. The PMO and local government have formulated a special livelihood-training plan for the vulnerable groups, the aim of the livelihood-training program is to provide skill to them, then they can earn more income from non-agricultural employment opportunities.

- Provide living hood and skill training without fee to the vulnerable groups so as to increase their employment opportunities
- Supervise and urge the local village committees to give the vulnerable groups priority to choose new house site.
- Provide skill training to the vulnerable groups without fees so as to increase their employment opportunities.

6-10 Restoration measures for women livelihood

In the affected villages, Women are largely engaged in the informal sector— working in the fields, or selling produce. Women's economic activities are also an important source of income for households. Land acquisition and dislocation may result in loss of livelihood, adding to women's economic hardships. Therefore, Consideration of gender issues is crucial in the implementation of resettlement and rehabilitation programs. Special needs and requirements of women must be considered and addressed in all program aspects—site selection, site and housing design, provision of civic infrastructure, access to service, provision of land and housing title, payment of compensation, and income restoration. In this project, the main problems that the women faced are how to strengthen their ability to adjust to new environment and their skill about non-agricultural production. The PMO, the local government will work with NGOs, devote to promote gender equity and increase the women's income.

i. Create new employment and livelihood options for women. According to the social assessment report, the Project will provide 5,000 person-years of work over the 5-year construction period. Project related services, such as procurement of construction materials and equipment and follow-on multiplier effects throughout the regional economy are expected to create an additional 9,000 person-years of work. It is estimated that approximately 40% of the construction jobs will be filled by the poor and vulnerable, including unemployed persons, rural migrants and women. Project operations will also create 220 full-time permanent jobs and Multiplier effects will lead to the creation of an additional 130 full-time permanent jobs throughout the municipality. The vulnerable groups especially the women have priority to

obtain the employment opportunities. Since unemployment is a major cause of women poverty, the women will benefit disproportionately from this job creation.

ii. Ensuring participation of women. The consultation process should include women and ensure that their participation is actively. All resettlement programs should consider the women's special needs; the women must be fully informed. The PROs plan to have separate meetings for women during the resettlement implementation.

iii. The local government and the resettlement offices ensure that the women have landownership and property rights same as man, when the women are divorced or widowed, they still have the right to obtain land or land compensation. The PRO also required that land/house titles and grants should be in the name of both spouses.

iv. Eliminating gender discrimination, encourage women's entrepreneurship. The PMO is seeking ways to establish partnership between local government and NGOs, and devotes to enhance the opportunities and quality of lives for women and girls. At first, Female staff should be hired by the resettlement organizations to work with and assist women in all aspects of resettlement activities, including planning and implementation of income restoration programs. Involve women's groups in resettlement planning, management and operations, job creation, and income generation. The second, the local government and the PMO will work with NGOs, and devote to eliminate discrimination in the investment climate, encourage women's participation in the formal labor force, and promote private sector investment that will enable women to reach their full potential.

6-10 Compensation and rehabilitation for affected public facilities

During project implementation, for main affected public facilities, e.g. power lines, telephone lines, roads, greenbelts and various underground lines, the Project Resettlement Office is responsible to communicate and negotiate with owners of public facilities and make a detailed rehabilitation and reconstruction plan, so that the affected infrastructure will be rehabilitated and reconstructed as soon as possible.

In case of monetary compensation, the PRO will timely pay cash and help coordinate with relevant departments to rehabilitate the above mentioned power, communication and transportation facilities, etc.

7 Budget and Fund Management

7-1 Expense budget of resettlement

Expenses incurred in acquisition, relocation and resettlement shall be allowed for in the total budget of the Project. According to the current price, total budget for land acquisition and resettlement in the Project is CNY 268,350,000. The budget estimate is shown in Table 7-1.

- Land acquisition expenses

It includes all compensation expenses for state-owned land and collective-owned land, including land compensation, resettlement compensation and various taxations. The compensation fund paid to APs or affected institutions (including affected villages and affected enterprises) are CNY 54,459,000, while the taxes and fees turned into government from the project owner are 30,326,000. The total budget cost for land acquisition including temporary land use is CNY 84,785,000.

- Compensations for demolished buildings. Total budget expense of compensation for various house expenses of affected persons or institutions is CNY 122,034,000.

- Compensations for young crops and ground attachments

Total budget for compensations for affected young crops and ground attachments is CNY 1,610,000.

- Management cost for land acquisition. Management cost is CNY 4,393,000; this cost is calculated by 2 % of the total expenses for land acquisition and relocation.

- Special assistance fund for the Vulnerable Groups

The fund is mainly for providing assistance to the vulnerable groups to rehabilitate their production conditions or providing subsidies to these families whose total houses areas are below 20 m². The budget of this fund is CNY 1,500,000.

- Training Fee

This fee is used to provide livelihood and skill training to the APs, especially to the agricultural labours who ready to work in non-agricultural sectors. The staff of the PRO at every level will also be trained, so as to equip them with knowledge in national laws on resettlement and ADB's resettlement policies; the budget of this fee is CNY 500,000.

- Management cost for resettlement and relocation.

The total budgeted expense that will be used in the preparation of land acquisition and relocation and daily administration is CNY 6,590,000. This is calculated by 3 % of the total expenses for land acquisition and relocation.

- Survey expenses for resettlement implementation and monitoring cost. The total expenses used for detailed measurement survey and retaining independent external monitoring organizations will be CNY 2,197,000.

- Contingency costs. Contingency costs refer to costs that cannot be predicted in the process of project implementation. The contingency costs consist of basic prepared fund and price-rise prepared fund. The basic prepared fund is for possible additional funds incurred in the process of project implementation or due to design changes during construction, while the price-rise prepared fund is for possible cost escalation between cost compilation and project implementation. This basic prepared fund is calculated at 10 % of the total expenses for land acquisition and relocation, while the price-rise prepared fund is calculated at 5 % of the total expenses for land acquisition and relocation. Total budget for the costs is CNY 32,949,000. Contingency support and a firm commitment by the EA that in such cases, livelihood support as described in the RP will be available to any APs whose lands cannot be restored.

7-2 Flow direction of resettlement funds

The Storm Water Management Component is the key infrastructure project in Wuhan city. According to the construction procedures of infrastructure project in Wuhan, Firstly Wuhan Development and Reform Commission, Wuhan Financial Bureau, and Wuhan Urban Construction Bureau formulate *Yearly Plan for Wuhan Urban Construction*, and submit the plan to Wuhan Municipal Government for approval. Secondly Wuhan Municipal Government collects investment according to *Yearly Plan for Wuhan Urban Construction* from Wuhan Financial Urban Construction Fund, and loans from commercial banks or development banks. All investments will be gathered together and managed or operated by Wuhan Urban Construction Fund Office (WUCFO). Thirdly the PMO formulate investment use plan and report to WUCFO according to the schedule of project. After checking the plan, WUCFO pays the compensation directly to the APs through the bank.

The expense of land acquisition is divided into two parts: one part is the land compensation and resettlement subsidies, which will be paid to the APs and the affected communities directly; another part is the fees and taxes, which should be turned into the government. According to the budget (Table 7-2), the total expense of land acquisition is CNY8,712,9000, in which CNY 3,131,6000 (36%) will be paid to the APs, CNY 2,548,6000 (29.2%) will be paid to the affected village communities, while 3,032,7000 (34.8%) will be turned into the government as fees or Taxes (Table 5-5). If the villagers agreed, the land compensation paid to the communities will also be paid to the APs.

In this project, The Wuhan Urban Construction Fund Office (WUCFO) shall be responsible

for the payment of compensation; The Resettlement Department of ADB Financed Project Administrative Office shall be responsible for the monitoring and management of resettlement funds. The Resettlement Department of Jianxing Company shall be responsible for the examination of the use of resettlement funds. The resettlement fund flow chart and monitoring or checking procedures of fund use are shown in Figure 7-1.

Table 7-1 the amount and percentage of land compensation fund¹ paid to APs, government and the village communities

Item		Luojiagang Sub-project		Yangshigang Sub-project		Three Gate Connection		Changqing Pump Station		Total	
		Amount (CNY 10,000)	Percent age (%)	Amount (CNY 10,000)	Percentage (%)	Amount (CNY 10,000)	Percent age (%)	Amount (CNY 10,000)	Percent age (%)	Amount (CNY 10,000)	Percent age (%)
Compensation fund for permanent land acquisition	Paid to APs ²	1098.7	35.0	119.0	28.2	1599.0	34.0	80.6	37.8	2897.3	34.2
	Paid to Village Community	993.4	31.7	127.5	30.3	1372.1	29.1	55.6	26.1	2548.6	30.0
	Turned to government	1045.3	33.3	174.7	41.5	1735.6	36.9	77.1	36.1	3032.7	37.8
	Subtotal	3137.4	100	421.2	100	4706.7	100	213.3	100	8478.5	100
Compensation fund for temporary land Occupation	Paid to APs	74.0	100	150.5	100	9.8	100	0	100	234.3	100
	Paid to Village Community	0	0	0	0	0	0	0	0	0	0
	Turned to government	0	0	0	0	0	0	0	0	0	0
	Subtotal	74.0	100	150.5	100	9.8	100	0	100	234.3	100
Total Compensation fund for land acquisition	Paid to APs	1172.7	36.5	269.5	47.2	1608.8	34.1	80.6	37.8	3131.6	36.0
	Paid to Village Community	993.4	30.9	127.5	22.3	1372.1	29.1	55.6	26.1	2548.6	29.2
	Turned to government	1045.3	32.5	174.7	30.5	1735.6	36.8	77.1	36.1	3032.7	34.8
	Total	3211.4	100	571.5	100	4716.5	100	213.3	100	8712.9	100

7-3 Resettlement fund management

7-3-1 Resettlement fund categories

The resettlement fund refers to the special payment that has been allowed for in the budget for all expenses occurred during the process of land acquisition and relocation and resettlement, which consist the following aspects:

¹ It doesn't include the compensation fund for the young crops and ground attachments, which will be paid directly to the APs.

² The resettlement subsidies CNY 720,9000 for 136mu fishponds will be paid to the state-owned farm who is responsible to provide new employments for the affected labors.

Table 7-2 Resettlement Fund Budget for Storm Water Management Project

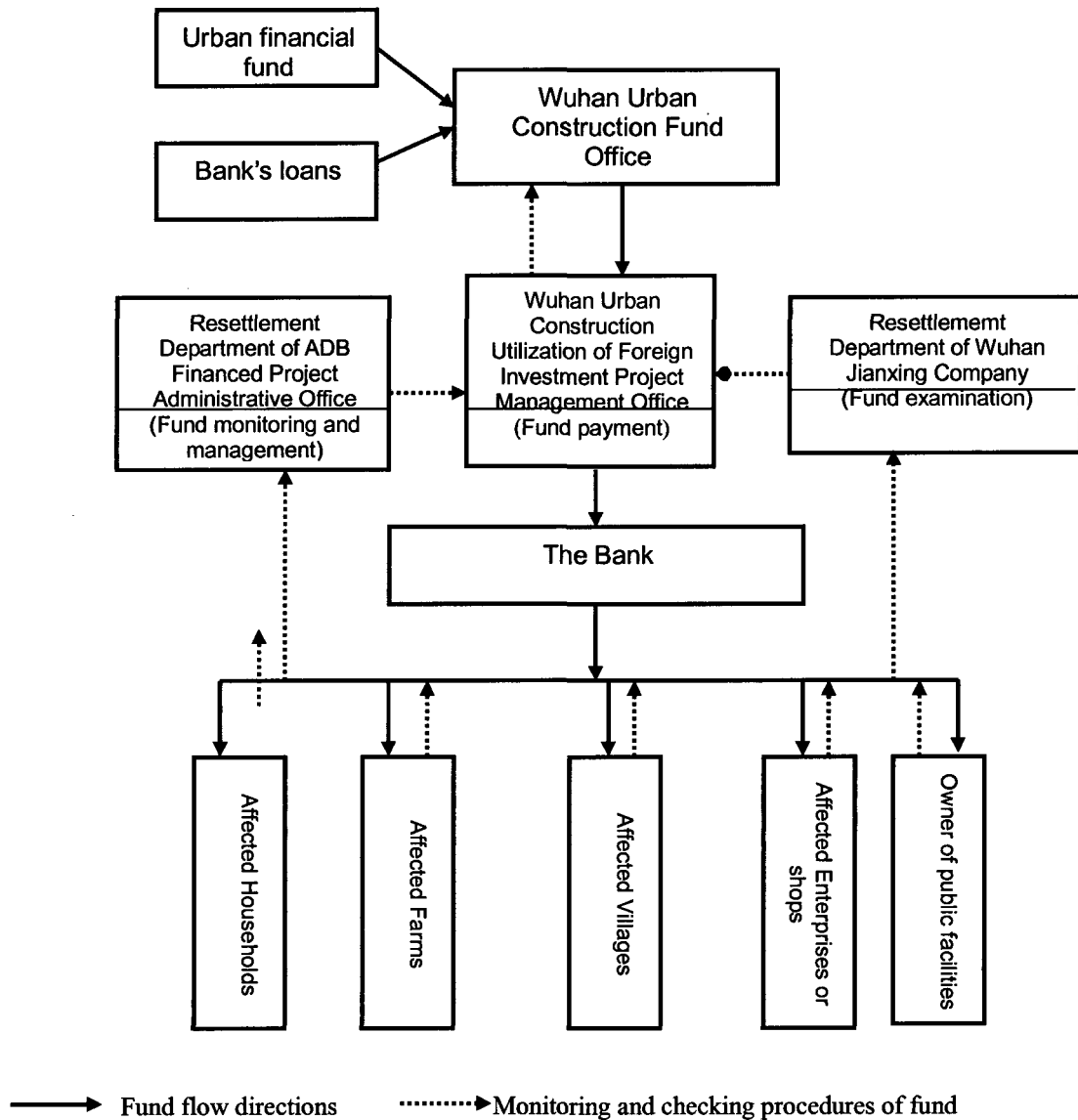
No.	Budget item	Unit	Luojialu (Hongshan District)			Yangsigang (Hangyang District)			Three-gate Connection (Dongxihu District)			Changqing Pump Station (Dongxihu District)			Total compensation (CNY 10,000)
			Qty.	Compensation rate (CNY)	Amount (CNY 10,000)	Qty	Compensation rate (CNY)	Amount (CNY 10,000)	Qty.	Compensation rate (CNY)	Amount (CNY 10,000)	Qty	Compensation rate (CNY)	Amount (CNY 10,000)	
I	Compensation for permanent land acquisition														
1	Dry land	mu	49.4	160400	792.4	0.1	147250	1.5	62	122375	758.7	0	122375	0.0	1552.6
2	Pond	mu	68.9	89824	618.9	21.7	82460	178.9	89	68530	609.9	0	68530	0.0	1407.1
3	Fish pond	mu	2.4	121904	29.3	0	111910	0	4.9	93005	45.6	0	93005	0.0	74.9
4	Nursery	mu	4.5	160400	72.2	0	147250	0	0	122375	0	0	122375	0.0	72.2
5	Orchard	mu	18.6	160400	298.3	1.8	147250	26.5	0	122375	0	0	122375	0.0	324.8
6	Woodland	mu	5.8	96240	55.8	0	88350	0	175.6	73425	1289.3	18.3	73425	134.4	1479.5
7	House site	mu	23.1	38496	88.9	3.7	35340	13.1	2.2	29370	6.5	0.6	29370	1.8	110.3
8	Wasteland	mu	35.4	38496	136.3	7.5	35340	26.5	88.9	29370	261.1	0	29370	0.0	423.9
Compensation paid to APs (1-8)					2092.1			246.5			2971.1			136.2	5445.9
9	Fee paid to the Government				1045.3			174.7			1735.6			77.1	3032.6
Total (1-9)					3137.4			421.2			4706.7			213.3	8478.5
10	Compensation for temporary land use														
11	Dry land	mu	8.6	12832	11.0	0	11780	0.0	2	9790	2.0	0	9790	0.0	13.0
12	Pond	mu	10.5	12832	13.5	8.9	11780	10.5	3	9790	2.9	0	9790	0.0	26.9
13	Woodland	mu	1.5	12832	1.9	0	11780	0.0	5	9790	4.9	0	9790	0.0	6.8
14	Road restoration	mu	3.4	140000	47.6	10	140000	140.0	0	140000	0.0	0	140000	0.0	187.6
Total (9-12)					74.0			150.5			9.8			0.0	234.3
Compensation for total land acquisition (1-12)					3211.4			571.6			4716.5			213.3	8712.8
III	Compensation for demolished buildings														
(I)	Rural residences with certificates														
14	Reinforcement	m ²	0	830	0.0	0	830	0.0	0	830	0.0	0	830	0.0	0.0
15	Brick and concrete	m ²	21123	570	1204.0	5378	570	306.5	1311	570	74.7	0	570	0.0	1585.3
16	Brick and wood	m ²	1430	420	60.1	0	420	0.0	84	420	3.5	0	420	0.0	63.6
17	Simple house	m ²	0	340	0.0	0	340	0.0	0	340	0.0	0	340	0.0	0.0
18	Location of house site	m ²	9021	1920	1732.0	2467.9	2280	562.7	721	1500	108.2	0	1500	0.0	2402.9
Sub-total (14-18)					2996.1			869.2			186.4			0.0	4051.7
(II)	Urban residence with certificate														

No.	Budget item	Unit	Luojialu (Hongshan District)			Yangsigang (Hangyang District)			Three-gate Connection (Dongxihu District)			Changqing Pump Station (Dongxihu District)			Total compensation (CNY 10,000)
			Qty.	Compensation rate (CNY)	Amount (CNY 10,000)	Qty	Compensation rate (CNY)	Amount (CNY 10,000)	Qty.	Compensation rate (CNY)	Amount (CNY 10,000)	Qty	Compensation rate (CNY)	Amount (CNY 10,000)	
19	Reinforcement	m ²	0	2230	0.0	0	2580	0.0	0	2030	0.0	0	2030	0.0	0.0
20	Brick and concrete	m ²	2550	1970	502.4	0	2320	0.0	0	1770	0.0	1500	1770	265.5	767.9
21	Brick and wood	m ²	0	1820	0.0	0	2170	0.0	0	1620	0.0	0	1620	0.0	0.0
22	Simple house	m ²	0	1740	0.0	0	2090	0.0	0	1540	0.0	0	1540	0.0	0.0
Sub-total (19-22)					502.4			0.0			0.0			265.5	767.9
(III)	Residence without certificate														
23	Reinforcement	m ²	0	830	0.0	0	830	0.0	0	830	0.0	0	830	0.0	0.0
24	Brick and concrete	m ²	0	570	0.0	0	570	0.0	0	570	0.0	0	570	0.0	0.0
25	Brick and wood	m ²	580	420	24.4	112	420	4.7	0	420	0.0	0	420	0.0	29.1
26	Simple house	m ²	2605	340	88.6	600	340	20.4	0	340	0.0	0	340	0.0	109.0
Sub-total (23-26)					112.9			25.1			0.0			0.0	138.0
(IV)	Shop with certificate														
27	Reinforcement	m ²	60	3630	21.8	167	4330	72.3	0	3030	0.0	0	3030	0.0	94.1
28	Brick and concrete	m ²	6615	3370	2229.3	0	4070	0.0	0	2770	0.0	0	2770	0.0	2229.3
29	Brick and wood	m ²	0	3220	0.0	0	3920	0.0	0	2620	0.0	0	2620	0.0	0.0
30	Simple house	m ²	0	3140	0.0	0	3840	0.0	0	2540	0.0	0	2540	0.0	0.0
Sub-total (27-30)					2251.0			72.3			0.0			0.0	2323.3
(V)	Shop without certificate (the budget calculated according to the highest compensation prices)														
31	Reinforcement	m ²	0	2541	0.0	0	3031	0.0	0	2121	0.0	0	2121	0.0	0.0
32	Brick and concrete	m ²	1130	2359	266.6	0	2849	0.0	0	1939	0.0	0	1939	0.0	266.6
33	Brick and wood	m ²	2660	2254	599.6	0	2754	0.0	0	1854	0.0	0	1854	0.0	599.6
34	Simple house	m ²	280	2198	61.5	0	2688	0.0	0	1778	0.0	0	1778	0.0	61.5
Sub-total (31-34)					927.7			0.0			0.0			0.0	927.7

No.	Budget item	Unit	Luojialu (Hongshan District)			Yangsigang (Hangyang District)			Three-gate Connection (Dongxihu District)			Changqing Pump Station (Dongxihu District)			Total compensation (CNY 10,000)
			Qty.	Compensation rate (CNY)	Amount (CNY 10,000)	Qty	Compensation rate (CNY)	Amount (CNY 10,000)	Qty.	Compensation rate (CNY)	Amount (CNY 10,000)	Qty	Compensation rate (CNY)	Amount (CNY 10,000)	
(VI)	Business buildings of enterprises and institutions														
35	Reinforcement	m ²	200	2530	50.6	0	2880	0.0	325.65	2330	75.9	0	2330	0.0	126.5
36	Brick and concrete	m ²	14057	2270	3190.9	2230	2620	584.3	399.2	2070	82.6	0	2070	0.0	3857.8
37	Brick and wood	m ²	0	2120	0.0	0	2470	0.0	0	1920	0.0	0	1920	0.0	0.0
38	Simple house	m ²	0	2040	0.0	0	2390	0.0	0	1840	0.0	0	1840	0.0	0.0
Sub-total (35-38)					3241.5			584.3			158.5			0.0	3984.3
(VII)	Non-business buildings of enterprises and institutions														
39	Brick and wood	m ²	250	420	10.5	0	420	0.0	0	420	0.0	0	420	0.0	10.5
40	Simple house	m ²	0	340	0.0	0	340	0.0	0	340	0.0	0	340	0.0	0.0
Sub-total (39-40)					10.5			0.0			0.0			0.0	10.5
IV	Compensation for young crops														
41	Fruit tree	Tree	729	40	2.9	21	40	0.1	200	40	0.8	0	40	0.0	3.8
42	Tree	Tree	5837	40	23.3	32	40	0.1	6000	40	24.0	32	40	0.1	47.6
43	Nursery	mu	4.5	5000	2.3	0	5000	0.0	0	5000	0.0	0	5000	0.0	2.3
44	Young crops	mu	58	1000	5.8	0	1000	0.0	32	1000	3.2	0	1000	0.0	9.0
Sub-total (41-44)					34.3			0.2			28.0			0.1	62.7
V	Compensation for attachments														
45	Tomb		2	1200	0.2	2	1200	0.2	0	500	0.0	0	500	0.0	0.5
46	Well		7	840	0.6	0	840	0.0	4	840	0.3	0	840	0.0	0.9
47	Wall	m ²	1644	36	5.9	350	36	1.3	1450	36	5.2	0	36	0.0	12.4
48	Terrace	m ²	7166	11	7.9	450	11	0.5	5000	11	5.5	60	11	0.1	13.9
49	Stone way	m ²	6000	38	22.8	4000	38	15.2	6000	38	22.8	0	38	0.0	60.8
59	Telephone		107	108	1.2	17	108	0.2	27	108	0.3	24	108	0.3	1.9
51	Air conditioner		58	200	1.2	14	200	0.3	13	200	0.3	24	200	0.5	2.2
52	TV set		62	450	2.8	13	450	0.6	29	450	1.3	24	450	1.1	5.8
Sub-total (45-52)					42.5			18.2			35.7			1.9	98.4
VI	Transitional allowance for relocation														
53	Removing fee		355	400	14.2	43	400	1.7	29	400	1.2	24	400	1.0	18.0

No.	Budget item	Unit	Luojiayu (Hongshan District)			Yangsigang (Hangyang District)			Three-gate Connection (Dongxihu District)			Changqing Pump Station (Dongxihu District)			Total compensation (CNY 10,000)
			Qty.	Compensation rate (CNY)	Amount (CNY 10,000)	Qty	Compensation rate (CNY)	Amount (CNY 10,000)	Qty.	Compensation rate (CNY)	Amount (CNY 10,000)	Qty	Compensation rate (CNY)	Amount (CNY 10,000)	
54	Transitional allowance for residence	m ²	2510 3	6	15.1	5378	6	3.2	1395	6	0.8	1500	6	0.9	20.0
55	Transitional allowance for shops	m ²	1376 8	20	27.5	167	20	0.3	0	20	0.0	0	20	0.0	27.9
56	Transitional allowance for units	m ²	1205 7	15	18.1	3100	15	4.7	725	15	1.1	0	15	0.0	23.8
57	Removing fee for indoor facilities		156	928	14.5	17	928	1.6	8	928	0.7	24	928	2.2	19.0
58	Reconstructi on fee for enterprises				25.0			5.0			750.0			0.0	780.0
Sub-total (53-58)					114.4			16.5			753.8			4.1	888.8
Total expenses for basic land acquisition and relocation					13444.7			2157.5			5878.9			484.9	21966.1
Management expenses for land acquisition (2%)					268.9			43.2			117.6			9.7	439.3
Special help fund for Vulnerable Groups					70.0			50.0			20.0			10.0	150.0
Fee for RO Staff Training					16.0			11.0			5.7			5.0	37.7
APs skill training					4.0			4.0			2.3			2	12.3
Fee for relocated buildings Evaluation					44.0			8.0			2.0			2.0	56.0
Management expenses for resettlement and relocation (3%)					403.3			64.7			176.4			14.5	659.0
Expense for resettlement plan and monitoring (1%)					134.4			21.6			58.8			4.8	219.7
Contingency (15%)					2016.7			323.6			881.8			72.7	3294.9
Total budget					16402.1			2683.6			7143.5			605.8	26835.0

Figure 7-1 Fund flow chart



- Basic resettlement expenses

It includes land acquisition, compensation for house expenses, compensation for attachments to the ground and transitional allowance for relocation and etc.

- Relevant resettlement expenses

It includes house property evaluation cost, cost for training, resettlement monitoring expenses, relocation agent fee of relocation units and etc.

- Resettlement administrative expenses

It mainly includes payments of personnel salary and welfare to the staff of ROs and daily

expenses to run ROs.

7-3-2 Management of resettlement expenses

The compensation agreement is signed in accordance with the Project's resettlement policies and relevant regulations in land acquisition. For monetary compensation in cash, the *agreement should stipulate the compensation amount, payment mode, payment time limit, removal time limit and responsibility for breach of agreement and other terms agreed by APs.* For exchanging property ownership, information of resettlement location, affected areas and description of structures should be stipulated in the agreement.

- In managing the basic resettlement expenses, special bank accounts shall be set up by the PMO for this specific intended purpose only and all compensation shall be paid through uniformly networks. The PMO has the right to monitor the use of these special funds.

- *Basic resettlement expenses must be paid in accordance with the state regulations for land acquisition, relocation and policies in the Resettlement Plan, which should not be less than the compensation rate and scope stipulated in the Resettlement Plan.*

- The Resettlement Office shall be responsible for the examination and approval of scope, land area and price of land acquisition and relocation when the compensation shall be paid. The PMO will be responsible for checking of the data and collection and submission of reports.

- Land compensation (including resettlement compensation, compensation for young crops and taxes or fees), compensations for house and attachments to the ground, compensations for relocation including removal of indoor facilities, removal cost and transitional allowance, and loss of business shops and enterprises and institutions, will be examined and approved by the resettlement offices. The compensation amount will be rechecked by the PMO before the bank entrusted by the project owner making direct payments to the entitled owners and households.

- The PMO can entrust the professional demolition companies to implement relocations activities. The agency fees will be paid according to the *contracts agreed with the PMO.*

7-3-3 Annual plan of resettlement expenses

Plans of the basic resettlement expenses and relevant costs shall be put forward by resettlement implementation organizations separately; The PMO will be responsible for making the whole fund-use plan. Annual fund-use plan shall be reported to the PMO before November 20 of every year. Monthly plan shall be reported to the PMO every month before

the 20th and the PMO will collect and compile the relative plans to report to the Wuhan Urban Construction Fund Office 5 days after receiving the plans. According to the schedule of project construction, the annual use plan of basic resettlement expenses is shown in Table 7-2.

Table 7-2 the annual use plan of basic resettlement expenses

Sub-Project	Fund use in 2006		Fund use in 2007		Fund use in 2008		Total basic resettlement expenses Amount (CNY 10,000)
	Amount (CNY 10,000)	Percentage (%)	Amount (CNY 10,000)	Amount (CNY 10,000)	Amount (CNY 10,000)	Percentage (%)	
Luojiagang	9448.3	70.4	3632.9	27.1	338.8	2.5	13420
Yangsigang	2020.5	88.2	269.2	11.8	0	0	2289.7
Three Gates Connection	4716.6	80.2	753.8	12.8	408.6	7	5879
Changqiang Pump Station	219.5	45.3	265.5	54.7	0	0	485
Total basic resettlement	16404.9	74.3	4921.4	22.3	747.4	3.4	22073.7

8 Organizations

8-1 Organizations in connection with resettlement work

For the purpose of smooth implementation of The Storm Water Management Component resettlement work, relevant organizations at every level have been set up, which will be responsible for the general plan and coordination of the project resettlement work. Organizations in connection with the project resettlement work are as follows:

- **Wuhan Wastewater and Storm Water Management Project Leading Group**

The leading group consists of leaders from Wuhan Municipal Government, Wuhan Municipal Development and Reform Commission, Wuhan Municipal Finance Bureau, Wuhan Water Bureau, Wuhan Construction Commission, Wuhan Urban Plan Bureau (Wuhan Land Resources Management Bureau), Wuhan Urban Construction Fund Administrative Office and other relevant departments and etc.

- **Wuhan ADB Financed Project Management Office**

The Storm Water and Wastewater Project Management Office and Project Resettlement Office is the subsidiary departments of Wuhan ADB Financed Project Management Office.

- **Project implementation organizations: Wuhan Jianxing Company.**

- **Project Resettlement implementation organizations: Resettlement Department of Wuhan ADB Financed Project Management Office, Resettlement Department of Jianxin Company, Wuhan Municipal Land Bureau, land bureaus at all levels, land management offices at town levels of relevant sub-projects and relocation companies entrusted by the owners.**

- **Survey and designing organizations: Wuhan Urban Planning and Design Institute and Wuhan Municipal Engineering Design and Research Institute.**

- **Independent Monitoring Organization (IMO)**

8-2 Responsibilities of all organizations

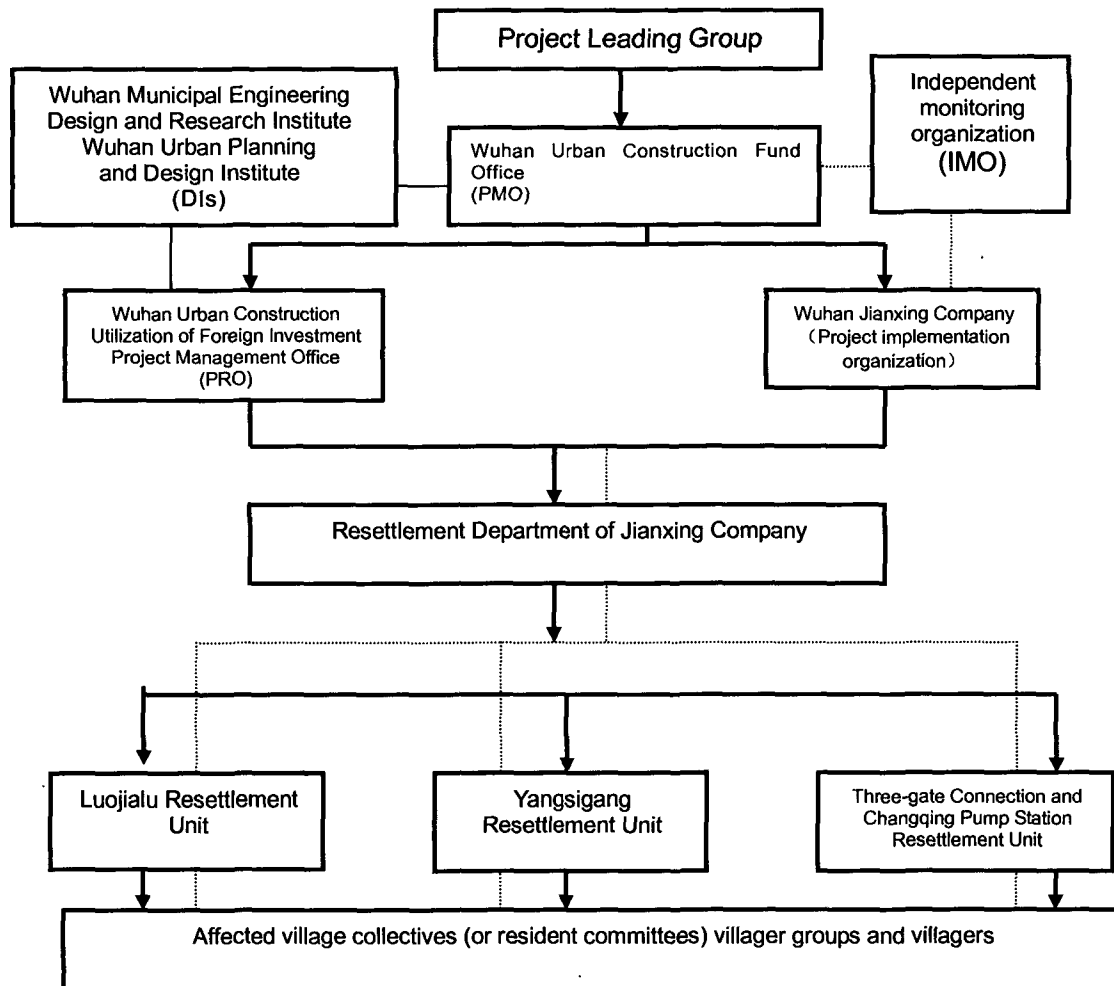
8-2-1 Project Leading Group

Main responsibilities of the Project Leading Group:

- **Coordinate between relevant departments during the project preparation phase**
- **Make decisions on major project construction and resettlement problems**

For organization network, see Figure 8-1.

Figure 8-1 Sketch map of organization networks



8-2-3 Wuhan ADB Financed Project Management Office

- Decide the land acquisition and relocation and resettlement policies
- Entrust the design units to make project design
- Entrust resettlement consultation, survey and monitoring organizations and organize the compilation of *Resettlement Plan*.
- Be responsible for entrusting the environment impact assessment organization to compile the *Environment Impact Assessment Report*.
- Be responsible for the coordination of land acquisition and relocation, resettlement actions and construction schedule.
- Handle all examination and approval procedures of land acquisition from relevant

government departments.

- Monitor payment and use of fund

8-2-4 Resettlement Department of PMO

- Organize Wuhan Urban Planning and Design Institute and the project resettlement consultation organizations to implement resettlement survey and socioeconomic survey, analyze and handle all survey information;

- Be responsible for the business training of survey data processing with computer for resettlement staffs at different levels of districts and towns.

- Publicly disseminate information on resettlement policies, including resettlement laws and regulations of state and Wuhan, various compensation rates and methods of the project resettlement, rights and obligations of the affected persons, project implementation schedule and etc.

- Organize the compilation of *Resettlement Plan*. According to the relevant laws, regulations and resettlement survey data, on the basis of full consultation with affected families and units, be responsible for the organization of compiling *Resettlement Plan* for the project resettlement.

- Provide business training for resettlement staff at all levels. The main purpose is to let resettlement staffs at all levels to get familiar with resettlement working procedures, know the detailed operation methods, handle various problems in the resettlement and enhance working efficiency.

- Be responsible for organization of detailed relocation implementation and supervision and guidance during the relocation.

- Be responsible for communications and contacts with resettlement experts of ADB and social experts.

- Be responsible for communications and contacts with external monitoring organizations and examination and approval of external monitoring report.

- Handle complaints and coordinate in settling disputes.

- Supervise the implementation of the resettlement plan.

- Carry out internal monitoring on the resettlement work.

8-2-5 Resettlement Department of Wuhan Jianxing Company

- Responsible for the construction, operation, maintenance and management of project

construction

- Entrust the relocation companies to implement building demolition
- Supervise removal activities of Relocation Companies
- Be responsible for communications and contacts with resettlement offices at all levels and Relocation Companies
- Coordinate resettlement implementation and construction schedule.

8-2-6 Resettlement Unit of sub-projects

- Provide local socioeconomic development information to the PRO, support monitoring and survey of resettlement organizations
- Be responsible for the implementation of the *Resettlement Plan*
- Train resettlement staffs at township (street) levels
- Guide and supervise the resettlement work of PROs at township level
- Collect and distribute funds for the affected units and individuals and supervise the use of funds
- Provide progress report to the PRO
- Handle and report complaints to the above levels
- Check and confirm the vulnerable groups, and submit the name list of the vulnerable groups to PRO
- Provide skill training to the resettled labors

8-2-7 Village committee (or residence committee)

- Check the submitted data of land acquisition, land rights, property rights and land-use right, population and laborer information
- Participate resettlement survey
- Be responsible for holding public consultation meetings with villagers to consult the fund use plan at village levels or selection of resettlement sites
- Report to the resettlement organizations at higher level about desires, suggestions and complaints of affected persons
- Organize and coordinate the building relocation and reconstruction work and provide assistance to the vulnerable families
- Collect the APs' grievances and appeals and help Resettlement Office to deal with the problems appeared in the process of resettlement

8-2-8 Survey design organization

- Determine survey scope and arrange resettlement area.
- Provide drawings to resettlement department and evaluate project impact.
- Coordinate with resettlement departments, register land rights and property rights and rights of use
- Assist the resettlement departments to compile *Resettlement Plan*.

8-2-9 Independent monitoring organization

As an independent monitoring department, it is responsible for the monitoring of all aspects of the resettlement work, providing resettlement training service, and submitting regular reports and independent monitoring reports to the PRO and ADB. Detailed responsibilities and tasks will be discussed specially in Chapter XI and Appendix IV.

8-3 Organization staffs and equipments

In order to complete land acquisition, relocation and resettlement of the Project, the PMO has selected some staff (at least 40% is female workers) from Wuhan City Construction Investment Co. Ltd., who are with higher educational background and rich experiences and those who are familiar with ADB policies about involuntary displaced persons to be responsible for the project resettlement work. The PMO also entrusts independent monitoring organizations and environment impact assessment organizations with rich experiences in implementing ADB project resettlement to provide consultation services. The PMO will allocate vehicles, computers, photocopiers, cameras and communication tools for the staff in accordance with their work requirements. During the project implementation period, special staff that have the relevant experience and are familiar with laws and regulations will be seconded to the PROs at district and township (street offices) levels. For information on staffing at various levels, see Table 8-1.

8-4 Training of staffs

For the purpose of enhancing of the resettlement organization staff's understanding of the state policies and regulations of involuntary displaced person resettlement for ADB financed projects, updating their knowledge and concepts and improving their quality, the PRO will organize training and study tours in accordance with their work requirements.

Table 8-1 Staff information in resettlement organizations

Resettlement organization	Staff (person)	Qualification of staff	Operation period
Project Management Office	4	University degree 40% is female workers	From 2004 to 2011
Project Resettlement Office	6	Junior college degree 40% is female workers	From 2005 to 2011
Resettlement Department of Jianxing Company	10	Junior college degree at least 30% is female workers	From 2005 to 2011
Resettlement Office of Sub-projects	25	Above technical secondary school degree 40% is female workers	From 2005 to 2011
Village Committee (Or Residence Committee)	25	Major leaders	From 2005 to 2011
Survey Organization	20	University degree 40% is female workers	From 2005 to 2007
Independent monitoring organization	6	University degree and above, 50% is female workers	From 2005 to 2010

Training contents include mainly state and local policies and regulations on the resettlement, resettlement policies on involuntary displaced persons of ADB, socioeconomic survey method, computer data management knowledge, resettlement implementation steps, fund management method, measures to restore production and living status of affected persons, procedures, methods of handling complaints, etc. Training modes include training conferences, lectures by invited experts; visits to similar projects to exchange experiences with other owner units so as to learn their successful experiences and prevent and avoid similar problems. The PRO has set up the following training plan (see Table 8-2).

Table 8-2 Training plan for resettlement staff

Content	Number	Fund budget (CNY)	Time	Status
Relative regulations and policies of state land acquisition and relocation, policies and principles on involuntary displaced persons of ADB	12	40,000	Jul 2005 Aug 2005	Completed
Socioeconomic survey method and operation and management of relocation survey data	15	45,000	Jun 2005 Aug 2005	Completed
Compilation of fund use plan at village level and supervision management methods	15	45,000	Aug 2005	Completed
Payment procedure of resettlement fund, supervision management and statistics	15	35,000	Dec 2005	Planned
Compilation seminar on <i>Resettlement Plan</i>	6	25,000	Jun 2005	Completed
Inspect resettlement planning experiences of ADB financed projects	6	60,000	Dec 2005	Planned
Inspect resettlement implementation experiences of ADB financed project	6	60,000	Feb 2006	Planned
Internal monitoring method for resettlement work	4	25,000	May 2006	Planned

Detailed methods of handling resettlement coordination	10	42,000	May 2006	Planed
Total	89	377,000		

8-5 Measures to strengthen organization capabilities

- Select staff who have higher business quality, strong organization and coordination capabilities and computer knowledge, to be responsible for the resettlement work and keep the staffing relatively stable. In the resettlement offices, 40% workers should be female, and every resettlement office must hire at least one female worker to responsible for women's affairs in the process of resettlement.

- Strengthen business quality training. Through various training, enable staff in the resettlement organizations at all levels to understand completely the principles, policies and procedures on involuntary resettlement of the state and ADB, and be aware of new policies so as to enhance their working activities.

- Organize staff of resettlement organizations at all levels to visit and inspect similar projects of other places in the country by batches so as to learn their successful resettlement experiences from the similar projects and reduce faults during resettlement process.

- Invite experienced consultation experts and independent monitoring organization, special organizations, local government and affected persons to share their opinions and suggestions.

- Improve office conditions and allocate necessary transportation and communication tools.

- Establish and perfect post responsibility system strictly follow rules and regulations and clearly define responsibilities of individual staff.

- Strengthen communications with relevant departments and organizations, establish good report system and form an organization network for smooth information exchange.

- Enhance political qualities of staff in resettlement offices at all levels, train resettlement staff to endure hardship, be practical and realistic and provide just services for everyone.

9 Public Consultation

The RP was prepared with full consultation and full information sharing with APs. The PROs have publicized and introduced resettlement policies of each subproject via socioeconomic survey, social impact assessment survey and other communication and consultation channels. The PMO also has consulted with various affected persons through consultation meetings. Through wide consultation, coordination and communication, related local government, affected villages and APs can full understand the potential resettlement impacts, resettlement polices and consider income restoration measures.

9-1 Main methods for public consultation and information disclosure

(1) Media propaganda

The public can participate directly in consultation and can obtain relative project construction and resettlement information through media. The PMO has introduced the project construction and resettlement information via suitable radio, television channels, newspapers and magazines so as to inform the public and improve the project transparency.

(2) Compilation and Distribution of resettlement Information booklet

The PRO has compiled the *Resettlement Information Booklet*, and has distributed them to the affected families or units by 31st Nov. 2005. The booklet mainly introduce the resettlement policies of ADB and municipal government, the project, status of affected families and affected units, resettlement schedules, compensation rates, etc.

(3) Socioeconomic survey

BY utilizing the advantage of maximum contacts with the affected persons during the socioeconomic survey, the project construction status, implementation significance and impact of the project, resettlement compensation policies, rates and implementation plans and etc. can be disseminated to the affected persons. Questions of the affected persons can be answered and their requirements and concerns can be understood.

(4) Public consultation conferences / workshops / meetings

- The PRO periodically organizes official public consultation meetings. Topics, scale and participants of the meetings have arranged in conformity with the relevant requirements. Delegates of vulnerable groups, especially women delegates, will be invited to the meetings. Their attendance will be monitored by an external independent monitoring organization. During FS stage, the APs have invited to express their requirements and suggestions with an intention to satisfy the reasonable requirements of the majority affected persons.

- Public consultation meetings are also held by the independent monitoring organizations. During the implementation process, the independent monitoring organization will hold a public consultation conference every two or three months. *They will be targeted at specific groups* such as the affected residences, women, special groups, etc. Delegates of vulnerable groups, especially women delegates will be invited to these meetings. The PMO and PRO will send specific persons to participate in the meetings to find out the feelings and desires of the affected persons so as to take their concerns into consideration in the working schedule of PRO and respond to their urgent problems in a timely manner.

Key points of public participation and consultation are:

- Gather desires and suggestions of the affected persons for production arrangements; publicize resettlement policies and production restoration plan to the affected villages, groups, and enterprises; consult opinions and suggestions with the affected persons about production rehabilitation plans.

- Compensation rates for house, land and property loss

The PRO has consulted with the PRO at district levels on compensation rates prior to and during the compilation of the *Resettlement Plan*. After consultation with the affected villages (residence committee) and collective households and enterprises and institutions, considered opinions can be formed. ADB and Wuhan Municipal Government will publicize the final result after the examination and approval.

- Selection house sites for relocation

With the help of engineering design institutes (DIs), the PROs at township levels have consulted with the affected collectives, enterprises and institutions about the rebuilding and relocation selection of house sites.

- Houses, attachments to the ground and property impact situation

During the socioeconomic survey, the DIs, survey implementation organization, affected

units and affected families have checked and jointly agreed to the situation of the affected houses, land, attachments to the ground and properties. During the survey, affected persons have participated directly in completing the questionnaires, which have been checked and signed by the respondents.

9-2 Public consultation plan

Along with the development of construction preparation and implementation work, the PRO and local PROs will hold further public consultations. The major consultation contents are as follows:

- Labor arrangement mode and production rehabilitation measures
- Detailed opinions of the affected persons on the engineering design

Before construction, local PROs will notify the affected villages and groups of the engineering designs. For aspects that the affected persons have adverse opinions, the PRO will request the DIs to revise and optimize the designs, provided that such revisions satisfy engineering and technical standards.

- Selection of residence relocation sites (at least two options) and reconstruction modes
- Compensation for relocation households and payment process arrangements
- How to reduce the degree of impact on peripheral residences to the minimum during construction
- Other problems of the affected persons, such as indirect effect on productions and living conditions of residences outside the demarcated areas during construction

For public consultation activities between the PROs at various levels and affected persons that have been held and the public consultation activity to be conducted, see Table 9-1 and Appendix II. According to the work schedule of the PRO, offices at district levels may hold consultation meetings if necessary, and report the information to the PRO. In addition to consultation activities held by the PRO, the monitoring organization will consult independently with the affected persons on other monitoring problems and collect their complaints and suggestions and provide monitoring information to relocation departments at various levels.

Table 9-1 Implementation schedule and plan of public consultation

Main contents	Consultation mode	Time	Implementation organization	Participants	Remarks
Consult with the affected persons for suggestions of optimized construction design	Public conference On-the-spot survey	2005 June-August	PRO, designing unit and villager committee	All affected persons and stakeholders	Completed
Publicize project impact information to the affected persons, consult with the affected persons of their resettlement desire	Socioeconomic survey	2005 May-August	PRO, Wuhan University	All affected persons	Completed
Consult with local government and unit representative in the affected areas for primary intention of resettlement rehabilitation	Public conference	2005 August	PRO Wuhan University	Local government officials and firm leaders	Completed
Consult with Wuhan urban planning and land management departments for resettlement policies	Consultation	August 2005	Wuhan Land Resources Bureau, PRO and Wuhan University	Wuhan Land Resources Bureau, PRO and Wuhan University	Completed
Provide resettlement compensation rates and information booklets to APs and AVs		Nov.31, 2005	PROs, IAs Local government officials township government,	APs AVs	Completed
Provide final <i>Resettlement Plan</i> report to the affected persons	Public meetings	Feb. 2006	PROs, villager committee,	All affected persons	Consult in the library/offices
Detailed measurement surveys on the affected scope, material property and relocation of land acquisition and relocation	On-the-spot interview with the affected households	Before the implementation of land acquisition and relocation plan	PRO, township government, village committee and removal company	All affected persons	
Publicize the construction process, the specific resettlement compensation of each households scheme to the affected persons	Public and township meetings	Before the implementation of land acquisition	Project implementation organization	Stakeholders, beneficiaries and affected persons	
Notify the affected persons about their rights and interests and value and compensation payment date again	Public conference	Before the implementation of land acquisition and relocation plan	PRO, township government, village committee and removal company	All affected persons	
Monitor the impact of land acquisition and relocation to the affected persons	Visit families	During the implementation of land acquisition	Wuhan University	Random sampling	

9-3 Consultation with the affected persons during the implementation period

(1) Villager symposiums

Symposiums organized by local governments and resettlement departments; with villager delegates and village leaders are tools to gather key problems that villagers concern the most, their opinions and suggestions on these problems.

(2) Consultation meetings with affected enterprise and workers

Legal person or delegates of enterprise and workers shall be consulted sufficiently on compensation rates to reach decisions.

(3) Land acquisition and resettlement consultation meetings at district levels

Relocation consultation meetings will be held by city and district level PROs according to the relocation areas concerned. Visits should be organized for the affected persons to view the relocation area, to let them know the status of the relocation sites and the supporting facilities, to provide choices for the affected persons and to consult with them, so as to improve the *Resettlement Plan*. After the relocation meetings, the resettlement staff will make door-to-door interviews with the affected persons to request their signature on the Resettlement Agreement.

(4) Publishing of information of displaced persons

The PRO will publicize in a timely manner the resettlement policies, resettlement criteria and other information to the affected persons through relocation bulletin, media and etc.

After the compilation of the *Resettlement Plan*, copies will be placed in the Hubei Library, Wuhan Library and PROs at district levels for reference.

9-4 Function of IMO in the consultation

- Present key problems most concerned by the affected persons (such as compensation rates, laborer arrangements, project implementation timetable and etc.) and report complaints
- Consult periodically; hold meetings and symposiums with the affected persons
- Provide opinions and suggestions to resolve the complaints
- Along with the project development, public consultations between the project owner and affected persons; and independent monitoring organization will be recorded by the relocation departments and the related information kept in file.

10 Grievances and Appeals

Resettlement is a complicated task. It is inevitable that the affected persons will have grievances and complaints during the resettlement implementation. For the purposes of guarantee the interests of the affected persons, the PMO will establish a set of highly transparent grievance and complaint collection and dealing procedures which are simple and easy to carry out to objectively, justly and efficiently deal with the grievances and complaints of the mass so as to ensure that the resettlement works goes on smoothly.

10-1 Means of grievance and complaint collection

(1) Finding out grievances of the affected persons from the report of the local resettlement offices, including grievances of the mass, the progress, working measures and existent problems

(2) All sub-project construction units must submit construction journal to the project owner every week, from which information on whether there is any people affecting the construction can be known

(3) Problems on land acquisition and relocation coordination discovered by the project owner in field inspection

(4) Relevant information reflected by the independent monitoring organization

(5) Letters and calls of the affected persons

(6) Relevant special problems reflected by the audit and disciplinary inspection divisions

(7) Special investigation of internal and external monitoring

10-2 Procedures for complaints and appeals

• Stage I

The affected persons may present their grievances to the village committee or the local resettlement office orally or in a written form. For oral grievances, the village committee or the local PRO must keep a written record and provide a clear reply within two weeks. When it involves serious problems needing to be reported to the PRO at a higher level, the village committee or the local resettlement office must endeavor to

obtain a reply from the PRO at the higher level within two weeks.

- **Stage II**

In case that reply at Stage I does not satisfy the complainants, the complainants may appeal to the PRO at a higher level within one month after receiving the reply at Stage I. The PRO at the higher level must make a decision within three weeks.

- **Stage III**

In the event that the affected persons are not satisfied with the reply of the sub-PRO (at district level), they may appeal to the PMO within one month after receiving reply at Stage II. The PMO shall make a reply within four weeks.

- **Stage IV**

In case that the affected persons are not satisfied with the reply at Stage III, they may appeal to the civil court within 15 days after receiving the reply from the PMO.

10-3 Principles to deal with grievances and complaints

The PMO at each level must conduct field investigation and research about the grievances of the public, and provide objective and just resolutions in line with the principles and standards specified in the state laws and the *Resettlement Plan* after full consideration of the public's opinions and after patient consultation. Complaints beyond their capability of handling must be submitted to the resettlement and relocation divisions at the higher level and they shall lend a hand in the investigation.

The appealed has the right of further appeal on condition that the decision-making institution does not reply within the specified dates.

In the process of resettlement, women may have some special grievances and complaints, so the PMO have planned at least one female worker in every resettlement group to responsible for the women's grievances. The local government and the NGOs such as Civil Administrative Bureau and the Women' Federation will also supervise the resettlement activities and safeguard the APs especially the women's rights.

10-4 Contents and measures of reply

10-4-1 Contents of reply

- A brief of grievances of the complaints
- Results of fact-investigation

- Principles and standards in the relevant state regulations and *Resettlement Plan*
- Resolutions and references
- The complainants have the right to appeal to the PRO at a higher level and the civil court. The project unit shall pay the legal costs.

10-4-2 Measures to reply

- Reply to complaints on exceptional cases shall be delivered to the complainant in written form.
- Reply to complaints that frequently occur shall be made public to the villages or groups the complaints belonged to via holding villagers' meetings or issuing documents.
- Whatever the forms of reply, they must be delivered to the resettlement divisions the complaints belonged to

10-5 Complaint and appeal resolution reporting

During execution of the *Resettlement Plan*, the acquisition and relocation divisions should keep the complaints and the resolution decisions under registration and good management, and report it to the PRO in written form monthly. The PRO shall look into the complaint resolution records and conditions regularly.

11 Monitoring and Evaluation

According to requirements of the *Resettlement Handbook* of ADB, The Storm Water Management Project shall establish an internal and external monitoring evaluation system for resettlement during the process of resettlement implementation. The internal monitoring is organized and performed by the project implementation unit, while the external monitoring is implemented by independent monitoring organization with rich expertise and relevant experiences. Monitoring reports prepared by the project management office and the external M&E agency are submitted to ADB for review and comments by ECRD Resettlement Specialist. Copies should be sent to RSES.

11-1 Internal monitoring

11-1-1 Purpose of Internal monitoring

Internal monitoring is a constant internal monitoring on the implementation of the *Resettlement Plan*, which is performed by the proprietor and the resettlement implementation organization with a superincumbent management system in order to have a full, instant and precise control on the resettlement progress, and identifies and solves problems so as to provide basis for decision-making in implementation of resettlement.

The internal monitoring is aimed at regulating and guiding the internal monitoring activities of the proprietor of the ADB financed project, the resettlement implementation organization and other institutions involved in the resettlement to ensure orderly, and effective resettlement monitoring and evaluation and that the land acquisition and relocation is carried out in accordance with the *Resettlement Plan* so that the parties concerned shall be able to have instant control of the resettlement implementation status and the existent problems and be able to solve them on time.

Contents of internal monitoring include: periodic surveys, identification and evaluation of the status of *Resettlement Plan* implementation; precise data collection and data analysis to ensure accurate monitoring findings; scientific, objective and just evaluation of the implementation status of the Resettlement Plan. The PRO will report to the project proprietor and ADB quarterly so that they will be able to get acquainted with the progress of the project and make scientific policy decisions.

Function of internal monitoring: internal monitoring is an important part of the project management, which is aimed at controlling the resettlement implementation status, by establishing and using the resettlement information management system, collecting, analyzing information on the progress, fund and quality and information related to the resettlement implementation of activities so as to be aware of the existent of possible problems. Internal monitoring also analyzes the causes of problems and provides suggestions for solutions, so as necessary remedial actions can be taken in an adequate and timely manner.

11-1-2 Internal monitoring implementation procedures

The internal monitoring of the project consists of two stages: the preparatory stage and the implementation stage. The preparatory stage starts with the identification of the project by ADB financed project, through the project preparation, pre-evaluation, and evaluation and ending with approval of the project. The implementation stage starts with implementation of resettlement and ends with the realization of the resettlement objective.

1. The preparatory stage of internal monitoring

When the project is at preparatory stage, the internal monitoring work begins.

The preparations for internal monitoring of the resettlement implementation organizations include:

- Organize training for personnel of the resettlement implementation organization on the resettlement policies and experiences of ADB, the state resettlement policies, Resettlement Plan preparation, resettlement implementation, resettlement monitoring evaluation, etc;
- Employ professional institutions and specialists who will involve in compiling of *Resettlement Plan* and organizing socioeconomic survey.

2. Implementation stage of internal monitoring

The primary tasks of internal monitoring organization at the resettlement implementation stage include:

- Be responsible for the internal monitoring of resettlement activities according to the *Resettlement Plan*
- Submit a detailed internal monitoring report to ADB every quarterly
- Timely update of statistics data on resettlement implementation

11-1-3 Contents of internal monitoring

Primary contents of internal monitoring are as follows:

- Fulfillment of the resettlement policies and compensation rates, which includes mainly establishment and implementation of resettlement policies, actual situation of the compensation rates for various impacts and losses (permanent land acquisition, temporary occupancy of land, relocation of houses, relocation of shops, relocation of enterprises and institutions, relocation of special facilities, etc.). A particular explanation of whether the resettlement is executed in accordance with the *Resettlement Plan* should be added. If there is any change to it, the causes must be accounted for.

- Land acquisition and relocation and resettlement implementation progress, which mainly reflects the project overall schedule and annual plan, progress of the resettlement organization and the staffing, implementation progress of permanent land acquisition in the Project region, temporary occupancy of land, regulation of land in the resettlement regions (including various resettlement land such as land for productive use, house sites, public facilities), implementation progress of acquiring (or allocating) and distribution of them, house relocation progress, reconstruction progress of houses for resettlement, relocation progress, implementation progress of production and development project, public facilities construction progress, special facilities restoring, removing, and reconstructing progress, mines, industrial enterprises and institutions relocation and construction progress, labor employment arrangement progress and progress of other resettlement activities;

- The resettlement budget and the execution, which mainly reflects the amount and time of level-by-level appropriation of the resettlement fund, use and management of the resettlement fund of the resettlement implementation organizations at each level, number of land proprietors (including villages, and groups, etc.) and users and time of use, use and management of the compensation fund for land owned collectively by the village, supervision and audit of use of fund;

- Status of production and employment arrangement for displaced persons, including the major means of rural resettlement (arrangement by land regulation, development of new land, arrangement in enterprises and institutions, and arrangement by finding jobs on their own), population, resettlement employment of relocated enterprises, the vulnerable groups (including women's families, aged families, and the disabled families, etc.), rehabilitation of land occupied for temporary use, efficiency of resettlement and etc.;

- Reconstruction of displaced persons' house and arrangement of their life, including the ways of resettlement and resettlement destination, arrangement and allocation of house sites, forms of house reconstruction, the work of *water, electricity and road connection and site formation* for the house sites, payment of the compensation funds, the resettlement ways and destination of urban displaced persons, the payment of compensation funds, public facilities (water, electricity, road, communication network), removal and etc.

- Rehabilitation and reconstruction of enterprises and institutions and various special facilities (water resources, power, posts and telecommunications, traffics, transportation, pipes and wires and etc.);

- Complaints, appeals, public participation, consultation, information publication and status of external monitoring, including channels, procedures, and institution held responsible of the complaints and appeals, subject matters of complaints and appeals and its dealing, major activities that the public take part in and consult on and the contents and forms of public participation and consultation, implementation efficiency of public participation and consultation, progress and effects of *Resettlement Information Booklet* compiling, publication of the resettlement information and external monitoring evaluation activities;

- Solving the problems related to the resettlement in the memo of ADB supervision missions

- Offering solutions to the existing problems in resettlement activities

Table 11-1 Progress Report on Land Acquisition, House Demolition and Resettlement

Unit: _____

Report cut-off date : _____ / ____ / ____ (d/m/y)

Date: _____ / ____ / ____ (d/m/y)

Items	Unit	Planned Qty.	Completed Qty.	Accumulated Qty.	% of Completion
Permanent land acquisition	mu				
Temporary land occupation	mu				
House demolition	M ²				
Incl.: private house	M ²				
Public (collective) house	M ²				
Land Compensation	CNY 1000 0				
Payment of house demolition compensation	CNY 1000				
Reconstruction of private house	M ²				

Items	Unit	Planned Qty.	Completed Qty.	Accumulated Qty.	% of Completion
Reconstruction of public (collective) house	M ²				
APs moving to new house	Pers ons				
APs receiving training	Pers ons				
Job Provision	Pers ons				
Land readjustment	mu				

Prepared by: _____ Signature (In-charge): _____ Seal: _____

Table 11-2 Execution Progress on Funds Utilization

Nanning City _____ (group) _____ (village) _____ (town) **Xixiangtang District.**

Cut-off date: _____ / _____ / _____ (d/m/y)

Date: _____ / _____ / _____ (d/m/y)

Affected institution	Description ¹	Unit/Qty.	Investment Required (CNY)	Compensation Received in Reporting Period (CNY)	Accumulative Compensation	% of Completion
Village --						
Village --						
Collective						
Household						
Other units						

Prepared by: _____ Signature (In-charge): _____ Seal: _____

11-1-4 Internal monitoring methods

Internal monitoring is superincumbent monitoring of resettlement implementation inside the resettlement implementation organization, which demands an unblocked and superincumbent resettlement implementation information management networks between the project proprietor and the resettlement implementation organizations at each level to follow up and control the progress of resettlement in all regions and implementation of all sub-projects. The resettlement implementation departments at each level report to the leadership from bottom to top the implementation progress, fund and effects of the resettlement through the

¹ "Description" refers to the construction of village road (qty.), labor training and employment, subsidies to vulnerable groups etc.

information management system for analysis and treatment of the resettlement organization.

The following methods are adopted in the Internal monitoring of the Project based on the project implementation status:

- Standardized statistics report system

The report forms, reflecting the fund appropriation progress and conditions of completion of acquisition and relocation, is a periodical report, which shall be submitted regularly from bottom to top at the end of each month when the funds are appropriated so that the job schedule will be under control.

- Periodic report system

Various forms are adopted to exchange information related to problems in resettlement implementation work between the municipality, district, township and the independent monitoring organization and advices of solution are presented.

- Periodic data gathering

At the beginning of each month, the PRO shall call an acquisition and relocation resettlement coordination conference with participation of the municipal and regional resettlement office, who will reflect back the implementation progress and the existent problems, exchange working experiences and work over the solutions.

- Resettlement inspection

The PRO will perform routine and non-routine field inspections of the resettlement work of the resettlement organization at lower level, solve resettlement problems on the spot and monitor the resettlement schedule and execution status of the resettlement policies.

- Exchange information with the independent monitoring organization

Keep frequent communication and information exchange between the resettlement implementation organization and the external monitoring organization, and take findings and evaluation suggestions of the external monitoring organization as reference basis for internal monitoring.

11-1-5 Internal monitoring organization and staffing

During the implementation of this project, PROs of sub-project will be organized by personnel from relevant government administrative departments, such as the Land Bureau, the Construction Bureau, and responsible for the resettlement work within the project area, and entrust and supervise the house relocation of relocation companies. See the staffing of the resettlement internal monitoring and implementation organizations in Table 11-3.

Table 11-3 Personnel of the internal monitoring implementation organization

Resettlement organization	Personnel at ordinary times	Personnel at peak times
Project Resettlement Office	2	3
Resettlement Department of Wuhan Jianxing Company	3	6
Luojiagang Sub-project Resettlement Unit	5	16
Yangsigang Sub-project Resettlement Unit	3	8
Three Gates Connection and Changqiang Pump Station Resettlement Unit	3	8

11-1-6 Internal monitoring arrangement and report

Internal monitoring is a continuous process. At least an overall monitoring shall be conducted quarterly. During critical periods of relocation, more frequent monitoring should be conducted.

At the preparatory stage of the project, the internal monitoring organization shall compile internal progress reports half a year for review by the ADB. The formats may vary from project to project and different stages according to requirements of each subproject. After the project starts, detailed half yearly and annual reports shall be compiled based on conditions of the Project, and some special reports maybe needed according to needs of project management. The final resettlement completion report shall be prepared after the completion of project. Internal monitoring reports shall be submitted to the people's government at corresponding level, resettlement implementation organization at higher level and the project owner.

WPMO and IA shall submit internal monitoring reports to ADB quarterly.

11-2 External monitoring

According to resettlement requirements of ADB financed project, during the implementation of resettlement an external monitoring organization that is experienced in resettlement shall be employed to monitor and evaluate the implementation of resettlement and rehabilitation in order to guarantee that the resettlement is executed in compliance with the *Resettlement Plan*.

Independent monitoring aims at providing resettlement evaluation by organizations independent from the government, who will inspect the implementation of the *Resettlement Plan* in broad and long-term views. Independent monitoring will follow up the resettlement activities so as to supervise and evaluate whether the resettlement is implemented according

to the following regulations and policies:

- State laws and regulations on resettlement;
- ADB's Policy on Involuntary Resettlement
- *Resettlement Plan*
- Whether the living standard of the affected persons surpasses or at least is restored to that before the acquisition

11-2-1 External monitoring organization and personnel

In order to ensure smooth completion of external monitoring of the project, professional institutions with rich experiences are to be entrusted to perform the external monitoring by the PMO in March, 2006. Factors that should be taken into consideration in selection of external monitoring personnel are mainly: (1) The external monitoring personnel should have similar work experiences, rich experiences in socioeconomic survey, and comprehend the policies of ADB on involuntary resettlement, and have good knowledge of the state and local policies and laws on resettlement. (2) Capability of conducting social survey and research independently with good communication skills and hardworking. (3) An appropriate proportion of female personnel in the external monitoring.

11-2-2 Responsibilities of independent monitoring organization

The independent monitoring organization shall undertake the following tasks:

- Conduct a baseline survey on the standard of living before the resettlement begins so as to master the basic production and living conditions of the affected persons.
- Follow up the resettlement procedures so as to monitor the implementation of resettlement; Collect grievances and complaints of the affected persons, which shall be reported timely to the PRO and local resettlement offices; submit monitoring reports to the resettlement office and ADB.
- Follow up the changes in production and living standard of the affected persons and provide evaluation on the resettlement activities and measures;
- Based on the survey and full consultation with the affected persons, offer constructive suggestions to the PRO and local resettlement offices, and guarantee the smooth resettlement and rehabilitation of the production and living standard of the affected persons.

11-2-3 Methods and procedures of independent monitoring

The following methods are adopted in resettlement monitoring by the independent monitoring organization:

- On the basis of resettlement survey, establish a database about the conditions of the affected persons and conduct household interviews periodically. The external monitoring organization shall manage the basic conditions of the relocated households dynamically by fully utilizing the socioeconomic survey data and the resettlement information management system established by the project so that the state of the displaced persons will be under control at any moment. Based on the conditions reflected in the database, conducting face-to-face interview with the affected households to give audience to the complaints, grievances and suggestions and publicizing the relevant State policies, requests of ADB and information about the project construction.

The household interview shall be conducted by the external monitoring organization, who shall obtain a list of affected persons and relevant information from the grass-root institutions without accompaniment of personnel from local resettlement organization or local administrations. The visiting personnel in household interviews should be fixed comparatively for one specific region, namely one fixed person should make repeated visits to the same affected region so that a trusting relationship can be established between the visiting personnel and the affected persons, which will be of benefit to the development of the work.

- Occasional seminars are held with the affected persons in regions where the affected persons are concentrated. The external monitoring organization shall hold seminars in regions where the affected persons are concentrated to hear the opinions of the affected persons on important issues affected by the Project. Such seminars may be formal or informal; the personnel of the grass-roots resettlement organization may or may not be invited to such seminars, depending on the specific conditions of the Project.

- On site observation: Personnel of the external monitoring organization shall visit the resettlement places to inspect the conditions of resettlement

- Case studies: The exceptional and typical cases in the resettlement exercise shall be studied with great emphasis, and the origins of the problems analyzed to find out the solutions and provide suggestions for discussion.

- Survey by questionnaires: Sampling surveys are conducted to find out the conditions of the rehabilitation of the displaced persons' production and life and their attitudes about the

resettlement. The survey result shall be analyzed in a timely manner and the problems shall be resolved, which shall provide references for the resettlement work in the future.

11-2-4 Major contents of independent monitoring

Independent monitoring mainly includes the following contents:

(1) Monitoring of resettlement of affected enterprises and shops

● The external monitoring organization follows up and monitors the resettlement of enterprises and institutions mainly by on site investigation, telephone follow-up interview and case studying. The contents under monitoring are:

- Whether the land acquisition and relocation are well linked with the resettlement work
- Whether the commercial losses of enterprises are compensated for

(2) Monitoring of resettlement of relocated households

The external monitoring organization shall monitor the resettlement of households whose houses are relocated with emphasis. The following aspects of such affected persons shall be monitored with emphasis:

- Whether the compensation price for houses and other attachments to the ground are calculated on the basis of replacement cost
- Whether the compensation fund are paid in full and in good time
- Whether house sites for the newly constructed houses are selected by means of consultation
- Whether the time for relocation is reasonable
- Whether the transitional and removal expenses are paid
- Whether the material compensation is discounted
- Whether the infrastructure in the resettled area such as water, electricity and road have been provided, including information on who will be responsible for the supplying of these facilities and whether the resettled area is easily accessible to clinics and schools

3. Monitoring of production rehabilitation

With consideration of characteristics of the affected land and its management, the external monitoring organization shall monitor the following aspects of production rehabilitation with emphasis:

- Whether the compensation rates for all land acquisition are established in accordance with relevant state laws;

- Whether the procedures of land acquisition and compensation are able to guarantee that the affected villages and groups are fully compensated;
- Whether the amount of land acquired, compensation rates and the amount of compensation are made public to the whole village and how they are published;
- In case the land compensation is to be paid to the specific affected persons, then how the payment range has been determined, and whether the land will be redistributed;
- In case of land redistribution, how the land readjustment plan has been determined, whether its determination has been discussed and consulted by the affected persons;
- Whether there is a specific and feasible plan for centralized use of land compensation;
- Whether the determination of the land compensation use plan has taken the opinions of interest related villagers into consideration, and how the use plan of land compensation is finally determined;
- How the benefits from use of land compensation is distributed. How the actual economic benefits of the affected labors are guaranteed.

4. Monitoring of the resettlement organization operation

Monitoring of the resettlement organization performance is mainly done by field interview, and review of the working data and records. The monitoring contents are:

- Whether the staffing of resettlement organization at each level is sufficient for the resettlement work;
- Whether the resettlement organization at each level has the necessary working condition;
- Whether the personnel of the resettlement organization has met with the demands of the resettlement work;
- The resettlement organization personnel training status;
- Internal data management status of the resettlement organizations;

5. Monitoring of resettlement of the vulnerable groups

The vulnerable groups especially the women are the particular groups the resettlement organization shall pay special attention to and also the most vulnerable groups in external monitoring. The external monitoring organization shall follow up and monitor the affected vulnerable groups by door-to-door interviews, questionnaires and case study. Contents of monitoring include mainly:

- What preferential policies are established for the vulnerable groups in the Project;

- Whether the especial needs of the female affected persons is fully considered in the resettlement options.
- Whether the vulnerable groups especially the women can obtain the project-related employments and skill training. How many of them are employed in the project construction.
- Whether the affected urban poor families can afford to buy new houses;
- Whether the rural poor families obtain assistance during the process of house relocation;
- Whether all resettlement groups have hired a female staff to deal with the women's affairs during the resettlement implementation.
- Measures for rehabilitation of production and life of the affected rural poor families.

6. Living standard baseline survey of the affected persons

Before the resettlement starts, the external monitoring organization shall establish the project resettlement base information by conducting sampling surveys, which are done in form of questionnaires. Samples are taken and categorized among all the affected households involved in the socioeconomic surveys at the project preparatory stages. It is primarily decided that 20% of the households affected by land acquisition are sampled, 20% of the households affected by both land acquisition and relocation are sampled, and 50% of the affected enterprises and institutions are sampled. All of the vulnerable groups are surveyed as sample families.

Contents of the living standard baseline survey of the affected households include mainly: size of the household, production and operation conditions, building area of house, annual income of the household, employment structure, annual expenditures of the household, traffic conditions, water supply conditions, power supply conditions, dwelling environment, subjective evaluation on the production and living conditions.

Table 11-4 Sample distribution of living standard baseline survey of displaced persons

Types of samples	Households			Affected enterprise and shops	Vulnerable groups
	Affected by land acquisition only	Affected by relocation only	Affected by both land acquisition and relocation		
Sampling (%)	20%	20%	20%	50%	100%

7. Monitoring and evaluation on project resettlement efficiency

After the resettlement starts formally, the external monitoring organization shall carry out tracking monitoring on the resettlement efficiency periodically.

The external monitoring organization shall follow up and investigate the affected households half a year after their resettlement by means of sampling. The questionnaires are applied to find out the affection of resettlement on life and production of the survey respondents so as to evaluate the resettlement efficiency.

Selection of the samples for follow-up survey is under the same principles with that of the living standard baseline survey, and it is better to follow up and survey such samples as in the living standard baseline survey. A database for all samples surveyed should be established to provide basis for sampling of the follow-up survey after the living standard baseline survey is finished. For those survey respondents difficult to follow up due to various reasons, substituted survey respondents should be found in similar affected families in same communities with the clues in the database of the socioeconomic survey at early stage.

Contents of the follow-up survey are well linked with that of the living standard baseline survey for convenience of comparison analysis of the changes in life and production of the household before and after resettlement. Subjective evaluations on the resettlement are also surveyed for reference of resettlement efficiency evaluation.

11-2-5 Reporting system of external monitoring

The external monitoring organization compiles external monitoring reports based on the observation and survey data, which has two purposes: the first is to report the resettlement progress and the existent problems to ADB and the resettlement implementation organization objectively; the second is to give evaluation of the socioeconomic effects of the resettlement and present constructive opinions and advices, consequently improving and perfecting the resettlement. The reporting cycles of the external monitoring organization to ADB and the Project proprietor are as follows:

- The semi-annual external monitoring report about resettlement shall be submitted to ADB and PMO before 30, June every year.
- The annual evaluation report shall be submitted to ADB and PMO before 31, December every year.
- A resettlement completion report will be submitted to ADB and PMO after all resettlement activities have been finished.

Conventional monitoring reports shall at least include the following aspects: (1) monitoring objects; (2) progress of the resettlement work; (3) major monitoring findings of the external monitoring organization; (4) main problems; (5) basic evaluation opinions and advices of external monitoring.

The reports of external monitoring organization in both English and Chinese shall be submitted to experts of the Project office and ADB simultaneously.

The external monitoring organizations' tasks, responsibilities and the Monitoring indicators, measures are clearly listed in the TOR of Resettlement Monitoring and Evaluation, which is shown in the Appendix IV.

12 Resettlement Implementation Schedule

12-1 Resettlement implementation schedule

Based on the project implementation schedule, the Project will start implementation in the early 2006 and complete in 2008 in stages. The basic schedule principles of land acquisition and relocation schedule are:

- Land acquisition should be completed three months before the commencement of the project construction. The specific time should be determined in accordance with the requirements of land acquisition and resettlement work.
- During resettlement, affected persons have the opportunity to participate in detailed operations of the reconstruction location choice, relocation time arrangements and transitional arrangements, etc.
- Before the commencement of the project, the PRO must announce the acquisition area, and accomplish the relevant public participation. The resettlement fund should be deposited in the special account of the PRO one month before the formal relocation.
- All compensations should be given to the property owner completely and directly within 3 months since the date of sign agreement. No institution and individual may use the property compensation on behalf of the property owner and no discount could be permitted in payout.

The total project implementation schedule plan of land acquisition and resettlement is established in accordance with the progress of land acquisition and resettlement in the project. The Resettlement Plan Schedule of the Storm Water Management Component is shown in Table 12-1.

12-2 Resettlement Schedule Arrangement

The following is the key points of the Resettlement Plan:

- The land acquisition scope is finally determined by construction drawing of each individual project. It shall be done before the start-up of survey and calculation of relocated material objects.
- Before signing compensation and resettlement agreement, survey and calculation of material objects shall be operated by resettlement department and property owner together in accordance with red line drawing of land acquisition.

- Resettlement offices of each district will be established in the preliminary preparation stage of the project. The resettlement offices should organize the social and economic survey with the help of Independent Monitoring Organization (IMO). The survey includes all adverse effects on the relocated households, enterprises & institutions and shops.

- The resettlement offices of districts and city organize and hold a mobilization meeting, which migrant households and relocated units' attendance to publicize relevant policies and resettlement measures on land acquisition, relocation, compensation and resettlement. The announcement of land acquisition will be formally publicized after the mobilization meeting, but before signing the compensation and resettlement agreement.

- The planning arrangement of land acquisition shall be clearly informed to relocated households. The information includes: the analysis and classification of households, enterprises and institutions in relocation scope; the classification of acquired land, buildings and other property; the determination of compensation ratio of land and other property as well as the predetermined relocation schedule. Other information for relocated persons includes: other information channel and how and to which departments a complaint in the implementation of relocation can be lodged. The compensation and resettlement agreement will be completed after the material object measurement. The agreement will come into force after the relocated households and representative of project office sign it together. The agreement signature and validation shall be before the implementation of land acquisition.

- Allowance for the transition period shall be paid to relocated households before the commencement of relocation.

- Affected infrastructure shall be removed or rehabilitated before the commencement of construction project or completed after the accomplishment of project construction as soon as possible so as to minimize the adverse effects of service interrupt.

- Training program for APs shall be made within 6 months after commencement of the project construction.

- The external monitoring shall be initiated within 2 months after the commencement of project construction, and the baseline survey shall be conducted.

- Planning and reconstruction of house resettlement shall be completed before land acquisition and relocation. If it is delayed, transitional arrangements for relocated households should be accomplished before relocation.

- Allowance or assistance in other forms should be given to persons who lose their

cultivated land to help them improve or at least restore their original living standard.

Table 12-1 Resettlement Plan Schedule of the Storm Management Component

No	Resettlement Activities	Start	End
1	Preparation of the RP	2005-03-01	2006-03-28
2	Establish Project Resettlement Office	2005-03-01	2005-04-01
3	Entrust institution to prepare RP	2005-04-06	2005-04-15
4	Social and Economic survey of resettlement	2005-04-18	2005-08-30
5	Preparation and compile of RP	2005-04-08	2006-03-28
6	Information Disclosure and training	2005-04-18	2006-06-30
7	Consult and negotiate with APs and related government departments	2005-04-18	2006-06-30
8	Disclosure of Draft RPs and Resettlement Information Booklets to APs	2005-11-10	2005-11-30
9	Land Pre-appraisal	2006-01-15	2006-01-25
10	Disclosure of revised RPs or RIBs to APs	2006-02-13	2006-02-28
11	Uploading RPs to ADB website	2006-02-15	2006-02-30
12	Implementation stage and monitoring	2007-02-01	2009-12-29
13	(1) Luojiagang Sub-project	2007-03-01	2010-01-29
14	Conduct detailed measurement surveys	2007-03-01	2007-06-01
15	Prepare detailed village rehabilitation plan	2007-03-10	2007-06-01
16	Sign land acquisition agreement,	2007-07-01	2007-08-31
17	Resettlement fund payment	2007-07-11	2007-10-31
18	Relocate to new houses	2006-8-01	2007-8-01
19	The project construction	2008-01-01	2009-12-29
20	Income restoration measures	2007-04-01	2008-03-26
21	Training Program	2007-04-01	2007-10-26
22	(2) Yangsigang Sub-project	2007-03-01	2009-12-31
23	Conduct detailed measurement surveys	2007-03-01	2007-06-01
24	Prepare detailed village rehabilitation plan	2007-03-10	2007-06-15
25	Sign land acquisition agreement	2007-07-01	2007-08-01
26	Resettlement fund payment	2007-07-04	2007-09-28
27	The project construction	2008-01-01	2009-12-31
28	Income restoration measures	2007-04-12	2008-04-07
29	Relocate to new houses	2006-09-01	2007-09-01
30	Training Program	2007-04-01	2007-10-26
31	(3) Three Gates Connection Sub-project	2007-3-01	2009-12-31
32	Conduct detailed measurement surveys	2006-04-01	2006-06-01
33	Prepare detailed village rehabilitation plan	2006-03-10	2006-06-01
34	Sign land acquisition agreement	2006-07-01	2006-08-1
35	Resettlement fund payment	2006-06-10	2006-09-05
36	The project construction	2006-10-1	2008-03-31
37	Income restoration measures	2006-05-01	2006-10-31
38	Relocate to new houses	2006-04-01	2006-09-01
39	Training Program	2006-05-01	2006-7-31
40	(4) Changqing Pump Station Sub-project	2007-03-30	2009-08-28

41	Conduct detailed measurement surveys	2007-05-30	2007-06-01
42	Prepare detailed village rehabilitation plan	2007-02-01	2007-08-01
43	Sign land acquisition agreement	2007-05-01	2007-07-01
44	Resettlement fund payment	2007-08-01	2007-11-01
45	The project construction	2007-09-03	2009-03-01
46	Relocate to new houses	2007-03-01	2007-08-15
47	Monitoring and Evaluation	2006-04-01	2010-04-01
48	Baseline survey	2006-5-01	2007-7-01
48	Internal monitoring	2006-05-01	2010-04-01
49	External monitoring and evaluation	2006-04-01	2010-04-01

14 Appendix

Appendix I Related Articles of relevant regulations

1 Abstract of state laws on land acquisition compensation

(1) Land Administration Law of the People's Republic of China

- The state may make expropriation or acquisition on land according to law for public interests, but shall give compensations accordingly.

- All units and individuals shall use land in strict compliance with the purposes of use defined in the overall plans for land utilization. Any change to be lawfully made in land ownership, in the right to the use of land or in the purpose of use of land shall be registered.

- Where land for agriculture is to be used for construction purposes, the formalities of examination and approval shall be gone through for the conversion of use.

- Land acquisition shall be compensated for on the basis of its original purpose of use. Compensation for acquired cultivated land shall include compensation for land, resettlement subsidies and attachments and young crops, and young fish on the acquired land. Compensation for acquisition of cultivated land shall be 6 to 10 times the average output value of the acquired land for three years preceding such acquisition. Resettlement subsidies for acquisition of cultivated land shall be calculated according to agricultural population needing to be resettled, which is calculated by dividing the amount of acquired cultivated land by the average amount of the original cultivated land per person of the unit the land of which is acquired. The standard resettlement subsidies to be divided among members of the agricultural population shall be 4 to 6 times the average output value of acquired cultivated land for the three years preceding such acquisition.

- Once a plan for compensation and resettlement subsidies for the acquired land is decided on, the local people's government concerned shall make it known to the public and solicit comments and suggestions from the collective economical organizations, the land of which is acquired, and the affected farmers.

- The rural collective economical organizations, the land of which is acquired, shall accept supervision by making it known to its members the income and expenses of the compensation received for land acquisition. The compensation and other charges paid to the unit for its land

acquired are forbidden to be embezzled or be misappropriated.

- A construction unit that wishes to use State-owned land shall get it by such means of compensation as assignment. However, land to be used for the following purposes may be allocated with the approval of a people's government at or above the county level.

- (1) For state organs or military purposes;

- (2) For urban infrastructure projects or public welfare undertakings;

- (3) For major energy, communications, water conservancy and other infrastructure projects supported by the state; and

- (4) Other purposes as provided for by laws or administrative regulations.

(2) Regulations on the Implementation of the Land Administration Law of the People's Republic of China

- The competent departments of land administration of people's governments above the county level should, in conjunction with the departments concerned at the same level, evaluate land grades in accordance with the standards for land grade evaluation. Results of local land grade evaluation should be made public in society upon examination and verification of people's government at the corresponding level and approval of the competent department of land administration at the next higher level. Adjustment in land grades shall be made once every six years in accordance with the state of national economic and social development.

- Municipal or county people's government shall, upon approval of the land provision plan, issue a certificate of approval for land for construction for the construction unit. In the case of paid-for use of state-owned land, the competent department of land administration of municipal or county people's government shall conclude a contract on the paid-for use of state-owned land with the land user; in the case of appropriation for use of state-owned land, the competent department of land administration shall verify and issue a certificate of decision on the appropriation of state-owned land.

- Payment of various expenses for land acquisition should be affected in full within 3 months starting from the date of approval of the land acquisition and resettlement plan.

- Funds earmarked for land acquisition resettlement subsidy must be used for the designated purpose and shall not be diverted to any other purpose. For persons required to be resettled by the rural collective economic organization, payment of the resettlement subsidy shall be made to the rural collective economic organization to be administered and used by the rural collective economic organization; where resettlement is to be arranged by other units, the

resettlement subsidy shall be paid to the resettlement units; where no unified resettlement is required, the resettlement subsidy shall be given to the individuals to be resettled or used for the payment of insurance premium for the resettled persons on gaining the consent of the resettled persons.

(3) *Administrative Regulations on Urban House Demolition and Relocation of the State Council*

- The parties that demolish and relocate houses shall make compensation for the parties whose houses have been demolished according to these Regulations. No compensation shall be made for buildings built in violation of rules and temporary buildings beyond the approved time limit.

- The demolition and relocation compensation may adopt means of compensation in currencies or the exchange of ownership of houses. The parties whose houses have been demolished may select the compensation means.

- The amount of compensation in currencies shall be determined by the estimated price of the real estate market according to the sectors, purposes, floor area, and so on of the demolished houses.

- If the means of exchange of ownership of houses is adopted, the parties that demolish and relocate houses and the parties whose houses have been demolished shall calculate the compensation amount of the demolished houses and the price of the exchanged houses, and settle the balance of the exchange of ownership according to Article 24 of these Regulations.

- The parties that demolish and relocate houses shall provide houses that accord with the national quality and safety standards to be used for the relocation..

- The parties that demolish and relocate houses shall pay the removal allowances to the parties whose houses will be demolished or the tenants of these houses. During the transition, if the parties whose houses have been demolished or the tenants of these houses arrange their residences by themselves, the parties that demolish and relocate houses shall pay the temporary relocation allowances. If the parties whose houses have been demolished or the tenants of these houses have the temporary houses used during the resettlement process provided by the parties that demolish and relocate houses, the parties that demolish and relocate houses shall not pay the temporary relocation allowances.

- The parties that demolish and relocate houses, if causing production or business stoppage due to demolishing and relocating non-residential houses, shall pay appropriate

compensation.

(4) *Decision of the State Council on Deepening the Reform on Strict Management to Land*

- Perfect land acquisition compensation measures. Local people's governments at or above county level shall take practical measures to guard the farmers whose land has been acquired against the decrease in living standards resulting from land acquisition. Land compensations, resettlement subsidies and compensations for attachments to the ground and young crops shall be paid promptly at full amount in accordance with law. The people's governments of provinces, autonomous regions and municipalities directly under the Central Government shall assent to the increase of resettlement subsidies to the farmers landless due to land acquisitions, whose original living standards cannot be maintained or social security fees cannot be afforded after being paid land acquisition compensations and resettlement subsidies according to current laws and regulations. In case the total amount of land acquisition compensations and resettlement subsidies reach the legal maximum, yet is still insufficient for the farmers whose land is acquired to retain their original living standards, the local people's government may make up for it by incomes from the use of state-owned land.

- Properly resettle the farmers whose land is acquired. Local people's governments at or above county level shall enact specific measures to guarantee the long-term livelihood of the farmers whose land is acquired. For projects with stable benefits, the farmers may buy a share via the lawfully authorized rights of construction land usage. The local people's government within the city planning districts shall bring the farmers whose land is acquired under the employment system for cities and towns and establish the social security system; in acquisition of land owned by farmers collectively outside the city planning districts, the local people's government shall be obligatory to remain necessary land for the farmers to cultivate or arrange for them corresponding jobs. Farmers landless without basic production and living conditions shall be removed and resettled to another place.

- Complete land acquisition procedures. Farmers' collective ownership of land and contractual operation right of land shall be guaranteed during the process of land acquisition. Prior to the report of land acquisition to higher authorities for examination and approval, the purpose, location, compensation rates for land acquisition and the resettlement arrangements shall be made public to the farmers with land to be acquired. The country collective economic organizations and farmers must confirm the investigation results of the status of the acquired

land. If necessary, the Ministry of Land and Resources shall organize the hearing of witnesses according to relevant regulations. The relevant materials acknowledged and confirmed by the farmers whose land is to be acquired shall be deemed as the essential materials for report for approval of land acquisition. The establishment and perfection of the coordination and arbitration system for solving disputes on land acquisition compensations and resettlements shall be quickened so as to defend the lawful rights and interests of the farmers whose land is acquired and the land users. The proceedings of land acquisition shall be made public after approval except for exceptional cases.

2 Abstract of local regulations

(1) Administrative Measures of Wuhan Municipality on Urban House Demolition and Relocation

- The administrative departments in charge of house demolition and relocation shall make public the proceedings such as the parties that demolish and relocate houses, the scopes of demolition and relocation, time limit of demolition and relocation, and so on covered in the house demolition and relocation license by means of public announcement of house demolition and relocation while issuing the house demolition and relocation licenses.

- In case of demolition and relocation of houses under direct management of the housing administrative department (**HDM**) or under management of the unit itself (**HMU**) and private houses (**PH**), the remover shall sign the demolition and relocation compensation agreement with the relocation household in written form according to the Measures. For compensation in currencies, the amount of compensation, type of payment, time limits of payment and removal, liabilities for breach of contract, and other matters the parties concerned consider necessary to be covenanted shall be specified in the agreement. For compensations by means of exchange of property rights, an agreement shall be signed concerning proceedings including the location, floor area of the house for resettlement, and the settlement of price difference.

- The remover shall pay compensations to the relocation household in accordance with *the Regulations* and the Measures. No compensation shall be made for buildings built in violation of rules and temporary buildings beyond the approved time limit. Compensation shall be made for temporary buildings within the approved time limit according to the resettlement price and service life of the buildings.

- The demolition and relocation compensation may adopt means of compensation in currencies or the exchange of ownership of houses. Unless otherwise specified in the

Measures, the relocation household may select the compensation means.

- The amount of compensation in currencies shall be determined according to the estimated unit price in real estate market (price for per m² of the floor area, similarly hereinafter) and the floor area of the house demolished.

The market unit price of houses to be demolished shall be given by the real estate appraisal institutions with corresponding qualifications. The market unit price of houses to be demolished shall be determined on the basis of the location, purpose, structure, depreciation, etc. of the houses to be demolished.

The class of location of the house to be demolished shall be determined according to the land use classification published by the municipal government.

- HDMs that are transformed from residential houses into non-residential uses shall be deemed as residential houses and appropriate compensation for the building area of operation shall be paid.

- The remover shall pay removal allowances to the relocation households or the tenants of these houses. During the transition, if the relocation households or the tenants of these houses arrange their residences by themselves, the remover shall pay temporary relocation allowances. If the relocation households or the tenants of these houses have the temporary houses used during the resettlement process provided by the remover, the remover shall not pay temporary relocation allowances. The transition period cannot exceed two years.

- The remover shall pay compensations for such non-residential buildings relocated as those for commercial purposes and production according to the following regulations:

(I) The expenses on equipment transportation and installation shall be calculated according to the costs of goods transportation and equipment installation specified by the state and the municipality.

(II) Compensations for equipments that cannot be restored to its normal running shall be determined by deducting the depreciation charges from its purchase price.

(III) In case of production or business stoppage arising from the demolition and relocation of non-residential houses and exchange of house property rights are adopted, compensation shall be made as 6 times that of their average salary in the previous year, to the personnel on the payroll who directly take part in production or operation within the scopes of relocation.

(2) Administrative Measures of Wuhan Municipality on Collective-Owned Land Demolition and Relocation

- The relocation households who live within the Middle Ring of relocation may choose compensation in currencies or by means of exchange of house property rights for demolition and relocation of their dwelling houses. If conditions permit, after approved by law, the country collective economic organization may arrange the resettlement for them by building the multi-layer dwelling collectively; application for examination and approval of house site resettlement may be made in case the need for agricultural production and the cultivated land per capita reaching or exceeding that of the cultivated land per capita of the whole city is assured and comply with conditions of approval of house sites.

The relocation households who live beyond the Middle Ring of relocation may choose compensation in currencies, by means of exchange of house property rights or setting of another house site for demolition and relocation of their dwelling houses. If conditions permit, the country collective economic organization may make concentrated and unified resettlement according to the farmers' community pattern.

- The remover shall pay compensation to those who choose compensation in currencies. The amount of compensation shall be determined according to the replacement cost of the demolished house and the location of house sites. The standards for building replacement cost are established by the Municipal price administrative department jointly with the department of real estate.

Compensation for house sites with different locations is determined according to their location. The location of house sites in Jiang'an, Jianghan, Qiaokou, Hanyang, Wuchang, Qingshan, Hongshan, Wuhan Economic & Technological Development Zone and Wuhan East Lake Hi-tech Development Zone are divided into three categories according to the overall city planning of Wuhan: the first category covers areas within the second ring road (including the second ring road), the second category covers areas between the second ring road and the third ring road (the Middle Ring road), and the third category covers areas outside the third ring road (Middle Ring road). The Municipal price administrative department jointly with the department of real estate establishes the specific rates for compensation.

The compensation rates for house sites in different locations in Dongxihu, Hannan, Caidian, Jiangxia, Xinzhou and Huangpi are made by their respective people's government, which shall be submitted to the Municipal price administrative department and land administrative department for approval.

- For demolition and relocation of residential houses, the remover shall make compensation for and resettlement of relocation households according to the standard of

arranging one house site for one household. The floor area, building area of the relocated houses for compensation calculation shall be determined according to the area ratified within the law. In case the floor area of the demolished house is less than 60m², and the relocation household has no other residence within the city, the floor area of the demolished house shall be deemed as 60m².

(3) Compensation and Resettlement Measures of Wuhan Municipality for Acquisition of Collective-Owned Land

- The compensation for land acquisition shall be paid according to the following standards:

(I) Compensation for acquisition of cultivated land shall be 10 times that of the average annual output value of the acquired land of the previous three years before acquisition.

(II) Compensation for acquisition of garden plots; woodlands and other cultivated land shall be 6 times that of the average annual output value of the neighboring cultivated land of the previous three years.

(III) Compensation for acquisition of construction land, unused land shall be 6 times that of the average annual output value of the neighboring cultivated land of the previous three years.

- Compensation for the young crops in the acquisitioned land product value of which can be calculated shall be paid according to its product value. No compensation for those that can be harvested shall be paid. For those that cannot be harvested, the compensation shall be that of the product value of one harvest season. Reasonable compensations shall be paid for the young crops product value of which cannot be calculated.

- The farm irrigation and electromechanical irrigation and drainage facilities, power, broadcasting, and communication facilities and other attachments which can be removed shall be removed by the property right unit with the removing expenses being paid by the land user; for those that cannot be removed, the land user shall pay compensations according to the replacement costs.

- The compensation for lawfully approved temporary use of collective-owned land should be paid to the rural collective economic organization according to the following regulations:

(I) Compensation for temporary use of cultivated land shall be 3 times that of the average annual output value of the previous three years with consideration of length of land use. Land use of less than one year shall be calculated on the basis of two years, and that of

more than one year (including one year) shall be calculated on the basis of three years.

(II) Compensation for temporary use of other productive land shall be the average annual output value of its neighboring cultivated land of the previous three years multiplied by length of land use.

Compensations for the young crops and attachments to the ground within the scope of temporary land use shall be paid to their owners according to the actual losses.

(4) Circular on Compensation Rates for the Acquisition of Collective-Owned Land and the Demolition and Relocation of House Sites in Accordance with Their Locations

- Locations of peasant house sites (trusteeship zone included) within Jiang'an, Jianghan, Qiaokou, Hanyang, Wuchang, Qingshan, Hongshan districts and Wuhan Economic and Technological Development Zone and Wuhan East Lake High-tech Development Zone are divided into three categories according to the overall city planning of Wuhan: the first category covers areas within the second ring road (including the second ring road), the second category covers areas between the second ring road and the third ring road (the Middle Ring road), and the third category covers areas outside the third ring road (the third ring road included). The compensation is the product of the determined legal floor area of the building and the house site location compensation rate. Among them, the house site location compensation rate of the first category is CNY 2,280 /m², the second is CNY 1,920 /m², and the third is CNY 1,500 /m².

- The house site locations and compensation rates in Dongxihu, Hannan, Caidian, Jiangxia, Xinzhou and Huangpi districts (the trusteeship of the development zone excluded) shall be formulated by district governments and submitted to city bureau of price administration and bureau of land resources for approval.

(5) Opinions of Wuhan Municipal Committee of CPC and the People's Government of Wuhan Municipality on Actively Promoting the Comprehensive Reconstruction of "Villages in City"

- In the process of comprehensive reconstruction of "village-in-city", the registered permanent agricultural residences of villagers could be reregistered as permanent urban residences free of charge according to relevant state and provincial regulations.

- After finishing the reformation of collective economic organizations of "villages-in-city" and changing the permanent agricultural residences of the villagers into urban residences, the

villagers' committees should be replaced by community neighborhood committees as stipulated in *Organic Law on the Villagers' Committee in the People's Republic of China* and *Organic Law on the Urban Residents' Committee in the People's Republic of China*.

- The economic entity established after reformation should give priority to relocated village labor forces on employment, encourage and guide them in finding jobs by themselves and start their own business. The unemployed relocated village labor forces who long for employment shall be granted Preferential Certificate of Re-Employment and enjoy relevant preferential policies. Relevant departments and district governments shall provide special skill training for labor forces with both ability and will to work; the expense of training is paid under the special financial fund at city and district levels.

- In the reconstruction of "village-in-city", the legal floor area of each demolished house should be confirmed, registered and filed. The mover shall make resettlements by means of equal replacement on the basis of the confirmed area and resettlement rate established by the department of planning. Should the confirmed area go beyond the rate, the excessive part shall be compensated on the basis of housing replacement cost.

- With the consent of the relocation household, the remover may make settlement in cash.

- To make a rational use of land and reduce the intensity of exploitation, commercial houses may be properly constructed in the returned area in accordance with control detailed planning as well as the application of the relocation household. In this case, the relocation household shall be resettled by substituting the building area of commercial houses with residential areas at a certain ratio.

- Relevant taxation and fees involved in the construction and resettlement of returned house of the former villagers shall be implemented in accordance with related policies for individual building construction of farmers. During the construction of land exploitation and utilization projects, the auxiliary expense of infrastructure will not be charged; other payable stipulated fees, if rated, shall be charged at the lower limit; otherwise, it shall be charged in half.

4-2-3 Involuntary Resettlement Policy and Social Safeguard Strategy of ADB

(1) Involuntary Resettlement Policy of ADB

ADB released its involuntary resettlement policy in 1995, and after that was the publication of *Handbook on Resettlement: a Guide to Good Practice*, both of which provide systematic

policy basis and practical operation guide for the resettlement of ADB financed projects.

The main targets and principles of ADB involuntary resettlement policy are:

- Avoid involuntary resettlement wherever feasible
- Explore all viable project options and minimize resettlement if population displacement is unavoidable.

- If population displacement is unavoidable, they should be compensated and assisted so that their economic and social future will generally be at least as favorable with the project as without it

- The affected people should be fully informed and closely consulted on resettlement and compensation options

- Existing social and cultural institutions of APs and their hosts should be supported and used to the greatest extent possible. APs should be integrated economically and socially into host communities

- The Policy also specifies that lack of formal legal title to land is not a bar to compensation and other assistance. Appropriate assistance should be provided to address the needs of the poorest affected persons such as female-headed households, and other vulnerable groups such as indigenous groups and ethnic minorities, helps them improve their status.

- Any involuntary resettlement should, as far as possible, be conceived and executed as a part of a development project or program

- The full costs of resettlement and compensation should be included in the presentation of Project costs and benefits

- Eligible costs of resettlement and compensation may be considered for inclusion in Bank loan financing for the project, if requested.

In order to materialize above-mentioned principles and the target of resettlement policy, ADB has required following practical measures to be taken:

- Involuntary resettlement should be avoided when feasible and minimized if it is unavoidable by selecting viable project options.

- In the stage of initial social assessment, the number of APs should be identified as much as possible, and the advisable outline of work should be established in feasibility study of project preparation technical assistance.

- Resettlement shall be deemed as a part of all projects including department project, private department project, cooperatively financed project and the loan project of development

financial institutions.

- All the people concerned especially all affected persons and vulnerable groups of them in particular should participate in the Project planning and implementation.

- All and any losses of any affected persons, including those without formal legal title to land, shall be compensated for according to replacement costs,.

- When the removal of housing is needed, consult with affected persons and community of resettlement region, make removal schemes to ensure the living standard of displaced persons could be restored.

- When people are going to lose income and livelihood, proper restoration projects should be established for the purpose of improving or at least restoring production condition.

- When affected persons are vulnerable groups or resettlement will strain social relations, a preparation process should be provided for affected persons to adjust to society changes.

(2) Social Safeguard Strategy of ADB

This social safeguard strategy is issued by ADB for the purpose of virtually protecting the vulnerable groups in the process of resettlement. It has five basic components as follows:

- Labor market policies and programs designed to improve working conditions and promote the flexible and efficient operation of labor markets

- Social insurance programs to cushion the risks associated with unemployment, ill health, disability, work-related injury and old age

- Social assistance and pension systems for the most vulnerable groups with no other means of adequate support, including single mothers, the homeless, or physically or mentally challenged people

- Micro and area-based schemes to enhance the security level of vulnerable groups including those born disabled, including micro insurance, agricultural insurance, social funds and programs to manage natural disasters

- Child protection to ensure the healthy and productive development of children

Meanwhile it is required in the social protection strategy of ADB that the enterprises and commercial workers affected by the projects should be minimized as far as possible.

Appendix II Public consultation meeting summary (Dongxihu District)

Date: Aug. 17, 2005

Location: Conference Room of Dongxihu Cultivation Farm

Participants: Huang Nian (Project Office), Yin Jianjun (Hohai University, consultant expert of migration), Cheng Dening (Wuhan University), Hu Qiudu (government coordinator of resettlement in Dongxihu District), Chen Wei (Jinyinhu International Golf Industry Development Co., Ltd.), Xu Yong'an (Dongxihu Cultivation Farm), Zhu Sanqing (Administrative Committee of Jinyinhu Business City), Wang Suixin (Administrative Committee of Jinyinhu Ecological Park), Liu Quanxiang (Wuhan Changqing Drainage Station), Hu hongshan(Wuhan Changqing Drainage Station), Xu Jiaohong (Jinyinhu International Golf Industry Development Co., Ltd.), Zhu Huarong (Neighborhood Committee of Machi Community, Dongxihu Cultivation Farm), Wei Niankai (Neighborhood Committee of Machi Community, Dongxihu Cultivation Farm), Xiao Shizhong (Dongxihu Cultivation Farm).

Conference summary:

After repeated coordination with affected local governments, enterprises and institutions by Wuhan Urban Construction of Foreign Investment Funded Project Management Office, Wuhan Sewage and Rainwater Management Office, Wuhan Sewage and Storm Water Management Consulting Company (BV Company) and Wuhan University, etc., a public consultation conference was held in Dongxihu District on Aug.17, 2005 with representatives of affected persons as well as enterprises and institutions. The aim of the conference is to introduce the design scheme of the Asian Development Bank financed project, information of land acquisition as well as the planning and policies of resettlement compensation to displaced persons, affected enterprises and institutions timely. The participants had a spirited discussion on several topics as below:

1. Project composition, engineering design plan, the scope and degree of land acquisition impact, implementation schedule and resettlement compensation policy were introduced to affected persons. Doctor Yin Jianjun, the resettlement expert of Hohai University, introduced the latest involuntary resettlement policies, principles and basic requirements of ADB on the conference; he also put an emphasis on problems that should be pay attention to in resettlement. Doctor Cheng Dening of Wuhan University gave an introduction of basic condition of project impact as well as the preliminary planning, policies and measures of resettlement. He also provided engineering planning drawing to each affected institutions to help them obtain more information about project and land acquisition and relocation.

2. According to the drawing provided by Project Office, participants gave a detailed introduction of the basic condition of their institutions as well as influence on production and life of displaced persons project construction may arouse. By the introduction, we realized several important problems we may face in the process of land acquisition of this project: (1) As to the land acquisition problem of Jinyinhu International Golf Development Co., Ltd., members of the cooperation claimed that the new fairway of golf course is under construction near one side of the airport expressway. If new channel is excavated, the new fairway under construction and the standard of golf course may be impacted, thus they hope Project Office and design unit take the problem into account. (2) In the process of land acquisition, Jinyinhu Power Substation should be removed integrally. At the present time, project office had already informed the leader of Dongxihu District Power Company of the matter. Leaders of this company determined to hold a special conference for the resettlement plan.

3. Consult with displaced persons and institutions for their will and suggestions about resettlement. To improve or at least restore the pre-project living standard of displaced persons, it is very important to establish resettlement and restoration plan in accordance with local practical situation. Therefore we listened to opinions and suggestions of displaced persons on resettlement in detail.

(1) Land acquisition and labors force resettlement. Affected region used to be state farm and cultivation farm. The land belongs to state cultivated land, labors force that work on the land are employees of farm and cultivation farm. Most of the land acquisition belongs to judicial entity; part of which is state-owned land used for construction. Requisition of this part of land will not influence the production of the enterprises. The project owner got the land mainly by purchasing the state land use right. Other land requisitioned is state cultivated land, after requisition of which, production conditions of some labor force will be affected and resettlement needed. Leaders of farm denoted that since the land acquisition area is small and labor force worked on the land is the employee of the farms who enjoy basic social securities. The farms will resettle those employees by compensation in currencies. At the same time, the farm will give priority to some employees for employment in non-agricultural department.

(2) Land compensation rate. Affected persons and local government have already realized the fact that the project is a municipal infrastructure construction project. After completion of the project, the drainage problem and sewage management problem of Dongxihu District will be greatly solved. Therefore local government has a strong wish of project construction, displaced persons and units have also realized the significance of this project. However, affected persons think Dongxihu District has developed fast in recent years; the land value of it has a potential in appreciation. So the affected local government hopes the

land acquisition compensation ratio can be determined as above ten times and labor force resettlement subsidy above fifteen times. Those compensation ratios are comparatively higher ratios in the stipulation of relevant regulations. They believe that could be a great help to the resettlement of affected persons.

(3) Relocation and reconstruction of housing. A staff building of Changqing Drainage Pump Station in Dongxihu District and the office building, dormitory and dinning room etc. of Jinyinhu Power Substation will be removed for project construction. Leaders of Changqing Drainage Pump Station pointed out that the property right of the staff building had already been transferred to the individuals of thirty employee households; each employee has their own opinion on resettlement. In the near future, leaders will consult with each householder to learn their will and take the result of consultation into account in resettlement planning. With regard to the office building, dormitory and dinning room etc. of Jinyinhu Power Substation, leaders of the Power Company claimed the power substation might not be reconstructed and the problem what the removal of demolition aroused can be solved by changing the circuitry of electricity transmission. As for the private residences of Machi Community, which need to be relocated, the residents hope the farm and cultivation farm will provide new house sites and unified planning for them after land acquisition, so that they could reconstruct the new residences themselves after getting land acquisition compensation.

Public Consultation conference summary

(Consultation conference of resettlement policy)

Date: Aug. 18, 2005

Location: Conference Room of the People's Government of Wuhan Municipality

Participants: Wang Xiaoyun (Project Office), Yu Qingguo (Project Office), Huang Nian (Project Office), Yin Jianjun (BV company, expert consultant of migration), Cheng Dening (Wuhan University), Song Guanghua (Division of Cultivated Land Protection under Bureau of Land Resources of Wuhan Municipality), Wang Lin (Division of House Demolition and Relocation under Bureau of Urban Planning of Wuhan Municipality).

Conference summary:

To get a better understanding of land acquisition policy and resettlement compensation policy of Wuhan Municipality, Doctor Yin Jianjun, the expert of resettlement and Doctor Cheng Dening of Wuhan University hoped that the Project Office could invite the leading officials of government departments long responsible for land acquisition and relocation management of Wuhan Municipality to attend the special consultation conference of land acquisition policy. Therefore the special seminar of land acquisition and relocation and resettlement compensation policy of Wuhan Municipality was held by Project Office in Aug.18, 2005. The leading officials of Bureau of Land Resources and Bureau of Urban Planning of Wuhan Municipality were invited to the seminar.

On the conference Doctor Yin Jianjun firstly introduced some new principles and policies of Asian Development Bank on involuntary resettlement and analyzed some differences on the resettlement between China and ADB. Later, the participants emphasized some problems of resettlement policy and consult these problems with the leading officials of government managerial department.

(1) Classification criteria of house sites in collective-owned land requisitioned in the project and the location-based price. Song Guanghua (Division of Cultivated Land Protection under Bureau of Land Resource of Wuhan Municipality) introduced relevant stipulation of Decree No.148 of the People's Government of Wuhan Municipality. As stipulated in the document, compensation rate of house site location should be determined according to different locations. The housing location is divided into three categories in accordance with the overall planning of ring road of Wuhan municipality: the first category is the section within the second ring road (the second ring road included), the second is the section between the second ring road and the third ring road (middle ring), and the third is the section outside the third ring road (middle ring).

(2) Compensation of unlicensed houses. Land acquisition area of this project involves

many “villages-in-city” in which many unlicensed private houses exist. For the compensation of those houses, *Circular of Opinions on Dealing with Issues Left over from History of Collective-Owned Land Acquisition Compensation* was promulgated by the People’s Government of Wuhan Municipality on Aug. 30, 2004. As the circular stipulated, houses constructed before Dec.31, 1986 without registration of property rights and legal approved documents should be demolished, the relocation compensation is 95% of the summation of the location compensation of house sites and the replacement cost. Houses constructed between Jan. 1, 1987 and Dec. 31, 1998 should be removed; the resettlement compensation is 85% of the summation of the location compensation of house sites and the replacement cost.

(3) Fees paid to the higher level for land acquisition. Mr. Song Guanghua, Division of Cultivated Land Protection under Bureau of Land Resource of Wuhan Municipality introduced that there are still some fees need to be paid to the higher level for land acquisition in Wuhan Municipality. According to state laws, besides land compensation, resettlement subsidy, compensation for attachments to the ground and green crops; construction unit that has requisitioned rural collective-owned land should also hand in other taxation and fees, which include (1) use fee for additional construction land; (2) reclamation fee of cultivated land; (3) fund for water works; (4) tax on occupation of cultivated land; (5) development fee for new vegetable fields ;(6) management fee of land acquisition; (7) labor cost of fish pond excavation. As Wuhan Rainwater and Wastewater Project belongs to municipal infrastructure project, the development fee for new vegetable fields in Wuhan Storm Water Management Component can be derated in accordance with relevant documents, laws and regulations.

(4) The resettlement and compensation policy of state cultivated land. Land acquisition of this project involved state farms. For the requisition of state cultivated land, Bureau of Land Resource of Wuhan Municipality made concrete stipulation in Document No.450. The rate of compensation for requisition of state cultivated land, resettlement subsidy as well as compensation for land attachments and green crops will be executed in accordance with *Compensation and Resettlement Measures of Wuhan Municipality for Requisition of Collective-owned Land*, the No.149 Decree of the People’s Government of Wuhan Municipality.

(5) Support policy for vulnerable groups. Leaders of Bureau of Land Resources of Wuhan Municipality pointed out that no special support policy for vulnerable groups exists in Wuhan at present, but according to practical situation, special preference will be given to vulnerable groups in practical operation. Now the only preferential policy for vulnerable groups is embodied in *Administrative Measures of Wuhan Municipality on Urban House Demolition and Relocation*. The measures stipulated that if the requisitioned residential housing of private house owners and tenants of house under direct management of the housing administrative

department or under management of the unit itself has a building area of less than 20 m² (20 m² included), the compensation will be calculated as 25 m², if the area is between 20 m² and 30 m², the compensation will be calculated as 30 m².

Public consultation meeting summary

(Resettlement consultation meeting of Luojiagang Sub-Project)

Date: Aug.21, 2005

Location: Meeting Room of Heping Village, Hongshan Township

Participants: Huang Nian (Project Office), Fang Jian (Wuhan University), Huang Fuxiang (Wuhan University), Hu Xiulin (Wuhan University), Xu Peiqiang (Heping Village), Zhang Yihong (Heping Village), Zhang Guoqiang (Heping Village), Hu Cuifang (Heping Village), Zhang Zhongni (Heping Village), Zhu Xingui (Tuanjie Village), Li Jiuming (Tuanjie Village), Chen Daojin (Tuanjie Village), Yang Zhou (Tuanjie Village), Peng Yunkai (Yujiatou Village), Yao Juying (Yujiatou Village), Li Baoyun (Yujiatou Village), Wang Wenhong (Yujiatou Village).

Conference summary:

After repeated coordination with affected local governments and units by Project Office and Wuhan University, a public consultation conference with representatives of affected persons as well as enterprises and institutions was held in Heping Village, Heping Township of Hongshan District on Aug. 21, 2005. The participants had a spirited discussion on several topics and the affected persons are consulted for their opinions and suggestions.

(1) The function of project construction. Project Office and Wuhan University gave a brief introduction of the content and function of the project. After listening to the introduction, the affected persons have a preliminary understanding of the contents and significance of the project. Most of them had a positive attitude toward the project; they think the project is a great help for solving drainage problem in this region and benefit the production operations and life of local community much. Especially in recent years, the district was developing rapidly, but the municipal infrastructure was still lagging behind. Now the district is a selected place to implement the comprehensive reconstruction of "village-in-city" of Wuhan. As the construction of this project will be a help to the improvement of local environment, the masses of the district give full support to this project.

(2) Compensation for house demolition and relocation and the resettlement. Although a large number of houses will be removed in this project, for their simple structure and crudity, compensation has become an important problem arousing great attention of the affected persons. According to the comprehensive reconstruction plan of "village-in-city" of Wuhan Municipality, community neighborhood committee will replace villagers' committee in the affected villages. As the affected area is near Xudong Business Zone, those affected villages

are establishing the reconstruction plan of "village-in-city" and making unified planning of commercial estate and residential estate. Most of the villagers hope that returned houses could be provided or house sites could be arranged in a unified way for house reconstruction. For unlicensed residences, affected persons indicated that many houses, which were built by villagers themselves, are not equipped with lawful certificate of property right for the land in this area is collective-owned. Village leaders pointed out that in the reconstruction of "village-in-city"; house sites and legal buildings of villagers will be confirmed and registered in detailed lists for report to the district government. Project Office denoted that the compensation principle for unlicensed buildings had already been stipulated in special document of the municipal government. The compensation principle in this project is that unlicensed buildings will be compensated according to replacement costs, but the house site compensation will not be included.

(3) Land acquisition and production resettlement. According to the introduction of local villagers, most of local population has permanent rural residences, but a majority of them were no longer engaged in agricultural production, agricultural income only accounts for 10% of the total income of local residents. Neighboring to the rising business zone, village collectivity has established a large number of commercial enterprises and found enormous employment opportunities for the residents. Besides that, formal villagers could also enjoy profit sharing as well as some social welfare. Project Office introduced the situation of land acquisition to affected persons, and denoted that the land acquisition is aimed to widen the old channels along the two sides, so most of the land to be requisitioned is ponds. As those ponds are not the major source of income of the villagers, land acquisition will not bring much loss to their income. The affected persons said that they have no worry on land acquisition affecting income and as long as reasonable compensation could be provided, their income may increase instead of decrease.

After the consultation, villagers also gave some advices. They hope that once the land acquisition plan is fixed, detailed scope of land acquisition and date of commencement and relocation can be informed to local government, affected persons and relocated household in particular in time to ensure that the affected villages could make plans as soon as possible and the relocated households have abundant time to settle their work and inhabitation.

Appendix III Resettlement Booklet

Dear _____:

The construction of Wastewater and Storm Water Management, a key project of Wuhan, will affect the location of your family (unit) to some extent. The booklet is distributed to inform you on the basic status of the project, relevant land acquisition and relocation policies of the state and the impacts on your family.

1. Relevant Land Acquisition and Relocation Laws, Regulations and Compensation Rates

Relevant land acquisition, relocation and compensation policies are as follows:

Category	Rates for land acquisition compensations and resettlement subsidies
1. Permanent Land Acquisition	Paddy fields, vegetable fields, pond and fishpond ____ CNY per <i>mu</i> ; dry land, commercial forests and timberlands ____ CNY per <i>mu</i> ; wasteland and other unprofitable land ____ CNY per <i>mu</i> .
2. Temporary Land Use	Calculate according to compensation rate per land-use year in various locations.
3. Compensation for Young Crops	Paddy fields and vegetable fields ____ CNY per <i>mu</i> , dry land ____ CNY per <i>mu</i> .
4. Resettlement Compensation	Compensate ____ CNY per resettled agricultural person.
5. Houses	Brick and concrete ____ CNY per m ² , brick and wood ____ CNY per m ² , earth and wood ____ CNY per m ² , simple ____ CNY per m ² . Plus suitable compensation for removes and loss of working time.
6. Attachments to the Ground	Terrace ____ CNY/m ² , well ____ CNY/well, enclosing wall ____ CNY/m, tomb ____ CNY/tomb, big timber tree ____ CNY/tree, small timber tree ____ CNY/tree, tree with fruits ____ CNY/tree, and trees without fruits ____ CNY/tree.
7. Professional Infrastructure	Compensate according to specific replacement cost or negotiated price of facility.

The compensation rate of land acquisition and relocation is determined on the basis of sufficient survey, with reference to involuntary resettlement principle of Asian Development Bank as well as state laws and regulations, and aimed to restore and improve living standard of affected persons in short period after resettlement.

2. Impacts on your family (unit)

Project	Quantity	Compensation rate	Compensation deserved	Remark
1				
2				
3				
4				
Total				

3. Estimated time of project implementation

Items	Time
Promulgate bulletin of land acquisition and relocation	
Pay fund	
Land acquisition and relocation	
Move into new house	
Preparation for the project	
Implementation of the project	

4. Rights and obligations of affected objects

(1) Rights of affected objects

Get all kinds of deserved compensation in complete conformity with the above compensation rates; reflect opinion and suggestions to land acquisition and relocation offices or project resettlement offices of village committee, town, township, district progressively, specific contents of which including base number of compensation quantity, compensation rate, time of compensation payment, site selection for house reconstruction, etc. various resettlement offices must reply to complaints of affected objects and problems subordinate resettlement office reflects within 15 days.

(2) Obligation of affected objects

- Actively cooperate with implement of state project.

- New buildings shall not be constructed within scope of resettlement survey, otherwise compensation fund will be canceled.
- Demolish buildings within the red-line scope of project planning.

5. Assistance to vulnerable families

Vulnerable families would get assistance as listed below:

- Fund assistance. Village would distribute subsidies for hardship in the process of house relocation.
- Labor assistance. Village would provide labor assistance in house relocation and reconstruction.
- Relieve compulsory work of the labor forces of the year.
- Give them priority in site selection for house reconstruction and location of plantation in redistribution.

6. Organizations of land acquisition and relocation

The Project Resettlement Office (PRO)

Address: Postal code: Tel:

Resettlement Department of Jianxing Company

Address: Postal code: Tel:

Resettlement Unit of Luojiagang Sub-project

Address: Postal code: Tel:

Resettlement Unit of Yangsigang Sub-project

Address: Postal code: Tel:

Resettlement Unit of Three Gates Connection and Changqing Pump Station

Address: Postal code: Tel:

External monitoring organization: Address: Postal code: Tel:

7. Right of interpretation of the booklet

The right of interpretation of the booklet belongs to the PRO.

Appendix IV TOR of Resettlement M&E

Objectives

1. The external monitoring and evaluation (M&E) undertaken by an qualified institution independent to the WPMO, IAs and resettlement implementation agencies is to monitor and evaluate whether the target of the land requisition, resettlement and relocation activities are realized. Through this process, evaluation opinions and recommendations will be put forward on the resettlement, housing relocation and restoration of the resettler's living standards. Through M&E, systems will be adopted to identify problems, formulate remedial measures and take follow-up actions in a timely manner to ensure good implementation of resettlement.
2. The external monitoring and evaluation institution (Monitor) will report independently to the WPMO and ADB. It will conduct follow-up investigations, monitoring and evaluation of the resettlement activities according to the RP and provide advice for decision-making and mitigation measures.

Scope of Work

1. According to the WPMO's initial arrangements, an experienced independent organization will be entrusted to carry out the external M&E activities. The institute will (i) provide technical assistance and training for the Project Resettlement Office (PRO), (ii) assist with the finalization of Village compensation allocation and utilization (rehabilitation) plan (iii) conduct monitoring investigations of resettlement implementation in accordance with RP requirements, (iv) evaluate living standards of the APs to determine adequacy of restoration, and (v) prepare and submit M&E reports to WPMO and ADB as stipulated in Section F.

Main Indicators to be Monitored and Evaluated

1. The main Indicators for Monitoring include three aspects: (i) Progress: including preparation, implementation of land requisition, housing relocation and resettlement;(ii) Quality:

including civil construction quality and degree of resettlers' satisfaction; and (iii) Investment: including allocation and use of funds. Main Indicators for Evaluation include:

- (i) Economic conditions: household economic development before and after resettlement, including assets, production materials, subsistence materials, income, etc.
- (ii) Environmental conditions: living environment before and after resettlement, including traffic, culture and education, sanitation, commercial service facilities, etc.
- (iii) Employment: change in employment, including employment rate, assistance to the different APs, especially the vulnerable APs, such as vulnerable families, etc.
- (iii) Development in community: local economy in resettlement host sites, environmental development, neighborhood relation, and public opinions after resettlement.
- (iv) Conditions of Vulnerable Groups: including before and after situations of poor households, disabled, elderly, children, women, etc.

Monitoring and Evaluation Measures

1. Monitoring and evaluation will be performed on the basis of the survey data provided by the survey design institution and resettlement implementation institutions. With an overall understanding of the situation, the evaluation will be performed by sample surveys, key informant interviews and rapid rural appraisal techniques. Typical samples, including resettled households, affected villages/communities will be selected to establish an evaluation index system for different types of APs. Referring to the updated research output on living quality both in China and abroad, the indexes will be non-dimensionally treated, and the survey results will be analyzed and the computation results evaluated and compared. In addition to typical samples, there will also be focused investigation of vulnerable groups.
2. Generally, the external monitoring and evaluation institution will carry out the following work.

(1) Survey of the APs' living standards

1. A base-line survey will be conducted for this project, including the collection of selected samples of the base-line living standards of the APs. (The preliminary samples will be

randomly collected). The living standard will be investigated once a year to monitor the variation in the APs' living standards. The necessary data can be obtained by periodical survey, random interview and site visits, based on which statistical analysis and evaluation are performed. There will also be targeted surveys of vulnerable groups.

2. The survey comprises various indicators of living standards. Some of the indicators will be used for weighing the dynamic variation of living standards before and after the land requisition and resettlement. The selected indicators will be checked to see whether they are reasonable in reflecting the actual production and living levels in the base-line survey and are subject to modification according to the actual conditions, so as to guarantee the message obtained reflects the quality and quantity of the real situation.

Sampling scale is as below table 1.

Table 1 Sample distribution of living standard baseline survey of displaced persons

Types of samples	Households			Shops and enterprises and institutions	Vulnerable groups
	Affected by land acquisition only	Affected by relocation only	Affected by both land acquisition and relocation		
Sampling proportion	20%	20%	20%	50%	100%
Estimated Households	50	275	105	42/19	7
Surveyed Households	10	55	21	21/10	7

(2) Providing Training

1. A training program and budgets for resettlement units has been prepared and included in each RP (see Table 8-2). The Monitor will assist to arrange for the training and participate in the training. In particular, one training similar will be arranged with the cooperation of ADB resettlement specialist, prior to the project resettlement process.

(3) Providing guidance to finalize Village compensation allocation and utilization (rehabilitation) plans

1. Preliminary plans have been included in RPs based on the initial consultation and participation during the PPTA stage. The Monitor will follow-up the formulation and finalization of these plans for the 15 affected villages (7 plans prepared for Storm Water Component and 8 plans for Wastewater Component. For seriously affected villages (5 were identified), guidance should be provided where required to formulate viable plans and ensure adequate participation and acceptance of the plans by the APs and host villages. The finalize plans should be submitted to WPMO and ADB prior to the payment of land compensation.

(3) Holding Public Consultation

1. The independent monitoring and evaluation institution will participate in the public consultation conferences held by the villages and townships. By this method, the institution can evaluate the effectiveness the public participation and the cooperative attitude of the APs towards the RP implementation. Such activities will be conducted during and after the resettlement implementation.

(4) Gathering the APs' Opinions

1. The independent monitoring and evaluation institution will often interview the district s resettlement offices and villagers to know the opinions collected from the APs and interview the APs who have grievances. The institution will report the opinions and suggestions from affected individuals and collectives to the Project Resettlement Office, and provide advice for improvement, so that the resettlement implementation can be more smooth and effective.

(5) Other Responsibilities

1. The Monitor will monitor and provided advice to the PRO for the following activities in the process of implementation:

(i) House demolition and rehabilitation,

- (ii) Production arrangement and rehabilitation (and use of funds),
- (iii) Support to vulnerable groups,
- (iv) Relocation of private-owned shops, enterprises and institutes,
- (v) Re-construction of special facilities,
- (vi) Payment and amount of the compensation,
- (vii) The APs' transfer,
- (viii) Employment of laborers,
- (ix) Training,
- (x) Schedule of the items above mentioned,
- (xi) Organizational efficiency for the resettlement,
- (xii) Use of compensation of the collective-owned land
- (xiii) The APs' incomes, expenditures, and assets
- (xiv) Employment of the surplus laborers and income increase of them
- (xv) Village compensation allocation and utilization (rehabilitation) plans.

Working Processes

- (i) Preparation of monitoring and evaluating outline,
- (ii) Identify computer software for monitoring and evaluating of the resettlement,
- (iii) Drafting the investigation outline, survey forms, and record cards for sample villages and sample households,
- (iv) Design of the village and household social-economic and opinion surveys,
- (v) Carry out base-line surveys,
- (vi) Establishing the information system for monitoring and evaluation Investigation for monitoring
 - Community socio-economic survey
 - Resettlement implementation institutions
 - Village / community survey
 - Household survey
 - Survey for other affected objects
- (vii) Sorting of monitoring information and establishment of database Comparison

analysis.

Monitoring and Evaluation Report Arrangement

- (i) A baseline survey(s) shall be carried out by independent monitoring agency before land acquisition or demolition.
- (ii) The semi-annual external monitoring report shall be submitted to ADB and WPMO during the project implementation at six-month intervals.
- (iii) The annual evaluation report shall be submitted to ADB and PMO during the project implementation, commencing one year after completion of relocation. This evaluation will be done at least twice, or until incomes have been fully restored. The final evaluation report should provide an overall assessment of resettlement.

ADB TA - 4436 - PRC

**Project Preparatory Technical Assistance
Wuhan Wastewater and Storm Water
Management Project**

Final Report

December 2005

Volume 4

**Report and Recommendation of the
President**

Consultant
Black & Veatch (Asia) Ltd

Executing Agency
Wuhan Municipal Government

ASIAN DEVELOPMENT BANK

RRP: PRC XXXX

**REPORT AND RECOMMENDATION
OF THE
PRESIDENT
TO THE
BOARD OF DIRECTORS
ON A
PROPOSED LOAN
TO THE
PEOPLE'S REPUBLIC OF CHINA
FOR THE
WUHAN WASTEWATER AND STORM WATER MANAGEMENT PROJECT**

Draft

December 2005

CURRENCY EQUIVALENTS

(as of 1 July 2005)

Currency Units	–	Chinese Yuan (CNY)
	–	US Dollar (\$)
CNY 1.00	=	\$ 0.123
\$ 1.00	=	CNY 8.11

ABBREVIATIONS

Abbreviation	Full name/description
ADB	Asian Development Bank
AP	Affected Person
CWRC	Changjiang Water Resources Commission
EA	Executing Agency (which is WMG as represented by WPMO)
EIA	Environmental Impact Assessment
EIRR	Economic Internal Rate of Return
EMP	Environmental Management Plan
EPB	Environmental Protection Bureau
FIRR	Financial Internal Rate of Return
FMA	Financial Management Assessment
FYP	Five Year Plan
HPG	Hubei Provincial Government
IA	Implementing Agency
ICB	International Competitive Bidding
LIBOR	London Inter-bank Offered Rate
MDG	Millennium Development Goal
PDMF	Project Design and Monitoring Framework
PIU	Project Implementation Unit
PLG	Project Leading Group
PMO	Project Management Office
PPTA	Project Preparatory Technical Assistance
PRC	People's Republic of China
PSP	Private Sector Participation
RP	Resettlement Plan
SEIA	Summary Environmental Impact Assessment
SEPA	State Environmental Protection Administration
WACC	Weighted Average Cost of Capital
WDC	Wuhan Drainage Company
WMG	Wuhan Municipal Government
WMMP	Wuhan Municipal Master Plan

WUIDC	
WUCF	Wuhan Urban Construction Foundation
WWMP	Wuhan Wastewater Management Project
WWTP	Wastewater Treatment Plant
YRB	Yangtze River Basin

WEIGHTS AND MEASURES

kilometer per square kilometer	—	km / km ²
square kilometer	—	km ²
square meter	—	m ²
cubic meter	—	m ³
cubic meter per day	—	m ³ /day
cubic meter per second	—	m ³ /s
ton	—	t

NOTES

- (i) The fiscal year (FY) of the PRC Government ends on 31 December.
- (ii) In this report, "\$" refers to US dollars.

This report was prepared by a team consisting of :

- Sangay Penjor, Project Team Leader;
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- Kathleen Moktan, Financial Management Specialist;
- Sri Handayni, Poverty and Social Specialist;
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SUPPLEMENTARY APPENDICES

(draft listing only, for further discussion at Loan Fact Finding)

- A. Detailed Cost Estimates and Financing Plan
- B. Detailed Financial Management Assessment
- C. Organization Chart of Project Implementing Agencies
- D. Outline Terms of References for Consulting Services
- E. Health Impact Analysis
- F. Detailed Financial Analysis and Financial Projections
- G. Detailed Economic Analysis and Least Cost Analysis
- H. Detailed Description of Project Components
- I. Institutional Analysis and Capacity Building
- J. Willingness to Pay Survey
- K. Socio Economic Assessment
- L. Two Resettlement Plans (Wastewater and Storm Water Components)

LOAN AND PROJECT SUMMARY

Borrower	The People's Republic of China (the PRC)
Classification	<p>Poverty: Targeted Intervention – Millennium Development Goal (MDG) 7</p> <p>Sector: Water Supply, Sanitation and Waste Management</p> <p>Subsector: Water supply and sanitation</p> <p>Thematic: Environmental Sustainability; Sustainable Economic Growth</p> <p>Subtheme: Urban environmental improvement; fostering physical infrastructure development</p>
Environment Assessment	<p>Category A</p> <p>An environmental impact assessment (EIA) has been undertaken. The Summary EIA (SEIA) was circulated to the Board along with the summary resettlement plan on xx December 2005 and uploaded on the Asian Development Bank (ADB) website on xx December 2005.</p>
Project Description	<p>The Wuhan Wastewater and Storm Water Management Project (the Project) is a key urban infrastructure initiative of the Wuhan Municipal Government (WMG). The Project will help Wuhan, the capital city of Hubei Province to:</p> <ul style="list-style-type: none">(i) reduce water pollution;(ii) protect water resources;(iii) alleviate economic losses and social hardship from localized flooding;(iv) promote sustainable economic development; and(v) improve the environment, living conditions and public health standards. <p>The Project has 5 wastewater management subprojects to provide improved wastewater collection and treatment, and 4 storm water management subprojects to provide improved flood alleviation in 8 districts of Wuhan. The Project will also involve targeted capacity building and training in wastewater and storm water management, and the design and regulation of private sector initiatives for the respective Implementing Agencies (IAs). The Project supports the Government's successive Five Year Plans (FYPs), to improve living conditions and health in PRC cities, and promote their sustainable economic development.</p>

Rationale

Wuhan is strategically located at the confluence of Yangtze and Han rivers and is the capital of Hubei Province. It is a major center of communications, education, culture, economy, trade, transportation and industry in central China. Wuhan covers an area of 8,467 km², which includes an urban built up area of 211 km². As of 2004, the Municipality had a population of approximately 7.8 million in its 7 urban and 6 suburban districts. Wuhan has abundant water resources including many rivers and lakes which together take up 2,144 km², about one-quarter of the urban and suburban areas.

Despite the abundant water resources, rapid economic growth and continuing urbanization over the last 25 years in Wuhan have resulted in inadequate urban infrastructure and placed pressure on overloaded facilities. In 2004, about 2 million m³/d of wastewater was generated but only 26.8 % of which was treated by 4 wastewater treatment plants. Demands for water for domestic and industrial use are steadily increasing. At the same time, quantities of wastewater are increasing rapidly as are the associated pollution loads. Due to a lack of sufficient wastewater collection and treatment facilities, increasingly severe problems related to water pollution and urban drainage has resulted in serious water quality problems in the Wuhan section of the Yangtze River.

The built up areas in Wuhan are mostly below the average flood level of the Yangtze and Han rivers. Protected by flood control bunds, during wet seasons storm water is discharged to the rivers by pumping. Being located in the subtropical monsoon climate zone, distinct seasonal variation and heavy summer rains place particular stress on Wuhan's urban drainage system. Combined sewer overflows also become major sources of water pollution. Aging and inadequately maintained drainage network and under capacity pumping stations result in frequent severe flooding events.

Water pollution has been growing in magnitude, creating water supply problems and economics losses, and impacting on development and economic growth. To achieve sustainable wastewater management and water resource protection, ADB approved the Wuhan Wastewater Management Project in 2003, to increase wastewater treatment percentage to 56 % by 2007. This is line with the WMG's current comprehensive initiative through to 2010, to install additional WWTPs to raise the treatment percentage to the mandated 80 % target, and to increase the drainage network coverage to between 11.5 and 12.5 km / km², and to expand total drainage pumping capacity to more than 700 m³/s.

The 5 wastewater subprojects and 4 storm water subprojects, together with the Project's capacity building activities will contribute significantly to pollution control and environmental management in Wuhan. Beneficiaries will include not only residents of Wuhan but also those living along the Yangtze River downstream of Wuhan.

Objectives and Scope The project objectives are to enhance the urban environment and public health, through better wastewater management, protection of water resources and flood alleviation. Related objectives include :

- (i) contributing to reducing the discharge of untreated wastewater in Wuhan, and towards achieving the goal of 80 % wastewater treatment rate by 2010;
- (ii) supporting integrated approaches to basin-wide pollution prevention and control, improving water quality of rivers and lakes in Wuhan and in downstream reaches of Yangtze River;
- (iii) attaining river water quality objectives;
- (iv) strengthening capability and increasing efficiency of the IAs, and enabling Wuhan Drainage Company (WDC), the IA responsible for the wastewater management component to be commercially managed;
- (v) tariff reforms and increases to achieve full cost recovery and promote the economic use of resources;
- (vi) improving health and living standards of Wuhan residents;
- (vii) direct and indirect poverty reduction; and
- (viii) improving wastewater and storm water service efficiency through increased competition and private sector participation (PSP).

Cost Estimates The total project cost is \$ 266.43 million equivalent including a foreign exchange cost of \$ 139.65 (52.4 %) and a local currency cost of \$ 126.78 million (47.6 %) equivalent.

Financing Plan

Source	(\$ million equivalent)			
	Foreign Exchange	Local Currency	Total Cost	Percent
A. Asian Development Bank	100.00	0	100.00	37.5
B. Wuhan Municipal Government	39.65	32.69	72.34	27.2
C. Local Bank Loans	0	94.09	94.09	35.3
Total	139.65	126.78	266.43	100.0

ADB will provide a loan of \$100 million equivalent, to finance 37.5 % of the foreign exchange cost of the Project. The remaining financing will be provided through a combination of equity from wastewater charges and WMG, and borrowing from domestic PRC commercial banks.

Loan Amount and Terms A loan of \$ 100 million from ADB's ordinary capital resources will be provided under ADB's London inter-bank offered rate (LIBOR) based lending facility for US dollar loans. The loan will have a 25-year term including a grace period of 5 years, an interest rate determined in accordance with ADB's LIBOR based lending facility, a commitment charge of 0.75 % per annum, and such other terms and conditions as set forth in the draft Loan and Project Agreements. In accordance with current ADB policy the front end fee will be waived.

Allocation and Re-lending Terms	The loan proceeds will be re-lent by the PRC Central Government to HPG, who will on-lend the loan proceeds to WMG on the same terms and conditions as the ADB loan. WMG will on-lend part of the loan proceeds to the WDC on the same terms and conditions as the ADB loan. The balance of the loan will be applied directly by WUCF on behalf of WMG to finance the storm water component. The end borrowers will assume the foreign exchange and interest rate variation risks for the ADB loan.
Period of Utilization	Until 31 December 2011.
Estimated Project Completion Date	31 December 2010
Implementation Arrangements	A Project Leading Group (PLG) has been established, headed by the Vice Mayor of WMG and comprising representatives from Wuhan Municipal's Construction Committee, Water Affairs Bureau, Planning Committee, Planning Bureau, Water Bureau, Financial Bureau, Price Bureau, Environmental Protection Bureau, Caidian and Dongxihu district governments and related agencies. The PLG will provide overall policy guidance, facilitate interagency coordination, and resolve any institutional problems affecting project implementation. The existing Wuhan Wastewater Management Project (WWMP) project management office has been retained for this follow on Project. The WPMO will also be the secretariat of the PLG. Separate Project Implementing Units (PIUs) have been established by WDC and WUCF who will implement the wastewater and storm water components respectively. These PIUs report to the WPMO and also coordinate and monitor activities of the IAs.
Executing Agency	Wuhan Municipal Government
Procurement	ADB-financed equipment and materials will be procured in accordance with the ADB's <i>Guidelines for Procurement</i> . Major contracts for equipment and materials will be tendered through international competitive bidding or international shopping procedures, depending on the contract amount.

Consulting Services

About 25 person-months of international consultants and 150 person-months of domestic consultants will be required to support WPMO and IAs in project implementation and capacity building to be funded under the Project. The scope and extent of consulting services takes account of the consulting support incorporated into WWMP and also the specific needs of the Project. Consulting services are required for specific areas and include: (i) development of a sludge management strategy for Wuhan; (ii) investigation and control of inflow and infiltration into the wastewater collection network; (iii) assistance with the private sector participation initiatives; (iv) financial management; (v) operations and maintenance improvements; and (vi) extended development of water quality modeling. The international consultants will also provide training and capacity building in wastewater management and treatment planning, water quality management, financial management, and environmental monitoring and management. The consultants will be recruited in accordance with the ADB's *Guidelines on the Use of Consultants*.

Project Benefits and Beneficiaries

The Project will benefit over 3 million urban and suburban residents whose living conditions and public health standards will be improved, by increasing wastewater treatment and more reliable potable water supply. The Project will reduce trans-boundary pollution, by reducing pollutant into the tributaries of the Yangtze River Basin (YRB). The amount of pollutants expected to be removed annually from the YRB as a direct result of the Project, include:

- (i) 20,000 t biochemical oxygen demand;
- (ii) 36,000 t chemical oxygen demand;
- (iii) 25,000 t suspended solids;
- (iv) 3,000 t ammonia nitrogen; and
- (v) 340 t total phosphorous.

These water quality improvements will contribute to the integrated river basin-wide management program and trans-jurisdictional pollution prevention and control. The water quality target is to restore the Yangtze and Han Rivers within the Wuhan section meets Class II national standards; and the major lakes in Wuhan meets Class III by 2010.

The Project will contribute in the provision of reliable drinking water to Wuhan. The Project will provide flood relief, thus minimizing waterborne diseases, loss of life and damage to property, agriculture and infrastructure. The Project will improve the drainage-sewerage network by separating storm water and wastewater flows into different systems, and rehabilitating defective pipes.

The Project will create a minimum of 222 full time permanent jobs with WDC for the operation of the facilities, 5,000 person years of work during the 5 year construction period, 130 full time permanent jobs and 8,100 person-years of work as a result of the Project's economic spin off effects. Approximately 40% of the construction jobs will be filled by the poor and vulnerable, including unemployed persons, rural migrants and women, representing therefore a key intervention in the poverty cycle. Public health benefits will accrue through a reduction in waterborne diseases. The Project is estimated to reduce water related disease episodes by an average of 8,000 cases per year.

ADB supported tariff reforms in the PRC water sector facilitated the policy dialogue on tariff reforms and cost recovery undertaken during project processing. The national guidelines on water tariffs prepared with ADB assistance are being implemented in Wuhan and as a result the water and wastewater tariffs are continuing to be adjusted upwards. The financing of wastewater treatment infrastructure directly from wastewater tariff increases, which is in line with the ADB policy, will have a demonstratable impact on wastewater tariff reform in both the PRC and Asia. The Project is technically sound, affordable to beneficiaries, and financially and economically viable with the following financial internal rates of return for the wastewater management component, all higher than the real weighted average cost of capital of 4 % and:

- (i) Central urban area - 12.36 %
- (ii) Dongxihu district - 7.58 %
- (iii) Caidian district - 10.91 %

The combined economic internal rates of return for Project are well above the deemed economic opportunity cost of capital of 12 % :

- (i) wastewater management component - 22.6 %
- (ii) storm water management component - 19.6 %
- (iii) the whole Project - 21.5 %

Risks and Assumptions

A potential risk remains that WMG will not proceed with the institutional reform it gave assurance to under WWMP, that the WDC be allowed to operate as an integrated and autonomous wastewater utility responsible for all wastewater operations in the project area (including Caidian and Dongxihu Districts.) Potential financial and commercial risks related to the Project include :

- (i) failure to meet the cash/equity transfers required to construct the Project;
- (ii) failure by WMG to increase the tariffs to ensure continuing full cost recovery; and
- (iii) failure of WMG to cause Dongxihu and Caidian districts to introduce/increase wastewater tariffs to meet cost recovery targets.

The potential financial and policy risks will be mitigated by assurances related to the financial and managerial autonomy for WDC and that WMG will ensure storm water operations and maintenance is fully financed. ADB review missions will monitor WDC's compliance with the financial and operational covenants to ensure its financial sustainability. The risks associated with lack of local funding will be addressed by the assurance from WMG that they would meet whatever cost increases are incurred, and provide a guarantee on the required equity injections to meet the financing requirements of the Project.

ADB review missions will monitor implementation progress and compliance with the financial and operational covenants.

The Project does not have any unusual technical risks. The project components will use standard technology that conforms to international standards. Specific construction risks will be mitigated by the use of experienced consultants to prepare designs and experienced contractors for construction, and monitor project implementation.

I. THE PROPOSAL

1. I submit for your approval the following report and recommendation on a proposed loan to the People's Republic of China (PRC) for the Wuhan Wastewater and Storm Water Management Project (the Project).

2. In line with its long term goals for the urban sector of improving living conditions, minimizing flooding incidents, protecting water resources and enhancing wastewater treatment coverage, the Government of the PRC has requested the Asian Development Bank (ADB) to assist in implementing wastewater and storm water projects in Wuhan in central China. The proposed Project is a natural follow-on investment to the ADB financed Wuhan Wastewater Management Project (WWMP), currently under implementation. The Project is consistent with ADB's policy and will help the PRC achieve environmental sustainability and improved surface water quality and basic sanitation conditions. This report is based on the findings of the loan fact finding mission and discussions with the central and local governments, relevant agencies, and community organizations. Past ADB assistance to the PRC in the sector is in **Appendix 1**. The Project Design and Monitoring Framework (PDMF) is in **Appendix 2**.

RATIONALE: SECTOR PERFORMANCE, PROBLEMS AND OPPORTUNITIES

A. Performance Indicators and Analysis

3. Annual economic growth in the PRC has averaged 8 % over the last 20 years and economic growth is projected to average 7 % over the next 5 years. Gross domestic product exceeded \$ 1 trillion in 2000, and was \$ 1.65 trillion in 2004. The urban population has grown from about 190 million in 1980 to over 524 million in 2003, about 40 % of the total population. This is further expected to rise to 700 million or 50 % by 2030. The Government's Agenda for Economic Reform and Social Development in the New Century aims to accelerate urbanization and the development of large, medium and small cities and small towns. This urbanization process will continue to increase the demand for all urban services. In particular, it will place a strain on the physical and financial capacity of most cities to provide adequate urban infrastructure such as wastewater and storm water facilities. Without significant investment, there will be a deterioration of the quality of life for urban residents, degradation of the urban environment and inefficient economic development.

4. The PRC's urban areas face environmental threats from pollution of rivers, lakes, and underground aquifers from untreated water. In 2003, about 46 billion m³ of wastewater were generated, of which about 65 % was from municipal sources and 35 % from industrial sources. Currently, about 90 % of industrial wastewater is treated before discharge to a municipal sewer. Municipal wastewater is a major contributor to pollution of the PRC's rivers and lakes, with the most severe pollution impacts in the water-short northern region. Currently, only about 40 % (34 % in 1999) of urban wastewater is treated; the rest is discharged untreated to rivers and lakes. In regional and administratively higher level cities, only 30 % of rivers meet designated water quality standards compared with the Government objective of 60 % in the current Tenth Five-Year Plan (2001-2005). About 52 % of the water in the seven major river basins¹ (Yangtze River Basin, YRB being the largest among them) does not meet the Class III² national water quality standard. Surface water sources serving municipal water supply systems are polluted to levels

¹ Changjiang (Yangtze River), Haihe, Huaihe, Huanghe Liaohe, Songhuajiang, and Zhujiang.

² The PRC water quality standards have five classes of quality covering about 40 pollution parameters. Class I is pristine, while Class V is suitable only for industrial use. Class III is the minimum water quality required for municipal water supply.

unacceptable under water quality standards. To address the pollution of lakes and rivers, the following actions are needed to (i) strengthen laws, regulations, and institutions to address trans-jurisdiction pollution; (ii) adopt river basin management approaches for water resource management; (iii) reduce non-point source pollution; (iv) continue investment in municipal wastewater treatment plants (WWTPs) to mitigate the polluting effects of rapidly increasing urbanization; (v) diversify financing sources for environmental investments; and (vi) continue with institutional and financial reforms to facilitate balanced economic growth and environmental sustainability. Significant investments are needed nationally to solve water shortage problems, supply clean drinking water, expand wastewater treatment capacity, and reduce flooding.

5. Recognizing that adequate environmental protection and pollution controls are essential for sustainable economic growth, the Government has incorporated environmental protection as a national priority in its development strategy. In addition to enacting environmental protection laws and implementing regulations that emphasize preventive measures, the "polluter pays" principle, and decentralized environmental management, the Government has also undertaken numerous programs including those for wastewater management.³ Industries were ordered to treat wastewater to national wastewater discharge standards by the end of 2000; municipalities have been required under successive five-year plans to address wastewater collection, treatment and disposal; and pollution control plans have been developed and partially implemented for the key river basins. The Government plans to increase centralized urban wastewater treatment during the Tenth Five-Year Plan to increase the treatment rate to 45 %. The Government has decreed⁴ that by 2010, the wastewater treatment rate in all the PRC cities should not be lower than 60 %, and not lower than 70 % for major cities⁵ with secondary treatment facilities. The recent target set for major cities like Wuhan is 80 %. The State Environmental Protection Agency (SEPA) requires that all new WWTPs that are constructed provide at least secondary wastewater treatment. The treatment level required is also dependent on water quality class for the receiving water.

6. The Government has accorded priority in the Tenth Five-Year Plan to address wastewater treatment issues through policy reform, increased investment and improved urban infrastructure management. These initiatives will continue during the Eleventh Five-Year Plan. The Government's strategy focuses on: (i) protecting water sources by controlling industrial and other pollution; (ii) introducing water efficient technologies and operations; and (iii) using appropriate pricing mechanisms to encourage conservation and generate necessary funds for operation, maintenance and investment. The Government's ongoing economic and enterprise reform programs require that all wastewater projects be financially sustainable and capable of cost recovery. In contrast, storm water drainage is currently considered a public service to be financed from government revenues. The wastewater and storm water sector analysis is given in **Appendix 3**.

7. Wuhan's extensive water bodies take up one fourth of the urban built up area. In 2004 wastewater discharge was about 2 million m³/day, some 47 % of which was industrial wastewater. There are 4 existing WWTPs in Wuhan, most of which only provide primary

³ The PRC Law on Prevention and Control of Water Pollution was first adopted in 1984 and amended in 1996. The law was enacted to prevent and control water pollution, protect and improve the environment, safeguard human health, and ensure effective utilization of water resources. The law also establishes the standards for water environment quality and for discharge of water pollutants; and enumerates the planning, supervision, and management of the prevention and control of water pollution.

⁴ The Ministry of Construction. 2000. *Publication of Urban Wastewater Treatment and Control Technology Advice*. Beijing.

⁵ These include cities directly under the Central Government, provincial capital cities, and key tourist cities.

treatment and they are only able to treat 26.8 % of the wastewater generated. The investments being made under the WWMP will help increase this percentage to 45 %. The Wuhan Wastewater Master Plan and the contributions to the overall treatment rate by the multilateral and bilateral donor agencies and local interventions are in **Appendix 4**. The large quantity of untreated and primary treated wastewater discharged into rivers and lakes has caused a significant deterioration of water quality, which must be reversed. The entire Wuhan stretch of the Yangtze and Han rivers is of a Class III water quality. Many lakes in Wuhan are below Class V. It should also be noted that the future operation of the South North Water Transfer Project (middle route) will significantly reduce water flows in Han River with consequential further reduction in its assimilative capacity.

B. Analysis of Key Problems and Opportunities

1. Project Background

8. Traditional urban wastewater management practice in the PRC was based on the use of septic tanks. Rapidly increasing urbanization makes such an approach inadequate. Over the past decade there has been a fundamental shift towards an integrated approach to urban water management and use of centralized municipal wastewater treatment. Although much improvement has been made, the current status of wastewater management in the PRC still provides numerous opportunities to reduce water pollution, protect water resources, promote sustainable economic development and improve the living conditions and public health of urban and suburban residents. Key problems and opportunities in Wuhan include: (i) worsening surface water quality; (ii) inadequate wastewater treatment capacity; (iii) inadequate storm water discharge capacity; (iv) extending improvements to suburban areas; and (v) the need for ongoing financial and institutional reforms to make urban services genuinely sustainable.

9. Wuhan located in central region of the PRC, is the capital of Hubei Province. It lies in the Jiangnan Plain where the Han River joins the Yangtze River. It is strategically located approximately half way along the length of the Yangtze River and is a center of communications, education, culture, economy, trade, transportation and industry. Wuhan covers an area of 8,467 km², which includes an urban built up area of 211 km². As of 2004, the Municipality had a population of approximately 7.8 million. Wuhan's urban area is divided into three parts (Wuchang, Hankou and Hanyang) by the Yangtze River and the Han River. The Municipality includes 7 urban and 6 suburban districts. Wuhan has abundant water resources, including the Yangtze, Han and Fu rivers and many lakes, which together take up 2,144 km² or one-quarter of the urban and suburban areas.

2. Water Quality Management in the Yangtze River Basin

10. The Yangtze River, also known as Changjiang, is the largest river in the PRC. The Changjiang Water Resources Commission (CWRC) has overall responsibility for managing water resources within the whole basin. CWRC has developed a basin-wide management plan which provides a framework for managing water resources within the Basin. The Plan cites the deteriorating water quality of Yangtze River. Though the river is often seen as having a high assimilative capacity, the cumulative effect of the numerous point and non-point discharges is deteriorating its water quality. Effects are felt throughout the downstream reaches and the East China Sea. The Plan sets out a number of general pollution control targets with specific targets to be developed by individual provinces and cities.

3. Project Rationale

11. Despite the abundant water resources, rapid economic growth and continuing urbanization over the last 25 years in Wuhan have resulted in inadequate urban infrastructure and placed pressure on overloaded facilities. The Municipality is served by a mixture of wastewater, storm water and combined sewer networks. Due to a lack of sufficient wastewater collection and treatment facilities, increasingly severe problems related to water pollution and urban drainage have resulted in serious water quality problems in the water bodies within Wuhan.

12. Demands for water for domestic and industrial use are steadily increasing and this imposes increasing pressure on water resources. At the same time, quantities of wastewater are increasing rapidly as are the associated pollution loads. However, only a small proportion of wastewater flows are treated to comply with the discharge standards.

13. The built up areas in Wuhan are mostly below the average flood level of the Yangtze and Han rivers. Protected by flood control bunds, during wet seasons storm water is discharged to the rivers by pumping. Being located in the subtropical monsoon climate zone, distinct seasonal variation and heavy summer rains place particular stress on Wuhan's urban drainage system and combined sewer overflows also become major sources of water pollution. Aging and inadequately maintained drainage network and under capacity pumping stations result in frequent severe flooding events.

14. Water pollution has been growing in magnitude, creating water supply problems and economic losses, and impacting on development and economic growth. To achieve sustainable wastewater management and water resource protection, ADB approved the WWMP in 2003, to increase wastewater treatment percentage to 56 % by 2007.

15. The proposed Project is not stand-alone investment, but is an integrated part of the basin-wide Yangtze water resources management initiative, the Wuhan city urban development plan, the Wuhan Municipal Wastewater Master Plan and the Wuhan Storm Water Drainage Master Plan. The WMG is currently undertaking a comprehensive wastewater management through 2010, and planning to install additional WWTPs to raise the treatment percentage to its 80 % target by 2010. WMG is also undertaking a comprehensive urban drainage and flood control program to increase the drainage network coverage to between 11.5 and 12.5 km / km² through to 2010. The proposed Project will contribute significantly to achieving these strategic Master Plan goals. Beneficiaries will include residents of Wuhan and those living downstream.

16. As with the ongoing WWMP, the overall goal of the Project is to promote sustainable economic growth through sustainable wastewater management in Wuhan and water resource protection in the Wuhan section of the Yangtze River, so as to improve people's lives. In addition, specific attention to storm water management as frequent heavy summer rains cause serious localized flooding. The Project is intended to address major issues including (i) deterioration in surface water quality and urban environmental quality; (ii) ineffective regulatory control of municipal and industrial wastewater discharges; (iii) economic losses and disruption to livelihoods from frequent localized flooding; (iv) poor health and living standards of the poor; (v) lack of integrated wastewater management; and (vi) improving service efficiency through increased competition and private sector participation (PSP).

17. The Project will assist the WMG in formulating a practical approach to provide urban wastewater and storm water services and to introduce the principles of integrated resource management and pollution control. The Project will help improve the urban environment and public health through improved wastewater and storm water management, and to improve the water quality in and downstream of Wuhan. It will help improve the quality of life for urban poor by reducing waterborne diseases and relieving from urban flooding. The Project will also reduce poverty, directly and indirectly, through improved living conditions as well as permanent and temporary job creation.

4. Policy Dialogue

18. The Project supports and strengthens ADB policy dialogue and initiatives with the Government in several key areas including (i) cost recovery and tariff reform, (ii) wastewater management, (iii) storm water and sustainable flood management, (iv) trans-boundary pollution prevention and control, (v) water conservation, and (vi) corporate governance and enterprise reform (**Appendix 5**). The reform agenda for water supply and wastewater management moved forward significantly with the introduction of tariffs and enterprise reforms, strengthening of legal and regulatory frameworks, and promotion of private sector participation.

19. ADB has supported the water supply tariff reform process through two completed water tariff studies⁶ with the Ministry of Construction under which the National Guidelines on Water Tariffs were developed, promulgated, and implemented. The ADB's wastewater tariff study technical assistance⁷ (TA) developed national guidelines for wastewater tariffs, including tariff calculation methodologies that allow for full cost recovery taking into consideration affordability and social constraints. The TA also recommended options for encouraging multi-channel investment, including private sector participation in urban wastewater management. Wuhan held a public hearing meeting in November 2005 to discuss and consider the Water Supply Company proposed tap water tariff increasing plan in the central urban areas⁸. WMG plans to likewise hold a public hearing meeting in the fourth quarter of 2006 to increase the wastewater tariffs from CNY 0.80 per m³ to about CNY 1.00 or 1.10 per m³, which is scheduled to be implemented in 2007.

20. The Project supports several integrated wastewater management initiatives, including improved wastewater and storm water facility management; further enhancement in comprehensive water quality modeling; development of a sludge management strategy; and wastewater facility performance monitoring under a PDMF.

21. ADB is also providing support to the Government through TA to strengthen policy reform on the use of market-based instruments to enhance PSP in public utilities, mainly for water supply, and wastewater and solid waste management⁹. This ongoing TA will provide an analysis of the issues in the context of international best practices and how these could be adopted in the PRC. The ongoing ADB TAs will strengthen ADB's role in promoting PSP in water supply and wastewater management. The proposed Project will create the environment necessary for

⁶ ADB. 1997. *Technical Assistance to the PRC for Water Supply Tariff Study*; and ADB. 1999. *Technical Assistance to the PRC for Water Tariff Study II*. Manila.

⁷ ADB. 2001. *Technical Assistance to the PRC for National Guidelines on Urban Wastewater Tariffs and Management Study*. Manila.

⁸ The Water Supply Company proposed to increase tap water tariff for about CNY 0.45 / m³ in the central urban areas, which is subject to the public hearing and the government approval.

⁹ ADB. 2003. *Technical Assistance to the PRC for Policy Reform Support*. Manila.

eventual PSP by pursuing tariff reform, full cost recovery, enterprise reform, and improved governance; all are prerequisites for private sector involvement.

5. External Assistance

22. To help the WMG develop and implement its strategic Wastewater Master Plan, external assistance to date has been provided mainly from the ADB, World Bank, Finnish Government and Polish Government. The proposed Project will be the second ADB financed project to WMG. The ADB, World Bank, the Japan Bank for International Cooperation and many bilateral donors have provided financial and technical assistance to the PRC Government in the urban environmental protection and management sector. The World Bank has provided financial assistance for 26 urban environmental improvement, water supply and wastewater management projects.

6. Lessons Learned

23. ADB has provided more than \$ 1.7 billion in loans for wastewater and water supply projects in the PRC. Loan projects have generally been implemented well. During project processing, lessons of experience were addressed by (i) thoroughly evaluating the technical designs and technologies; (ii) ensuring an adequate debt-equity ratio for the project Implementing Agencies (IAs); (iii) undertaking rigorous sensitivity analysis of cash flows, and financial and economic analysis; and (iv) incorporating institutional strengthening measures to improve the level of corporate governance taking into account the capacity building components included in the first ADB financed WWMP, to ensure that there is no duplication of effort.

24. Lessons learned from ADB post evaluation experience in water supply and sanitation highlight the importance of integrating both supply and demand concerns into project design. Encouraging broad reforms, such as commercial management, and introducing competition will promote efficient and responsive delivery of water supply and wastewater services. Appropriate pricing policies for water and sanitation services are also required. Other lessons learned include (i) the importance of a thorough review of technical designs; (ii) the need for strategic master plans in urban development and environmental management; (iii) consideration of local conditions and constraints; (iv) the need for sufficient attention to sustainability issues; (v) the need for quality and competent Executing Agencies (EAs) to ensure the delivery of project benefits; (vi) the importance of measures to support financial reform, particularly in establishing autonomous wastewater entities and tariff increases; (vii) the need for institutional strengthening, particularly in establishing managerial autonomy; (viii) the need to address regulatory and enforcement issues; (ix) the importance of public education on environmental improvement; (x) the need to provide training to utility personnel; (xi) better public consultation and community participation; (xii) early attention to resettlement issues; and (xiii) the need to support public-private partnerships in water supply and wastewater treatment. PRC has recently undertaken a performance portfolio review of the water supply, sanitation, and waste management sector, which identified successes and deficiencies, and lessons learned from portfolio performance.¹⁰ Major issues identified include (i) delays in the start-up of projects and in the procurement process; (ii) institutional arrangements for project implementation and sustainable operations; and (iii) loan savings accompanied by cancellation of surplus loan amounts. These issues were reviewed in detail during project processing and lessons learned incorporated in the Project design. Lessons learned from the ongoing ADB WWMP and the

¹⁰ PRC: *Water Supply, Sanitation and Waste Management Portfolio Performance Review*. Final Report, July 2005.

World Bank's Hubei Urban Environment Project have also been incorporated in designing the proposed Project.

III. THE PROPOSED PROJECT

A. Impact and Outcome

25. The overall impact of the Project is an enhanced urban environment, improved public health, and quality of life for the urban and suburban residents and businesses in Wuhan City. The outcome of the Project is improved management of surface water resources in Wuhan Municipality by (i) improving and expanding wastewater services in the urban area of Wuhan and the suburban area of Caidian, and Dongxihu, thereby, contributing to achieving the target of 80 % wastewater treatment rate by 2010; (ii) supporting integrated approaches to basin-wide pollution prevention and control, improving water quality of rivers and lakes in Wuhan and in downstream reaches of Yangtze River; (iii) reducing flooding in Qiaokouqu District and Yangsigang and Liujiao Road storm water drainage areas in Wuhan; (iv) increasing the efficiency and management capacity of the two Implementing Agencies (IAs);¹¹ and (v) improving cost recovery through a better tariff structure, with gradual increases to achieve full cost recovery.

B. Outputs

26. Structural and nonstructural measures are essential for improved wastewater and storm water management. The Project will cover institutional capacity strengthening to facilitate an integrated approach to water resource management including pollution and flood control. Structural measures such as new and upgraded wastewater treatment facilities, collection network extension and rehabilitation, and larger capacity storm water pumping stations, designed to the national design standards will be undertaken. The structural and nonstructural measures are described below. **Appendix 6** contains a detailed description of the Project components.

27. The Project will directly benefit over 3 million urban and suburban residents, whose living conditions and public health standards will be improved by increasing the wastewater treatment and improving storm water management. The wastewater management component includes the following subprojects, (i) expanding and upgrading the Erlangmiao primary WWTP from 180,000 m³/day to 240,000 m³/day with secondary treatment; (ii) increasing the capacity of the Nantaizi Lake secondary WWTP from 100,000 m³/day to 200,000 m³/day; (iii) upgrading the 100,000 m³/day Huangpu Road pretreatment WWTP to secondary treatment; (iv) constructing sewer pipelines and pumping stations; and (v) constructing a secondary 50,000 m³/day WWTP at Caidian. The storm water management component includes the following subprojects (i) improving the Luojia Road drainage works and increasing the related pump station capacity; (ii) increasing capacity of the Yangsigang and Changqing pump stations and constructing storm water pipelines; and (iii) connecting three key drainage control gates. The wastewater component is consistent with the overall pollution load reduction targets of the Yangtze River Water Resources Protection Plan, and with the ongoing WWMP of constructing 13 WWTPs by 2020. Benefits of all the wastewater subprojects will include improved quality of water resources, local environmental and health improvements from reduced pollution of watercourses, and reduced downstream pollution in the Yangtze River. The storm water

¹¹ The IAs include (i) the Wuhan Drainage Company Ltd for the wastewater components; and (ii) Wuhan Urban Construction Foundation for the storm water components.

component will enhance the performance of the drainage system and the combined sewer overflows and improve flood control in several urban areas of Wuhan.

C. Special Features

28. The Project supports and strengthens ADB policy dialogue and initiatives with the Government in several key areas including: (i) cost recovery and tariff reform; (ii) wastewater management; (iii) corporate governance and enterprise reform; (iv) safe and reliable arrangements for sludge disposal; and (v) storm water management arrangements.

29. The Project will build on the WWMP tariff and institutional reforms and help WMG to develop a structured and rational approach for the private sector to participate in both wastewater and storm water management. Project preparations have identified a possible national initiative to review and improve the financing and management of storm water services in the PRC. Project preparations have also highlighted the need for policy development to translate the "beneficiary contributes" principle into some practical procedures to reflect private sector development gain associated with public sector projects.

30. The Project supports several special features regarding environmental aspects, including: (i) training in the operation and management of wastewater and storm water facilities to ensure effective operation; (ii) further enhancement of a comprehensive water quality model which will be developed under the WWMP; (iii) assistance in the preparation of a strategic sludge management study; and (iv) monitoring of future performance of the operation and maintenance of the wastewater facilities against a number of indicators, under the project design and monitoring framework (PDMF); (v) demonstration of the potential economic benefits of an integrated and strategic long-term approach to planning of wastewater infrastructure facilities.

D. Cost Estimates

31. The total Project cost is \$ 266.43 million equivalent, including a foreign exchange cost of \$ 139.65 million (52.4 %) and a local currency cost of \$ 126.78 million equivalent (47.6 %). A summary of cost estimates is given in Table 1. Detailed cost estimates are included in Appendix 7.

Table 1: Cost Estimates
(\$ million)

Component	Foreign Exchange	Local Currency	Total Cost
A. Base Costs ^a			
I. Develop Wastewater Treatment Facilities in Central Urban Areas			
Erlangmiao WWTP	14.56	7.88	22.44
Nantaizi Lake WWTP	11.39	11.10	22.49
Huangpu Road WWTP	9.38	5.36	14.74
II. Develop Wastewater Treatment Facilities in Suburban Areas			
Dongxihu Sewer System	11.70	7.92	19.62
Caidian WWTP	6.06	5.64	11.70
III. Develop Storm Water System in Wuhan			
Drainage Works in Luojia Road Area of Wuchang	18.17	27.02	45.19
Yangsigang Pump Stations and Pipes Works in Hanyang	4.71	5.58	10.29
Tri-gate Connection Works in Dongxihu	19.87	18.63	38.50
Changqing Pump Station Expansion	11.97	7.41	19.38
IV. Project Management	1.00	-	1.00

Subtotal	108.81	96.54	205.35
B. Contingencies			
Physical ^b	9.65	10.88	20.53
Price ^c	6.78	6.45	13.23
Subtotal	16.43	17.33	33.76
C. Financial Charges during Implementation ^d	14.41	12.91	27.32
Total	139.65	126.78	266.43

^a In 2005 prices.

^b Computed at 10 % for all civil works, land acquisition and resettlement, equipment, training, and consulting.

^c Computed, based on foreign exchange inflation rate of 2.8 % in 2006, and 1.9% in 2007 and onwards; and local currency inflation rate at 3.3 % in 2006, 3.2 % in 2007, and 3.0 % in 2008 and onwards; and includes provision for potential exchange rate fluctuation under assumption of a purchasing power parity exchange rate,

^d Includes interest and commitment charges. Interest during construction has been computed at the five-year forward Libor rate plus a spread of 0.6 %.

E. Financing Plan

32. The Government has requested a loan of \$ 100 million, about 37.6 % of the total project cost. Since this is well below 60 % of the total project cost, the ADB cost sharing limit for the PRC, it was agreed that the civil works percentage financing under the Project would be set at 70 %. The proceeds of the ADB loan will be used to finance the foreign exchange cost of the Project, including interest during construction on the loan. Local costs will be financed by wastewater tariffs, WMG budget sources and domestic loans from the PRC banks. The financing plan for the Project is summarized in Table 2. The detailed financing plan is in **Appendix 8**. The ADB loan is proposed to come from ADB's ordinary capital resources. The loan will carry an interest rate to be determined in accordance with ADB's LIBOR based lending rate system for US dollar loans and a commitment charge of 0.75 % per annum. The loan will have a term of 25 years, including a grace period of 5 years.

Table 2 Financing Plan
(\$ million)

Sources	Foreign Exchange	Local Currency	Total Costs	Percentage
A. ADB Loan	100.00	-	100.00	37.5 %
B. Wuhan Municipal Government	39.65	32.69	72.34	27.2 %
C. Local Bank Loans	-	94.09	94.09	35.3 %
Total	139.65	126.78	266.43	100.0 %

33. The Government has provided ADB with the reasons for its decision to borrow under ADB's LIBOR-based lending facility on the basis of these terms and conditions, and an undertaking that these choices were the Government's independent decision and not made in reliance on any communication or advice from ADB. The Borrower will be the Government of the PRC, which will re-lend to the HPG and then to WMG. WMG will on-lend a portion of the loan proceeds to WDC who will implement the wastewater component. For the storm water component, being non-revenue generating, WMG will assume full financial responsibility for this component. All on-lending will be on the same terms and conditions as the ADB loan. The end borrowers will assume the foreign exchange and interest rate variation risks for the ADB's loan. The flow of funds and on-lending arrangements are illustrated in **Appendix 9**.

F. Implementation Arrangements

1. Project Management

34. The EA will be WMG. A Project Leading Group (PLG) has been established, headed by the Vice Mayor of WMG and comprising representatives from Wuhan Municipal's Construction Committee, Water Affairs Bureau, Planning Committee, Planning Bureau, Water Bureau, Financial Bureau, Price Bureau, Environmental Protection Bureau, Caidian and Dongxihu district governments and related agencies. The PLG will provide overall policy guidance, facilitate interagency coordination, and resolve any institutional problems affecting project implementation. The existing WWMP project management office has been retained for this follow on Project. The WPMO will also be the secretariat of the PLG. Separate Project Implementing Units (PIUs) have been established by WDC and WUCF who will implement the wastewater and storm water components respectively. These PIUs report to the WPMO and also coordinate and monitor activities of the IAs. WDC is a limited liability company incorporated under the PRC Company Law and is also the IA for the ongoing WWMP. It is therefore experienced in ADB project implementation and has a board of directors overseeing financial and operational matters of the WDC including: (i) hiring/firing of senior management; (ii) reviewing staffing and remuneration plans; (iii) reviewing the progress of construction and approving annual construction plans; (iv) reviewing and approving annual financial budgets; (v) reviewing the investment plans and accounts of the IAs and related subprojects; and (vi) approving the procurement of major equipment and civil works contracts.

35. WUCF is a government agency responsible to WMG for coordinating the implementation of government sponsored urban infrastructure projects where these are largely or wholly financed from government revenues. WUCF is not an operator or provider of services however, and its responsibilities for asset management end once asset commissioning has taken place. At that time the public assets are passed over to the relevant government department, which in this case will be the Wuhan Municipal Water Authority (pumping stations) together with its subordinate units at the district government level (storm water drainage etc). These arrangements are commonplace in the PRC.

36. While WDC will undertake construction management directly, WUCF will outsource this activity to an experienced qualified construction management company. Once the physical construction is completed WUCF will pass the storm water assets to local district Water Bureau for operations and maintenance. The institutional and capacity building measures are in **Appendix 10**. The difference in implementation arrangements for the two components reflects the different financing and institutional arrangements for wastewater and storm water management in Wuhan, and the PRC generally. The internal controls and accounting and auditing procedures of WDC were reviewed through a Financial Management Assessment (FMA) and these are considered fully adequate for both the construction and operational phase of the Project as indicated in **Appendix 11**. An assessment was also undertaken of both IAs' technical and institutional capacities, which are adequate for project implementation. WDC's current and projected financial position and the Project financial analysis is detailed in **Appendix 12**. The organization of the IAs is in **Appendix 13**. The IAs will retain the services of design institutes, specialist procurement agencies and construction supervision companies to assist in the implementation activities. The WPMO and IAs already have a number of their staff trained in project management. WUCF will need some training on the relevant ADB procedures during implementation of the Project.

37. With the help of international consultants, the WPMO and the IAs will develop expertise in: (i) efficient operations of the wastewater and storm water facilities; (ii) functional areas covering, administration, finance, accounting and business planning; and (iii) use of PSP and outsourcing contracts.

38. WDC is already a recipient of consulting services support under the WWMP, so capacity building will be weighted towards the storm water component.

2. Implementation Schedule

39. The Project will be implemented over a period of 5 years from 2006 to 2010 (Appendix 14). This schedule is considered realistic because the project implementation structure is already in place, and preparatory works are under way. ADB's successful experience in similar projects in the PRC and EA and IAs' in depth knowledge and experience in storm water and wastewater, and externally funded projects indicates that this schedule is achievable.

3. Procurement

40. Equipment, materials and goods, and services financed by the loan will be procured in accordance with ADB's Guidelines on Procurement and the PRC's Tendering and Bidding Law and procurement regulations. Procurement of equipment will follow ADB procedures for international competitive bidding (ICB) for packages each with a value greater than \$ 1 million. Packages of equipment valued at \$ 1 million or less will be procured following international shopping procedures; packages valued at \$ 100,000 and less will be procured through direct purchase procedures. Civil works contracts costing more than \$10 million will be procured using ICB. Civil works contracts valued at \$ 10 million equivalent or less can be procured using local competitive bidding procedures in accordance with the PRC Tendering and Bidding Law and the respective procurement regulations.¹² Selection and engagement of contractors will be subject to ADB approval.¹³ Indicative procurement packages are listed in **Appendix 15**. Major equipment will be purchased through ICB procedures and financed by the ADB loan. The internationally tendered equipment packages will include necessary technical support for ensuring proper installation, testing, commissioning, and training of operational staff as part of the related contracts. In accordance with ADB requirements, foreign contractors may participate in bidding for local competitive bidding contracts.

4. Advance Procurement Action

41. The Government requested advance procurement action to expedite project implementation. The Government has also requested for retroactive financing. This is needed to meet specific WMG targets for an early completion of the Huangpu Road WWTP subproject, and also so that wastewater collection network contracts can be coordinated with road improvements where such opportunity exists. Advance action will include (i) tendering, and bid evaluation for civil works contract packages; and (ii) preparation of tender documents for the procurement of materials, plant, equipment, and vehicles. Such advance action will cover the period from the end of the Appraisal Mission visit until loan effectiveness. The issuance of invitations to bid under advance procurement action will be subject to ADB approval.¹⁴ All advance procurement actions will be undertaken in accordance with ADB Guidelines on Procurement. The Government and WMG were advised that approval of advance action does not commit ADB to finance the Project. The Mission supports the requested retroactive financing and would submit this request to ADB Management for approval.

¹² ADB. 1997. *Technical Assistance to the PRC for Establishment of National Procurement Regulations for the Public Sector*. Manila.

¹³ ADB will require WPMO to use ADB-approved standard bidding documents (to be developed as necessary) to ensure high quality and consistency of the documents; this will facilitate ADB review.

¹⁴ Advance action request will be submitted for ADB Management approval in February 2006.

5. Consulting Services

42. Provision has been made for 25 person-months of international and 150 person-months of domestic consulting services to support WPMO and IAs in project implementation and capacity building to be funded under the Project. The scope and extent of consulting services takes account of the consulting support incorporated into WWMP and also the specific needs of the Project. Consulting services are required for specific areas and include: (i) development of a sludge management strategy for Wuhan; (ii) investigation and control of inflow and infiltration into the wastewater collection network; (iii) assistance with PSP initiatives; (iv) financial management; (v) operations and maintenance improvements; and (vi) extended development of water quality modeling.

43. Capacity building for IAs will be achieved through consultant inputs, hands-on training on project facilities, and domestic and international training financed from the loan. The consultants will be recruited in accordance with ADB's Guidelines on the Use of Consultants and other arrangements satisfactory to the ADB on the engagement of domestic consultants. Appendix 16 presents the outline terms of reference for the consulting services, and the indicative budget.

6. Disbursement Arrangements

44. To make adequate amounts of the project loan proceeds available on a timely basis, Wuhan Municipal Finance Bureau will establish an impress account after loan effectiveness in accordance with the ADB Loan Disbursement Handbook. Disbursements from the impress account will be supported by an appropriate withdrawal application and related documentation. Such documentation will demonstrate, among other things, that the goods and/or services were (i) produced in and procured from ADB member countries, and (ii) eligible for ADB financing. The initial amount to be deposited in the impress account will not exceed 6 months of estimated expenditure for the Project or 10 % of the loan amount, whichever is lower. ADB statement of expenditures procedure may be used to reimburse eligible expenditures and to liquidate advances in amounts not exceeding \$ 200,000 equivalent per item of expenditure.¹⁵ Provision of certification by the Government to confirm the execution and delivery of an on-lending agreement incorporating the same terms and conditions of the loan with the foreign exchange rate and interest rate variation risks being borne by the concerned IA, regarding a project component will be required as a condition of disbursement for the concerned project component.

7. Accounting, Auditing and Reporting

45. Sound auditing is an important element of good governance and an important anticorruption measure. ADB is helping strengthen the PRC auditing system. The IAs will maintain records adequate to identify goods and services financed out of the loan proceeds, following accounting principles and practices prescribed by the PRC Accounting Law. The law requires enterprises to prepare financial statements and generally follow internationally accepted accounting standards. The IAs will maintain separate project accounts and records. The financial statements of the project accounts and the annual corporate financial statements for IAs will be subject to external audit by the WMG Audit Bureau, Hubei Provincial Audit Bureau, and State Audit Administration. The audits will be carried out in accordance with regulations for auditing approved by the State Council and will meet ADB requirements. A separate auditor's opinion on the use of the impress account and statement of expenditure will be incorporated in the audit reports. The IAs' annual audited financial statements and audited project accounts will be submitted to ADB no later than 6 months after the end of the fiscal year

¹⁵ Limits for the impress account and the statement of expenditure are in accordance with the recent review of ADB's PRC portfolio and to facilitate improved efficiency in loan disbursement.

for the entire implementation period.¹⁶ The Government, HPG, and WMG have been informed about ADB policy on submission of audited financial statements on a timely basis. HPG and the IAs will submit reports and information to ADB concerning the use of the loan proceeds, project implementation, and IA performance. They will include (i) quarterly progress reports on project implementation; (ii) annual reports; and (iii) a project completion report, not later than 3 months after completion of the project facilities.

8. Project Design and Monitoring Framework

46. Project Design and Monitoring Framework (PDMF) indicators include: (i) service levels; (ii) treated wastewater quality and other measures of operational performance; (iii) percentages of wastewater collected and treated; (iv) user satisfaction with the urban environment; and (v) relevant economic and health data to monitor project impacts. The relevance and practicability of data collection for the indicators was confirmed with the WPMO. **Appendix 2** outlines the contents of the PDMF.

47. At the beginning of project implementation, the WPMO and IAs with the assistance of consultants, will develop comprehensive PDMF procedures to systematically generate data on inputs and outputs of the project components and the socioeconomic, health and environmental indicators to be used to measure project impacts. A set of indicators for the monitoring of future performance of the WWTPs will be designed prior to operation start-up by the loan implementation consultants. The WPMO and IAs will refine the PDMF, confirm achievable targets, firm up monitoring and recording arrangements, and establish systems and procedures no later than six months after project inception.

48. Under the PDMF, baseline and progress data will be reported at the requisite time intervals including the environmental management plan's semi-annual reporting. The WPMO will be responsible for analyzing and consolidating the data through its management information system. The PDMF will be designed to permit adequate flexibility to adopt remedial action regarding project design, schedules, activities, and development impacts. The WPMO, with the assistance of the consultants, will monitor and assess activities, and report to ADB quarterly on the physical implementation and financial aspects of the Project to ensure that impacts are monitored and reported in line with ADB requirements.

9. Governance and Anticorruption Measures

49. The Government is increasingly concerned with governance issues and has conducted well publicized campaigns against corruption involving use of public funds. During project processing, ADB's anticorruption policy was explained to central and local government officials. Attention was drawn to the section on fraud and corruption that was added to ADB's Guidelines for Procurement, particularly the need for bidders, suppliers and contractors to observe the highest standards of ethics in the procurement and execution of the ADB financed contracts, and the sanctions to be applied if fraud and corruption are discovered. The anticorruption provisions added to ADB's Guidelines on the Use of Consultants were discussed. ADB provided TAs to draft procurement regulations and standard bidding documents and for improving governance to reduce the incidence of fraudulent practices.

¹⁶ IAs currently have three tiers of audit including (i) internal audit, (ii) municipal government level audit, and (iii) provincial and state government level audit.

10. Project Review

50. Besides regular ADB review missions, ADB and the Government will undertake a comprehensive mid term review, two years after project implementation begins. This review will include a detailed evaluation of the scope, implementation arrangements, resettlement, achievement of scheduled targets, and progress on the agenda for policy reform and capacity building measures. A review of wastewater tariffs in Wuhan together with compliance with other assurances provided by the various project agencies, will also be undertaken. If possible, the opportunity will be taken to coordinate the mid term review of the Project with the final completion review of the WWMP. This will potentially allow incomplete or supplementary capacity building needs from WWMP to be continued under this Project.

11. Resettlement Monitoring

51. ADB requires resettlement monitoring and evaluation of the affected persons (APs) during implementation and for at least 2 years after the resettlement program has been completed. The WPMO will retain the services of a domestic external monitor. The monitor will visit the subprojects regularly to (i) review progress and the general welfare of those resettled, (ii) make recommendations to resolve any issues/problems, and (iii) support the resettlement training for local officials. The monitor will pay special attention to vulnerable groups, including the floating population, women, and the poor, to assess whether they have fully regained their standard of living. Monitoring and evaluation reports will be prepared semi-annually during implementation and annually for two years after completion of resettlement activities. These reports will be simultaneously submitted to ADB, PMO, and the IAs, and will be uploaded to ADB website.

IV. PROJECT BENEFITS, IMPACTS AND RISKS

A. Project Benefits and Impacts

52. Towards achieving national wastewater treatment targets, WMG will construct one new WWTP and upgrade and/or expand 3 existing WWTPs. Upon project completion 210,000 m³/day treatment capacity will be added, and all the 4 WWTPs will provide a total of 590,000 m³/day secondary treatment to the received wastewater to reach related national standards. The Project also involves construction of associated sewer networks and pumping stations to accommodate growth in wastewater flows to year 2015 in the project areas. The health benefits are described in **Appendix 17**.

53. In the storm water management component, 102 m³/s drainage pumping capacity will be added, increasing the total capacity to 292 m³/s to cater for the year 2020 design flood flows in the project areas. The Project also involves construction of new and rehabilitation of old storm water networks. Overall, residents of Wuhan will benefit from reduced flooding incidents, an improved living environment, a reduced risk of environment health hazards and better prospects for economic development and growth.

54. The Project will :

- (i) reduce pollution in Wuhan's surface water and the Wuhan reach of the YRB by improving the wastewater collection and increasing the wastewater treatment rate;
- (ii) improve flood control by improving the drainage systems. Relief in flooding would minimize loss of life and damage to property, agriculture and infrastructure;

- (iii) improve the effectiveness of wastewater and storm water management by continuing the process of separating the storm water drainage and wastewater sewers; and
- (iv) protect public health through a reduction in waterborne diseases and contribute to the overall well being of the population residing in the project area.

B. Policy Reform

55. The Project supports and strengthens several ABD initiatives :

- (i) comprehensive pollution prevention and control;
- (ii) improved wastewater management to create a sustainable urban environment;
- (iii) enterprise reform and corporate governance;
- (iv) cost recovery and tariff reform; and
- (v) use of PSP where appropriate.

56. The need for comprehensive solutions to urban environmental management is recognized by WMG. The Project will assist the Government to develop a practical strategy for sludge treatment and disposal of residuals. The Project will also actively examine the use of outsourcing as a means to improve service efficiency.

C. Institutional Strengthening

57. The WWMP included a major institutional strengthening component to strengthen the management of WDC. This process is still ongoing and the results cannot yet be fully evaluated, although the FMA conducted by the PPTA consultants indicates that WDC has robust financial control systems. In view of the WWMP program of institutional strengthening the Project will include a number of more specialized and complementary initiatives to deal with specific issues that include:

- (i) development of a sludge management strategy
- (ii) reducing inflow and infiltration levels in the wastewater collection network, which has been identified as a particular problem in the Erlangmiao catchment.
- (iii) possible corporatization of storm water management
- (iv) selective use of private sector initiatives to introduce competition.

D. Social Dimensions

1. Land Acquisition and Resettlement

58. The Project includes 9 subprojects, of which 7 subprojects require land acquisition and resettlement. The Project will affect 15 villages and neighborhood in Hanyang District, Dongxihu District, Hongshan District and Caidian District of Wuhan City. The subprojects will acquire 938.3 mu of land permanently, of which 59% is classified as cultivated land. In addition, 390.7 mu of land will be occupied temporarily during the construction phase. 39,288 m² of residential housing (including 4,157 m² of unlicensed housing) will be demolished, among which 34,638 m² (88%) are rural residents' housing, and 4,650 m² (12%) are urban residents' housing. 43 enterprises and institutions with 18,881 m² of structures will have to be demolished, and 19 shops with 10,912 m² (of which 4,070 m² is unlicensed) of structures will have to be demolished. In total, 421 households with 1,799 persons (including 161 persons classified as floating population) will be affected directly by land acquisition and/or house demolition.

59. Two Resettlement Plans (RPs) have been prepared – one for 3 wastewater subprojects and one for 4 storm water subprojects. The land acquisition and resettlement compensation policy is based on the PRC Land Administration Law, relevant local government regulations and ADB's Policy on Involuntary Resettlement. The total cost is estimated to be CNY 355 million or \$44 million. The draft RPs provide a socioeconomic profile of those affected and the scope of the impacts; and addresses issues related to entitlements for compensation, legal framework, public consultations, grievance procedures, rehabilitation measures, budget, implementation arrangements, and monitoring plan. It was agreed that no consulting services for resettlement would be required under the ADB, since the WPMO has good experience and will finance the external monitor with domestic funds. The TOR for the external monitor has been drafted and WPMO will submit to the agreed scope of work when the qualified external monitor is engaged. However, WPMO requested some funds to be provided under ADB loan for resettlement training and study tours for the staff of subproject resettlement units. ADB will also deliver some training. The Summary RP is provided in **Appendix 18**, including resettlement supervision milestones.

60. The IAs are revising the RPs based on ADB comments. By 31 December 2005, the two RPs should be revised, endorsed by the WPMO and submitted to ADB for review and approval¹⁷. By 15 January 2006, the RPs should be disclosed to the relevant local officials and the 15 affected villages and neighborhood. A brief resettlement information booklet will be provided to the affected 421 households, 43 enterprises and 19 shops. The draft final RPs will be posted on ADB website prior to loan appraisal and the approved RPs should be posted by Board approval. Since the Project Feasibility Study has not been approved yet, there are some uncertainties regarding the timing for pre-examination of land use, village rehabilitation plans and final compensation rates. ADB recommends these matters should be resolved 3 months prior to commencement land acquisition or displacement of houses. WPMO should inform ADB of such development and will update the RPs, where deemed necessary, as a condition for land acquisition and disbursement for related civil works. Civil works and resettlement should be scheduled in an integrated manner which permits adequate time for notification, planning and relocation of affected households.

¹⁷ ADB requires RPs to be generally acceptable prior to the Management Review Meeting. Some small revisions may be requested which should be incorporated in the RP, which would then be deemed approved by ADB.

2. Poverty Reduction

61. The Project supports the achievement of the Millennium Development Goal (MDG) for environmental sustainability (MDG Goal 7 Target 10). Direct beneficiaries number 3 million including 0.24 million poor persons. Indirect beneficiaries include 4 million persons living within and downstream of Wuhan. The Project will reduce flooding and associated damages, more sanitary living conditions, improve environmental conditions, reduce morbidity and mortality from water-borne and water washed diseases and reductions in associated medical costs and loss of working days. The Project is estimated to reduce water related disease by an average of 8,000 cases per year. This impact is associated with an annual reduction of 5,800 days of lost work and a net present value of savings in medical costs and avoidance of lost earnings of CNY 7.7 million.

62. Women and poor will benefit disproportionately from the project. Poor households and vulnerable groups tend to reside in areas which have poorer service levels and they have less capacity to cope with the disruption and illness caused by those poor services. Reductions in flooding and illness will reduce women's burden of work. A reduction in lost school days and workdays represent a key intervention in the poverty cycle. Adverse impacts of tariff adjustments on the poor are largely eliminated by existing tariff subsidies for poor households to offset the cost of water and wastewater services. These subsidies are in addition to the Minimum Living Security Scheme subsidies.

63. The Project will provide 5,000 person-years of work over the 5-year construction period and economic spin-off effects of 8,100 person-years of work. Approximately 40% of the construction jobs will be filled by the poor and vulnerable, including unemployed persons, rural migrants and women, representing therefore a key intervention in the poverty cycle. Project operations will create 220 full-time permanent jobs with the WDC and an additional 130 full-time permanent jobs throughout the municipality.

64. A participatory process has been used throughout project preparation. Methods included household and business surveys, consultation with key stakeholders, focus groups, and public consultation meetings, and key informant interviews with involved agencies. The participatory approach will continue during project implementation, monitoring and evaluation, based on periodic public hearing meetings on tariff increases and a new customer complaints desk to receive process and document customer complaints on an ongoing basis. A number of key indicators are proposed for monitoring of social and poverty reduction aspects of the Project. Most of these are incorporated into the PDMF.

E. Financial Aspects

65. A progressive tariff increase is recommended to achieve full cost recovery for the Project. Table 3 below shows the proposed tariffs in real terms in the central urban area and in the subproject service areas in Dongxihu and Caidian suburban districts.

Table 3 Proposed Wastewater Tariffs (CNY/m³)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Central Urban Areas	0.80	0.95	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Dongxihu Suburban Area	0.05	0.05	0.45	0.45	0.45	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Caidian Suburban Area	0.00	0.00	0.20	0.20	0.20	0.80	0.80	0.95	0.95	0.95	0.95	0.95

66. The financial evaluation of the Project has been undertaken in real terms using constant 2005 prices. The project cost estimates and financial projections in nominal terms were converted to real terms by adjusting for the projected effects of foreign and domestic inflation and currency fluctuation. Incremental costs and benefits were derived by evaluating the financial position of the IAs under with-and-without project scenarios. The Project is affordable to beneficiaries and financially viable with the following financial internal rates of return (FIRR) for the wastewater management component, all higher than the real weighted average cost of capital (WACC) of 4 % :

- (i) Central urban area - 12.36 %
- (ii) Dongxihu district - 7.58 %
- (iii) Caidian district - 10.91 %

67. The discounted cash flow analysis and financial statement projections are in **Appendix 19**. The sensitivity analysis included examining the risks of 5 factors (wastewater tariff, volume of water sold, wastewater revenue collection rate, capital investment cost, and operations and maintenance costs) change unfavorably to impact on the Project. Sensitivity analysis indicates that the FIRR would be acceptable under adverse conditions. The Project is considered both financially viable and sustainable.

68. The pro forma financial statement projections for the Caidian subproject and the Dongxihu have been consolidated into the financial statement projections for the WDC. Both the discounted cash flow analysis and financial statement projections have shown satisfactory results for the wastewater management subprojects, based upon the progressively tariff increase approach.

69. WMG has sufficient financial resources to take on responsibility for guaranteeing the loan repayments, and has provided assurances that they accept this risk. There is a risk that the Municipality might not provide the cash / equity transfers required to construct the Project, but this risk is minimized by PRC's stringent review and approval process for foreign assisted projects, under which PRC is the ultimate guarantor of the ADB loan.

F. Economic Aspects

70. The Project is an integral part of the ongoing provincial, municipal, and basin-wide environmental programs directly contributing to environmental protection of the YRB. The economic analysis was conducted over a 25 year period inclusive of the project construction period, in accordance with the ADB's Guidelines for the Economic Analysis of Projects. Project benefits and costs were estimated on a without- and with-project basis appropriately apportioned on the basis of being tradable or non-tradable, and with appropriate adjustments to the non-incremental and incremental project benefits. Incremental benefits were valued on the basis of willingness to pay and, in the case of flood prevention, avoided damages.

71. The economic internal rate of return (EIRR) for the wastewater management component is 22.6 % and the EIRR for the storm water management component is 19.6 %. The EIRR for the whole Project is estimated at 21.5 %, which exceeds the economic opportunity cost of capital, assumed at 12 %. The economic analysis is in **Appendix 20**.

G. Environmental Aspects

72. The summary environmental impact assessment (SEIA) along with the Summary RP will be circulated to the ADB Board and posted on the ADB website in mid January 2006. The Project will improve the urban environment and surface water quality, in Wuhan and in the YRB. The Project will target substantial improvements in wastewater management and will have significant positive effects on water pollution control in the Wuhan reach of the YRB. The Project will provide more reliable potable water quality to Wuhan residents, as a result of improved raw water quality. The Project will have an overwhelming positive environmental impact and any environmental risks during construction and the life of the Project can be mitigated through measures in the SEIA. The SEIA summarizes the environmental impacts, mitigation measures and monitoring plans.

73. The annual wastewater to be treated will increase by about 77 million t, to 215 million t. In addition, the treatment of 102 million t of wastewater will be upgraded from primary to full secondary treatment. Some key annual wastewater load reduction impacting the YRB include:

- (i) 20,000 t biochemical oxygen demand;
- (ii) 36,000 t chemical oxygen demand;
- (iii) 25,000 t suspended solids;
- (iv) 3,000 t ammonia nitrogen; and
- (v) 340 t total phosphorous.

74. The environmental management plan (EMP), prepared as part of the SEIA, will guide environmental mitigation and monitoring under the Project. Extensive public consultations were undertaken twice during the preparation of the domestic EIAs involving meetings with stakeholders, focus groups and surveys. The EIA and environmental conclusions are in **Appendix 21**. The cumulative effects of these wastewater load reductions can be assessed through comprehensive water quality modeling which is being developed under the WWMP, as discussed in **Appendix 22**. Progress with the water quality modeling will be assessed at the time of the mid-term review and will be further developed with support through the implementation consultancy services.

75. There has been agreement reached to discard the consideration of sludge incineration from the options for sludge management strategy.

H. Project Risks and Mitigation Measures

76. The Project does not have any unusual technical risks. The storm water and wastewater subprojects under the Project have adopted conventional engineering design and treatment processes that are robust and with proven records of reliable performance. The ICB equipment procurement packages will include technical support for installation, testing and commissioning of mechanical and electrical plant as recommended by the manufacturer. Based on the performance of ADB's PRC portfolio, cost overruns and major implementation delays are not expected to occur.

77. A potential risk remains that WMG will not proceed with the institutional reform it gave assurance to under WWMP, that the WDC be allowed to operate as an integrated and autonomous wastewater utility responsible for all wastewater operations in the project area (including Caidian and Dongxihu Districts.)

78. Potential financial and commercial risks related to the project include :

- (iv) failure to meet the cash/equity transfers required to construct the Project;
- (v) failure by WMG to increase the tariffs to ensure continuing full cost recovery; and
- (vi) failure of WMG to cause Dongxihu and Caidian districts to introduce/increase wastewater tariffs to meet cost recovery targets.

79. The potential financial and policy risks will be mitigated by assurances related to the financial and managerial autonomy for WDC and that WMG will ensure storm water operations and maintenance is fully financed. ADB review missions will monitor WDC's compliance with the financial and operational covenants to ensure its financial sustainability. The risks associated with lack of local funding will be addressed by the assurance from WMG that they would meet whatever cost increases are incurred, and provide a guarantee on the required equity injections to meet the financing requirements of the Project.

V. ASSURANCES

A. Specific Assurances

80. In addition to the standard assurances, the Government, WMG and IAs have given the following assurances, which will be incorporated in the legal documents:

- (i) WMG, as the EA will have overall responsibility for the Project. WUCF will be responsible for day to day implementation activities of the storm water component. The Government, through HPG and WMG, will ensure that WDC will be maintained as a separate legal entity with full financial and managerial autonomy as provided for under the relevant laws of the PRC to (a) be responsible for day to day implementation activities of the wastewater component; (b) be responsible for operating the entire wastewater infrastructure in Wuhan (including Caidian and Dongxihu districts); and (c) be entitled to receive all monies collected by levying the appropriate wastewater tariff.
- (ii) On land acquisition and resettlement, the WMG will ensure that (a) all land and rights-of-way required by the Project are made available in a timely manner; (b) the RPs will be implemented promptly and efficiently in accordance with their terms in accordance with all applicable PRC laws and regulations, and ADB's *Policy on Involuntary Resettlement*; (c) all APs are given adequate opportunity to participate in resettlement planning and implementation; (d) timely provision of counterpart funds will be paid for land acquisition and resettlement activities; and (e) any obligations in excess of the RP budget estimates are met.
- (iii) WMG and the IAs will ensure that the RP in the Chinese language will be made available to the APs on an as requested basis, and that a Resettlement Information Booklet, including detailed explanations on resettlement, related compensation entitlements and where further information can be obtained, will be distributed to all APs.
- (iv) WMG will ensure that sufficient counterpart funds are made available and disbursed in a timely manner such that all APs by the resettlement under the Project are compensated and assisted prior to displacement from housing, land and assets in accordance with the RP such that they are at least as well off as they would have been in the absence of the Project.

- (v) WMG and the IAs, will ensure that :
 - (a) adequate staff and resources are committed to supervising and internal monitoring the implementation of each subproject RP;
 - (b) quarterly monitoring during resettlement implementation, followed by a resettlement completion report for each subproject;
 - (c) an independent agency acceptable to ADB will be contracted to carry out monitoring and evaluation, including data disaggregated by gender where applicable, and forward reports to ADB as specified in the RPs;
 - (d) a summary of annual government audits of resettlement disbursements and expenditures is provided to ADB;
 - (e) ADB is promptly advised of any substantial changes in the resettlement impacts and, if necessary, a revised RP is submitted to ADB for its approval;
 - (g) civil works contractors' specifications include requirements to comply with the RPs and entitlements for permanent and temporary impacts to APs; and
 - (h) contractors are supervised to ensure compliance with requirements of the RPs, applicable law and ADB's *Policy on Involuntary Resettlement*.
- (vi) The WMG, through the relevant IAs, will also ensure that (a) adequate staff and resources are committed to supervising and internal monitoring of the implementation of each RP; (b) quarterly monitoring during resettlement implementation, followed by a resettlement completion report for each subproject; (c) an independent agency acceptable to ADB be contracted to carry out monitoring and evaluation and forward reports to ADB semi-annually, and to report on final village agreements for compensation allocation and utilization and submit to ADB prior to land acquisition; (d) a summary of annual government audits of resettlement disbursements and expenditures is provided to ADB; (e) ADB is promptly advised of any substantial changes in the resettlement impacts during implementation and, if necessary, an updated resettlement plan is submitted to ADB for its approval; (f) and the civil works and house demolition contractors are supervised to ensure compliance with requirements of the RPs, applicable law and ADB's *Policy on Involuntary Resettlement*.
- (vii) The Government, through HPG and WMG, will ensure that all local cost financing including cash injection and tariff revenues necessary for the Project is provided and disbursed in a timely manner to enable the full and timely completion of the Project. The Government, HPG and WMG will also ensure that in the event of any shortfall of funds or cost overruns WMG will make available such funds as are required to complete the Project.
- (viii) WMG will ensure that the Board of Directors of WDC operates effectively and fully discharges its supervisory and managerial responsibilities. The Board will be required to meet at least monthly and undertake all the functions provided for in the company charter. The IAs will establish and maintain financial control and management arrangements compatible with the relevant ADB guidelines.
- (ix) WMG will ensure that Caidian District Government establishes a local Branch Company as a subsidiary of WDC and all wastewater assets (sewers, pumping stations, etc) in the urban constructed area of the District will be transferred to this company before the new Caidian WWTP becomes operational. Caidian District will also ensure all wastewater charges collected within the District are passed to this newly formed Branch Company.

- (x) WMG will ensure that Dongxihu District Government transfers all wastewater assets in the urban constructed area of the Dongxihu District to WDC by the end of 2008, together with all wastewater charges collected, and that WDC will henceforth accept responsibility for the collection and treatment of all wastewater generated in Dongxihu District.
- (xi) The Government, through HPG and WMG, will ensure that throughout the Project, no material organizational changes (either financial, operational or structural) to, nor material asset transfer to or from the IAs will be formally approved or implemented without prior ADB approval, if such changes would affect the ability of the IAs, District Governments or WMG to perform their obligations under the Project agreement and on-lending agreements. In the event that (a) any change in ownership of the Project facilities; or (b) any sale, transfer or assignment of the shares of any IA is anticipated, the Government, HPG, WMG and the concerned IA will consult with ADB at least six months prior to the implementation of such change. The Government, HPG, WMG and the concerned IA will ensure that such change be carried out in a lawful and transparent manner.
- (xii) HPG, WMG and IAs will ensure that :
 - (a) all civil works in the Project including WWTPs, wastewater collection systems, storm water networks and pumping stations are constructed and operated in accordance with environmental procedures and guidelines of the Government and ADB;
 - (b) any adverse environmental impacts arising from the Project are minimized by implementing the mitigation measures prescribed in the SEIA;
 - (c) civil work contracts entered into with contractors will include obligations of contractors relating to the environment including mitigation and monitoring measures as specified in the SEIA;
 - (d) WPMO will submit annual reports on EMP implementation to ADB.
- (xiii) WMG and IAs will ensure that :
 - (a) project facilities are constructed, operated, maintained and monitored in strict conformity with all relevant laws and regulations of the PRC, including all applicable national and local environmental protection regulations and standards for control of air emissions, wastewater, sediment and sludge disposal, and solid waste management, the environmental mitigation measures recommended in the EMP and the subproject EIAs for the Project are implemented;
 - (b) the mitigation measures are incorporated into the design and bidding documents, and justification is provided to the ADB for any proposed changes to the mitigation measures required during design, construction, operations and maintenance;
 - (c) justification is provided to the ADB within 60 days if any changes have to be implemented for safety or emergency reasons; and
 - (d) environmental monitoring programs will be monitored and recorded under the guidance and supervision of the Wuhan Municipal EPB and the monitoring information will be submitted to ADB in project progress reports.
- (xiv) WMG undertakes to ensure that sludge and dredged material generated in the course of implementation of the Project are disposed of in accordance with arrangements that comply with national and local regulations, and that it creates no significant risk of secondary pollution.

- (xv) WMG undertakes to ensure that by the end of 2009 all wastewater sludge generated by all WWTPs located within the whole city of Wuhan is disposed of in accordance with arrangements that comply with national and local regulations, and that it creates no significant risk of secondary pollution.
- (xvi) WMG and the IAs will submit to ADB annual environmental reports commencing from the start of project implementation until one year after the commencement of operation of the project facilities. The reports will include :
 - (a) progress made on mitigation measures and monitoring;
 - (b) restoration, condition, and return of lands temporarily acquired during construction;
 - (c) problems encountered;
 - (d) data collected;
 - (e) results of the independent monitoring of resettlement activities;
 - (f) any research results; and
 - (g) a corrective action plan if any violation of the PRC's environmental standards, rules, regulations, or laws has occurred.
- (xvii) WMG and WDC shall appoint qualified consultants to:
 - (a) investigate and study the extent and degree of inflow and infiltration problem in the existing Wuhan wastewater collection systems, and to recommend a long term sewer rehabilitation program and, if deemed necessary, to recommend improved design and construction sewers, manholes and other sewerage related facilities with an objective to minimize inflow and infiltration;
 - (b) conduct a computer based drainage model to better understand the flood alleviation capability of drainage facilities provided and planned.
 - (c) assist WMG in the study of sludge disposal options, and recommend viable, practical longer term disposal route for sewage sludge generated within Wuhan.
 - (d) provide advice on detailed sewer connections and separation arrangements.
 - (e) review and suggest appropriate improvements to storm water management operations, including institutional reform and the use of outsourcing contracts.
- (xviii) WMG undertakes to ensure that an industrial pollution control plan will be developed by the end of 2007.
- (xix) The IAs agree to establish financial control and management arrangements in accordance with the ADB's *Guidelines for Assessment of Borrower's / Executing Agency's Internal Control, Accounting System and Capability for the Use of ADB's Disbursement Procedures*.
- (xx) WMG, will ensure that WDC maintains the following financial ratios:
 - (a) minimum debt service coverage ratio of 1.3;
 - (b) minimum current ratio of 1.2; and
 - (c) maximum debt equity ratio of 70 : 30.
- (xxi) WMG will ensure that wastewater tariffs charged by WDC are set at a level that ensures full cost recovery of O&M, depreciation and financial costs, i.e., debt service obligations, and a reasonable profit margin for WDC.
- (xxii) WMG will ensure that no entity, whether Government agency, institution, or enterprise, regardless of ownership, will be granted an exemption from the tariff established

pursuant to the above or granted a preferential rate or excused for delays in payments without penalties.

- (xxiii) WMG will undertake a review of the regulation on tariff regimes prior to the mid term review of project implementation. The findings will be submitted to ADB for review and discussion. Such a review will include :
 - (a) recalculation of minimum cost recovery tariffs based on actual project costs,
 - (b) affordability and willingness-to-pay surveys,
 - (c) financial / economic benefits, and
 - (d) extension of the price escalation mechanism to household and commercial users and other potential fees, charges, to encourage water conservation and sound environmental behavior.
- (xxiv) WMG will review the impact of water and wastewater tariffs adjustment on the poor and maintain and adjust the water tariff subsidy to protect the basic living standards of the urban poor.
- (xxv) WMG will ensure that public hearing be conducted on tariff increase with key stakeholders, including representative of the poor. Public support for tariff reforms should be cultivated through public information and participation programs including presentations at public meetings and news release.
- (xxvi) WMG and each IA will ensure that all civil works contractors engaged under the Project
 - (a) provide timely payment of wages and safe working conditions to all workers including male and female workers (with such requirements being included in civil works contract and monitored by construction supervision consultants);
 - (b) provide women's employment, where appropriate, and pay equal wages to the male and female employees for equivalent work;
 - (c) not employ child labor in Project activities as prohibited in the relevant laws and regulations of the Government; and
 - (d) monitor the effects of the Project on women through collection and compilation of gender-disaggregated data, where relevant, including in the resettlement plan and project design monitoring framework.
- (xxvii) WMG and each IA will, in coordination with the responsible agencies, cause the contractors to disseminate information on the risks of socially and sexually transmitted diseases, including HIV/AIDS, to their employees during Project implementation.
- (xxviii) WMG and each IA will, in coordination with the responsible agencies, assure that appropriate health promotion activities are employed to increase the likelihood that the project health benefits are realized especially among the poor and vulnerable populations.
- (xxix) WMG and the IAs will ensure that construction and operational health and safety are incorporated into the design and bidding documents, and that health and safety information is disseminated to contractors who shall in turn disseminate such information to those employed during project implementation and facility operations.

B. Conditions for Loan Effectiveness

81. The subsidiary Loan Agreement has been duly executed and delivered on behalf of, and has become fully effective and binding on, the parties thereto in accordance with their terms.

VI. RECOMMENDATION

82. I am satisfied that the proposed loan would comply with the Articles of Agreement of ADB and recommend that the Board approve the loan of \$100 million, to the People's Republic of China for the Wuhan Wastewater and Storm Water Management Project from ADB's ordinary capital resources with interest to be determined in accordance with ADB's LIBOR-based lending facility; an amortization period of 25 years, including a grace period of 5 years; and such other terms and conditions as are substantially in accordance with those set forth in the draft Loan and Project Agreements presented to the Board.

Haruhiko Kuroda
President

Dated : xx 2006

ADB TA - 4436 - PRC

**Project Preparatory Technical Assistance
Wuhan Wastewater and Storm Water
Management Project**

Final Report

December 2005

Volume 5

**PROJECT ADMINISTRATION MEMORANDUM
(PAM)**

Consultant
Black & Veatch (Asia) Ltd

Executing Agency
Wuhan Municipal Government

ASIAN DEVELOPMENT BANK

PAM: PRC XXXX

PEOPLE'S REPUBLIC OF CHINA

LOAN NO. xxxx-PRC

Wuhan Wastewater and Storm Water Management Project

PROJECT ADMINISTRATION MEMORANDUM (PAM)

Draft

December 2005

CURRENCY EQUIVALENTS

(as of 1 July 2005)

Currency Units	–	Yuan (CNY)
	–	US Dollar (\$)
CNY 1.00	=	\$ 0.123
\$ 1.00	=	CNY 8.11

ABBREVIATIONS

Abbrev	Full name/description
ADB	Asian Development Bank
EA	Executing Agency
HPG	Hubei Provincial Government
IA	Implementing Agency
ICB	International Competitive Bidding
LIBOR	London Inter Bank Offered Rate
O&M	Operations and Maintenance
PAM	Project Administration Memorandum
PDMF	Project Design and Monitoring Framework
PIU	Project Implementing Unit
PLG	Project Leading Group
PRC	People's Republic of China
PSP	Private Sector Participation
SEIA	Summary Environmental Impact Assessment
WDC	Wuhan Drainage Company
WMG	Wuhan Municipal Government
WPMO	Wuhan Project Management Office
WUCF	Wuhan Urban Construction Foundation
WWMP	Wuhan Wastewater Management Project
WWTP	Wastewater Treatment Plant
YRB	Yangtze River Basin

WEIGHTS AND MEASURES

kilometer	–	km
square kilometer	–	km ²
cubic meter per day	–	m ³ /day
tonne	–	t

NOTES

- (i) The fiscal year (FY) of the PRC Government ends on 31 December.
- (ii) In this report, "\$" refers to US dollars.

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I. PROJECT DESCRIPTION

A. Project Area and Location

1. Wuhan located in central region of the Peoples' Republic of China (PRC), is the capital of Hubei Province. It lies in the Jiangnan Plain where the Han River joins the Yangtze River. It is strategically located approximately half way along the length of the Yangtze River and is a center of communications, education, culture, economy, trade, transportation and industry. Wuhan covers an area of 8,467 km², which includes an

urban built up area of 211 km². As of 2004, the Municipality had a population of approximately 7.8 million. Wuhan's urban area is divided into three parts (Wuchang, Hankou and Hanyang) by the Yangtze River and the Han River. The Municipality includes 7 urban and 6 suburban districts. Wuhan has abundant water resources, including the Yangtze, Han and Fu rivers and many lakes, which together take up 2,144 km² or one-quarter of the urban and suburban areas.

2. Despite the abundant water resources, rapid economic growth and continuing urbanization over the last 25 years in Wuhan have resulted in inadequate urban infrastructure and placed pressure on overloaded facilities. The Municipality is served by a mixture of wastewater, storm water and combined sewer networks. Due to a lack of sufficient wastewater collection and treatment facilities, increasingly severe problems related to water pollution and urban drainage have resulted in serious water quality problems in the water bodies within Wuhan. In 2004, about 2 million m³/d of wastewater was generated but only 26.8 % of which was treated by 4 wastewater treatment plants (WWTPs). Demands for water for domestic and industrial use are steadily increasing and this imposes increasing pressure on water resources. At the same time, quantities of wastewater are increasing rapidly as are the associated pollution loads. However, only a small proportion of wastewater flows are treated to comply with the discharge standards. Increasingly severe problems related to water pollution and urban drainage has resulted in serious water quality problems in the water bodies within Wuhan. Although the Yangtze River is often seen as having a high assimilative capacity, the cumulative effect of the numerous point and non-point discharges is deteriorating its water quality.

3. The built up areas in Wuhan are mostly below the average flood level of the Yangtze and Han rivers. Protected by flood control bunds, during wet seasons storm water is discharged to the rivers by pumping. Being located in the subtropical monsoon climate zone, distinct seasonal variation and heavy summer rains place particular stress on Wuhan's urban drainage system and combined sewer overflows also become major sources of water pollution. Aging and inadequately maintained drainage networks and under capacity pumping stations result in frequent severe flooding events.

4. Water pollution has been growing in magnitude, creating water supply problems and economic losses, and impacting on development and economic growth. To achieve sustainable wastewater management and water resource protection, the Asian Development Bank (ADB) approved the Wuhan Wastewater Management Project (WWMP) in 2003, to increase wastewater treatment percentage to 56 % by 2007. The Wuhan Municipal Government (WMG) is currently undertaking a comprehensive wastewater management through 2010, and planning to install additional WWTPs to raise the treatment percentage to its 80 % target by 2010. WMG is also undertaking a comprehensive urban drainage and flood control program to increase the drainage network coverage to between 11.5 and 12.5 km / km² through to 2010. The proposed Project will contribute significantly to achieving these strategic Master Plan goals. Beneficiaries will include residents of Wuhan and those living downstream.

B. Objectives and Scope

5. The Wuhan Wastewater and Storm Water Management Project (the Project) is not a stand-alone investment but an integrated part of the basin-wide Yangtze water resources management initiative, the Wuhan city urban development plan, the Wuhan

Municipal Wastewater Master Plan and the Wuhan Storm Water Drainage Master Plan. As with the ongoing WWMP, the overall goal of the Project is to promote sustainable economic growth through sustainable wastewater management in Wuhan and water resource protection in the Wuhan section of the Yangtze River, so as to improve people's lives. In addition, specific attention is given to storm water management as frequent heavy summer rains cause serious localized flooding. The Project is intended to address major issues including (i) deterioration in surface water quality and urban environmental quality; (ii) ineffective regulatory control of municipal and industrial wastewater discharges; (iii) economic losses and disruption to livelihoods from frequent localized flooding; (iv) poor health and living standards of the poor; (v) lack of integrated wastewater management; and (vi) improving service efficiency through increased competition and private sector participation (PSP).

6. The Project assists the WMG in formulating a practical approach to provide urban wastewater and storm water services and to introduce the principles of integrated resource management and pollution control. The Project helps improve the urban environment and public health through improved wastewater and storm water management, and to improve the water quality in and downstream of Wuhan. It helps improve the quality of life for urban poor by reducing waterborne diseases and relieving from urban flooding. The Project also reduces poverty, directly and indirectly, through improved living conditions as well as permanent and temporary job creation.

C. Project Components

7. Structural and nonstructural measures are essential for improved wastewater and storm water management. The Project covers institutional capacity strengthening to facilitate an integrated approach to water resource management including pollution and flood control. Structural measures such as new and upgraded wastewater treatment facilities, collection network extension and rehabilitation, and larger capacity storm water pumping stations, designed to the national design standards are being undertaken. The structural and nonstructural measures are described below. Appendix 1 contains a detailed description of the Project components.

8. The Project will directly benefit over 3 million urban and suburban residents, whose living conditions and public health standards will be improved by increasing the wastewater treatment and improving storm water management. The wastewater management component includes the following subprojects, (i) expanding and upgrading the Erlangmiao primary WWTP from 180,000 m³/day to 240,000 m³/day with secondary treatment; (ii) increasing the capacity of the Nantaizi Lake secondary WWTP from 100,000 m³/day to 200,000 m³/day; (iii) upgrading the 100,000 m³/day Huangpu Road pretreatment WWTP to secondary treatment; (iv) constructing sewer pipelines and pumping stations; and (v) constructing a secondary 50,000 m³/day WWTP at Caidian. The storm water management component includes the following subprojects (i) improving the Luojia Road drainage works and increasing the related pump station capacity; (ii) increasing capacity of the Yangsigang and Changqing pump stations and constructing storm water pipelines; and (iii) connecting three key drainage control gates. The wastewater component is consistent with the overall pollution load reduction targets of the Yangtze River Water Resources Protection Plan, and with the ongoing WWMP of constructing 13 WWTPs by 2020. Benefits of all the wastewater subprojects will include improved quality of water resources, local environmental and health improvements from

reduced pollution of watercourses, and reduced downstream pollution in the Yangtze River. The storm water component will enhance the performance of the drainage system and the combined sewer overflows and improve flood control in several urban areas of Wuhan.

D. Risks and Mitigation Measures

9. Identifiable risks are outlined in Appendix 2. The Project does not have any unusual technical risks. The storm water and wastewater subprojects under the Project have adopted conventional engineering design and treatment processes that are robust and with proven records of reliable performance. The major equipment procurement packages include technical support for installation, testing and commissioning of mechanical and electrical plant as recommended by the manufacturer. Based on the performance of ADB's PRC portfolio, cost overruns and major implementation delays are not expected to occur.

10. A potential risk remains that WMG will not proceed with the institutional reform it gave assurance to under WWMP, that the Wuhan Drainage Company (WDC, the Implementing Agency (IA) for the wastewater management component) be allowed to operate as an integrated and autonomous wastewater utility responsible for all wastewater operations in the project area (including the Caidian and Dongxihu Districts.)

11. Potential financial and commercial risks related to the project include: (i) failure to meet the cash / equity transfers required to construct the Project; (ii) failure by WMG to increase the tariffs to ensure continuing full cost recovery; and (iii) failure of WMG to cause Dongxihu and Caidian districts to introduce/increase wastewater tariffs to meet cost recovery targets.

12. The potential financial and policy risks have been mitigated by assurances related to the financial and managerial autonomy for WDC and that WMG will ensure storm water operations and maintenance is fully financed. ADB review missions monitor WDC's compliance with the financial and operational covenants to ensure its financial sustainability. The risks associated with lack of local funding is being addressed by the assurance from WMG that they meet whatever cost increases are incurred, and have provided a guarantee on the required equity injections to meet the financing requirements of the Project.

E. Project Features

1. Policy Reform

13. The Project supports and strengthens several ABD initiatives : (i) comprehensive pollution prevention and control; (ii) improved wastewater management to create a sustainable urban environment; (iii) enterprise reform and corporate governance; (iv) cost recovery and tariff reform; and (v) use of PSP where appropriate.

14. The need for comprehensive solutions to urban environmental management is recognized by WMG. The Project is assisting the Government to develop a practical strategy for sludge treatment and disposal of residuals. The Project is also actively examining the use of outsourcing as a means to improve service efficiency.

2. Environmental Aspects

15. The Project when completed will improve the urban environment and surface water quality, in Wuhan and in the Yangtze River Basin (YRB). The Project targets substantial improvements in wastewater management and will have significant positive effects on water pollution control in the Wuhan reach of the YRB. The Project will provide more reliable potable water quality to Wuhan residents, as a result of improved raw water quality.

16. The annual wastewater to be treated will be increase by about 77 million t, to 215 million t. In addition, the treatment of 102 million t of wastewater will be upgraded from primary to full secondary treatment. Some key annual wastewater load reduction impacting the YRB include:

- (i) 20,000 t biochemical oxygen demand;
- (ii) 36,000 t chemical oxygen demand;
- (iii) 25,000 t suspended solids;
- (iv) 3,000 t ammonia nitrogen; and
- (v) 340 t total phosphorous.

17. The Project will have an overwhelming positive environmental impact and the negative impacts of the subprojects are minor. Any environmental risks during construction and the life of the Project are being / can be mitigated through measures in the Summary Environmental Impact Assessment (SEIA) report. The SEIA (Appendix 3) summarizes the environmental impacts, mitigation measures and monitoring plans.

18. During construction, most impacts are related to access roads, construction sites, and labor camps. Temporary impacts on air and water quality are overcome as excavation and construction activities are completed and temporarily used areas rehabilitated. Odor problem in dredging during drainage system rehabilitation is short term, lasting only during the construction period, and is mitigated by frequent disposal of dredged material to identified landfill sites. During operation, most problems will be related to operations and maintenance of wastewater facilities.

3. Social Analysis

19. The Project will reduce flooding and associated damages, more sanitary living conditions, improve environmental conditions, reduce morbidity and mortality from water-borne and water washed diseases and reductions in associated medical costs and loss of working days. The Project is estimated to reduce water related disease by an average of 8,000 cases per year. This impact is associated with an annual reduction of 5,800 days of lost work and a net present value of savings in medical costs and avoidance of lost earnings of CNY 7.7 million. Women and poor will benefit disproportionately from the project. Poor households and vulnerable groups tend to reside in areas which have poorer service levels and they have less capacity to cope with the disruption and illness caused by those poor services. Reductions in flooding and illness will reduce women's burden of work. A reduction in lost school days and workdays represent a key intervention in the poverty cycle. The health impact analysis is given in Appendix 4.

20. The Project minimizes the risk of factory closure on environmental grounds. Since unemployment is a major cause of poverty, the poor benefit disproportionately from job creation or prevention of job destruction. The Project provides 5,000 person-years of work over the 5-year construction period and economic spin-off effects of 8,100 person-years of work. Approximately 40 % of the construction jobs are filled by the poor and vulnerable, including unemployed persons, rural migrants and women, representing therefore a key intervention in the poverty cycle. Those temporarily employed in construction operations will benefit from additional training and experience that will provide them with opportunities in future infrastructure construction. Project operations will create 220 full-time permanent jobs with the WDC and an additional 130 full-time permanent jobs throughout the municipality.

21. A participatory process has been used throughout project preparation. Methods included household and business surveys, consultation with key stakeholders, focus groups, and public consultation meetings, and key informant interviews with involved agencies. The participatory approach is being continued during project implementation, monitoring and evaluation, based on periodic public hearing meetings on tariff increases and a new customer complaints desk to receive process and document customer complaints on an ongoing basis. A number of key indicators for monitoring of social and poverty reduction aspects of the Project, most of which are incorporated into the Project Design and Monitoring Framework (PDMF), see Appendix 5.

4. Institutional Strengthening

22. The WWMP included a major institutional strengthening component to strengthen the management of WDC. This process is still ongoing and the results cannot yet be fully evaluated, although the financial management assessment conducted by the Project Preparatory Technical Assistance consultants indicated that WDC has robust internal control, accounting and auditing systems fully adequate for both the construction and operational phase of the Project. In view of the WWMP program of institutional strengthening the Project includes a number of more specialized and complementary initiatives to deal with specific issues that include: (i) development of a sludge management strategy; (ii) reducing inflow and infiltration levels in the wastewater collection network, which has been identified as a particular problem in the Erlangmiao catchment; (iii) possible corporatization of storm water management; and selective use of private sector initiatives to introduce competition.

II. COST ESTIMATES AND FINANCING PLAN

A. Cost Estimates

23. The total Project cost is \$ 266.43 million equivalent, including a foreign exchange cost of \$ 139.65 million (52.4 %) and a local currency cost of \$ 126.78 million equivalent (47.6 %). A summary of cost estimates is given in Table 1 below. Detailed cost estimates are included in Appendix 6.

Table 1: Cost Estimates
(\$ million)

	Foreign	Local	Total
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Component	Exchange	Currency	Cost
A. Base Costs ^a			
I. Develop Wastewater Treatment Facilities in Central Urban Areas			
Erlangmiao WWTP	14.56	7.88	22.44
Nantaizi Lake WWTP	11.39	11.10	22.49
Huangpu Road WWTP	9.38	5.36	14.74
II. Develop Wastewater Treatment Facilities in Suburban Areas			
Dongxihu Sewer System	11.70	7.92	19.62
Caidian WWTP	6.06	5.64	11.70
III. Develop Storm Water System in Wuhan			
Drainage Works in Luojia Road Area of Wuchang	18.17	27.02	45.19
Yangsigang Pump Stations and Pipes Works in Hanyang	4.71	5.58	10.29
Tri-gate Connection Works in Dongxihu	19.87	18.63	38.50
Changqing Pump Station Expansion	11.97	7.41	19.38
IV. Project Management	1.00	-	1.00
Subtotal	108.81	96.54	205.35
B. Contingencies			
Physical ^b	9.65	10.88	20.53
Price ^c	6.78	6.45	13.23
Subtotal	16.43	17.33	33.76
C. Financial Charges during Implementation ^d	14.41	12.91	27.32
Total	139.65	126.78	266.43

^a In 2005 prices.

^b Computed at 10 % for all civil works, land acquisition and resettlement, equipment, training, and consulting.

^c Computed, based on foreign exchange inflation rate of 2.8 % in 2006, and 1.9% in 2007 and onwards; and local currency inflation rate at 3.3 % in 2006, 3.2 % in 2007, and 3.0 % in 2008 and onwards; and includes provision for potential exchange rate fluctuation under assumption of a purchasing power parity exchange rate,

^d Includes interest and commitment charges. Interest during construction has been computed at the five-year forward Libor rate plus a spread of 0.6 %.

B. Financing Plan

24. The Government has requested a loan of \$ 100 million, about 37.6 % of the total project cost. Since this is well below 60 % of the total project cost, the ADB cost sharing limit for the PRC, it has been agreed that the civil works percentage financing under the Project is set at 70 %. The proceeds of the ADB loan are used to finance the foreign exchange cost of the Project, including interest during construction on the loan. Local costs are financed by wastewater tariffs, WMG budget sources and domestic loans from the PRC banks. The financing plan for the Project is summarized in Table 2. The detailed financing plan is in Appendix 7. The ADB comes from ADB's ordinary capital resources. The loan carries an interest rate determined in accordance with ADB's London Inter Bank Offered Rate (LIBOR) based lending rate system for US dollar loans and a commitment charge of 0.75 % per annum. The loan has a term of 25 years, including a grace period of 5 years.

Table 2 Financing Plan
(\$ million)

Sources	Foreign Exchange	Local Currency	Total Costs	Percentage
A. ADB Loan	100.00	-	100.00	37.5 %
B. Wuhan Municipal Government	39.65	32.69	72.34	27.2 %

C. Local Bank Loans	-	94.09	94.09	35.3 %
Total	139.65	126.78	266.43	100.0 %

25. The Government has provided ADB with the reasons for its decision to borrow under ADB's LIBOR-based lending facility on the basis of these terms and conditions, and an undertaking that these choices were the Government's independent decision and not made in reliance on any communication or advice from ADB.

C. Allocation of Loan Proceeds

26. The Borrower is the Government of the PRC, which re-lends to the Hubei Provincial Government (HPG) and then to WMG. WMG on-lends a portion of the loan proceeds to WDC who implements the wastewater management component. For the storm water management component, being non-revenue generating, WMG assumes full financial responsibility for this component. All on-lending is on the same terms and conditions as the ADB loan. The end borrowers assume the foreign exchange and interest rate variation risks for the ADB's loan. The flow of funds and on-lending arrangements are illustrated in Appendix 8.

III. IMPLEMENTATION ARRANGEMENTS

A. Executing and Implementing Agencies

27. The Executing Agency (EA) is WMG. A Project Leading Group (PLG) has been established, headed by the Vice Mayor of WMG and comprising representatives from Wuhan Municipal's Construction Committee, Water Affairs Bureau, Planning Committee, Planning Bureau, Water Bureau, Financial Bureau, Price Bureau, Environmental Protection Bureau, Caidian and Dongxihu district governments and related agencies. The PLG provides overall policy guidance, facilitate interagency coordination, and resolve any institutional problems affecting project implementation. The existing WWMP project management office (WPMO) has been retained for this follow-on Project. The WPMO is also the secretariat of the PLG. Separate Project Implementing Units (PIUs) have been established by WUCF (Wuhan Urban Construction Foundation, the IA who implements the storm water component) and WDC. These PIUs report to the WPMO and also coordinate and monitor activities of the IAs. WDC is a limited liability company incorporated under the PRC Company Law and is also the IA for the ongoing WWMP. It is therefore experienced in ADB project implementation and has a board of directors overseeing financial and operational matters of the WDC including: (i) hiring / firing of senior management; (ii) reviewing staffing and remuneration plans; (iii) reviewing the progress of construction and approving annual construction plans; (iv) reviewing and approving annual financial budgets; (v) reviewing the investment plans and accounts of the IAs and related subprojects; and (vi) approving the procurement of major equipment and civil works contracts.

28. WUCF is a government agency responsible to WMG for coordinating the implementation of government sponsored urban infrastructure projects where these are largely or wholly financed from government revenues. WUCF is not an operator or provider of services however, and its responsibilities for asset management end once asset commissioning has taken place. At that time the public assets are passed over to the relevant government department, which in this case will be the Wuhan Municipal

Water Authority (pumping stations) together with its subordinate units at the district government level (storm water drainage etc). These arrangements are commonplace in the PRC.

29. While WDC undertakes construction management directly, WUCF has outsourced this activity to an experienced qualified construction management company. Once the physical construction is completed WUCF will pass the storm water assets to local district Water Bureau for operations and maintenance. The difference in implementation arrangements for the two components reflects the different financing and institutional arrangements for wastewater and storm water management in Wuhan, and the PRC generally. An assessment has also been undertaken of both IAs' technical and institutional capacities, which are adequate for project implementation. The organization of the IAs is in Appendix 9.

30. With the help of international consultants, the WPMO and the IAs will develop expertise in: (i) efficient operations of the wastewater and storm water facilities; (ii) functional areas covering, administration, finance, accounting and business planning; and (iii) use of PSP and outsourcing contracts.

31. WDC is already a recipient of consulting services support under the WWMP, so capacity building is weighted towards the storm water component.

B. Cost Recovery Mechanisms

32. In accordance with PRC government policy all local governments are expected to charge reasonable fees for wastewater collection and treatment. Wastewater tariffs should be established based on the cost of operating the facilities and the affordability of the consumers. In cities where profitability is not possible, local governments are encouraged to set a minimum price that can cover operations and maintenance (O&M) costs.

33. Sufficient cost recovery through an effective wastewater tariff mechanism is key to successful implementation of the Project. Progressive tariff increase and introduction of wastewater collection, starting from the first year of project implementation (2006) allow part of the construction fund to accumulate during the construction period. This is critical for WMG, through contributions from beneficiaries, to ensure adequate and timely provision of counterpart funds during project implementation of the wastewater management component, and support O&M and finance overhead costs including debt servicing.

34. The storm water subprojects are non revenue earning subprojects. WMG assures that adequate government budgetary funds are available to cover the O&M costs needed for normal operation.

C. Operations and Maintenance

35. All wastewater and storm water facilities to be built, extended or rehabilitated under the Project will be operated and maintained by the IAs during implementation and after completion of the works. The annual O&M costs of the flood water management component excluding depreciation, amortization and the non-cash cost items, in real

terms would be around CNY 30.58 million :

(i)	Wuchang Luojia Subproject	CNY 10.67 million
(ii)	Hanyang Yangsigang Subproject	CNY 2.51 million
(iii)	Dongxihu 3 Gate Connection Subproject	CNY 5.44 million
(iv)	Changqing Subproject	CNY 11.96 million

36. On the same basis, the annual O&M costs for the wastewater management component are as follows totaling CNY 66.6 million :

(i)	Erlangmiao Subproject	CNY 18.3 million;
(ii)	Nantaizi Lake Subproject	CNY 12.8 million;
(iii)	Huangpu Road Subproject	CNY 19.6 million;
(iv)	Caidian Subproject	CNY 6.8 million; and
(v)	Dongxihu Subproject	CNY 9.1 million.

37. The IAs concerned are responsible for O&M from their own resources. At any time before and during project implementation, ADB may request copies of approved O&M budgets for works and facilities to be financed under the Project.

IV. IMPLEMENTATION SCHEDULE

38. The Project is being implemented over a period of 5 years from 2006 to 2010 (Appendix 10). This schedule is considered realistic because the project implementation structure has been in place and is well under way. ADB's successful experience in similar projects in the PRC and EA and IAs' in depth knowledge and experience in storm water and wastewater, and externally funded projects indicates that this schedule is achievable.

V. CONSULTANT RECRUITMENT

39. Provision has been made for 25 person-months of international and 150 person-months of domestic consulting services to support WPMO and IAs in project implementation and capacity building to be funded under the Project. The scope and extent of consulting services takes account of the consulting support incorporated into WWMP and also the specific needs of the Project. Consulting services are required for specific areas and include: (i) development of a sludge management strategy for Wuhan; (ii) investigation and control of inflow and infiltration into the wastewater collection network; (iii) assistance with PSP initiatives; (iv) financial management; (v) operations and maintenance improvements; and (vi) extended development of water quality modeling.

40. Capacity building for IAs is achieved through consultant inputs, hands-on training on project facilities, and domestic and international training financed from the loan. The

consultants has been recruited in accordance with ADB's Guidelines on the Use of Consultants and other arrangements satisfactory to the ADB on the engagement of domestic consultants. Appendix 11 presents the terms of reference and fee breakdown of the consulting services.

VI. PROCUREMENT

A. General

41. Equipment, materials and goods, and services financed by the loan are procured in accordance with ADB's Guidelines on Procurement and the PRC's Tendering and Bidding Law and procurement regulations. Procurement of equipment follows ADB procedures for international competitive bidding (ICB) for packages each with a value greater than \$ 1 million. Packages of equipment valued at \$ 1 million or less are procured following international shopping procedures; packages valued at \$ 100,000 and less are procured through direct purchase procedures. Civil works contracts costing more than \$10 million are procured using ICB. Civil works contracts valued at \$ 10 million equivalent or less are procured using local competitive bidding procedures in accordance with the PRC Tendering and Bidding Law and the respective procurement regulations. Selection and engagement of contractors is subject to ADB approval. Procurement packages and status are listed in Appendix 12. Major equipment is purchased through ICB procedures and financed by the ADB loan. The internationally tendered equipment packages include necessary technical support for ensuring proper installation, testing, commissioning, and training of operational staff as part of the related contracts. In accordance with ADB requirements, foreign contractors are allowed to participate in bidding for local competitive bidding contracts.

B. Advance Procurement Action and Retroactive Financing

42. The Government has requested advance procurement action to expedite project implementation, and retroactive financing. This is needed to meet specific WMG targets for an early completion of the Huangpu Road WWTP subproject, and also so that wastewater collection network contracts can be coordinated with road improvements where such opportunity exists. Advance actions included (i) tendering and bid evaluation for civil works contract packages; and (ii) preparation of tender documents for the procurement of materials, plant, equipment, and vehicles. Such advance actions covered the period from the end of the Appraisal Mission visit until loan effectiveness. The issuance of invitations to bid under advance procurement action was subject to ADB approval in accordance with ADB Guidelines on Procurement.

43. The Appraisal Mission has given support to the requested retroactive financing and would submit this request to ADB Management for approval.

VII. DISBURSEMENT PROCEDURES

44. To make adequate amounts of the project loan proceeds available on a timely basis, Wuhan Municipal Finance Bureau has established an impress account after loan effectiveness in accordance with the ADB Loan Disbursement Handbook. Disbursements from the impress account are supported by an appropriate withdrawal application and related documentation. Such documentation demonstrates, among other

things, that the goods and / or services are (i) produced in and procured from ADB member countries, and (ii) eligible for ADB financing. ADB statement of expenditures procedure may be used to reimburse eligible expenditures and to liquidate advances in amounts not exceeding \$ 200,000 equivalent per item of expenditure. Provision of certification by the Government to confirm the execution and delivery of an on-lending agreement incorporating the same terms and conditions of the loan with the foreign exchange rate and interest rate variation risks have been borne by the concerned IA, regarding a project component was required as a condition of disbursement for the concerned project component.

VIII. PROJECT MONITORING AND EVALUATION

45. PDMF for the Project indicators include: (i) service levels; (ii) treated wastewater quality and other measures of operational performance; (iii) percentages of wastewater collected and treated; (iv) user satisfaction with the urban environment; and (v) relevant economic and health data to monitor project impacts. The relevance and practicability of data collection for the indicators have been confirmed with the WPMO. Appendix 5 contains the PDMF.

46. The PDMF procedures were developed at the beginning of project implementation by the WPMO and IAs with the assistance of consultants, to systematically generate data on inputs and outputs of the project components and the socioeconomic, health and environmental indicators to be used to measure project impacts. A set of indicators for the monitoring of future performance of the WWTPs will be designed prior to operation start-up by the loan implementation consultants.

IX. REPORTING REQUIREMENTS

47. Under the PDMF, baseline and progress data are reported at the requisite time intervals including the environmental management plan's semi-annual reporting. The WPMO is responsible for analyzing and consolidating the data through its management information system. The PDMF is designed to permit adequate flexibility to adopt remedial action regarding project design, schedules, activities, and development impacts. The WPMO, with the assistance of the consultants, monitors and assesses activities, and reports to ADB quarterly on the physical implementation and financial aspects of the Project to ensure that impacts are monitored and reported in line with ADB requirements. Appendix 13 gives the progress report format. WPMO ensures that copies are consolidated and submitted to ADB. In addition to periodic reporting and monitoring, ADB and WMG jointly review project implementation at least once a year to identify and resolve major issues.

48. Within three months of physical completion of the Project, WPMO will submit to ADB a completion report that describes implementation of the Project including institutional strengthening, policy reform, other project implementation matters, actual costs incurred in relation to cost estimates, benefits, beneficiary consultations, and other information requested by ADB.

X. ACCOUNTING AND AUDITING REQUIREMENTS

49. The IAs maintain records adequate to identify goods and services financed out of

the loan proceeds, following accounting principles and practices prescribed by the PRC Accounting Law. The law requires enterprises to prepare financial statements and generally follow internationally accepted accounting standards. The IAs maintain separate project accounts and records. The financial statements of the project accounts and the annual corporate financial statements for IAs are subject to external audit by the WMG Audit Bureau, Hubei Provincial Audit Bureau, and State Audit Administration. The audits are carried out in accordance with regulations for auditing approved by the State Council and meet ADB requirements. A separate auditor's opinion on the use of the impress account and statement of expenditure is incorporated in the audit reports. The IAs' annual audited financial statements and audited project accounts are submitted to ADB no later than 6 months after the end of the fiscal year for the entire implementation period. The Government, HPG, and WMG are aware of ADB's policy on submission of audited financial statements on a timely basis. HPG and the IAs submit regular reports and information to ADB concerning the use of the loan proceeds, project implementation, and IA performance. The reports include (i) quarterly progress reports on project implementation; (ii) annual reports; and (iii) a project completion report, not later than 3 months after completion of the project facilities. ADB's audit letter is shown in Appendix 14.

XI. MAJOR LOAN COVENANTS

50. A summary of the Loan Covenants is shown in Appendix 15. Compliance to the Loan Covenants is monitored throughout the implementation of the Project.

XI. KEY PERSONS INVOLVED IN THE PROJECT

51. The following are the key persons involved in the implementation of the Project:

- ADB :
- Ministry of Finance :
- Executing Agency :
- WDC :
- WUCF :

XII. ANTICORRUPTION

52. As a major multilateral development institution and one of the leading sources of development funding in Asia, the ADB welcomes the emphasis on combating corruption as part of its broader work on issues of governance and capacity building. The policy's emphasis upon strengthening the essential prerequisites for effective public administration is designed to ensure that the fundamental building blocks for transparent, predictable, and accountable administration are in place. These building blocks include an appropriate legal framework and effective enforcement mechanisms; a professional, competent, motivated, and meritocratic civil service; transparent procurement practices; effective internal control systems; and a well-functioning independent audit office.

Participation, the fourth major principle in ADB's governance policy, is also of relevance.

53. At the broadest level, ADB's stance on anticorruption issues is intended to reduce the burden that widespread, systemic corruption exacts upon the governments and economies of the region. More specifically, ADB's approach is centered upon three objectives:

- (i) supporting competitive markets and efficient, effective, accountable, and transparent public administration as part of ADB's broader work on good governance and capacity building;
- (ii) supporting promising anticorruption efforts on a case-by-case basis and improving the quality of dialogue with the relevant agencies on a range of governance issues, including corruption; and
- (iii) ensuring that ADB projects and staff adhere to the highest ethical standards.

54. During project processing, ADB's anticorruption policy (attached as Appendix 16) was explained to the central and local government officials. Attention was drawn to the section on fraud and corruption in ADB's Guidelines for Procurement, particularly the need for bidders / suppliers / contractors to observe the highest standards of ethics in procuring and executing ADB financed contracts, and the sanctions if fraud and corruption are discovered. Similarly, the anticorruption provisions added to ADB's Guidelines on the Use of Consultants were discussed.

55. The Government is increasingly concerned with governance issues and has conducted well publicized campaigns against official corruption. The Tendering and Bidding Law stipulates that tender and bidding activities follow the principles of openness, fairness, impartiality, and good faith (Article 5). This law covers key construction projects funded by the State and all externally funded projects. Article 6 stipulates that "no organizations or persons shall, by any means, limit or exclude legal persons or other organizations outside from other regions or systems from participating in the bidding procedure. No illegal interference in any form is permitted in the bidding process." Article 32 specifically prohibits bribes and collusion, while Articles 49-64 specify appropriate sanctions for all abuses of the law, including substantial fines and criminal prosecution. ADB is helping to develop the implementation regulations for the Tendering and Bidding Law.