



Report and Recommendation of the President to the Board of Directors

Project Number: 39019
September 2006

Proposed Loan
People's Republic of China: Inner Mongolia
Autonomous Region Environment Improvement
Project

Asian Development Bank

CURRENCY EQUIVALENTS

(as of 5 September 2006)

Currency Unit	–	yuan (CNY)
CNY1.00	=	\$0.1260
\$1.00	=	CNY7.9385

ABBREVIATIONS

ADB	–	Asian Development Bank
CO ₂	–	carbon dioxide
EARD	–	East Asia Department
EIRR	–	economic internal rate of return
EMP	–	environmental management plan
FIRR	–	financial internal rate of return
GDP	–	gross domestic product
GIMAR	–	government of Inner Mongolia Autonomous Region
IEE	–	initial environmental examination
IMAR	–	Inner Mongolia Autonomous Region
JBIC	–	Japan Bank for International Cooperation
KfW	–	Kreditanstalt für Wiederaufbau
NEB	–	net economic benefit
NFB	–	net financial benefit
NO _x	–	nitrogen oxides
PIA	–	project implementing agency
PPMS	–	project performance management system
PRC	–	People's Republic of China
PMO	–	project management office
SO ₂	–	sulfur dioxide
SOE	–	state-owned enterprise
TA	–	technical assistance
TSP	–	total suspended particulates

WEIGHTS AND MEASURES

kg	–	kilogram
km	–	kilometer
m ²	–	square meter
m ³	–	cubic meter
MW	–	megawatt (1 million watts)
t	–	ton (1,000 kg)

NOTE

In this report, "\$" refers to US dollars and "tons" refers to metric tons.

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LOAN AND PROJECT SUMMARY

Borrower	People's Republic of China (PRC)
Classification	Targeting Classification: General intervention Sector: Energy Subsector: Energy sector development Theme: Environmental sustainability Subthemes: Global and regional transboundary environmental concerns and issues, cleaner production, control of industrial pollution
Environment Assessment	Category B (sensitive). An initial environmental examination was undertaken. The summary initial environmental examination was circulated to the Board in February 2006.
Project Description	The Project covers the municipalities of Wuhan and Bayannur in Inner Mongolia Autonomous Region (IMAR) and consists of the following: (i) improvement of central heating supply in Dengkou, Hangjinhouqi, Linhe, Wuhai, Wulatehouqi, Wulateqianqi, Wulatezhongqi, and Wuyuan; (ii) gas transmission/distribution improvement in these eight areas; (iii) wastewater treatment in Wulatehouqi and Wulateqianqi; and (iv) institutional reforms and corporate governance improvement for all project implementing agencies (PIAs). Policy dialogue with the Government during project processing focused on (i) maximizing benefits to the poor and ensuring that the poor have sufficient heating by establishing specific gas and heating assistance programs, (ii) implementing market-based tariff reforms and improving billing collection, and (iii) promoting private sector participation.
Rationale	Recent rapid economic growth has led to worsening trends of environmental pollution and ecosystem degradation, particularly air and water quality in all major areas (including the eight project areas). The improved economic performance will not be sustainable if the government of the Inner Mongolia Autonomous Region (GIMAR) does not immediately respond to the worsening trend of air and water pollution. Urban environmental improvement requires a comprehensive approach including addressing air and water pollution, providing clean and cheaper fuel, promoting private sector participation and institutional strengthening to improve operational efficiency of public utilities, and encouraging energy conservation. GIMAR's willingness to improve the urban environment will provide a supportive environment for implementing an environmental improvement project in IMAR.

Impact and Outcome	<p>The Project will improve the environment by reducing atmospheric and water pollution in IMAR. This will be achieved by establishing an efficient, safe, and reliable gas and heating supply and wastewater treatment facilities to protect water resources, which will conserve energy and water resources in the project areas.</p> <p>The Project will have four outputs or components. Component A will improve the central heating systems in the project areas by installing efficient and large boilers to facilitate the closure of 396 existing small coal-fired boilers. Component B will provide gas transmission and distribution systems in these areas to supply clean and cheaper gas to replace liquefied petroleum gas and coal consumption. Component C will protect water resources by enhancing wastewater treatment capacity through construction of wastewater treatment plants and a sewage network in Wulateqianqi and Wulatehouqi. Component D comprises (i) institutional strengthening and training for implementing the institutional and financial reform action plans, (ii) assistance to the PIAs to implement tariff and regulatory reforms, and (iii) development of options for private sector participation. Overall, the Project is consistent with the Asian Development Bank (ADB) operational strategy in the PRC</p>
Project Investment Plan	The investment cost of the Project is estimated at \$330.4 million equivalent including contingencies
Financing Plan	A loan of \$120.0 million from ADB's ordinary capital resources will be provided under ADB's London interbank offered rate (LIBOR)-based lending facility to cover 36% of the project cost including interest and commitment charge during construction on the ADB loan. 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. The balance of the project cost will be financed by equity of \$175.4 million (53%) from the PIAs and domestic loans of \$35.0 million (11%).
Allocation and Relending Terms	The ADB loan proceeds will be made available by the Borrower to GIMAR through a subsidiary loan agreement. These proceeds will in turn be onlent, in succession, to the municipalities and/or counties and PIAs. All subsidiary and onlending agreements will be made on the same terms and conditions as the ADB loan.
Period of Utilization	Until 31 December 2011
Estimated Project Completion Date	30 June 2011
Executing Agency	Government of Inner Mongolia Autonomous Region

Implementation Arrangements

The Project will be implemented over 4.5 years. GIMAR will be the Executing Agency. The subcomponents will be implemented by eight PIAs. A project management office will be responsible for managing, coordinating, and supervising implementation of project subcomponents. Each PIA will establish a project implementation office to undertake direct responsibility for design, construction, and operation of subprojects. Project implementation started in August 2006 with the preparation of bidding documents.

Procurement

Equipment, materials, and services financed from the proceeds of the ADB loan will be procured in accordance with ADB's *Procurement Guidelines*. Items financed with local currency funds by GIMAR will be procured following local competitive bidding procedures acceptable to ADB. Advance procurement action and retroactive financing was requested by GIMAR and approved by ADB.

Consulting Services

Twelve person-months of international consulting services and 85 person-months of national consulting services will be provided to assist GIMAR with project implementation, including project management, procurement, construction supervision and monitoring and evaluation of project impacts. An additional 8 person-months of international consulting services and 38 person-months of national consulting services will be provided for implementing institutional reforms and facilitating implementation of heating tariff reforms. All consultants will be selected and engaged in accordance with ADB's *Guidelines on the Use of Consultants*.

Project Benefits and Beneficiaries

By addressing air and water pollution, the Project will indirectly benefit the entire urban population of about 2.2 million residing in the eight project areas. An estimated 71,324 or 7.5% of the total urban beneficiaries are poor as measured by the various city poverty lines. The increased use of gas and better central heating supplies will reduce the use of conventional fuels such as raw coal, wood, and coal briquettes to mitigate adverse environmental and health impacts, particularly on the poor. Approximately 0.96 million urban residents will benefit from the natural gas and central heating supply with the Project. The wastewater treatment programs in Wulateqianqi and Wulatehouqi will reduce wastewater pollution and improve the living conditions and social economic environment in the two counties.

The Project will improve energy efficiency of gas and heating supply by 22% and conserve energy annually equivalent to 540,000 tons (t) of standard coal. The Project will provide substantial environmental and health benefits, including annual emission reduction of total suspended particulates, sulfur dioxide, nitrogen oxides, and greenhouse gas of carbon dioxide. The wastewater treatment component will lead to annual discharge reduction of chemical oxygen demand, biological oxygen demand, suspended solids, ammonia nitrogen, total nitrogen, and total phosphorus. The quantifiable local and global environmental benefits over the project life are expected to be about CNY52.2 million and CNY43 million, respectively, in net present value at 2004 prices. Unquantifiable environmental benefits, such as reduced damage from the wastewater of small boilers and gas leaks, are also expected to be significant.

The economic and financial internal rates of return for the whole Project are satisfactory at 21.4% (with local environmental benefits) and 7.7%, respectively. The Project's poverty impact ratio is estimated at 13.5%, higher than the ratio of poverty population to total population in the project areas (7.5%). The Project will create about 10,240 person-years of job opportunities during construction and 1,412 full-time jobs during project operation. Of the total, 4,090 person-years of job opportunities will be filled by the poor, women, and minorities with an estimated total of CNY44.2 million in wage payments during construction. In addition, 565 employment opportunities with CNY6.1 million of annual wage payments are expected to go to the poor, women, and minorities during project operation. A total of 52,337 poor households will benefit from a discount on gas and heating supply connection fees (22,971 poor households) and gas and heating bills (29,366 poor households), resulting in estimated annual savings of CNY10.2 million in connection fees and CNY26.84 million in discounts on gas and heating bills.

Risks and Assumptions

The risk of insufficient gas and heating demand for the Project is minimal as the gas and central heating supply under the Project is mainly to meet existing demand and a small fraction of incremental demand. Macroeconomic conditions are expected to continue to be sound with continuing political stability in the PRC and strong economic performance in IMAR. GIMAR will issue and enforce stricter air and water quality standards. The gas and central heating supply, and wastewater treatment under the Project are based on proven designs and conventional technologies that have been successfully used in the PRC; no

significant technical risks are anticipated. The risk of the delay in loan effectiveness and construction due to late internal approval and procurement are addressed by early preparation of all related reports, timely submission of relevant documents, and procurement training for all PIAs. The PIAs will be subject to good governance supervision under the project performance management system. ADB's close involvement will ensure that competent consultants will be recruited on time. To fully assess the potential project risks, a probabilistic risk analysis was performed using the Monte Carlo simulation technique based on 3,000 simulations for the economic and financial internal rates of return and the poverty impact ratio. The risk analysis concludes that the Project is robust under future uncertainties, that the risks associated with it are minimal and acceptable, and that the probability of negative outcomes for the poor is also minimal.

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 Inner Mongolia Autonomous Region Environment Improvement Project. The design and monitoring framework is in Appendix 1.

II. RATIONALE: SECTOR PERFORMANCE, PROBLEMS, AND OPPORTUNITIES

A. Performance Indicators and Analysis

2. The PRC has severe environmental problems associated with rapid economic growth, heavy reliance on coal as the primary fuel, and use of obsolete technology in some industries. The State Environmental Protection Administration (SEPA) estimates that since the early 1990s pollution has resulted in a loss to the PRC economy of approximately 4% of gross domestic product (GDP), with air pollution accounting for 59%, water pollution 36%, and solid waste 5%.¹ In particular, the SEPA estimates that damage from sulfur dioxide (SO₂) and acid rain costs the country CNY110 billion annually. Of the PRC's 342 major areas, only 132 met the national class II air quality standard in 2004. By 2005, only 30% of the rivers met their designated water quality standards, or about half the Government's target in the 10th Five-Year Plan (2001–2005). In seven major river basins, 52% of river courses do not meet the class III standard. The Government's efforts in environmental improvement have resulted in a steady decline of major air emissions since the mid-1990s. However, during 2002–2004, PRC energy consumption increased by 40%, with the consumption of coal, oil, natural gas, and hydropower increasing by 45%, 33%, 37%, and 30%, respectively. Since 2002, emissions have resumed the upward trend. Inner Mongolia Autonomous Region (IMAR) is one of the PRC provinces with severe air pollution problems in areas due to its heavy reliance on coal as the primary fuel for industry and residential consumption. In 2004, only 7 of 21 areas in IMAR met the national air quality standards. A sector and subsector analysis is provided in Appendix 2.

3. In 2004, 90% of SO₂ and 85% of carbon dioxide (CO₂) emitted into the air in the PRC resulted from burning coal. The PRC is now the world's largest coal producer and consumer. Production of raw coal nearly doubled in 4 years, from 1,000 million tons (t) in 2000 to 1,956 million t in 2004—about 35% of global production in 2004. Coal accounted for 67.7% of the nation's total energy consumption in 2004 and will continue to be the primary energy resource for the foreseeable future. In 2003 and 2004, the PRC's GDP grew at 9.5%, but primary energy consumption grew at 15.3%. To meet the increasing energy demand, coal production increased by 20.8% in 2003 and 17.3% in 2004. Natural gas production increased from 27.2 billion cubic meters (m³) in 2000 to 41.5 billion m³ in 2004, representing a 52.5% increase. In IMAR, coal production was 203.3 million t in 2004 with over 78 active coal mines with capacity greater than 30,000 t per year. State-owned coal mines account for 80% of coal production capacity. In 2004, the per capita reserves of coal, oil, and natural gas in the PRC were 56%, 11%, and 0.4%, respectively, of the world's average.

4. Urban gas and heating demands have grown rapidly due to rising incomes, privatization of residential housing, and housing sector growth. As incomes increase, people living in the cold northern provinces have demanded more and better heating. Central heating in terms of square meters (m²) recorded an annual growth rate of 16% between 1992 and 2004. Nationwide, residential buildings account for about 70% of the total space heating, with commercial and public buildings accounting for the remaining 30%. Heating demand in IMAR has also grown rapidly during the past decade. In the PRC, over 60 million t of coal are burned by 500,000

¹ Based on a study by the Policy Research Center for Environment and Economy of the State Environmental Protection Administration.

small, inefficient, coal-fired heating boilers every year, resulting in the emission of substantial amounts of SO₂, CO₂, nitrogen oxide (NO_x), and total suspended particulates (TSP). The majority of urban heating supply in IMAR comes from 5,000 of these small boilers, creating severe air pollution problems in urban areas.

5. Municipal wastewater is a major contributor to pollution of the PRC's rivers and lakes. For many PRC areas, in the absence of a centralized municipal wastewater treatment plant, mixtures of raw municipal wastewater and partially treated industrial wastewater are discharged directly to the nearest body of water. According to water quality standards, surface water sources serving municipal water supply systems are polluted to unacceptable levels. In 2004, municipal sources generated 65% of the country's estimated 46 billion m³ of wastewater; industrial sources generated 35%. Effective municipal wastewater treatment is still in its early stages, with only about 40% of municipal wastewater treated. Although about 90% of industrial wastewater is treated, much of it meets only low effluent standards before discharge. Similarly, about 44% of wastewater in IMAR was treated in 2004; the rest was discharged untreated, mainly into the Yellow River and Wuliangsu Lake, affecting downstream water quality.

B. Analysis of Key Problems and Opportunities

1. Key Problems and Constraints

6. IMAR has a population of about 24 million, with 26% living in urban areas. As one of the 12 western provinces, its economic development has been relatively slow. In 2004, the average per capita GDP in IMAR was CNY11,305, slightly higher than the national average of CNY10,561. Of IMAR's 101 counties, 31 are national poverty counties and 29 are provincial poverty counties. IMAR's GDP increased 8% annually in real terms between 1990 and 1995, and 12% between 1996 and 2004. Recent rapid economic growth has led to the worsening trend of environmental pollution and ecosystem degradation, particularly air and water quality in all major areas (including the eight project areas). Water shortage has become a major constraint of IMAR's economic development. Recent improved economic performance will not be sustainable if the government of IMAR (GIMAR) does not immediately react to the worsening trend of air and water pollution.

7. Continued strong economic growth in IMAR, combined with a significant increase in urban housing construction, has resulted in gas, heating, and water demand outpacing supply. Concerns are growing about ensuring sufficient gas, heating, and water supply for the urban poor. The adverse effects of urban poverty are often compounded by environmental pollution from energy and water sources at the household level. The gas, heating, and water distribution systems are usually badly functioning or absent in the poorer sections of the city. The poor do not have the information, access, or funds for more efficient (less-polluting) equipment and fuels. Poorly maintained gas, heating, and water distribution systems increase the exposure of the poor to daily doses of pollutants, as well as to the risk of accidents. Indoor air pollution particularly puts women and children at risk.

8. In IMAR, SOEs have provided public utilities. They have low efficiency, low profitability and liquidity, and partly rely on local government support for their operations. The low efficiency of public utilities has resulted in substantial waste of energy and water resources, and environmental pollution and ecosystem degradation. The experience in IMAR and elsewhere in the PRC indicates that SOE supply of public utilities is not sustainable. The private sector needs to participate in public utilities to set benchmarks and improve efficiency. So far, the private sector has only very limited involvement in urban gas, heating, and water supply in IMAR. The present business environment and conditions of public utilities do not provide enough incentives to attract private investors because of (i) technical and/or institutional uncertainties involving

local government control over gas and heating distribution, (ii) poor fee collection because heating has traditionally been considered as part of the welfare system, (iii) lower profit margins due to the Government's policy for public utilities, (iv) difficulties in obtaining long-term loans due to low profitability and discrimination of the private sector by state-owned banks, and (v) lack of clear and transparent tariff setting and approval criteria and procedures.

2. Strategies of the Government and Asian Development Bank

9. One of GIMAR's main development objectives is to contain the worsening trend of environmental pollution and ecosystem degradation, and to improve the environment in areas. GIMAR's environmental strategy will focus on strengthening its control of pollutant discharge by issuing regulations and water standards, and improving monitoring and enforcement. Air quality in areas will be improved by substituting coal with gas where feasible, closing polluting small boilers for heating, and increasing the use of efficient technologies and management that minimize urban pollution. Wastewater treatment will be another area of GIMAR's development focus to provide clean water to its residents and alleviate water shortage.

10. The operational strategy of the Asian Development Bank (ADB) in the PRC aims to help the country achieve economic growth in an efficient, equitable, and sustainable manner. ADB's energy sector strategy includes (i) developing cleaner energy sources, (ii) renovating and retrofitting existing facilities to improve efficiency and reduce emissions, (iii) promoting the corporatization and commercialization of energy utilities, and (iv) supporting tariff reforms. This is complemented by ADB's strategy for the environment sector, which supports the use of economic, supply-side, and other measures to (i) ensure sustainable utilization of natural resources and promotion of market-based pricing, and (ii) encourage cost recovery and better environmental information disclosure. For wastewater treatment and the protection of water resources, ADB is focusing on (i) improving wastewater treatment and water supply services through investment on physical infrastructure, (ii) promoting improved corporate governance and commercial management to enhance the potential for future private sector involvement, (iii) improving cost recovery by strengthening tariff systems and structures, and (iv) ensuring water resource conservation and environmental protection by continuing support for legislative and regulatory provisions. By working to reduce emissions and protect water resources, the Project is consistent with and provides support for GIMAR's development objectives and ADB's energy, water, and environmental strategy.

3. Opportunities

11. IMAR has air pollution problems due to heavy reliance on coal as the primary fuel for industry and residential consumption, particularly urban heating supply provided by small and inefficient coal-fired heating boilers. In 2004, IMAR generated 0.75 billion m³ of wastewater—31% from industrial sources—only 44% of the total was treated. Demand for gas, heating, and water supply for domestic and industrial use in IMAR has been increasing, imposing great pressure on its limited resources. GIMAR considers that proper treatment of wastewater, and adequate gas and heating supply are essential to enhance the living standards and productivity of urban residents, protect energy and water resources, and sustain the current level of economic growth. GIMAR will improve air and water quality in all major areas (including the eight project areas) to meet the national air and water quality standards by 2010. To achieve this, GIMAR will issue and enforce stricter air and water quality standards. By addressing both air and water pollution, the Project will be a major part of this effort. The Project, by improving the efficiency and capacity of gas and heating supply systems, closing the existing 396 small heating boilers in the project area, providing wastewater treatment facilities to collect and treat more than 80% of urban wastewater in two project areas, and implementing tariff reforms to

encourage demand-side management, will help reduce air and water pollution in IMAR and conserve energy.

12. The affordability of the poor for gas, heating, and water services is a major concern in IMAR. For example, the average heating bill for a poor household living in a 40 m² apartment unit in IMAR is about CNY160/month during the 5-month heating season. In a typical poor household of four, the income at the poverty line is CNY520/household/month in Linhe, CNY600 in Wuhai, and CNY912 in Wulateqianqi. Thus, the heating bill represents a large portion of a poor household's monthly income (30.7% in Linhe, 26.7% in Wuhai, and 17.5% in Wulateqianqi). This creates a serious affordability problem for poor households with income at or below the city poverty lines. In the project area where the temperature in the winter can go as low as minus 25⁰ Celsius, insufficient heating supply will severely affect the quality of life and health of the poor. GIMAR is willing to make efforts to provide a certain level of urban living standards to address the growing concern of urban poverty, including improving infrastructure of public utilities and establishing social assistance programs. Cost savings resulting from the efficiency improvements of the Project will be passed on to the poor in the form of lower gas, heating, and water bills, and connection fee discounts. Other assistance programs will be designed to alleviate affordability problems.

13. Although private sector participation is a new phenomenon in public utilities in IMAR, it has demonstrated positive impacts in terms of better management and operational efficiency. Between now and 2020, IMAR will need substantial capital investments to meet rising gas, heating, and water demand. The resources of local governments and those provided by the central Government can only meet 20% to 25% of the investment requirement. GIMAR recognizes the importance of private sector participation in sustaining supply of public utilities and is willing to support private sector involvement by providing a guarantee for lower cost funding and by carrying out necessary reforms. With GIMAR support, the Project, by selecting Bayannur Municipality as a pilot, will directly support private sector participation by providing better project facilities, and removing barriers and creating an enabling environment through policy dialogue in tariff reform and institutional strengthening. The Project's institutional strengthening will address the issues of implementing capacity, full-cost recovery, and improvement of corporate governance.

14. The urban environmental improvement requires a comprehensive approach and GIMAR's willingness to make efforts to improve the urban environment will provide a supportive environment for implementing an environmental improvement project in IMAR. The project design takes into consideration problem and constraints analysis, lessons learned, and assessment of alternative approaches. The focus of policy dialogue was based on the findings of ADB missions, information provided by the Government, beneficiary consultations, discussions with other funding agencies, and recommendations of the feasibility reports and project preparatory technical assistance (TA) consultants.

4. Lessons Learned

15. ADB's experience in the PRC's energy sector has shown that projects are generally well planned and implemented smoothly. The overall implementation performance of ADB's energy portfolio is satisfactory. Compliance with covenants is generally acceptable, although greater efforts are required to implement policy-related covenants. Rigorous government screening of projects has had a positive impact. The project completion and project performance audit reports for energy projects indicate that overall they were implemented smoothly, and assess them all as generally successful. Recently, some ongoing energy projects in the PRC have experienced implementation delays relating to long internal approval processes, procurement issues, and large cost savings.

16. The project completion reports prepared for three ADB environment projects and the project performance evaluation reports for one of the environment projects revealed that the actual achievements of some heating supply components were lower than estimated at appraisal. This was due to several factors, such as lower demand for heating, insufficient heat source, unsuitable design for switching from coal to natural gas, and lower heat and power tariffs than anticipated at appraisal. Some projected industrial establishments either did not materialize or lacked the financial capacity to pay for heating services. Some heating components were canceled when no noticeable progress was made and after the implementation agencies realized that the projected market for steam and heat usage was overly optimistic. In addition, the design to switch these heating companies' fuel source from coal to natural gas would have seriously affected their financial viability and required large government subsidies. The lower heat and power tariffs coupled with lower achievements prevented the project entities from achieving good financial performance. Lessons learned from ADB's post-evaluation experience in wastewater treatment indicate that both supply and demand-side concerns must be integrated 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. The Project will ensure the viability and sustainability of gas, heating, and water supply by incorporating these lessons in project design, preparation, risk assessment, and implementation. Appendix 3 presents a summary of external assistance and lessons learned.

III. THE PROPOSED PROJECT

A. Impact and Outcome

17. The Project will improve the environment by reducing atmospheric and water pollution in IMAR. This will be achieved by establishing an efficient, safe, and reliable gas and heating supply to facilitate the closure of small coal-fired boilers, and wastewater treatment facilities to protect water resources, which will conserve energy and water resources in the project areas.

B. Outputs

18. The Project has four components: urban central heating supply; natural gas transmission and distribution; urban wastewater treatment; and institutional reform and corporate governance improvement. The feasibility studies and engineering design for the subcomponents were prepared by several design and engineering institutes in the PRC with experience and qualifications acceptable to ADB. The project preparatory TA consultants reviewed the feasibility study reports and other supplementary documents. They noted that their previous comments were reflected in the project design and were satisfied with the quality of the feasibility studies and engineering design.

19. **Component A: Urban Central Heating Supply.** Component A comprises eight subcomponents and will involve the installation of 21 large efficient coal-fired boilers, 138 heat exchange stations, and 87.6 kilometers (km) of heat supply pipelines to facilitate closure of 396 small inefficient coal-fired boilers. The subcomponents are listed in Table 1.

Table 1: Subcomponents under Component A

City		New Boilers		Heat Exchange Stations	Heat Supply Pipelines	Old Boilers Closure
		No.	(MW)	No.	km	No.
A.1	Dengkou	3 ^a	29x3	11	3.0	39
A.2	Hangjinhouqi	3	58x3	31	10.6	11
A.3	Linhe			31	36.2	58
A.4	Wuhai	4	64x2+29x2	22	10.7	112
A.5	Wulatehouqi	2	29x2	14	9.0	35
A.6	Wulateqianqi	3	29x3	9	9.8	64
A.7	Wulatezhongqi	2	29x2	8	3.0	20
A.8	Wuyuan	4 ^a	29x4	12	5.3	57
Total		21	766	138	87.6	396

No. = number; MW = megawatt; km = kilometer.

^a Circulating fluidized bed (CFB)-type boilers.

Source: Project Management Office.

20. **Component B: Natural Gas Transmission and Distribution.** Component B comprises two subcomponents: (i) the Changqing–Wuhai–Linhe natural gas transmission pipeline subcomponent will construct a 401 km pipeline across the region of Erdos, Wuhai, and Bayannur; and (ii) the natural gas distribution subcomponent will construct (a) natural gas distribution networks in eight areas (same as component A), and (b) one master compressed natural gas station in Linhe to supply compressed natural gas.

21. **Component C: City Wastewater Treatment.** Component C has two subcomponents: (i) the Wulatehouqi wastewater treatment plant and sewage network subcomponent will construct (a) a 6,000 t/day wastewater treatment plant, and (b) 13.2 km sewage piping network; and (ii) the Wulateqianqi wastewater treatment plant and sewage network subcomponent will construct (a) a 80,000 t/day wastewater plant to treat the city's wastewater and industrial wastewater, and (b) a 40.0 km sewage piping network and five pumping stations.

22. **Component D: Institutional Reform and Corporate Governance Improvement.** Institutional capacity and corporate governance aspects were assessed by the project preparatory TA consultants for each project implementing agency (PIA). Based on the assessment, the TA consultants developed an institutional reform action plan for each PIA, and a financial reform action plan to address cost reduction, bill collection, and financial capacity of the PIAs. Both institutional and financial action plans were discussed with and supported by the PIAs. To strengthen the PIAs' institutional and financial management capacity, component D comprises (i) institutional strengthening and training for implementing the institutional and financial reform action plans, (ii) assistance to the PIAs to implement the tariff and regulatory reforms, and (iii) development of options for private sector participation. The institutional reform will require separation of government functions from commercial management of the PIAs, and transforming the noncorporate PIAs into new corporate structures according to the PRC's Company Law. The financial reforms will assist all the PIAs to build capacity in cost reduction, bill collection, efficient accounting, and commercial management. The consultants under component D will also help the PIAs prepare tariff reform action plans in accordance with recommendations made by ADB's TA² for Pro-Poor Urban Heating Tariff Reforms.³ The TA formulated national pro-poor heating tariff guidelines and established the principles of an effective heating tariff collection mechanism. The consultants under component D will also study

² ADB. 2001. *Technical Assistance to the People's Republic of China for Pro-Poor Urban Heating Tariff Reforms*. Manila.

³ The Ministry of Construction was the executing agency for the TA. The TA's objective was to help the Government reform the urban heating sector and promote sustainable urban heating supply in the PRC by (i) formulating pro-poor national heating tariff guidelines, and (ii) establishing an effective heating tariff collection mechanism. The TA was completed in 2005.

options for private sector participation in the PIAs. The options developed and implemented will demonstrate how public utilities can be privatized without lowering the quality of utility supply. The Project will provide additional opportunities for ADB to address policy concerns and help create a supportive environment for private sector participation.

C. Special Features

23. Energy Efficiency Improvement and Energy Conservation. Energy conservation and efficient use of energy are of high priority in the 11th Five-Year Plan (2006–2010). ADB is actively supporting the PRC in both these areas. The Project will build large and efficient (above 80% combustion efficiency) heat boilers equipped with modern pollution control devices to facilitate the closure of 396 small coal-fired boilers. These existing small coal-fired boilers have low thermal efficiency in the range of 55% to 65%, and do not have adequate pollution control devices. In addition, the natural gas pipelines and urban gas distribution networks under the Project will provide cleaner fuel that has 25% higher efficiency than coal. Overall, the Project's gas and central heating supply components are expected to improve energy efficiency by 22%. The improvement will annually conserve energy equivalent to 340,000 t of standard coal from the central heating supply and 200,000 t from the gas supply.

24. Urban Heating Tariff Reforms. Heating tariff reforms are required to improve and sustain urban heating supply in IMAR. The current average heating tariff of about CNY15/m² for the heating season in IMAR is still lower than that of other provinces, but reflects supply cost in the project areas.⁴ Tariff reforms need to focus on the tariff structure and bill collection. At present, all of the urban heating tariffs are based on a simple fixed rate per square meter (e.g., CNY/m²) of the living area or floor area of buildings. Problems with the current heating tariff structure, payment, and collection systems include (i) the tariff structure does not encourage efficient use of heat; (ii) the enterprise-based tariff payment system is not market-oriented and causes difficulty in tariff collection and (iii) transparent criteria and methodologies for tariff setting and adjustment are lacking. In addition, the layout of the piping system in existing buildings makes disconnecting supply to delinquent customers difficult for the heating company. All new buildings in IMAR are required to follow new building codes and use energy-efficient building materials. Traditionally in IMAR, heating bills were paid by employers for their employees. In the mid-1990s, many SOEs became financially unviable and could not pay the heating bills for their employees. This caused tariff collection to drop to 50%, creating severe financial difficulties for the heating companies. Tariff collection improved to 70% in 2004 in the project areas and a further improvement to 95% is expected with the Project. To address these issues, GIMAR will implement the agreed heating tariff reforms in the project areas. The consultants under component D will help develop specific reform action plans for (i) installing radiator control valves in apartment units to encourage heat conservation, (ii) implementing a two-part heating tariff so that the variable charge will be based on actual heat consumption, (iii) installing heat-measuring devices in apartment units to support consumption-based billing systems, and (iv) training heating company staff on implementation of reform measures. After the reforms, consumers will have the ability to regulate the amount of heat that they consume, which is essential if tariff-based incentives for heat conservation, insulation installation, and heat loss reduction are to work.

25. Private Sector Participation. With the combined efforts of GIMAR and the ADB project team, the Project will establish private sector participation in central heating and wastewater treatment subsectors in IMAR. Bayannur municipality was selected as the pilot area to involve the private sector in public utilities. The Project will directly support five privately owned

⁴ The heating tariff of CNY15/m² in IMAR is lower than about CNY19.5/m² in Xinjiang, CNY20/m² in Heilongjiang, and CNY24/m² in Beijing.

companies in central heating supply and wastewater treatment to upgrade and expand heating supply services and provide wastewater treatment facilities. Through policy dialogue and other reform measures, an enabling environment for private sector participation will be created by reducing institutional uncertainties, improving fee collection, and promoting transparent tariff setting. The five private heating companies involved expect to benefit from the Project in the areas of technology upgrade, institutional strengthening, and heating tariff reforms. For the local governments, the efficiency gains of the heating supply companies with the Project will be used to reduce the financial burden in subsidizing the poor and proper treatment of wastewater that was discharged untreated into the Yellow River. Further, a better managed heating subsector will reduce the efforts of local governments to ensure that their urban residents have sufficient heating. The Project will demonstrate that private sector participation in public utilities can be beneficial to all parties, and will catalyze private sector involvement in the heating and water subsectors in IMAR. The consultants under component D will identify options for future private sector participation in the rest of the project implementing companies.

26. **Benefits for the Poor.** In the project areas, heating bills currently account for 17.5% to 30.7% of the average monthly incomes of poor households. Although improving facilities and supply efficiency will preclude tariff increases, measures need to be taken to make gas and heating more affordable to the poor. GIMAR agreed to include two specific programs. The first will require the PIAs to provide gas and heating connection, and tariff discounts to the poor, based on the benefits of the cost savings arising from the 22% efficiency improvement and increasing bill collection to 95%. Each PIA has committed to share the benefits and extend the discount to the poor after satisfying the loan conditions. They estimate that 52,337 poor households will benefit: 22,971 from the discount on gas and heating supply connection fees, and 29,366 from the discount on gas and heating bills. This will result in an annual benefit of CNY10.2 million in connection fees, and CNY26.8 million in discounts on gas and heating bills; representing about 1.8% of the total revenue of the gas and heating companies after the Project is completed. The second program requires the county governments to establish a heating assistance fund for the poor. It will be included in the annual county budget and the funding level will not be dependent on budget availability. The county government subsidies through the heating assistance fund will be designed so that average heating expenses do not exceed 5% of a poor household's monthly expenditure.

27. The experience from the ongoing TA, Heating Supply for Urban Poor in Liaoning Province,⁵ will also help GIMAR implement pro-poor national heating tariff guidelines and improve tariff collection; design heating assistance programs for the poor; and develop an effective provincial and local monitoring, supervision, and evaluation systems. To make heating affordable, about CNY13.4 million will be provided through the heating assistance fund. If the first program from the PIAs has a shortfall due to a delay in realizing project benefits, the city governments will increase the contribution to cover the gap. These assistance programs are consistent with ADB policy that tariff subsidies to the poor be transparent and explicit, and funded by the government budget; separating the welfare objective from the commercial management of public utilities.

D. Project Investment Plan

28. The project investment cost is estimated at \$330.4 million equivalent, including physical and price contingencies, and financial charges during development (Table 2 and Appendix 4). The foreign exchange costs are \$135.3 million, or about 41%.

⁵ ADB. 2004. *Technical Assistance to the People's Republic of China for Heating Supply for Urban Poor in Liaoning Province*. Manila.

Table 2: Project Investment Plan
(\$ million)

Item	Total ^a
I. Base Cost	
A. Urban Central Heating Component	145.48
A1. Dengkou Central Heating Supply	9.71
A2. Hangjinhouqi Central Heating Supply	24.71
A3. Linhe Central Heating Supply	21.49
A4. Wuhai City Central Heating Supply	47.07
A5. Wulatehouqi Central Heating Supply	9.79
A6. Wulateqianqi Central Heating Supply	10.89
A7. Wulatezhongqi Central Heating Supply	7.06
A8. Wuyuan Central Heating Supply	14.75
B. Natural Gas Transmission and Distribution	88.80
B1. Chang-Wu-Lin Gas Transmission	49.36
B2. Gas Distribution and CNG Station	39.44
C. City Wastewater Treatment Component	23.56
C1. Wulatehouqi Wastewater Treatment	5.30
C2. Wulateqianqi Wastewater Treatment	18.26
D. Institutional Reform and Corporate Governance Improvement	0.60
Subtotal (I)	258.41
II. Contingencies^b	
Physical	25.84
Price	8.53
III. Finance Charges during Implementation^c	37.61
Total	330.40

CNG = compressed natural gas.

^a Based on an exchange rate of \$1 = CNY8.11.

^b Physical contingencies are assumed to be 10% of base cost, while price contingencies were computed to be the sum of base cost plus physical contingency multiplied by the inflation rate.

^c Interest during construction was computed based on the estimated annual loan releases multiplied by the 5-year LIBOR swap rate, plus provision for ADB's spread. A commitment fee of 0.75% of the unreleased portion of the ADB loan was included.

Note: Totals and subtotals may not add up due to rounding.

Source: Estimates of project implementing agencies and Asian Development Bank.

E. Financing Plan

29. The Government has requested a loan of \$120.0 million (36.3% of the total project cost) from ADB's ordinary capital resources to help finance the Project. The loan will have a 25-year term including a grace period of 5 years, an interest rate determined in accordance with ADB's London interbank offered rate (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. These finance charges during construction will be financed from ADB loan. The Government has provided ADB with (i) the reasons for its decision to borrow under ADB's LIBOR-based lending facility on the basis of these terms and conditions, and (ii) an undertaking that these choices were its own independent decision and not made in reliance on any communication or advice from ADB. The balance of the project cost will be financed by the PIAs through equity of \$175.44 million (53.1%) and domestic loans of \$34.97 million (10.6%). The loan from local banks will have a repayment period of 5 to 10 years, including a grace period of 1 to 2 years, and an interest rate of 6.5%. The Borrower will be the PRC, which will make the proceeds of the loan available to GIMAR on the same terms and conditions as those of the ADB loan. These proceeds will in turn be onlent, in succession and on the same terms and conditions as the ADB loan, to the municipalities of Bayannur and Wuhai; the counties of Linhe, Dengkou, Hangjinhouqi, Wuyuan, Wulatehouqi, Wulateqianqi, and Wulatezhongqi; and to the PIAs. The PIAs will assume the foreign exchange and interest variation risks of the loan. The Borrower and GIMAR have assured that counterpart funding will be provided to meet the requirements of the Project. Table 3 provides the financing plan for the Project.

Table 3: Financing Plan
(\$ million)

Source	Equity and Domestic Loan	ADB Loan	%
Project Implementation Agency	175.44		53.1
Inner Mongolia Western Natural Gas Limited	55.77	45.45	
Inner Mongolia Saiwaixing Huazhang Paper Limited	18.84	13.96	
Wulatehouqi Water Company	3.52	2.63	
Bayannur Fuyuan Shiye Group Limited	30.72	23.59	
Wulatehouqi Huibao Thermal Limited	6.45	5.14	
Wuhai Thermal Company	41.51	13.02	
Inner Mongolia Haosheng Thermal Limited	14.88	12.57	
Wulatezhongqi Dagong Thermal Limited	3.74	3.64	
Loans			
Asian Development Bank		120.00	36.3
Local Banks	34.97		10.6
Total	210.40	120.00	100.00

^a Based on an exchange rate of \$1 = CNY8.11.

Note: Totals and subtotals may not add up due to rounding.

Source: Estimates of project implementing agencies and Asian Development Bank.

F. Implementation Arrangements

30. **Project Management.** GIMAR will be the Executing Agency for the Project. The subcomponents will be implemented by various PIAs. A project management office (PMO) will be responsible for managing, coordinating, and supervising implementation of all project subcomponents. Each PIA will establish a project implementation office to be directly responsible for design, construction, and operation of subprojects. Based on an assessment of GIMAR's management expertise and its extensive experience in World Bank and other bilateral projects, GIMAR shows the capability to implement this Project and demonstrates strong commitment for the Project.

31. **Implementation Period.** Construction of the project facilities is expected to take place over 4.5 years beginning in August 2006, and project components to be completed by 30 June 2011. Site preparation for some heating facilities has been completed; the routing of the transmission and distribution pipelines and the location of the related facilities has been finalized. The project implementation schedule is in Appendix 5.

32. **Procurement.** All goods and works under the Project to be wholly or partly financed by ADB will be procured in accordance with ADB's *Procurement Guidelines*. Based on the implementation schedule, a procurement plan was prepared. Civil works contracts costing \$10 million or more and each supply contract costing \$1 million or more financed by ADB will be procured through international competitive bidding (ICB) procedures using ADB's standard bidding documents. Other supply contract packages costing less than \$1 million will be procured either using national competitive bidding (NCB), or in exceptional circumstances with the prior approval of ADB, limited international bidding (LIB) procedures. Supply contract packages costing less than \$100,000 will be procured using shopping procedures. Civil works contracts costing less than \$10 million will be procured through NCB. All locally financed items will be procured using procedures acceptable to ADB. Project design, construction supervision, quality control, and contract management will be performed in accordance with national standards acceptable to ADB and internationally accepted practices. Bidding documents will require disclosure of the risks of sexually transmitted diseases in health and safety programs. Equal job opportunities will be accorded to men and women. The procurement plan listing the packages and their modes of procurement is in Appendix 6.

33. **Consulting Services.** International and national consultants financed under the loan will be recruited in accordance with ADB's *Guidelines on the Use of Consultants* using the quality and cost-based selection method with simplified technical proposal. For project implementation supervision, about 12 person-months of international and 76 person-months of national consulting services⁶ will be engaged to assist GIMAR and the PIAs with (i) project design and engineering, (ii) procurement, (iii) construction supervision related to equipment and materials procured under ADB financing, (iv) project management, (v) impact monitoring and assistance to prepare all required reports to ADB and GIMAR. International and national consultants will also be recruited for the institutional reform and the corporate governance improvement subcomponent, which includes institutional and tariff reforms, and corporate governance improvement and related training. About 9 person-months of international consulting services and 53 person-months of national consulting services are expected to be required. Some national consultants will be engaged by the PMO and the project implementation offices for site supervision and various tasks relating to project implementation. They will have qualifications and experience acceptable to ADB. GIMAR was informed of the selection procedures of the quality and cost-based selection method.

34. **Disbursement Arrangements.** The loan proceeds will be withdrawn in accordance with ADB's standard disbursement procedures. To facilitate disbursement of numerous small expenditures, GIMAR will set up an imprest account after loan effectiveness in accordance with ADB's *Loan Disbursement Handbook* (January 2001). Disbursements from the imprest account will be supported by appropriate withdrawal applications and related documentation. Such documentation will demonstrate, among other things, that the goods and/or services are produced in and procured from ADB members, and eligible for ADB financing. The initial amount to be deposited into the imprest account will not exceed 6 months of estimated expenditures, or \$5.0 million, whichever is lower. The statement of expenditures procedure may be used for reimbursement of eligible expenditures. Individual payments to be reimbursed or liquidated under the procedure will not exceed \$200,000.

35. **Advance Procurement Action and Retroactive Financing.** In January 2006, the PMO started recruitment of the implementation consultants and procurement agents to prepare bid documents. In view of the advanced stage of project preparation, ADB management approved GIMAR's request for advance procurement action, which includes recruitment of consultants and procurement of goods and civil works, and the request for retroactive financing of eligible expenditures up to \$12.0 million (equivalent to 10% of the ADB loan) incurred prior to loan effectiveness but not earlier than 1 June 2006, or a maximum of 12 months prior to the date of the loan agreement, whichever is later. The Government was advised that ADB approval of advance procurement action⁷ and retroactive financing does not in any way commit ADB to approve the proposed loan. Contracts proposed for retroactive financing will be undertaken in accordance with ADB's *Procurement Guidelines* and *Guidelines on the Use of Consultants*.

36. **Accounting, Auditing, and Reporting.** The accounting, auditing, and reporting systems and procedures for the Project will be in accordance with the *Guidelines for the Financial Governance and Management of Investment Projects Financed by ADB*. Each PIA will maintain separate accounts of their operations and of the Project, and submit through the PMO to ADB audited project accounts and agency financial statements in English not later than 6 months after the end of the financial year. The Government, GIMAR, and the PIAs have been informed about ADB's policy on submission of audited financial statements and possible penalties for delays in submission. The submitted audited project accounts and agency financial statements should be of acceptable quality and be prepared in accordance with internationally

⁶ About 20 person-months of national consulting services under the implementation supervision will be provided to develop benchmarks and indicators for the economic, social, and environmental impact of the Project.

⁷ The advance action was published in *ADB Business Opportunities* on 24 March 2006.

accepted accounting standards. Financial statements with adverse opinions or disclaimers from auditors are considered unacceptable and cannot be submitted for this purpose. GIMAR and the PIAs, through the PMO, will also submit to ADB reports and information concerning the use of the loan proceeds, project implementation, and the performance of each PIA. The reports will include (i) quarterly progress reports on project implementation, and (ii) a project completion report not later than 3 months after completion of the project facilities. The PIAs will engage auditing firms with experience and qualifications acceptable to ADB to carry out the annual audits.

37. **Anticorruption Measures.** ADB's anticorruption policy⁸ was explained to and discussed with the PRC Government and GIMAR. Consistent with its commitment to good governance, accountability, and transparency, ADB reserves the right to investigate, directly or through its agents, any alleged corrupt, fraudulent, collusive, or coercive practices relating to the Project. To support these efforts, relevant provisions of ADB's anticorruption policy are included in the loan regulations and the bidding documents for the Project. In particular, all contracts financed by ADB in connection with the Project will include provisions specifying the right of ADB to audit and examine the records and accounts of GIMAR and all contractors, suppliers, consultants, and other service providers as they relate to the Project. The relevant sections of ADB's anticorruption policy will be included in all documents and contracts during bidding and implementation of the Project. Items financed by the PIAs with local currency funds will be procured following bidding procedures acceptable to ADB. For the Project, GIMAR will take the following anticorruption actions: (i) involve full-time officials from the Finance Bureau of IMAR in the supervision of bidding, construction, and operations; and (ii) carry out periodic inspections of the contractors' activities related to fund withdrawals and settlements.

38. **Project Performance Monitoring and Evaluation.** A project performance management system (PPMS) was developed by the project preparatory TA consultants and agreed to by GIMAR. The PPMS includes a set of measurable indicators based on the project design, impacts, and risks. The macroeconomic and sector performance, institutional capacity, and reforms were taken into account in designing the monitoring indicators. The indicators cover environmental impacts, and social and poverty impacts. The major indicators are presented in the design and monitoring framework. In addition, a feedback and reporting mechanism for effective project implementation and initial startup activities, including a baseline survey based on a random household sample to be monitored with follow-up surveys, was included in the PPMS. Each PIA will establish an environmental and resettlement management unit to coordinate environmental and resettlement management issues associated with the contract packages, and during construction and operation. GIMAR will engage an independent domestic agency to monitor implementation of the resettlement plan and prepare evaluation reports. The implementation supervision consultants will include an impact monitoring unit (an independent domestic agency) with 20 person-months of national consulting services to develop benchmarks and indicators for the economic, social, and environmental impact of the Project. During implementation, the implementation consultants and the impact monitoring unit will help GIMAR to monitor project impacts, and GIMAR and the PIAs will keep ADB informed of implementation progress with the environmental management plan (EMP) and resettlement plan through quarterly progress reports. Annual reports on achievement of resettlement, environmental, and social objectives will be submitted to ADB during project implementation and on completion. A longer term monitoring plan after project completion, including an effective monitoring and evaluation system, will be developed by the impact monitoring unit and implemented by GIMAR. The monitoring and evaluation system will include specific and measurable targets, and identify key risks and institutional arrangements for effective monitoring. The implementation consultants will also provide the necessary training on monitoring.

⁸ ADB. 1998. *Anticorruption*. Manila.

39. **Project Midterm Review.** Two years after loan effectiveness, ADB, GIMAR, and the PIAs will carry out a midterm review of the Project, covering all institutional, administrative, organizational, technical, environmental, social, poverty reduction, resettlement, economic, financial, and other relevant aspects that may have an impact on the performance of the Project and its continuing viability. The review will examine progress in sector reforms, and evaluate development and poverty impact, and compliance with assurances in the loan agreement. The review shall also undertake a comprehensive review of potential Loan savings, identify areas for reallocation of Loan proceeds, and change disbursement percentages, as appropriate.

IV. PROJECT BENEFITS, IMPACTS, ASSUMPTIONS, AND RISKS

40. Project preparation included economic, financial, environmental, and social assessments. The integrated benefits and impacts are expected to outweigh the costs.

A. Economic Analysis

41. Risks associated with the demand forecasts for the Project are minimal as the Project will provide gas, heating, and wastewater treatment mainly to meet the existing demand and a small share of incremental demand. The gas distribution component will meet only a small share of the total incremental demand for gas in the project areas. The city central heating supply component will replace small boilers to meet the existing heating demand and a small portion of incremental demand. A least-cost analysis was performed for each of the three categories of outputs by the Project, including (i) utilization of natural gas for industrial and residential consumption, (ii) central heating supply, and (iii) wastewater treatment. For specific industries and household cooking and water heating in the project areas, the analysis indicates that natural gas is the least-cost option. The large-size centralized boilers proposed under the Project for central heating supplies are the least-cost options. For wastewater treatment plants, considering the technical infeasibility of small-scale, individually installed wastewater treatment equipment, and the nonexistence of sewer systems between project areas and central sewage treatment plants, the analysis concluded that on-site sewage treatment plants provide the least cost option.

42. The economic internal rate of return (EIRR) was calculated for each project subcomponent and for the whole Project (Appendix 7). As in the least-cost analysis, the economic analysis applied the conversion factors to investment cost for land,⁹ cost of equipment fuel, and operation and maintenance costs where applicable. The benefits of output were valued based on the cost saving of alternative fuels and efficiency improvement. The cost-saving benefits were valued as the cost differences of the supply options with and without the Project. A survey was carried out to determine the appropriate supply options for each category of consumer. Local environmental benefits were taken into account in the EIRR calculation. Line losses are based on the statistics of historical line-loss rates in each project area.

43. The economic evaluation of the environmental impacts of the Project is based on the benefits transfer method. The evaluation used (i) the methodology adopted in ADB's *Economic Evaluation of Environmental Impacts: A Workbook* (1996) to determine the adjusted estimate of the monetary damages caused by air pollution during the study period, taking into account the location of the pollution sources, emission level, and population affected; and (ii) estimates of average annual climate change for carbon emissions to evaluate the monetary damage caused by greenhouse gas emissions. The economic evaluation of the environmental impacts of the

⁹ Land is valued at the economic opportunity cost (the estimated value of the best alternative utilization).

wastewater projects is based on the criterion of collecting fees for wastewater in IMAR.¹⁰ The EIRRs presented in Table 4 include only the local environmental benefits. If the global environmental benefits are added to the project benefits, the EIRR for the whole Project would increase to 22.6%.

44. The summary results of the EIRR calculation presented in Table 4 reflect all project-related costs, the benefits from cost savings of alternative fuels and efficiency improvement, and local environmental benefits. The EIRR calculation is a conservative approach, as it takes into account only the main benefits of different components but includes all project-related costs. This approach yields EIRRs ranging from 10.0% to 25.9% without and 14.0% to 40.0% with the local environmental benefits for the project subcomponents. For the whole Project, the EIRR will be 17.6% without and 21.4% with the local environmental benefits. Sensitivity analyses were performed for each subcomponent. For the EIRR of the whole Project, sensitivity analyses show the EIRR (with local environmental benefits) would decrease to (i) 17.6% if the Project experiences a cost overrun of 20%; (ii) 12.5% if the benefits are reduced by 20%; (iii) 15.0% if the Project experiences a commissioning delay of 1 year; and (iv) 6.4% if (i), (ii), and (iii) all were to happen.

Table 4: Summary of Economic Internal Rate of Return

Subcomponent	(%)	
	EIRR without Environment Benefits	EIRR with Local Environment Benefits
Dengkou Central Heating Supply	22.1	26.4
Hangjinhouqi Central Heating Supply	12.8	17.9
Linhe Central Heating Supply	10.0	14.0
Wuhai Central Heating Supply	11.0	15.0
Wulatehouqi Central Heating Supply	16.5	21.8
Wulateqianqi Central Heating Supply	17.9	23.7
Wulatezhongqi Central Heating Supply	14.3	20.1
Wuyuan Central Heating Supply	15.8	19.3
Chang-Wu-Lin Gas Transmission	20.4	20.4
Gas Distribution and Station	15.4	16.8
Wulatehouqi Wastewater Treatment	25.9	40.0
Wulateqianqi Wastewater Treatment	12.5	21.2
The Whole Project	17.6	21.4

EIRR = economic internal rate of return.

Source: Asian Development Bank estimates.

B. Financial Analysis and Projections

45. The natural gas component will be implemented by Inner Mongolia Western Natural Gas Ltd, a limited liability shareholding SOE. The company was formed in 2002 and its first phase of the gas pipeline was completed in 2004. The wastewater subcomponents in Wulateqianqi and Wulatehouqi will be implemented by Inner Mongolia Saiwaixing Huazhang Paper Ltd. and Wulatehouqi Water Company, respectively. The central heating component will be implemented by six different PIAs, including Inner Mongolia Saiwaixing Huazhang Paper Ltd. in Wulateqianqi; Bayannur Fuyan Shiye Group Ltd. in Linhe, Wuyuan, and Dengkou; Wuhai Thermal Company in Wuhai City; Wulatezhongqi Dagong Thermal Ltd. in Wulatezhongqi; Wulatehouqi Huibao Thermal Ltd. in Wulatehouqi; and Inner Mongolia Haosheng Thermal Ltd. in Hangjinhouqi. All the PIAs follow the accounting system prescribed by PRC law and regulations, which is being aligned with international financial reporting standards. An external auditor acceptable to ADB will be selected during the appraisal to audit the project and company financial statements.

¹⁰ This methodology was adopted in ADB. 2000. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to the People's Republic of China for the Tainjin Wastewater Treatment and Water Resources Protection Project*. Manila.

46. Summaries of the financial statements and projected financial performance of the PIAs are in Appendix 8. Differences exist among the PIAs due to corporate structure, size, age, and their core businesses. Inner Mongolia Saiwaixing Huazhang Paper Ltd., a private company, has good financial records. Two SOEs, Wuhai Thermal Power Company, Wulatehouqi Water Company, currently have low profitability and liquidity, and partly rely on local government support for their operations. These enterprises will have to take measures to reduce administrative costs and inefficiencies, and seek opportunities for privatization. Commercial operations of the gas pipeline of Inner Mongolia Western Natural Gas Ltd. only started in 2005; its financial performance is expected to be good based on its financial projections. Inner Mongolia Haosheng Thermal Company Ltd., Wulatehouqi Huibao Thermal Company Ltd., and Wulatezhongqi Dagong Thermal Company Ltd., are newly formed companies to implement central heating subcomponents. ADB's investment and institutional strengthening in gas and central heating supply will address concerns regarding high distribution losses, closure of inefficient small boilers, and poor bill collection. The PIAs must pay close attention to problems relating to productivity, operational inefficiencies, and improvement in bill collection to ensure project sustainability. The local governments have been supportive of tariff adjustments because of concerns for inefficient small boilers that pollute the environment, and for security of fuel supply. The PIAs will implement the financial reform action plans developed by the TA consultants with the help of the consultants under component D. Regular ADB review missions will closely monitor financial performance of the PIAs.

47. The financial viability of the subcomponents will be ensured by revenue enhancement and cost reduction measures, including implementation of a two-part heating tariff. The financial internal rates of return (FIRRs) of the subcomponents range from 6.7% to 8.4% (Table 5) and compare favorably with the respective estimated weighted average costs of capital ranging from 3.3% to 4.0% (Appendix 9). The FIRR (Table A9.2) for the whole Project is estimated at 7.7%, which also compares favorably with the weighted average cost of capital for the entire Project calculated on an after-tax basis at 3.9%. The Project is considered both financially viable and sustainable. Sensitivity analysis (Tables A9.1 and A9.3) shows that the FIRR for the whole Project would decrease to (i) 6.6% if the Project experiences a capital cost overrun of 10%, (ii) 6.7% with a 10% operating cost overrun, (iii) 5.2% if the benefits are reduced by 10%, (iv) 7.3% if the Project experiences a commissioning delay of 1 year, and (v) 2.9% if all four happen.

Table 5: Summary of Financial Internal Rates of Return and Weighted Average Cost of Capital
(%)

Subcomponent	FIRR	WACC
Dengkou Central Heating Supply	6.7	4.0
Hangjinhouqi Heating Supply	7.3	3.6
Linhe Central Heating Supply	7.1	4.0
Wuhai Central Heating Supply	8.4	4.4
Wulatehouqi Heating Supply	8.2	4.0
Wulateqianqi Heating Supply	7.6	4.0
Wulatezhongqi Heating Supply	7.5	3.5
Wuyuan Heating Supply	7.6	4.0
Chang-Wu-Lin Gas Transmission	7.9	3.7
Gas Distribution and Station	7.9	3.6
Wulatehouqi Wastewater Treatment	6.7	4.0
Wulateqianqi Wastewater Treatment	7.3	3.3
The Overall Project	7.7	3.9

FIRR = financial internal rate of return, WACC = weighted average cost of capital.

Source: Asian Development Bank estimates.

C. Environmental Benefits and Impacts

48. The Project is classified as environment category B (sensitive). The methodology and results of quantifying project environmental benefits are presented in Appendix 10. The Project has substantial environmental benefits resulting from energy efficiency improvements, reduction in emissions from coal burning, and reduction of pollutant discharge into the Yellow River and Wuliangsu Lake. Potential adverse impacts assessed during project preparation are temporary and localized during construction. According to the EMP, the PIAs will implement prudent construction management practices to minimize any construction impacts. The PIAs will be responsible for environmental management during project operation. The ADB review missions and the project implementation consultants will monitor and ensure implementation of these mitigating measures to minimize impacts during construction.

49. Provincial and local environmental protection bureaus are expanding public information programs, mainly via websites, newspapers, television, and radio.¹¹ Improved environmental disclosure is expected to facilitate environmental management measures included in the Project. In principle, ADB supports the expanded public information programs, including the environmental performance rating pilot project tested in Nanjing and other PRC areas during the past 3 years. Local environmental protection bureaus in IMAR will expand their public disclosure activities. GIMAR will ensure that any adverse environmental impacts arising from the construction and operation of the project facilities will be minimized by implementing the mitigation measures as identified in the initial environmental examination (IEE) and summary IEE.¹² The EMP prepared by GIMAR is summarized in the IEE; it covers all phases of project implementation from construction to operation.

50. The IEE concludes that the Project will provide significant benefits for the environment in the project area. Regional air quality will improve with closure of small coal-fired boilers, more efficient gas distribution systems, and reduction in coal use because of more efficient boilers. The environmental benefits from the Project include annual coal savings of 540,000 t, and an annual emission reduction of total suspended particulates of 19,136 t, SO₂ of 15,105 t, NO_x of 2,272 t, and greenhouse gas of CO₂ equivalent of 787,243 t. The wastewater treatment component will lead to annual discharge reduction of 14,126 t of chemical oxygen demand, 5,738 t of biological oxygen demand, 7,600 t of suspended solids, 898 t of ammonia nitrogen, 1,234 t of total nitrogen, and 88 t of total phosphorus. Water and soil pollution will be indirectly reduced due to lower rates of pollutant transfer from air to water, with reduced stress on local ecosystems. The quantifiable local environmental benefits over the project life are expected to be about CNY52.2 million in net present value at 2004 prices. The global environmental benefits of greenhouse gas reduction (CO₂) are expected to be about CNY43 million in net present values at 2004 prices. Unquantifiable environmental benefits, such as damage from the wastewater of small boilers and leaking gas, are also significant. The subcomponents will contribute to the water pollution control for the Yellow River and Wuliangsu Lake.

D. Social Benefits and Poverty Reduction

51. ADB commissioned a social and poverty impact assessment that included field interviews of the poor. Consultations were also held to gain an understanding of gender differences in the consumption pattern, needs, and priorities. During preparation of the assessment, various participatory techniques, such as household interviews, focus group

¹¹ The State Environmental Protection Agency has directed all areas to begin public awareness and disclosure programs by the end of 2004. Most areas in the PRC have mature public awareness programs; many have already initiated some type of expanded environmental information disclosure program.

¹² ADB. 2006. *Summary Initial Environmental Examination of the Inner Mongolia Autonomous Region Environmental Improvement Project in the People's Republic of China*. Manila.

discussions, socioeconomic survey of households, meetings with enterprises, and site reconnaissance, were used.¹³ Many government organizations were consulted as well. The poverty impacts of the Project are assessed by evaluating the expected distribution of net economic benefits to different groups. A summary poverty reduction and social strategy, presented in Appendix 11, summarizes measures to mitigate and enhance the impacts of the Project for the poor population. The approach only takes the direct project benefits into account in assessing poverty impact. The direct project benefits include (i) lower gas and heating tariffs due to more efficient supply, (ii) environmental benefits, and (iii) job creation associated with the Project.

52. An impact assessment for ethnic minorities in the project area was conducted in accordance with ADB's policy on indigenous peoples.¹⁴ The assessment indicates that most of the affected minorities are Mongolians. The people of Mongolian origin are equal with the Hans in land distribution, children's education, and politics where the two groups live together. Mongolians have their own special customs in religion, festivals, and house styles. The two ethnic groups have lived together peacefully for a long time. The social survey shows almost no difference in income level between Mongolians and Hans who are affected by the Project (net income per capita of Han and Mongolian nationality is CNY3,300 and CNY3,200, respectively).

53. The Project will directly benefit an urban population of about 2.2 million in the eight project beneficiary areas. Among these people, 0.96 million urban residents will benefit from the natural gas and central heating supply with the Project. An estimated 71,324 or 7.5% of the total urban beneficiaries are poor as measured by the various city poverty lines. The increased use of gas and better central heating supplies will reduce the use of conventional fuels such as raw coal, wood, and coal briquettes to mitigate environmental and health impacts, particularly on the poor.

54. The Project will create about 10,240 person-years of employment opportunities during construction and 1,412 full-time jobs during operation. Of the total, 4,090 person-years of employment opportunities will be filled by the poor, women, and minorities, with an estimated total of CNY44.2 million in wage payments during project construction. In addition, 565 employment opportunities with CNY6.1 million of annual wage payments are expected to go to the poor, women, and minorities during project operation. Local procurement of the materials required for the Project is expected to create additional jobs. The improved urban environment should enhance the local investment climate to attract more investment to the region and act as a catalyst for future development.

55. The improvement of air quality will reduce the morbidity and mortality rate of air-related diseases and associated medical costs, loss of working days, as well as human suffering in the project beneficiary areas. The poor, elderly, children, and women, who have less coping resources and are more vulnerable, will benefit greatly from the replacement of domestic use of coal and wood with gas and central heating. The wastewater treatment programs in Wulateqianqi and Wulatehouqi will reduce wastewater pollution and result in improved living conditions and socioeconomic environment in the two areas. A benefit distribution and poverty impact ratio analysis computed the poverty impact ratio of the Project (Appendix 12). The share of net project economic benefits directly accruing to the poor is estimated at 13.5%. Since the poverty impact ratio is substantially higher than the ratio of poverty population to total population in the project areas (7.5%), the Project is considered to be pro-poor.

¹³ A stratified random sampling based on income for 600 beneficiary households was conducted.

¹⁴ ADB. 1998. *The Bank's Policy on Indigenous Peoples*. Manila.

E. Land Acquisition and Resettlement

56. Permanent land acquisition for the Project includes 10.2 ha for gas transportation subcomponents, 33.36 ha for central heating subcomponents, and 7.69 ha for wastewater treatment subcomponents. The other subcomponents will result in a temporary disturbance to roads, and thus require compensation payments to government agencies for necessary arrangements and support during project implementation. A total of 133 farmers will be affected by permanent land acquisition: 20 by gas subcomponents, 102 by central heating subcomponents, and 11 by wastewater treatment subcomponents. An additional 175 people are estimated to be affected by temporary land occupation for an average of 90 days during project implementation. A socioeconomic survey of all affected households was conducted in September 2005. The impacts are minor and all those affected will receive cash compensation. To mitigate the impacts, compensation standards and a rehabilitation plan are proposed in the resettlement plan. A resettlement information booklet will be distributed to all affected households. A summary of the resettlement plan is presented in Appendix 13. GIMAR, the PMO, and the PIAs will ensure that all those affected are compensated in a timely manner and resettled in accordance with the plan. The PIAs will have additional consultations with those affected during project implementation. The estimated budget for resettlement compensation and rehabilitation is CNY26.95 million. GIMAR and the PIAs will ensure that all 784 workers affected by the closure of the small coal-fired boilers are reemployed in a timely manner and in accordance with the reemployment action plan prepared by the PIAs.

F. Assessment of Project Risks

57. A demand analysis was conducted to ensure sufficient demand for the gas, central heating, and water supplies generated by the Project. The risk of insufficient demand for the Project is minimal. The heating supply, wastewater treatment, and gas transmission and distribution improvement are to meet the existing demand and a small fraction of incremental demand in the project areas. The Project does not require a higher gas tariff as the current alternatives (mainly liquefied petroleum gas) have higher prices. The average heating tariff of CNY15/m² in IMAR reflects economic supply cost and is expected to increase mildly due to higher coal prices. The expected improvement in facility efficiency by about 22% and billing collection to 95% under the Project will improve the PIAs' financial performance without immediate heating tariff adjustments. Strong economic performance is expected in IMAR, based on the PRC's emphasis on the economic development of western regions and its large energy reserve.

58. The gas transmission and distribution, central heating supply systems, and wastewater treatment under the Project are based on proven designs and conventional technologies that have been used successfully in the PRC. No significant technical risks are anticipated. Precautions will be taken to minimize potential risks during project construction and operation. The risk of delay to loan effectiveness and construction due to late internal approvals and procurement is being addressed by GIMAR's approval of feasibility reports for all subcomponents in April 2006, starting recruitment of implementation consultants in January 2006, early preparation of bid documents in June 2006, and procurement training for all the PIAs in July 2006. The chance of large project cost savings will be minimal because of the recent upward trend in the prices of construction materials and a prudent cost estimate. GIMAR will mitigate the risk of inadequate project management by setting up the PMO with experienced professional staff who have had previous experience in design, construction supervision, and procurement. International and national consultants will also provide assistance in these areas. In addition, all of the PIAs will be subject to good governance supervision under the PPMS.

59. To fully assess the potential project risks, a probabilistic risk analysis was performed using the Monte Carlo simulation technique based on 3,000 simulations for both the EIRR and FIRR analyses.¹⁵ The crucial risk variables were selected because of their significant impact on the Project's economic and financial viability. The results indicate that the expected EIRR, based on the weighted average of all simulated combinations, is 17.8% or about 3.6% lower than the base-case value, without consideration of project risks. The probability of the EIRR falling below the cut-off rate of 12% is 7%. The economic risk is very low because the Project relies on existing demand, and benefits from efficiency improvements. The results indicate that the expected FIRR is 6.9%, about 0.8% lower than the base-case value, without consideration of project risks. The probability of the FIRR falling below the weighted average costs of capital for the Project of 3.9% is 11%.

60. Poverty is associated with vulnerability. The dimension of risk in poverty assessment is of significance since the poor are the most vulnerable to unexpected unfavorable events. The expected poverty impact ratio is 12.9%, 0.6% lower than the base-case value, without consideration of project risks, and still higher than the share of the poor in the project area. Even with pessimistic assumptions, the probability of a negative outcome for the poor is 4.3%. The risk analysis of the poverty impact ratio calculation, together with the analysis of the probability of overall project failure (risk analysis of the EIRRs and FIRRs), concludes that the probability of negative outcomes for the poor is minimal.

V. ASSURANCES

A. Specific Assurances

61. In addition to the standard assurances, the Government and GIMAR have given the following assurances, which are included in the legal documents:

- (i) **Closure of small coal-fired heat boilers.** GIMAR will ensure that the PIAs complete the closure of 396 small coal-fired heat boilers in the project areas in IMAR by 31 December 2009. GIMAR and the PIAs will ensure that all 784 workers affected by the closure of the small coal-fired heat boilers under the Project are reemployed in a timely manner and in accordance with the reemployment action plan so that they will be at least as well off as they would have been in the absence of the Project.
- (ii) **Implementation of heating tariff reforms.** GIMAR will cause the PIAs to progressively implement, at the city level, key heating tariff reforms including (a) installation of lock valves in individual apartment units in buildings to improve tariff collection; (b) installation of radiator control valves in apartment units in buildings to encourage heat conservation; (c) implementation of a two-part heating tariff structure that the variable charge shall be based on heat consumption; the overall heating tariff level should be cost-reflective and promote economic efficiency; (d) installation of heat measuring devices, at apartment level, to support consumption-based billing systems; and (e) conversion from enterprise-based tariff payment system to individual-based payment system.
- (iii) **Heating assistance to the poor.** GIMAR will ensure the PIAs will implement the pro-poor programs that provide heating tariff discounts to the poor based on the

¹⁵ The simulation was carried out using Risk Master computer software. Monte Carlo simulation works by generating a series of random numbers following the distribution of probability of each risk variable. For each simulation, which represents a combination of different states of risk variables, the EIRRs and FIRRs and poverty impact ratio are calculated and recorded. The results of 3,000 simulations are averaged.

cost savings from efficiency improvement under the Project. GIMAR will ensure the project areas will establish government-funded heating assistance programs to assist the poor and those with incomes marginally higher than the poverty level to pay heating bills.

- (iv) **Gas, heating, and water supply agreements.** GIMAR will cause the PIAs to sign and execute long-term gas, heating and water supply agreements with large prospective customers to ensure the demand of the gas and heating services.
- (v) **Financial performance of the PIAs.** In each fiscal year commencing from fiscal year 2007, the PIAs will be expected to maintain a debt-service coverage ratio of at least 1.4 times; and a current ratio of more than 1:1 by 2010 and thereafter, and a debt-equity ratio of not more than 70:30.
- (vi) **Change in ownership and operation.** In the event (a) of any change in ownership of the Project facilities or (b) any sale, transfer or assignment of shares or interest or other change of control in any PIA is anticipated, the PIAs, through GIMAR, will consult with ADB at least six months prior to the implementation of such change. Such change will be carried out in a lawful and transparent matter.
- (vii) **Institutional strengthening.** GIMAR will ensure that the PIAs will implement, in accordance with the implementation plan agreed upon between GIMAR and ADB, the agreed upon recommendations for financial and institutional strengthening made by the consultants under component D of the Project.
- (viii) **Environment.** GIMAR and the PIAs will ensure that the Project is constructed in accordance with national and local government environmental laws, regulations, procedures, and guidelines, as well as the ADB's policy on environment,¹⁶ and the environmental impact assessment. GIMAR and the PIAs will ensure that any adverse environmental impacts arising from the construction and operation of the project facilities will be minimized by implementing the mitigation measures in the EMP and the environmental monitoring plan. Environmental monitoring reports will be submitted to ADB twice annually for 2 years during the implementation period. The EMP (mitigation measures, monitoring plan, and institutional arrangements) will be updated during the engineering design stage, and be incorporated in the bidding documents and civil works contracts.
- (ix) **Land acquisition and resettlement.** GIMAR will ensure that land acquisition and resettlement are carried out promptly and efficiently following the resettlement plan agreed with ADB, in line with applicable laws and ADB's policy on involuntary resettlement.¹⁷ GIMAR will ensure that implementation of the resettlement plan is monitored and evaluated and reported to ADB as required in the plan.
- (x) **Monitoring and evaluation.** GIMAR will monitor and evaluate project impacts, with the assistance of consultants, as specified in the PPMS, to ensure that the project facilities are managed effectively and the benefits, particularly to the poor, are maximized. GIMAR will (i) engage consultants for monitoring and evaluation by December 2006; (ii) facilitate the data collection from local governments,

¹⁶ ADB. 2002. *Environment Policy*. Manila.

¹⁷ ADB. 1995. *Policy on Involuntary Resettlement*. Manila.

including local statistics offices, to measure the indicators in the PPMS during project implementation, at completion, and biennially, for 5 years thereafter, with the frequency as specified in the PPMS; and (iii) submit to ADB the reports summarizing the key findings.

B. Condition of Disbursement

62. Disbursement of the loan proceeds for each subcomponent of the Project will be conditional on the Government's certification, in form and substance satisfactory to ADB, that the applicable municipal government or county government, and the concerned PIA have executed and delivered the relevant PIA onlending agreement, which will include the terms and conditions as required in the Loan Agreement, and which has become effective and binding upon the parties thereto in accordance with its terms.

VI. RECOMMENDATION

63. 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 \$120,000,000 to the People's Republic of China for the Inner Mongolia Autonomous Region Environment Improvement Project from ADB's ordinary capital resources, with interest to be determined in accordance with ADB's London interbank offered rate (LIBOR)-based lending facility; a term 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

5 September 2006

DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
Impact Environmental improvement resulting from a reduction in atmospheric and water pollution	<p>Annual emission reduction of 787,243 t of CO₂, 15,105 t of SO₂, 2,272 t of NO_x, and 19,136 t of TSP in the project area</p> <p>Annual discharge reduction of 14,126 t of COD, 5,738 t of BOD, 7,600 t of SS, 898 t of NH₃-N, 1,234 t of TN, and 88 t of TP in the project area</p> <p>A total of about 30,000 poor households benefit from the gas and central heating supply connection and tariff discounts starting 2010</p>	<p>IMAR and project municipalities and counties statistical yearbooks</p>	Assumptions <ul style="list-style-type: none"> The Project is implemented as planned. Complementary reforms and activities are implemented. Major changes in macroeconomic condition do not affect gas and coal markets.
Outcome Efficient, safe, and reliable gas and heating supply and wastewater treatment systems that conserve energy and water resources in the project areas	<p>Reliable gas services to about 1 million urban population, with annual supply capacity of 434.5 million m³ of natural gas and 21.25 million m³ of CNG for residential, commercial, and industrial purposes in the project areas by 2010</p> <p>Reliable central heating services to about 1 million urban population, with a coverage area of 25.776 million m² and 826 MW heating supply capacity by 2009</p> <p>Closure of 396 small inefficient coal-fired boilers and an average 20% efficiency improvement in heating supply by 2009</p> <p>More than 85% of the household coal-fired stoves for heating and/or for cooking substituted by central heating and/or gas supply by 2010</p> <p>784 workers affected by the closure of 396 small boilers will be reemployed</p> <p>773.4 mu of land acquired</p>	<p>PPMS and PCR</p> <p>IMAR and project areas statistical yearbooks</p> <p>Reports and information provided by the PMO and the PIAs</p> <p>Implementation and impact monitoring by GIMAR and ADB</p> <p>Ex-post monitoring by GIMAR</p> <p>• Regular monitoring by an</p>	Assumptions <ul style="list-style-type: none"> GIMAR continues enforcing environmental standards Project implementation according to schedule Continued GIMAR effort in reforming the gas and heating sector Continued GIMAR effort in energy conservation and improvement of primary energy mix Complementary social services to the poor are in place Affected people are compensated and resettled in a timely manner Sufficient gas and heating demand The environmental management and mitigation plan is implemented People affected able to restore their living standard Risks <ul style="list-style-type: none"> Loan does not become effective in time due to domestic approval procedure Construction delayed due to internal approval procedure Compensation may not be paid according to the resettlement plan The institutional and

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
	<p>permanently and 9,801.8 mu occupied temporarily, affecting 133 people permanently and 177 people temporarily by 2009</p> <p>Daily wastewater treatment capacity increased by 86,000 m³ in Wulateqianqi and Wulatehouqi by 2009</p> <p>Treated water meets the national discharge standard and the 30 million t of the treated grey water recyclable annually by 2009</p> <p>Energy efficiency improves from 58% to 80% (by 22%) and energy conserved annually equivalent to 540,000 t of standard coal by 2010.</p>	<p>independent institute engaged by the PMO during land acquisition, at completion, and 1 year after</p>	<p>financial reform action plans are not implemented by the PIAs</p>
<p>Outputs</p> <p>1. Improved central heating systems in the project areas</p> <p>2. Provision of gas transmission and distribution systems in the project areas</p> <p>3. Enhanced wastewater treatment capacity in project areas</p> <p>4. Institutional strengthening and capacity building</p>	<p>A well-functioning central heating supply system in 8 project areas with 88 km of heating pipeline, 21 boilers, and 138 heating exchange stations by 2009; closure of 396 small coal-fired boilers by 2009</p> <p>Construction of a 401 km gas transmission trunk pipeline from Changqing to Linhe, including 7 transmission and 8 valve stations, and a 338 km urban gas distribution pipeline in 8 project areas including 1 CNG primary supply station, 3 CNG satellite filling stations, and 4 gas unloading stations by 2010</p> <p>Construction of 2 wastewater treatment plants, a 53 km sewer transmission pipeline, and 5 pumping stations by 2009</p> <p>An implementation plan developed by 2006 and implemented by 2009, and</p>	<p>Quarterly progress reports, PAMs, MTR, PPMS, and PCR</p> <p>Annual financial, operation, and performance reports of project companies</p> <p>Social, resettlement, and poverty monitoring report by implementation consultants</p> <p>Implementation and impact monitoring by GIMAR and ADB</p> <p>Compliance with ADB covenants</p> <p>Postevaluation monitoring by GIMAR</p>	<p>Assumptions</p> <ul style="list-style-type: none"> • Adequately staffed PMO and PIOs. • Sufficient counterpart funds • Project implemented according to schedule • Effective resettlement planning and monitoring • In-time procurement and quality equipment • Complementary social services to the poor in place • MOC, NDRC, and municipal/county price bureaus continue to implement urban gas and heating, and water sector reforms • Local government allocates sufficient budget for subsidizing heating tariffs for the poor • Cost savings from efficiency improvement are passed on to consumers. <p>Risks</p> <ul style="list-style-type: none"> • Loan covenants are not met during project implementation. • The recommendations made by the consultants are not implemented.

Design Summary	Performance Targets/Indicators	Data Sources/Reporting Mechanisms	Assumptions and Risks
	<p>95% of billing collection of PIAs by 2011</p> <p>The PIAs are profitable with a current ratio of at least 1:1, debt-equity ratio of not more than 70:30, and 1.4 times debt service ratio starting 2011</p>		<ul style="list-style-type: none"> Insufficient training for appropriate PMO staff
Activities with Milestones Output/Component A: <ol style="list-style-type: none"> Civil works: Contracts awarded by August 2006 and completed by December 2009 Materials and equipment: Procured by July 2008 Land acquisition: Completed by December 2008 Implementation consulting services: Consultants recruited by August 2006 and their works completed in June 2011 Project impact monitoring: Baseline data collected by February 2007 and monitoring and reporting starting in June 2007 Output/Component B: <ol style="list-style-type: none"> Civil works: Contracts awarded by September 2006 and completed by December 2010 Materials and equipment: Procured by July 2009 Land acquisition and resettlement: Resettlement completed by December 2008 Implementation consulting services: Consultants recruited by August 2006 and their works are completed in June 2011 Project impact monitoring: Baseline data collected by February 2007 and monitoring and reporting starting in June 2007 Output/Component C: <ol style="list-style-type: none"> Civil works: Contracts awarded by September 2006 and completed by December 2009 Materials and equipment: Procured by July 2008 Land acquisition and resettlement: Resettlement completed by December 2008 Implementation consulting services: Consultants recruited by August 2006 and their works completed in June 2011 Project impact monitoring: Baseline data collected by February 2007 and monitoring and reporting starting in June 2007 Output/Component D: <ol style="list-style-type: none"> Institutional strengthening: Consultants recruited by December 2006 and their works completed in December 2007 Tariff reforms: Action plan prepared by December 2007 and implemented before project completion Trainings: Training programs completed by December 2010 Project impact monitoring: Baseline data collected by February 2007 and monitoring and reporting starting in June 2007 			Inputs ADB: \$120.0 million <ul style="list-style-type: none"> Civil works: \$7.5 million Equipment: \$99.8 million Consulting Services: \$2.2 million Financing Charges: \$10.5 million Local Banks and PIAs: \$220.0 million <ul style="list-style-type: none"> Civil works: \$97.6 million Equipment: \$51.3 million Contingency: \$34.4 million Financing Charges: \$27.1 million

ADB = Asian Development Bank, BOD = biological oxygen demand, CNG = compressed natural gas, CO₂ = carbon dioxide, COD = chemical oxygen demand, GIMAR = Government of Inner Mongolia Autonomous Region, IA = implementing agency, IMAR = Inner Mongolia Autonomous Region, km = kilometer, LPG = liquefied petroleum gas, m³ = cubic meter, MW = megawatts (= 1,000,000 watts), MOC = Ministry of Construction, MTR = midterm review, NDRC = National Development and Reform Commission, NO_x = nitrogen oxides, PAM = project administration mission, PCR = project completion report, PIA = project implementing agency, PIOs = the project implementing office, PMO = the project management office, PPMS = project performance management system, PRC = People's Republic of China, SO₂ = sulphur dioxide, SS = suspended solids, t = tons, t/y = tons per year, TN = total nitrogen, TP = total phosphorus, TSP = total suspended particulates.

SECTOR AND SUBSECTOR ANALYSIS

A. Energy Sector and Environment

1. The People's Republic of China (PRC) has severe environmental problems, including air and water pollution associated with rapid economic growth, heavy reliance on coal as the major fuel, use of obsolete equipment, and inappropriate planning associated with a centrally planned economy. Estimates of economic losses caused by pollution range from 3.5% to 8.3% of gross domestic product (GDP). Pollution in the early 1990s resulted in annual economic losses of CNY99 billion (about 4% of GDP at the time), with air pollution accounting for 59%, water pollution 36%, and solid waste 5%.¹ The high economic losses reflect waste and inefficiency in the utilization of energy, raw materials, and water resources in the production of goods and services. This is partly a legacy of the past practice of locating industrial enterprises in urban centers, inappropriate regulatory measures, and pricing policies that did not provide adequate incentives for conservation and environment-friendly behavior. With rapid economic growth, the use of energy, raw materials, and water will continue to increase. Without introducing better technology, encouraging use of cleaner fuels, and increasing use of renewable energy, air and water quality will deteriorate and related economic losses will increase. The PRC's heavy reliance on coal as its primary fuel for industrial production, power generation, and commercial and residential applications—mainly heating and cooking, contributes significantly to emissions of sulfur dioxide (SO₂) and total suspended particulates (TSP), and high levels of urban air pollution. Air and water quality is poor in most of the PRC's industrial areas. Inner Mongolia Autonomous Region (IMAR) has air and water pollution problems due to heavy reliance on coal as the primary fuel for industries and residential consumption. Most urban heating is provided by small, inefficient, coal-fired heating boilers. These small boilers typically are not equipped with adequate pollution control devices, and are the major sources of air pollution in urban areas. Supplementary Appendix A provides additional information.

B. Coal Subsector

2. The PRC is the world's largest coal producer with 2004 production of 1,950 million tons (t) of raw coal accounting for 34% of the world's total coal production. Coal provides more than 75% of the energy for power generation, 65% of chemical raw materials, and more than 50% of commercial and civilian energy. Coal accounts for 95% of the nation's primary fossil energy resources. Coal will continue to be the primary energy fuel for the PRC, partly because of increasing thermal power capacity. Coal production was 1,400 million t in 1996. Gradually, as energy efficiency improved and other sources of energy developed, coal production declined to 1,000 million t in 2000. However it has been rapidly increasing since 2001. Coal production in IMAR totaled 72.5 million t in 2000, and increased to 203.3 million t in 2004. IMAR has over 1,258 active coal mines. State-owned coal mines account for 65% of coal production capacity.

C. Gas Utilization

3. In the PRC, three types of gas are distributed: manufactured town gas, natural gas, and liquefied petroleum gas. The development of the natural gas industry and city gas utilization has been rapid in recent years. In 2004, the reserve of natural gas was estimated at 47,000 billion cubic meters (m³). The proven reserve was 4,900 billion m³, and recoverable reserve 2,200 billion m³. Natural gas production and consumption were 40.8 billion m³ and 41.5 billion m³ respectively in 2004, which accounted for only about 3% of total primary energy production

¹ Based on a study by the Policy Research Center for Environment and Economy of the State Environmental Protection Administration.

and consumption in the PRC. Natural gas consumption in the PRC was substantially lower than the average level of 24.7% in the world in 2004. Most of the existing gas distribution systems are owned and operated by municipal gas companies controlled by city governments, and supervised by the national Ministry of Construction. Gas prices for end-use consumers were subsidized as a basic human need under the centrally planned system, but have recently been adjusted nearer to market prices. IMAR has 994 kilometers (km) of town gas distribution pipelines and 464 km of natural gas distribution pipelines. The most important end uses for gas are cooking, water heating, and to a lesser degree, space heating. The average gas price in IMAR, about CNY1.50/cubic meter (m^3) (heat value of 5,000 kilocalorie/ m^3), is comparable to the average of CNY2.10/ m^3 (heat value of 8,000 kilocalorie/ m^3) for other provinces in the PRC. The growing demand for city gas has been outpacing supply.

D. Urban Heating

4. Urban heating demand in the PRC has grown rapidly due to rising incomes, privatization of housing, and housing sector growth. In heated areas, demand increased by an annual average rate of 19.4% from 1996 to 2004. Urban heating demand grew rapidly during the past decade because of economic and housing growth, and housing reforms that promote private ownership. The total heated area of buildings in the PRC was only 734.3 million square meters (m^2) in 1996, but increased to 2,166.6 million m^2 in 2004. Residential buildings account for about 70% of the total space heating demand, and commercial and public buildings account for the remaining 30%. Only about 35% of total residential buildings were served by combined heat and power generation and/or urban central heating supply. The market penetration of central heating is relatively low, compared to the 55% to 60% range in developed European countries such as Denmark and Finland. About 500,000 small coal-fired heating boilers still operate in the PRC. The Government's policy promotes urban central heating supply systems using heat supplied from efficient, large, combined heat and power generation plants and/or large heating boilers. Similar to the national trend, heating demand in IMAR grew rapidly during the past 10 years. The total heated space grew at 18.7% per year, increasing from 32.18 million m^2 in 1996 to 92.15 million m^2 in 2004. IMAR's current average heating tariff of CNY15/ m^2 is lower than the CNY19.5/ m^2 in Xinjiang, CNY20/ m^2 in Heilongjiang, and CNY24/ m^2 in Beijing, but reflects IMAR supply cost.

E. Wastewater Treatment

5. In 2004, municipal sources generated 65% of the PRC's estimated 46 billion m^3 of wastewater; the industry sector generated 35% of the total. As the development of municipal wastewater treatment is still in the early stages, only 40% is treated. The rest is discharged untreated into rivers and lakes. Although about 90% of industrial wastewater is treated, much of it is only pretreated to a low effluent standard before discharge into a municipal sewer and to the nearest body of water. Municipal and industrial wastewaters are the major contributors to pollution of IMAR's rivers and lakes, affecting downstream water quality. IMAR generated 0.75 billion m^3 of wastewater in 2004, 31% of which were generated from industrial sources. Similar to the PRC's overall situation, only 44% of the total wastewater is treated in IMAR. The rest is discharged untreated into the Yellow River and Wuliangsu Lake. Wulateqianqi and Wulatehouqi have no wastewater treatment facilities, and discharge about 86,000 m^3 /day of wastewater. Recent regulations issued by the local governments restrict discharge of wastewater to the Yellow River.

EXTERNAL ASSISTANCE AND LESSONS LEARNED

A. External Assistance

1. External sources, including foreign direct investment, are increasingly being promoted and now finance about 20% of total annual investment in the energy sector of the People's Republic of China (PRC), mainly in the power sector. The Asian Development Bank (ADB) has approved about \$3.4 billion to the PRC energy sector to finance 27 projects in the public sector, and 2 private sector power projects. Of the power projects, thermal power projects account for 41% in terms of loan amount, with hydropower projects accounting for about 36%, followed by transmission and distribution (about 17%), and renewable energy (about 6%). ADB has also provided 100 technical assistance (TA) projects for the energy sector for about \$50 million to help prepare projects, provide policy advice, and build institutional capabilities of power utilities that are the executing agencies of ADB loans. ADB has extended nine loans amounting to \$1.5 billion for urban environmental improvement projects in the PRC, including district heating distribution, and combined heat and power cogeneration plants. Four projects have been completed and are in commercial operation resulting in improved overall ambient air quality in the assisted areas.

2. ADB is providing TA to support the Government's reform of heating tariffs.¹ The TA's objective is to help the Government reform the urban heating sector and promote sustainable urban heating supply in the PRC by (i) formulating pro-poor national heating tariff guidelines, and (ii) establishing an effective heating tariff collection mechanism. The World Bank is also an important source of external funding for urban district heating. Since the early 1990s, it has provided over \$600 million to finance environment improvement projects. The central heating system components of these projects helped reduce polluting emissions from small inefficient coal-fired heating boilers. In recent years, the World Bank has provided TA to support the Government's heating sector reforms.

3. Among bilateral sources, the Japan Bank for International Cooperation (JBIC) is the largest source of external assistance for the PRC's power sector. It has provided concessional loans totaling CNY438 billion (\$3.6 billion at the current exchange rate) for 14 power sector projects through its official development assistance window. JBIC has also provided special credits to major areas to improve their environment by installing emission control devices and equipment in power plants and factories, and through building water treatment facilities. JBIC is considering shifting its traditional focus of assistance in the power sector from hydropower and thermal power generation to energy conservation and renewable energy, particularly in the western region. German development cooperation, through Kreditanstalt für Wiederaufbau (KfW), has provided approximately \$400 million in mixed credits, mostly for power plants and turbine modernization projects. KfW also supported the Government in energy efficiency and renewable energy development. Other bilateral sources providing export credits or mixed credits in the energy sector include Australia, Canada, Denmark, France, Italy, Spain, United Kingdom, and United States.

4. ADB has established a working relationship with the World Bank in addressing policy issues and coordinating lending and TA operations, and exchanges views with bilateral sources and the private sector. Both ADB and the World Bank emphasize the importance of improving the management of power utilities, tariff reform, energy efficiency improvement, environmental protection, and a greater role for the private sector. During the processing of the Project,

¹ ADB. 2000. *Technical Assistance to the People's Republic of China for Pro-Poor Urban Heating Tariff Reforms*. Manila. The TA is nearly complete.

discussions were held with the World Bank, JBIC, and KfW to ensure that their respective activities are complementary and to maintain consistency in policy advice. Some additional information is presented in Supplementary Appendix C.

B. Lessons Learned

5. ADB's overall experience with energy and environment sector projects in the PRC has been positive. Projects are generally well designed and smoothly implemented, although substantial difficulties have emerged in some projects. Success is attributed to extensive preparation prior to ADB intervention, high degree of local ownership, effective leadership in project management offices, timely policy and enterprise reforms, and fortunate market conditions. Delays in mobilizing counterpart funds are not uncommon, but in most cases have not resulted in unsatisfactory performance.

6. Some problems in energy projects have arisen from inappropriate policies on energy pricing, especially coal versus natural gas (and urban heating), and enforcement of environmental protection requirements. For instance, the Xi'an-Xianyang-Tongchuan Environment Improvement Project, in general, was successfully implemented, but experienced the cancellation of two cogeneration subprojects due to fuel pricing considerations, i.e., while natural gas was the environmentally favored alternative, existing gas pricing would have required subsidies of 30–50% to achieve a positive financial internal rate of return.²

7. Persistent regulatory loopholes and weak enforcement of key provisions pose some project risk: emissions fees for sulfur dioxide and other waste gas emissions are still set below the marginal cost of abatement, making it cheaper for large coal-fired power plants and synthetic gas producers to pay the pollution discharge fees than to implement desulfurization methods. Waste coal power plants are given some regulatory exemption from stack emissions standards, based on the comprehensive reutilization principle. Sustained enforcement of total emissions quotas on a provincial and air-shed basis was at least partially successful in the late 1990s, but construction and operation of large coal-fired power plants in the project area may jeopardize the long-range emissions control plan.

8. Ongoing market reforms in gas and heating subsectors pose uncertainties in financial viability of project enterprises, particularly state-owned enterprises in the early stages of corporatization and commercialization. Ongoing environmental improvement projects³ illustrate that market reforms and material price volatility can outpace project implementation with two extreme outcomes: (i) they may constrain enterprise profitability, or (ii) enterprise mergers and acquisitions may accelerate management and ownership reforms to the point that external support is not critical. A recent completed project performance audit report of a similar environmental project, the Tangshan and Chengde Environmental Improvement Project, identified several important lessons including choosing suitable (not the most advanced) technology, integrated environmental and financial impacts, and emphasis on implementation.⁴

² ADB. 1997. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to People's Republic of China for the Xi'an-Xianyang-Tongchuan Environment Improvement Project*. Manila. (Loan 1543-PRC).

³ For example, ADB. 1999. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to People's Republic of China for the Shanxi Environment Improvement Project*. Manila. (Loan 1715-PRC) and ADB. 2001. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to People's Republic of China for the Acid Rain Control and Environmental Improvement Project*. Manila (Loan 1890-PRC).

⁴ ADB. 1993. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to People's Republic of China for the Tangshan and Chengde Environmental Improvement Project*. Manila (Loan 1270-PRC).

9. Experience in the wastewater management and water resources sector in the PRC indicates that projects are well planned and implemented. Willingness-to-pay analysis indicates that consumers are willing to pay substantially higher prices for water, and to a certain extent, are willing to pay for wastewater treatment. Under the Anhui Environmental Improvement Project, tariffs were increased to levels commensurate with full cost recovery of operation and maintenance costs.⁵ Capital costs were also being partially recovered through connection fees. Under the Fuzhou Water Supply and Wastewater Treatment Project, loan covenants require wastewater tariffs to be increased to cover all operation and maintenance and financial costs associated with treating wastewater.⁶ Lessons learned from ADB's post evaluation experience in wastewater, water supply, and water resources management in the Asia and Pacific region indicate that both supply and demand-side concerns must be integrated 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. Therefore, in particular, issues related to tariff levels, cost recovery, and commercialization of water utilities were carefully addressed during project preparation.

10. These lessons were taken into account in project design and preparation. During project preparation, lessons of experience were addressed by (i) thoroughly evaluating the technical designs and technologies; (ii) ensuring an adequate debt-equity ratio for the implementing agencies; (iii) undertaking rigorous sensitivity analysis of cash flows, and financial and economic analysis; (iv) incorporating institutional strengthening measures to improve the level of corporate governance; and (v) securing autonomy in operations and for procurement decisions by the implementing agencies. The project management office was given proper trainings in procurement and project administration. Institutional strengthening of the project implementing agencies will be implemented in parallel with loan-funded investments. Coordination with the World Bank and JBIC is active and ongoing, eliminating any overlap in assistance.

⁵ ADB. 1996. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to People's Republic of China for the Anhui Environmental Improvement Project for Industrial Pollution Abatement*. Manila. (Loan 1491-PRC).

⁶ ADB. 1998. *Report and Recommendation of the President to the Board of Directors on a Proposed Loan to People's Republic of China for the Fuzhou Water Supply and Wastewater Treatment Project*. Manila. (Loan 1636-PRC).

DETAILED COST ESTIMATES

Contract/Package	ADB Loan (\$ million)	Estimated Cost		Total Cost (\$ million)
		FX (\$ million)	LC (\$ million)	
A. Urban Central Heating Supply	63.55	62.72	94.75	157.51
1. Dengkou Central Heating Supply				
a. Equipment	4.45	3.68	1.68	5.36
b. Civil Works		0.74	3.54	4.28
c. Project Management	0.07	0.07		0.07
d. Institutional Strengthening	0.02	0.02		0.02
e. Financial Charge	0.44	0.44		0.44
Subtotal Component A1	4.98	4.95	5.22	10.18
2. Hangjinhouqi Central Heating Supply				
a. Equipment	11.49	12.41	2.36	14.77
b. Civil Works			9.75	9.75
c. Project Management	0.17	0.17		0.20
d. Institutional Strengthening	0.06	0.06		0.06
e. Financial Charge	0.86	0.86	4.98	5.83
Subtotal Component A2	12.57	13.50	17.09	30.62
3. Linhe County Central Heating Supply				
a. Equipment	9.85	10.29	0.57	10.86
b. Civil Works		0.10	10.38	10.48
c. Project Management	0.15	0.15		0.16
d. Institutional Strengthening	0.06	0.06		0.06
e. Financial Charge	1.00	1.00		1.00
Subtotal Component A3	11.06	11.60	10.95	22.57
4. Wuhai City Central Heating Supply				
a. Equipment	11.63	10.00	21.88	31.88
b. Civil Works		0.00	15.04	15.04
c. Project Management	0.17	0.17		0.16
d. Institutional Strengthening	0.07	0.07		0.07
e. Financial Charge	1.15	1.15		1.15
Subtotal Component A4	13.02	11.39	36.92	48.30
5. Wulatehouqi Central Heating Supply				
a. Equipment	4.57	4.00	2.30	6.30
b. Total Civil Works		0.10	3.33	3.44
c. Project Management	0.07	0.07		0.06
d. Institutional Strengthening	0.03	0.03		0.03
e. Financial Charge	0.48	0.48		0.48
Subtotal Component A5	5.15	4.68	5.63	10.30
6. Wulatezhongqi Central Heating Supply				
a. Equipment	3.25	3.07	1.02	4.09
b. Total Civil Works		0.00	2.92	2.92
c. Project Management	0.05	0.05		0.05
d. Institutional Strengthening	0.02	0.02		0.02
e. Financial Charge	0.31	0.31	1.46	1.76
Subtotal Component A6	3.63	3.44	5.40	8.85
7. Wuyuan Co. Central Heating Supply				
a. Equipment	6.74	6.02	2.28	8.30
b. Total Civil Works		0.92	5.43	6.35
c. Project Management	0.10	0.10		0.11
d. Institutional Strengthening	0.04	0.04		0.04
e. Financial Charge	0.67	0.67		0.67
Subtotal Component A7	7.54	7.74	7.71	15.46
8. Wulateqianqi Central Heating Supply				
a. Equipment	5.17	4.33	2.08	6.41
b. Total Civil Works		0.65	3.75	4.40

Contract/Package	ADB	Estimated Cost		Total
	Loan	FX	LC	Cost
	(\$ million)	(\$ million)	(\$ million)	(\$ million)
c. Project Management	0.07	0.07		0.08
d. Institutional Strengthening	0.02	0.02		0.02
e. Financial Charge	0.33	0.33		0.33
Subtotal Component A8	5.59	5.41	5.83	11.24
B. Natural Gas Transmission and Distribution Improvement	45.45	48.57	60.65	109.29
1. Gas Distribution and CNG Station				
a. Equipment	15.34	17.68	4.69	22.37
b. Total Civil Works	2.29	0.35	16.45	16.80
c. Project Management	0.26	0.26		0.28
d. Institutional Strengthening	0.10	0.10		0.10
e. Financial Charge	2.05	2.05	7.62	9.67
Subtotal Component B2	20.04	20.44	28.76	49.22
2. Chang-Wu-Lin Gas Transmission				
a. Equipment	19.57	24.97	7.59	32.56
b. Total Civil Works	2.73	0.04	16.39	16.43
c. Project Management	0.34	0.34		0.39
d. Institutional Strengthening	0.13	0.13		0.13
e. Financial Charge	2.65	2.65	7.91	10.56
Subtotal Component B3	25.41	28.13	31.89	60.07
C. City Wastewater Treatment	11.00	9.33	20.02	29.34
1. Wulatehouqi Wastewater Treatment				
a. Equipment	0.43	0.94	0.00	0.94
b. Civil Works	2.01	0.87	3.46	4.33
c. Project Management	0.04	0.04		0.03
d. Institutional Strengthening	0.01	0.01		0.01
e. Financial Charge	0.13	0.13		0.13
Subtotal Component C1	2.63	1.99	3.46	5.44
2. Wulateqianqi Wastewater Treatment				
a. Equipment	7.32	4.82	2.50	7.32
b. Total Civil Works	0.43	1.89	8.95	10.84
c. Project Management	0.11	0.11		0.11
d. Institutional Strengthening	0.04	0.04		0.04
e. Financial Charge	0.48	0.48	5.10	5.59
Subtotal Component C2	8.38	7.34	16.56	23.90
D. Institutional Strengthening	0.60	0.60	0.00	0.60
Contingencies				
Physical	0.00	11.01	14.84	25.85
Price	0.00	3.63	4.90	8.53
Finance Charges during Construction	10.54	10.54	27.06	37.61
Total Project Cost	120.00	135.25	195.16	330.41
ADB Loan Summary	Amount	Percentage		
a. Equipment	99.81	83.17		
b. Civil Works	7.45	6.21		
c. Implementation TA	1.60	1.33		
d. Institutional Strengthening	0.60	0.50		
e. Contingencies	0.00	0.00		
f. Financial Charges	10.54	8.79		
g. Total	120.00	100.00		

FX = foreign exchange, LC = local currency.

a Contingencies include physical contingency and price contingency. The physical is calculated as 10% of the total base cost, and the price is calculated as 3% of the total base cost and physical contingency.

Source: Estimates of project implementation agencies and Asian Development Bank.

PROJECT IMPLEMENTATION SCHEDULE

[illegible]

Task Name	2005				2006				2007				2008				2009				2010									
	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
(vi) Dengkou Central Heating Supply																														
(vii) Hangjinhouqi Heating Supply																														
(viii) Wuhai Central Heating Supply																														
Part B: Natural Gas Transmission and Distribution Improvement																														
(i) Chang-Wu-Lin Gas Transmission																														
(ii) Gas Distribution Subprojects																														
Part C: City Wastewater Treatment																														
(i) Wulatehouqi Wastewater																														
(ii) Wulateqianqi Wastewater																														
Part D: Institutional Reforms and Corporate Governance Improvement																														
Contract Award																														
Delivery of Contract Services																														

ADB = Asian Development Bank, EIA = environmental impact assessment, RP = resettlement plan.

PROCUREMENT PLAN

Project Information	Loan No.: PRC39019-01
Country	People's Republic of China (PRC)
Name of Borrower	PRC
Project Name	IMAR Environment Improvement Project
Loan or TA Reference	PRC 39019-01
Date of Effectiveness	
Amount (\$)	\$120,000,000.00
Of which Committed, \$	
Executing Agency	GIMAR
Approval Date of Original Procurement Plan	
Approval of most recent Procurement Plan	
Publication for Local Advertisements	
Period Covered by this Plan	Jun 2006 – Dec 2007

Procurement Thresholds, Goods & Related Services, Works and Supply and Install

Procurement Method	To be used above (Value \$)
ICB Works	\$10,000,000
ICB Goods	\$1,000,000
NCB Works	\$1,000,000
NCB Goods	\$100,000
Shopping Works	<\$100,000
Shopping Goods	<\$100,000
Exceptional Methods	
If limited international bidding, direct contracting, force account or community participation in procurement will be employed on the project, list them here and described the circumstances under which they may be employed.	
	N/A

Procurement Thresholds, Consultants Services

Procurement Method	To be used above (Value \$):
Quality-and-Cost-Based Selection	All amounts
Consultants Qualifications Selection	N/A
Least Cost Selection	N/A
Alternative Methods	
If quality-based selection, fixed budget selection, single source selection or selection of individual consultants that will be employed on the project list them here and described the circumstances under which they may be employed.	
	N/A

Ref Contract	Description	Method	Expected date of advertisement	Prior Comments Review (Y/N)
1.	Boiler and fans			
a.	Dengkou and Wuyuan	ICB	15-Oct-06	Y
b.	Wuzhong and Wuhou	ICB	15-Oct-06	Y
c.	Wuqian and Hanghou	ICB	15-Oct-06	Y
2.	Accessory of boilers			
a.	Wuyuan and Dengkou	NCB	15-Oct-06	Y
b.	Wuzhong, Wuhou, Wuqian, and Hanghou	ICB	15-Oct-06	Y
3.	Instrumentation and control system			
a.	Wuyuan, Dengkou, and Linhe	NCB	15-Oct-06	Y
b.	Wuzhong, Wuhou, Wuqian, and Hanghou	ICB	15-Oct-06	Y
4.	Electrical equipment			
a.	Wuyuan, Dengkou, and Linhe	NCB	15-Oct-06	Y
b.	Wuzhong, Wuhou, Wuqian, and Hanghou	ICB	15-Oct-06	Y
5.	Pipes and fittings, compensators			
a.	Wuyuan, and Dengkou	ICB	15-Oct-06	Y
b.	Linhe	ICB	15-Oct-06	Y
c.	Wuzhong, Wuhou, Wuqian, and Hanghou	ICB	15-Oct-06	Y
6.	Insulation			
a.	Wuyuan, and Dengkou	ICB	15-Oct-06	Y
b.	Linhe	ICB	15-Oct-06	Y
c.	Wuzhong, Wuhou, Wuqian, and Hanghou	ICB	15-Oct-06	Y
7.	Water pumps, valves, and heat exchange system			
a.	Wuyuan, Dengkou, and Linhe	ICB	15-Oct-06	Y
b.	Wuzhong, Wuhou, and Wuqian	ICB	15-Oct-06	Y
c.	Hanghou	ICB	15-Oct-06	Y
8.	Central heating system for Wuhai			
a.	Insulation	ICB	15-Oct-06	Y
b.	Pipes and fittings, compensators	ICB	15-Oct-06	Y
c.	Water pump, valve, heat exchange system, electric equipment, control system	ICB	15-Oct-06	Y
9.	Equipment for All Eight Gas Distribution			
a.	Lot 1	ICB	29-Dec-06	Y
b.	Lot 2	ICB	18-Oct-07	Y

Ref Contract	Description	Method	Expected date of advertisement	Prior Comments Review (Y/N)
10.	Piping and Fittings for All Eight Gas Distribution			
a.	Lot 1	ICB	29-Dec-06	Y
b.	Lot 2	ICB	18-Oct-07	Y
11.	Installation and Civil Works for Wuhai Distribution	NCB	29-Dec-06	N
12.	Bayannur City Compressors and Other Equipment for Primary Filling Station	ICB	29-Dec-06	Y
13.	Installation and Civil Works for Distribution and Primary Filling Station	NCB	29-Dec-06	Y
14.	Changqing-Wuhai-Linhe Transmission Pipeline			
a.	Equipment Lot (1)	ICB	20-Oct-06	Y
b.	Equipment Lot (2)	ICB	29-Dec-06	Y
c.	Piping and Fittings Lot (1)	ICB	20-Oct-06	Y
d.	Piping and Fittings Lot (2)	ICB	29-Dec-06	Y
15.	Installation Works Changqing-Wuhai- Linhe Transmission Pipeline			
a.	Lot (1)	NCB	20-Oct-06	Y
b.	Lot (2)	NCB	20-Oct-06	Y
c.	Lot (3)	NCB	20-Oct-06	Y
d.	Lot (4)	NCB	20-Oct-06	Y
16.	Pipeline Installation and Civil Works for Terminal Stations of Changqing-Wuhai-Linhe Transmission Pipeline	NCB	29-Dec-06	N
17.	Wulatehou Waste Water Plant			
a.	Civil Works	NCB	15-Oct-06	Y
b.	Equipment and Pipelines	ICB	15-Oct-06	Y
18.	Wulateqian Waste Water Plant			
a.	Civil Works	NCB	15-Aug-07	Y
b.	Equipment and Instruments	ICB	15-Aug-07	Y
c.	Pipes and fittings	ICB	15-Aug-07	Y
19.	Consulting Services			
a.	Institutional strengthening	QCBS	N/A	Y
b.	Project implementation supervision	QCBS	N/A	Y
c.	Project management and related tasks	QCBS	N/A	Y

ICB = international competitive bidding; IMAR = Inner Mongolia Autonomous Region; LCS = least cost selection; NCB = national competitive bidding; PRC = People's Republic of China; QBS = quality based selection; QCBS = quality cost based selection.

PROJECT ECONOMIC ANALYSIS

A. Demand Forecast

1. A demand forecast for each project component was carried out by the Government of Inner Mongolia Autonomous Region with assistance from the project preparatory technical assistance (TA) consultants. The demand forecasts concluded that the risk associated with demand forecast is minimal (Supplementary Appendix K) because the Project will provide gas, heating and water supply to meet the existing demand and a small share of incremental demand in the project areas. The Project will supply natural gas to replace liquefied petroleum gas (LPG) and coal for residential use (cooking and water heating), and a small portion of industrial consumption. The urban central heating supply will replace the existing small inefficient boilers. Water is in short supply in project areas and the demand for treated water under the Project is larger than supply. The risks associated with the demand forecast in the economic and financial viability analyses are minimal.

B. Least Cost Analysis

2. A least-cost analysis was performed for the three categories of end use to be served by the Project, including (i) natural gas for industrial use and for household cooking and water heating, (ii) central heating supply, and (iii) wastewater treatment. All the project subcomponents are parts of their area development master plans. The least cost analysis used 2004 constant prices and a discount rate of 12%. Tradable commodities were valued at border prices at the prevailing exchange rate (CNY8.11/\$1.0). Non-tradable commodities were valued at shadow prices, using a mix of standard and specific conversion factors.¹ The current alternatives (mainly LPG and coal) for some industrial use and household cooking and water heating in the project areas are either more expensive or more polluted and the analysis indicates that natural gas is the least-cost option. For the central heating supply component, several options including a gas-fired instead of coal-fired centralized heating system, coal-fired household heating systems, and gas-fired household furnaces were evaluated. Based on an analysis of main factors such as the coal and gas resources and their prices in Inner Mongolia Autonomous Region, and the local environmental benefits using gas, the least-cost analysis concludes that the large-size centralized boilers for central heating supplies proposed for the project areas are the least-cost option. The optimal size of the hot water boilers was assessed based on a market analysis of present and future heating demands. The least cost analysis for the wastewater treatment component was carried out to determine the lowest supply alternative that will meet environmental standards. Considering the technical feasibility of small-scale, individually installed wastewater treatment equipment and that there is no sewer system between the project areas to the major areas with central sewage treatment plants, the analysis concluded that the on-site sewage treatment plants are the least cost options. Equalized discount rates of the lowest cost options and the "without Project" scenario were applied to all components to justify the economic viability of the Project.

C. Economic Internal Rate of Return

3. Economic internal rates of return (EIRR) were calculated for each project subcomponent and for the whole Project. Consistent with the least cost analysis, the economic analysis applies

¹ A standard conversion factor of 0.93 is used in the current project. Border prices were used for all imported items. Local costs were shadow priced using group and specific conversion factors: 1.0 for equipment, 0.95 for steel, 0.74 for cement, 1.1 for timber, 1.25 for skilled labor, and 1 for unskilled labor. Taxes and duties were excluded. All these conversion factors were based on ADB project in the PRC (ADB. 2004. *Report and Recommendation of the President to the People's Republic of China for Liaoning Environmental Improvement Project*. Manila.)

the conversion factors for investment costs for land,² equipment costs, fuel costs, and operation and maintenance costs, where applicable. The input data and assumptions were reviewed by the project preparatory TA consultants and found appropriate. For the EIRR calculations, the benefits of output were based on (i) cost savings on alternative fuels, and (ii) incremental demand. The cost-saving benefits were the cost differences of the alternative energy supply options with and without the Project. A survey was carried out to determine the appropriate energy supply options for each category of consumers. The local environmental benefits were taken into account in the EIRR calculations. Transmission and distribution losses were based on the statistics of historical line loss rates in each city. For the central heating supply and natural gas transmission and distribution components, the benefits were based on the incremental benefits from resource cost savings, revenue, consumer surplus, and the local environmental benefits from reducing pollutant emissions. The main benefits of the wastewater treatment component were the amount of wastewater treated and utilization of treated wastewater in the cooling-system of nearby coal-fired thermal plant and for irrigation. In calculating the project's EIRR, the incremental economic benefit of treated wastewater was assumed at 50% of the economic value of clean water.

4. The details of the economic analysis are provided in Supplementary Appendix L. The EIRR calculation takes a conservative approach, as it takes into account only the main benefits of different components but includes all project-related costs. This approach yields EIRRs ranging from (i) 10.0% to 25.9% without and 14.0% to 40.0% with the local environmental benefits for the project subcomponents, and (ii) 17.6% without and 21.4% with the local environmental benefits for the whole Project. Sensitivity analyses were performed for each subcomponent. For the Project EIRR, sensitivity analysis showed the EIRR (with local environmental benefits) would decrease to (i) 17.6% if the Project was to experience a cost overrun of 20%, (ii) 12.5% if the benefits were reduced by 20%, (iii) 15.0% if the Project was to experience a commissioning delay of 1 year, and (iv) 6.4% if (i), (ii), and (iii) all happened.

Table A7.1: Summary of Economic Internal Rates of Return (%)

Subcomponent	Without Environmental Benefits	With Local Environmental Benefits
Wuhai Central Heating Supply	22.1	26.4
Dengkou Central Heating Supply	12.8	17.9
Linhe Central Heating Supply	10.0	14.0
Hangjinhouqi Central Heating Supply	11.0	15.0
Wuyuan Central Heating Supply	16.5	21.8
Wulateqianqi Central Heating Supply	17.9	23.7
Wulatezhongqi Central Heating Supply	14.3	20.1
Wulatehouqi Central Heating Supply	15.8	19.3
Chang-Wu-Lin Gas Transmission	20.4	20.4
Gas Distribution and Station	15.4	16.8
Wulateqianqi Wastewater Treatment	25.9	40.0
Wulatehouqi Wastewater Treatment	12.5	21.2
The Whole Project	17.6	21.4

EIRR = economic internal rate of return.

Source: Asian Development Bank estimates.

² Land is valued at the economic opportunity cost (the estimated value of the best alternative utilization).

D. Environmental Benefits

5. An economic evaluation of the environmental impacts of the Project was carried out based on the benefits transfer method. The evaluation used (i) the methodology adopted in the Asian Development Bank's *Economic Evaluation of Environmental Impacts: A Workbook* (1996) to determine the adjusted estimate of the monetary damages caused by air pollution during the study period, taking into account the location of the pollution sources, emission level, and population affected; and (ii) estimates of average annual climate change for carbon emissions to evaluate the monetary damage caused by greenhouse gas emissions. The economic evaluation of the environmental impacts of the wastewater component was calculated based on the criterion of collecting fees of wastewater in the project areas.³ The EIRRs presented in Table A7.1 have included only the local environmental benefits. If the global environmental benefits were added to the project benefits, the Project EIRR would increase to 22.6%.

E. Risk Analysis

6. A risk analysis, using the Monte Carlo simulation technique, was carried out for the EIRR to ensure the Project's viability. Based on the foregoing considerations and sensitivity analyses, crucial risk variables have been selected because of their significant impact on the Project's viability. The inputs for the risk analysis are taken from the base case benefit analysis over cost. The correlation between risk variables is explicitly considered before the simulation to avoid generating unrealistic project scenarios. The risk analysis for EIRR selected six variables: energy sales, capital cost, input (coal, gas, and water) prices, implementation delay, exchange rate, and local environmental benefits. The results were based on 3,000 simulations. The expected EIRR (without environmental considerations), based on the weighted average of all simulated combinations, is 17.8% (with a standard deviation of 5.1%), about 3.6% lower than the base case value without considering project risks. The probability for the EIRR to be below the considered discount rate of 12% is 7%. The very low economic risk is expected because the Project mainly relies on existing demand and benefits from efficiency improvement.

³ This methodology was used in the past ADB wastewater treatment project.

FINANCIAL PERFORMANCE AND PROJECTIONS

A. Summary of Past and Projected Financial Performance of Project Enterprises

1. The detailed historical and projected financial statements of the project enterprises for 2003–2011 are shown in Supplementary Appendix K and summarized here.

2. **Inner Mongolia Saiwaixing Huazhang Paper Limited Company.** A private enterprise engaged in paper manufacturing, the company has its own heating system providing heat to its employees' housing area. The company will implement the heating and wastewater treatment subcomponents in Wulateqianqi. Wastewater from its paper mill has brought serious pollution to the Yellow River, and its participation in the Project is in response to the provincial government's requirement that it treat its wastewater. The company is structured into functional divisions and has a board that meets regularly. Its finance division has 21 staff, and financial statements are computerized and comply with national and international accounting standards. Internal controls within the company appear to be adequate. The company has reported profits in the last 2 years. It maintained a current ratio of 1.0 for 2003 and 2004, and the proportion of debt to equity was 35% in 2003 and 28.8% in 2004.

3. **Bayannur Fuyuan Shiye Group Limited Company.** This company, a former state-owned enterprise, was privatized in 2003. It currently operates central heating facilities in Dengkou, Linhe and Wuyuan and expects to rehabilitate and augment these facilities under the Project. In addition to central heating, the company has business interests in the construction of boilers, real estate, and food processing. It has 1,007 staff, and is organized by operational divisions with support from functional divisions. Its board of directors is appointed for a 4-year term. The accounting system is computerized and financial statements comply with national and international standards. Internal controls within the company appear to be adequate. The company's audit committee reports to the board. Its current ratios were 1.1 in 2003 and 0.8 in 2004. Debt as a proportion to equity in 2004 was 35%.

4. **Wuhai Thermal Company.** This fully state-owned enterprise, established in 1993, will undertake the Wuhai municipality central heating scheme under the Project. The company has 170 full-time and some 300 seasonal employees. It is organized on a functional basis with functional managers reporting to the general manager. The company uses a manual accounting system. Although traditional recording of transactions is being done; strategic planning, forecasting, and decision-making roles of the finance function need to be strengthened. Internal controls and accounting procedures within the company need improvement. The company has been reporting losses for some years due to the low tariffs. As a government entity, the company does not have any debt. Its financial performance is weak with inadequate current assets to meet its current liabilities. The company will continue to need government assistance in its operations unless tariffs are raised to meet the cost of operations. Assistance will be given to strengthen the company's financial management under component D of the Project.

5. **Wulatezhongqi Dagong Thermal Limited Company.** This state-owned enterprise was privatized in 2004, and will undertake the central heating subproject in Wulatezhongqi under the Project. As a new company, it does not yet have a board of directors. The company is run by a president and chief executive officer; its finance division is headed by an experienced qualified national assistant accountant. While the company's financial management effectiveness cannot yet be assessed, it is expected to adopt adequate internal controls in its operations. Assistance will be given to strengthen corporate governance and financial management under component D of the Project.

6. **Wulatehouqi Huibao Thermal Limited Company.** This limited liability corporation was established in August 2005 with two main shareholders; Jianxin Group and Dong Sheng Miao Mining Company. The main activity of the business is heating supply. The company will undertake the Wulatehouqi central heating subproject under the Project. The company has a functional structure with deputy general managers reporting to the general manager, who in turn reports to the president. The company is in the process of setting up its finance division and has been informed that it should be headed by a qualified accountant.

7. **Inner Mongolia Haosheng Thermal Limited Company.** This new privately owned limited liability company was formed as a subsidiary of the Cashmere Wool Company, with its main business in heat supply. It will undertake the central heating project in Hangjinhouqi. The company is headed by a president and is organized functionally. A chart of accounts and manual of accounting is available, and the company is in the process of setting up its finance division. It is expected to adopt national accounting standards in the preparation of its financial accounts.

8. **Inner Mongolia Western Natural Gas Limited Company.** This limited liability shareholding company was established in 2002. Its shareholders are principally state-owned entities. Since its establishment, the company has been involved in the construction of the first phase of the natural gas pipeline of 501 kilometers. Its participation in the Project is to implement the second phase of the gas pipeline of approximately 400 kilometers and expand the distribution network. The company commenced commercial operations only in 2005 after completion of phase 1. The finance division is headed by a qualified accountant and its financial statements comply with national accounting standards. It has a computerized accounting system and internal controls appear to be adequate. It also has an audit committee reporting to the board. Due to the construction of the gas pipeline, it has a significant amount of debt, hence, a high gearing ratio of 77% in 2004. Its financial performance is expected to improve as commercial operations begin.

9. **Wulatehouqi Water Company.** This state-owned enterprise was established in 1981 to supply water to Sai and Bayin townships. It will implement the Wulatehouqi wastewater plant under the Project. The organization is structured according to two geographical regions under its control, each headed by a deputy general manager. Standard bookkeeping requirements in respect of reconciliations and registers were carried out. Its financial statements comply with national accounting standards. Its financial performance is rather weak and is supported by government subsidy. Its revenue is mainly from water supply; this is expected to increase when it is able to charge for wastewater when the Project is complete. If the company is to be sustainable in the future, the tariff must be set at an amount to at least cover cost. Assistance under Component D of the Project will provide the institutional strengthening it requires.

B. Assumptions Used for Financial Projections

10. The financial operations of the project companies were projected for 2006–2020 based on major assumptions described in the following paragraphs. Projections were prepared for the income statement, balance sheet, and cash-flow statement for all the companies participating in the Project.

11. The projected financial performance included the implementation and operation of the Project, which will be under construction between 2006 and 2009. Under the proposed loan, the project companies will be required to maintain a debt-service coverage ratio of at least 1.4 times,

a current ratio of at least 1:1 by 2010 and thereafter, accounts receivable not to exceed the equivalent of 3 months of sales by 2010, and a debt-equity ratio at a maximum of 70:30. The financial covenants of ADB are expected to be satisfied during the life of the Project. The debt-service coverage ratio is forecast to be adequate throughout. The debt-equity ratio will also be within the prescribed maximum limit. Other financial ratios are expected to remain satisfactory.

12. For the central heating projects, a 4-year construction period is assumed from 2006 to 2009. Project costs were estimated by design engineers and reviewed by technical assistance (TA) engineers. The main raw material is coal; the use of more efficient boilers is factored in. The Linhe and Wuhai facilities also use heat generated from the power plant. The other materials required are electricity and water, where the requirement was reviewed by the TA engineers. The current prices for these materials are used as the basis for financial projections and prices are assumed to increase by 0.8% per annum in real terms. The TA engineers estimated the direct and indirect staff costs and other operational overhead. Replacement of equipment is assumed to take place at regular intervals. Working capital increases are assumed based on a 1 month inventory, 1.5 month average for receivables, and 2 months for payables. The heating tariffs are segregated by domestic, industrial, and commercial tariffs; ranges vary in the project areas. Regular tariff reviews are assumed to occur to ensure full cost recovery.

13. Both the city gas pipelines and the Chang-Wu-Lin transmission pipeline are assumed to be constructed over 4 years from 2006 to 2009. Project costs were estimated by design engineers and reviewed by the TA engineers. The main raw material is the gas itself, which will be sourced from the Changqing gas field where the company has entered into a long-term purchase contract at CNY0.66/cubic meter (m^3). The other materials are electricity and water, which are at current prices. The TA engineers estimated the direct and indirect staff costs and other operational overhead. Working capital increases are assumed based on 0.5 month for receivables and 1 month for payables. The tariff is agreed at CNY1.45/ m^3 , which is used for projections. Technical and non technical losses are assumed at 3%.

14. The wastewater treatment subcomponents are assumed to be constructed over 4 years from 2006 to 2009. Project costs were estimated by design engineers and reviewed by the TA engineers. The main material requirements are in terms of electricity and chemicals, which are at current prices. The TA engineers estimated the direct and indirect staff costs and other operational overhead. Working capital increases are assumed based on 0.5 month for chemicals, 1 month for receivables, and 1 month for payables. No wastewater tariff is currently in place and an assumed tariff is used to ensure full cost recovery.

15. These subcomponents were aggregated with the relevant companies to provide company financial projections from 2006–2020. The projections assume that the proportion of the subprojects financed by ADB, domestic banks, and equity is as given by the companies. The cost of finance before tax by the ADB loan, domestic loans, and equity is assumed to be 5.42%, 6.5%, and 8% respectively. The ADB loan is assumed to have a grace period of 5 years and be repaid in 25 years, while the domestic loans will have a grace period of 1 year and be repaid in 5 years. Corporate taxation is assumed at the rate of 33% of the profit before tax and depreciation over 25 years with no residual value. The owners are expected to provide adequate equity at the required intervals to maintain a positive cash position. Working capital is projected on the assumption that improvements in its management will take place so that they are brought down to acceptable commercial levels.

Table A8: Summary Financial Performance and Projections
(CNY million)

Year Ending December 31				Projected					
	2003	2004	2005	2006	2007	2008	2009	2010	2011
A8.1: IM Saiwaixing Huazhang Paper Ltd. Co.									
Sales	300.7	333.8	343.8	366.5	381.2	438.9	455.3	475.8	494.5
Net Income After Tax	12.1	14.2	19.1	26.1	27.2	50.3	44.7	47.0	53.2
Total Assets	603.0	604.7	546.1	647.6	746.6	872.3	907.2	920.9	936.5
Long-term Debt	113.4	91.6	73.3	94.0	149.3	184.6	172.3	152.5	132.6
Current Ratio	1.0	1.0	1.1	1.1	1.2	1.4	1.6	1.8	2.2
Debt/(Debt + Equity) (%)	34.9%	28.8%	23.0%	23.6%	29.3%	30.4%	26.5%	22.5%	18.6%
Debt Service Coverage Ratio (times)	1.2	1.2	1.5	5.1	4.3	5.0	2.3	2.5	2.8
A8.2: Bayannur Fuyuan Shiye Group Ltd. Co.									
Sales	316.0	360.4	379.8	366.7	386.5	425.4	460.9	472.0	493.3
Net Income After Tax	29.9	41.7	50.8	34.3	40.7	43.2	47.1	31.7	35.0
Total Assets	493.6	707.1	845.7	873.8	1,025.6	1,199.3	1,353.9	1,385.6	1,415.0
Long-term Debt	82.5	129.5	118.5	80.5	121.1	174.2	229.3	223.8	217.9
Current Ratio	1.1	0.8	1.2	1.2	1.4	1.7	2.1	2.3	2.7
Debt/(Debt + Equity) (%)	39.7%	35.0%	18.2%	12.3%	14.9%	17.6%	19.8%	18.9%	18.0%
Debt Service Coverage Ratio (times)	1.3	0.5	0.3	1.91	2.39	2.41	2.69	5.23	4.40
A8.3: Wuhai Thermal Company									
Sales	17.7	22.2	27.1	28.0	46.0	79.0	107.3	129.3	143.9
Net Income After Tax	(9.7)	(21.8)	(4.2)	(2.3)	0.7	7.1	9.3	0.6	2.5
Total Assets	99.7	105.3	101.0	113.0	257.4	415.0	562.8	569.5	570.0
Long-term Debt	0.0	0.0	0.0	3.4	38.5	73.6	105.6	102.6	99.3
Current Ratio	0.5	0.2	0.3	0.3	0.5	0.9	1.1	1.3	1.7
Debt/(Debt + Equity) (%)	0.0%	0.0%	0.0%	4.6%	17.7%	19.9%	20.7%	20.2%	19.6%
Debt Service Coverage Ratio (times)			2.7	7.7	4.0	3.6	2.8	3.3	3.3
A8.4: Wulatezhongqi Dagong Thermal Ltd. Co.									
Sales			4.1	6.0	8.2	10.8	12.5	15.7	16.6
Net Income After Tax			0.6	1.4	0.8	1.5	1.7	0.9	1.3
Total Assets			14.4	18.0	49.5	85.8	116.6	126.0	126.6
Long-term Debt			0.0	2.8	18.1	25.0	29.5	29.5	28.7
Current Ratio			1.3	2.3	6.8	10.7	11.6	12.0	11.4
Debt/(Debt + Equity) (%)			0.0%	17.4%	38.4%	30.2%	26.1%	24.2%	23.4%
Debt Service Coverage Ratio (times)				17.0	0.2	0.3	0.2	2.7	2.5
A8.5: Wulatehouqi Huibao Thermal Ltd. Co.									
Sales			1.5	3.4	4.0	8.0	11.7	14.0	17.2
Net Income After Tax			0.5	2.7	1.7	1.9	1.5	-0.1	0.0
Total Assets			13.7	49.4	81.3	110.4	138.7	142.7	145.7
Long-term Debt			0.0	3.0	17.0	29.5	41.7	40.5	39.2
Current Ratio			0.5	1.6	4.0	4.9	4.9	2.0	1.4
Debt/(Debt + Equity) (%)			0.0%	6.2%	21.2%	27.0%	30.4%	29.0%	27.5%
Debt Service Coverage Ratio (times)				35.4	6.0	2.7	1.6	2.5	2.2
A8.6: IM Haosheng Thermal Ltd. Co.									
Sales			21.6	21.6	21.6	25.6	38.0	43.1	50.7
Net Income After Tax			1.3	0.4	0.6	1.2	2.9	0.4	0.5
Total Assets			53.9	59.4	124.0	202.6	285.3	290.3	290.2
Long-term Debt			0.0	9.2	50.8	68.9	101.9	101.9	99.0
Current Ratio			0.9	0.9	0.9	1.2	1.3	1.3	1.4
Debt/(Debt + Equity) (%)			0.0%	19.1%	44.1%	35.3%	36.8%	36.2%	35.2%
Debt Service Coverage Ratio (times)				4.8	0.1	0.1	0.2	2.2	2.0
A8.7: IM Western Natural Gas Ltd. Co.									
Sales			231.1	687.5	701.9	701.9	701.9	1,245.1	1,273.4
Net Income After Tax			(17.3)	40.8	36.8	38.6	36.4	74.0	66.1
Total Assets	630.9	731.7	801.5	947.5	1,230.1	1,425.8	1,603.5	1,615.1	1,608.2
Long-term Debt	500.0	500.0	531.0	501.9	625.7	722.2	765.8	692.8	619.2
Current Ratio	5.2	0.6	1.1	1.0	0.8	0.8	0.9	1.2	1.5
Debt/(Debt + Equity) (%)	83.3%	76.7%	74.4%	66.5%	60.7%	57.7%	53.6%	48.4%	43.5%
Debt Service Coverage Ratio (times)			0.8	3.0	0.8	0.7	0.8	1.6	1.6
A8.8: Wulatehouqi Water Co.									
Sales	0.7	1.4	2.2	2.5	3.0	3.6	7.0	7.9	9.0
Net Income After Tax	0.0	0.1	0.2	0.3	0.5	0.9	1.0	0.8	1.4
Total Assets	4.1	4.0	4.2	9.4	24.5	44.8	55.2	55.4	56.1
Long-term Debt	0.0	0.0	0.0	2.1	8.5	16.4	20.1	19.4	18.6
Current Ratio	1.3	5.3	7.6	11.9	14.4	2.7	4.2	6.5	9.1
Debt/(Debt + Equity) (%)	0.0%	0.0%	0.0%	22.9%	34.8%	37.2%	36.9%	35.6%	33.8%
Debt Service Coverage Ratio (times)				6.6	2.2	1.4	1.9	2.3	2.6

() = negative.

Source: Asian Development Bank staff estimates.

SUMMARY OF THE FINANCIAL ANALYSIS

A. General

1. This appendix describes the notes and assumptions used in the financial evaluation. All the costs and prices are expressed in constant 2005 prices. The economic lives of the subprojects are estimated at 25 years with no residual value. The financial operations of the individual project implementing agencies (PIAs) for the Project are projected based on the assumptions described in Appendix 8.

B. Benefits and Costs

2. The benefits from the Project will be derived from the sales of output from the individual subprojects based on the projected production levels and applicable tariffs. The capital costs include physical contingencies, but exclude price contingencies and financial charges during construction. The agreed transfer prices or projected purchase costs of inputs were considered. Other operating costs include personnel, distribution, administration, and other expenses.

C. Financial Internal Rate of Return

3. The financial internal rate of return of each subproject was calculated after income tax. The financial viability of the Project was subjected to sensitivity analysis under various adverse conditions. The sensitivity analysis results for the overall project are shown in Table A9.1.

Table A9.1: Sensitivity Analysis of FIRR for the Overall Project

Project Group		All Projects	Natural Gas	Wastewater	Central Heating
Item	Change Variable	FIRR (%)	FIRR (%)	FIRR (%)	FIRR (%)
Base Case		7.7	7.9	7.1	7.6
(i) Capital Cost Overrun	10%	6.6	6.8	6.1	6.6
(ii) O&M Cost Overrun	10%	6.7	7.4	4.7	6.5
(iii) Benefit Reduction	10%	5.2	5.3	6.6	4.9
(iv) Implementation Delay	1 Year	7.3	7.7	6.1	7.3
(v) Combination of (i),(ii),(iii)&(iv)		2.9	3.3	1.3	2.8
After-Tax WACC		3.9	3.7	3.5	4.0

FIRR = financial internal rate of return, O&M = operation and maintenance, WACC = weighted average cost of capital.

Source: Asian Development Bank estimates.

D. Weighted Average Cost of Capital

4. The weighted average cost of capital was calculated after tax in real terms, following the methodology in the *Guidelines for the Financial Governance and Management of Investment Projects Financed by the Asian Development Bank*¹ using actual capital mix and costs of funds. Actual interest rates of local loan funds were considered. For the Asian Development Bank (ADB) loan, the interest rate is based on the current London interbank offered rate on 5-year fixed-interest swap (currently at 5.48%) plus the ADB loan spread of 0.4%. The cost of equity is assumed to be 8.0%, and the cost of domestic borrowing 6.5%. The average domestic inflation rate is 3.0% per year. The income tax is 33%. The weighted average cost of capital is calculated to be 3.9%.

¹ ADB. 2001. *Guidelines for the Financial Governance and Management of Investment Projects Financed by the ADB*. Manila.

Table A9.2: Financial Internal Rate of Return (FIRR)
(CNY million)

Urban Central Heating Supply																
Item	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021-2031
1. Dengkou Central Heating Supply																
Cash Inflow	0	0	2	8	10	12	12	12	13	13	13	15	15	15	16	330
Cash Outflow																
Capital Cost	4	27	31	26	0	0	0	0	0	0	0	0	0	0	2	13
Operating Cost	0	0	1	5	7	8	8	8	8	8	8	9	9	9	9	150
After Tax Net Cash Flow	(4)	(27)	(30)	(23)	3	4	4	4	5	5	5	6	6	6	5	167
After Tax FIRR(%)	6.7%															
2. Linhe Central Heating Supply																
Cash Inflow	0	0	24	49	55	62	62	62	71	71	71	80	80	80	91	1186
Cash Outflow																
Capital Cost	10	62	67	54	0	0	0	0	0	0	0	0	0	0	12	48
Operating Cost	0	0	0	31	50	56	59	59	59	62	62	62	65	65	65	811
After Tax Net Cash Flow	(10)	(62)	(43)	(36)	5	5	2	2	11	8	8	18	15	15	14	327
After Tax FIRR(%)	7.1%															
3. Wuyuan Central Heating Supply																
Cash Inflow	0	0	4	10	16	19	19	19	21	21	21	24	24	24	27	488
Cash Outflow																
Capital Cost	6	40	47	39	0	0	0	0	0	0	0	0	0	0	7	24
Operating Cost	(0)	(0)	1	4	10	11	11	11	12	12	12	13	13	13	14	213
After Tax Net Cash Flow	(6)	(40)	(44)	(33)	6	8	8	8	9	9	9	11	11	11	7	251
After Tax FIRR(%)	7.6%															
4. Wulatezhongqi Central Heating Supply																
Cash Inflow	0	2	4	6	8	9	10	12	13	14	16	17	18	19	21	235
Cash Outflow																
Capital Cost	3	19	21	21	0	0	0	0	0	0	0	0	0	0	1	6
Operating Cost	(0)	3	4	5	7	7	7	8	8	9	9	10	10	10	11	121
After Tax Net Cash Flow	(3)	(19)	(21)	(20)	1	2	3	4	5	5	7	8	8	9	9	108
After Tax FIRR(%)	7.5%															
5. Hangjinhouqi Central Heating Supply																
Cash Inflow	(0)	(0)	1	13	18	22	23	25	31	32	34	41	43	45	55	754
Cash Outflow																
Capital Cost	9	64	73	75	0	0	0	0	0	0	0	0	0	0	4	20
Operating Cost	0	0	(1)	7	12	14	14	15	17	17	18	20	21	21	25	321
After Tax Net Cash Flow	(9)	(64)	(71)	(69)	6	8	9	10	14	15	16	21	22	23	26	413
After Tax FIRR(%)	7.3%															
6. Wulatehouqi Central Heating Supply																
Cash Inflow	(0)	1	4	8	10	13	15	16	21	24	24	24	26	26	26	325
Cash Outflow																
Capital Cost	6	29	26	26	0	0	0	0	0	0	0	0	0	0	2	13
Operating Cost	1	1	3	5	7	8	9	10	12	14	14	14	14	14	14	170
After Tax Net Cash Flow	(7)	(30)	(25)	(23)	3	5	6	6	9	10	10	10	12	12	10	142
After Tax FIRR(%)	8.2%															

Wastewater Treatment

Item	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021-2031
1.Wulatehouqi Wastewater Treatment																
Cash Inflow	0	0	0	3	3	4	4	4	5	5	6	7	7	8	9	144
Cash Outflow																
Capital Cost	5	14	19	10	0	0	0	0	0	0	0	0	0	0	1	4
Operating Cost	0	0	0	2	1	2	2	2	2	3	3	3	3	4	4	43
After Tax Net Cash Flow	(5)	(14)	(19)	-8	1	2	2	2	2	3	3	4	4	5	4	97
After Tax FIRR(%)	6.7%															
2.Wulateqianqi Wastewater Treatment																
Cash Inflow	0	0	26	27	27	27	34	35	35	36	43	44	45	45	46	505
Cash Outflow																
Capital Cost	20	61	65	18	0	0	0	0	0	0	0	0	0	0	8	41
Operating Cost	0	0	14	15	17	17	20	20	21	21	24	24	25	25	25	315
After Tax Net Cash Flow	(20)	(61)	(53)	(6)	10	10	14	15	15	15	20	20	20	20	12	148
After Tax FIRR(%)	7.3%															
3.Total-Wastewater Treatment																
Cash Inflow	0	0	26	29	30	31	38	39	40	41	49	51	52	54	55	648
Cash Outflow																
Capital Cost	25	75	83	27	0	0	0	0	0	0	0	0	0	0	9	45
Operating Cost	0	0	14	17	19	19	22	22	23	24	27	27	28	29	29	359
After Tax Net Cash Flow	(25)	(75)	(72)	(15)	11	12	16	16	17	17	22	23	24	25	16	245
After Tax FIRR(%)	7.1%															
Overall Project																
Cash Inflow	0	19	129	214	800	858	897	933	997	1033	1044	1079	1088	1093	1131	13211
Cash Outflow																
Capital Cost	213	812	726	554	0	0	0	0	0	0	0	0	0	0	138	497
Operating Cost	2	5	52	131	649	687	717	744	776	805	809	817	824	825	834	9771
After Tax Net Cash Flow	(216)	(798)	(649)	(471)	151	172	180	189	221	228	236	262	265	268	160	2943
After Tax FIRR(%)	7.7%															

FIRR = financial internal rate of return, () = negative.

Source: Asian Development Bank estimates

Table A9.3: Sensitivity Analysis of the Financial Internal Rate of Return
(CNY million)

Year	Base Case	Sensitivity Cases				
		(i) Capital Costs Plus 10%	(ii) Direct O&M Costs Plus 10%	(iii) Revenue Less 10%	(iv) Implementation Delay 1 Year	(v) Combination of (i), (ii), (iii) and (iv)
NPV	1,002.09	763.24	712.65	318.51	839.96	(225.63)
FIRR	7.7%	6.6%	6.7%	5.2%	7.3%	2.9%
SI		1.4	1.34	3.2	0.46	6.3
SV		41.96	34.62	14.66	61.81	8.16
WACC	3.9%	—	—	—	—	3.9%

() = negative, FIRR = financial internal rate of return, NPV = net present value, SI = sensitivity indicator, SV = switching value, WACC = weighted average cost of capital.

Source: Asian Development Bank estimates.

COMPUTATION OF PROJECT ENVIRONMENTAL BENEFITS

A. Methodology

1. The economic analysis of environmental impact requires an evaluation of avoided environmental costs of the Project, which are taken as environmental benefits/costs of the Project. For each subcomponent, the emissions from the Project and its alternative supply options are studied to identify its environmental benefits (costs). The environmental impact analysis is carried out in four steps: (i) major stressors or polluters are identified; (ii) impact screening is carried out for each stressor; (iii) if the impacts are major, efforts are made to place monetary valuation; and (iv) the benefits (costs) flows are quantified for integration with the economic analysis of the Project. Details of the methodology are presented in Supplementary Appendix L. Table A10.1 describes the typical coal contents used by residents and industry in the Inner Mongolia Autonomous Region. Based on analysis in Table A10.2, the annual avoided emissions of the major environmental stresses were estimated, including 1,792.3 ton of carbon dioxide, nitrogen oxide, particulate matter (PM10), sulfur oxide and total suspended particulates (TSP) which were calculated as the emission difference of the project component and alternative fuels (liquefied petroleum gas, propane, and coal) for consumers. These environmental stressors are screened for their potential impacts on four major groups: human health, human welfare, environmental resources, and global systems.

Table A10.1: Coal Quality Analysis

Item	Item	Unit	Value
Industrial Analysis	Heat value	Kcal/kg	5,300
	Total moisture	%	7.9
	Inherent moisture	%	—
	Ash content	%	21.4
	Volatile meter	%	15
Element Analysis	Carbon	%	57.4
	Hydrogen	%	3.52
	Oxygen	%	4.18
	Nitrogen	%	0.93
	Sulfur	%	0.46

— = not applicable., Kcal/kg = kilocalorie per kilogram.

Source: Asian Development Bank estimates.

2. In modeling the effects of waterborne discharges, various factors need to be considered, the most obvious being whether the receiving water system is a stream, estuary, lake, ocean, or groundwater table. Key water quality indicators are summarized in Table A10.2.

Table A10.2 Water Quality Indicators

Oxygen	Salinity	Nutrients	Toxics	Pathogens	Solids	Water Properties
Dissolved oxygen BOD ₅ , COD	Total dissolved solids	Nitrates Phosphates	Pesticides Heavy metal	Fecal coliforms	Total suspended solids	Temperature pH, turbidity hardness color, odor, taste, electrical conductance

BOD = biological oxygen demand, COD = chemical oxygen demand,.

Source: Asian Development Bank estimates.

3. Table A10.3 identifies potential environmental impacts. The benefit transfer method was used for this assessment. While adjusting the data from the results of original research in the United States (US) to the People's Republic of China (PRC) (Table A10.4), three major adjustments were carried out for (i) GDP differentials between the US and PRC, (ii) updating of price levels to 2004 constant prices, and (iii) medical cost level differentials between the US and PRC. For inflation adjustments, a GDP deflator was used. Table A10.5 summarizes the adjusted values for environmental impacts.

Table A10.3: Potential Impacts

Stressors	Human Health		Materials	Human Welfare		Coastal Marine	Environmental Resources		Global System
	Mortality	Morbidity		Resource Use	Social/Cultural		Ground-water	Biodiversity	
PM10	X	X	X	X					
SO ₂	X	X	X	X	X				
NO _x	X	X	X		X				
CO ₂									X
CH ₄									X

CO₂ = carbon dioxide, NO_x = nitrogen oxide, PM10 = particulate matter, SO₂ = sulfur dioxide.

Source: Asian Development Bank estimates.

Table A10.4: Unit Value for Environmental Emissions in the United States
(\$1,000 tons/person)^a

	Local		Regional		Distant	
	Low Limit	Upper Limit	Low Limit	Upper Limit	Low Limit	Upper Limit
PM10	0.200	0.300	0.100	0.300	0.040	0.080
SO ₂	0.040	0.080	0.020	0.040	0.010	0.020
NO _x	0.060	0.080	0.040	0.060	0.010	0.020

NO_x = nitrogen oxide, PM10 = particulate matter, SO₂ = sulfur dioxide.

^a The numbers are in 1992 prices.

Source: ADB. 1996. *Economic Evaluation of Environmental Impacts – A Workbook*. Manila.

Table A10.5: Adjusted Unit Value for Environmental Emissions
(CNY1,000 tons/person)^a

	Local		Regional		Distant	
	Low Limit	Upper Limit	Low Limit	Upper Limit	Low Limit	Upper Limit
PM10	0.279	0.419	0.119	0.358	0.035	0.070
SO ₂	0.056	0.112	0.024	0.048	0.009	0.018
NO _x	0.084	0.112	0.048	0.072	0.009	0.018

NO_x = nitrogen oxide, PM10 = particulate matter, SO₂ = sulfur dioxide.

^a The numbers are in 2004 prices.

Source: Asian Development Bank estimates.

B. Environment Benefit Summary

4. The total emissions were computed by first multiplying the emission factors (kilogram/gigajoules) with the estimated heat production (gigajoules per year) at the conclusion of the 25-year analysis period for the reference case (small boilers). Then the emissions from the central heating systems (large boilers) were estimated using the same method. The total emission reductions from project components were computed by comparing the emission levels

between the reference case and the Project components. For natural gas transmission and distribution, the environmental benefits are the environmental cost differences of the alternative energy supply options with and without the Project. Based on the externality cost of different fuels and the amount of air pollutant emissions, the environmental benefit due to the natural gas transmission and distribution can be calculated. However, calculating the incremental environmental benefit of wastewater treated by the Project is difficult. Considering the experience of the Asian Development Bank in wastewater projects in general and the country's circumstances in particular, the economic evaluation of the environmental impacts of the wastewater projects were calculated based on the criterion of collecting fees for wastewater in the PRC. The total economic values of the reduced wastewater from the subprojects are estimated in Table A10.6.

Table A10.6: Environmental Benefits for the Project
(CNY million)

Item	2006	2007	2008	2009	2010	2020	2030	NPV
Central Heating	0	0	24.0	33.0	38.0	58.0	58.0	298.0
Natural Gas	0	0	0	0	8.4	9.4	10.6	44.4
Wastewater	0	0	0	35.0	42.0	59.0	59.0	290.6

NPV = net present value.

Source: Asian Development Bank estimates.

SUMMARY POVERTY REDUCTION AND SOCIAL STRATEGY

A. Linkages to the Country Poverty Analysis

Is the sector identified as a national priority in country poverty analysis? <div style="float: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No </div>	Is the sector identified as a national priority in country poverty partnership agreement? <div style="float: right;"> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No </div>
Contribution of the sector or subsector to reduce poverty in the People's Republic of China (PRC):	
<p>In line with the Government's energy sector strategy to promote socioeconomic development and to meet the basic needs of the poor, increased clean gas and central heating supplies are needed to support the national poverty reduction program. Adequate and reliable gas and central heating supplies are essential to human well-being in the cold Inner Mongolia Autonomous Region. Gas and central heating supply will reduce coal and wood burning that cause serious environmental and air-related diseases in the project areas. The poor, women, and children can be particularly vulnerable as they tend to be exposed more extensively to urban pollution than other population classes. A better urban environment can improve the local investment climate to attract more investment to the region and promote the development of the industry and service sectors. Through careful design of project subcomponents and active policy dialogue, this Project provides specific gas and central heating assistance programs to the poor so they can have reliable gas and central heating supplies in the winter. The Project will improve the quality of life for the local people. Overall, the gas and central heating supplies of the Project will complement the PRC's poverty reduction efforts.</p>	

B. Poverty Analysis

Poverty Classification: General Intervention

Poverty analysis has been treated as an integral part of project design, and is based on quantitative and qualitative methodologies. Project planning and design have made use of national, provincial, municipal, and subproject poverty data; and involved field poverty assessments, questionnaire surveys, and stakeholder consultations, including with project beneficiaries. Participatory methods were used to identify the local poor population and the provisions that would help to improve the quality of their lives. The Project will directly benefit a total population of about 2.2 million in the eight project areas. Of the total beneficiaries, about 0.96 million urban residents will benefit from the gas supply and central heating supply. About 71,324 or about 7.5% of the total beneficiaries are poor as measured by the various city poverty lines. The increased use of gas and heating supplies (including the closure of 396 small inefficient coal-fired boilers) will reduce the use of coal and coal briquettes that cause environmental and health impacts, particularly for the poor. The Project will indirectly benefit the entire urban population residing in the eight project areas. The benefits for the poor from the Project include the following:

- (i) **Job creation:** The Project will create about 10,240 person-years of employment opportunities during project construction and 1,412 full-time jobs during operation. Of the total, 4,090 person-years of employment opportunities will be filled by the poor, women, and minorities with an estimated total of CNY44.2 million in wage payments during project construction. In addition, 565 employment opportunities with CNY6.1 million of annual wage payments are expected to go to the poor, women, and minorities during project operation. Local procurement of the materials required for the Project is expected to create additional jobs.
- (ii) **Reduced environmental (outside and indoor) impacts:** Through the development of methane gas supply; improved and increased gas and central heating supplies; and closure of 396 small, inefficient, and polluting coal-fired boilers, the Project will reduce air emissions of sulphur dioxide, carbon dioxide, nitrogen oxide, total suspended particulate, and solid wastes in the project areas. This will result in tremendous socioeconomic and environmental benefits to the local communities and populations. Improved air quality will reduce the morbidity and mortality rate of air-related diseases and associated medical costs, and loss of healthy working days in the project area. The poor, elderly, children, and women, who have fewer coping resources and are more vulnerable, will benefit disproportionately from the reduction in air emissions. Because women usually spend more time than men cooking; the length of their exposure to smoke is higher. As such the Project will benefit women more than men.

- (iii) **Enhanced quality of life for the poor:** Survey results show that majority of the urban residents believe that the supply of gas and central heating and the disposal of wastewater will improve the overall quality of life, reduce housework for women, decrease health problems, increase comfort and entertainment activities, and facilitate longer study periods during the winter.
- (iv) **Connection fee and tariff discount:** The average heating expenditure burden (the ratio of heating expenditure and the household's monthly income) of the poor in the project areas is high, ranging from 17.5% to 30.7% of their total household expenditure. Through policy dialogue, the project city governments and the project implementing agencies (PIAs) have agreed to specific programs to help the poor to pay for gas supply and winter heating. These programs will ensure the amount for gas or central heating that a poor household, as defined by the city poverty line, will pay is about 5% of the household's monthly income. The PIAs will provide connection fee and tariff discounts to the poor. These discounts will come from the cost savings from the efficiency improvement of the Project and financial profits of investment under the Project. If the household's payment plus the discounts given by the PIAs is less than the total gas or heating bill, the remainder of the gas or heating bill will be covered by local governments. This approach is consistent with ADB policy that tariff subsidies should be transparent and explicit, and that the government social objective should be separated from commercial management of enterprises. A summary of the discounts to the poor planned by the PIAs and preliminary cost savings follows:

A total of 52,337 poor households living under the city poverty lines classified for those with incomes under the minimum living guarantee in the project areas will benefit from the gas and central heating supply connection and tariff discounts offered by the PIAs. Of these, 22,971 poor households receiving the gas and heating supply connection will have annual savings of CNY10.2 million for the connection fees and CNY26.84 million for tariff reductions for the beneficiaries. The Project's city government-funded gas supply and central heating assistance program should supplement the tariff discounts offered by the PIAs so that the poor households can have sufficient gas and heating supply.

C. Participation Process

Is there a stakeholder analysis? ☒ Yes ☐ No

A stakeholder consultation and analysis was done during the project preparatory technical assistance (TA) and roles of each stakeholder were defined. The local governments and communities will assist the PIAs with land acquisition, implementation of a short resettlement plan, and organization of local labor for project construction. The Inner Mongolia Autonomous Region government (the Executing Agency), PIAs, and TA team undertook socioeconomic surveys and public meetings to raise awareness and gain local support. These processes enabled local stakeholders to express their opinions and to make relevant suggestions. Specifically, intensive consultation of village leaders, rural poor, and women were conducted during the TA socioeconomic survey on project impact and resettlement issues. The participatory activities are an ongoing process that will continue during project implementation. The poor and women will be given additional consideration during project implementation.

Is there a participation strategy? ☒ Yes ☐ No

A resettlement information booklet for the central heating subcomponent will be distributed to those affected by the Project. Further consultation with those affected will continue throughout the land acquisition process. Ongoing consultations will be carried out by the PIAs to understand and meet the evolving needs and expectations of the users; increase awareness of the public about the benefits of the Project; and encourage the active involvement of local communities to maximize their support for the Project, promote gas and heating consumption and saving, and raise the social acceptance of user fees. The consultations can take the forms of annual questionnaire surveys by consumer category, combined with ad hoc community forums. Women's organizations and schools usually have extensive networks that can be used for the distribution of information materials and survey questionnaires. To maximize project benefits to community members in the project area, the PIAs will ensure that the contractors maximize hiring laborers for project construction from local communities and provide necessary training. A social development action plan was prepared to address mitigation and enhancement measures to maximize project benefits to the communities in the project area.

D. Gender Development**Strategy to maximize impacts on women:**

To maximize the project benefits to women, preferential policies will be given to women for the employment and training opportunities generated from the construction and operation phases, and the proposed poverty reduction programs of the Project. Women's needs and interests will be represented during project implementation. The PIAs will adopt a proactive employment system and targeted training programs for women. The implementation of gender equity policies will encourage filling employment opportunities with women and the poor. Particular attention will be paid to women during the land acquisition and resettlement process.

Has an output been prepared? ☒ Yes ☐ No

E. Social Safeguards and Other Social Risks

Item	Significant/ Not Significant/ None	Strategy to Address Issues	Plan Required
Resettlement	<input type="checkbox"/> Significant <input checked="" type="checkbox"/> Not significant <input type="checkbox"/> None	The impacts of permanent land acquisition and temporary land occupation by project construction are limited. A total of 51.56 hectares (ha) of land will be acquired, of which 32% (16.36 ha) is farmland. Sixty-eight percent is wasteland and sandy land (35.19 ha). A total of 133 people (60 households) will be affected by the permanent farmland acquisition. An additional 175 are estimated to be affected by the temporary land occupation for an average of 90 days during the entire project implementation. Foreseen impacts will be minimal; however a short resettlement plan was prepared and will be updated once a detailed measurement survey is made. Consultation was carried out during the TA and further consultation will be carried out between the local government land committee and affected households.	<input type="checkbox"/> Full <input checked="" type="checkbox"/> Short <input type="checkbox"/> None
Affordability	<input type="checkbox"/> Significant <input checked="" type="checkbox"/> Not significant <input type="checkbox"/> None	The affordability of the poor has been assessed. In the project areas, heating bills account for 17.5% to 30.7% of the average monthly incomes of the poor households living under the city poverty lines. Through active policy dialogue, the PIAs and project areas have agreed to establish a city government-funded heating assistance fund of about CNY13.4 million for tariff discounts and connection fees to the poor so the eligible poor households will not pay generally more than 5% of their monthly income for gas and/or central heating supply. The annual savings will be CNY10.2 million for the connection fees and CNY26.84 million for tariff reductions for the poor household.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No
Labor	<input type="checkbox"/> Significant <input checked="" type="checkbox"/> Not significant <input type="checkbox"/> None	The Project will create about 10,240 person-years of employment opportunities during construction and 1,412 full-time jobs during operation. The closure of 396 small boilers will affect about 784 workers. Reemployment plans were prepared by the PIAs to ensure that all the affected workers will be reassigned to similar jobs or retrained. The affected workers will not be financially worse off than they would have been in the absence of the Project. The government of IMAR will ensure that no job and income losses will happen. The reemployment plan is summarized in Social Development Action Plan.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No

Item	Significant/ Not Significant/ None	Strategy to Address Issues	Plan Required
Indigenous Peoples	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None	<p>The Project will benefit all urban residents regardless of their ethnicity. Of the approximate 174,600 (or 8% of total project beneficiaries) members of minority groups, most are Mongolian, who will benefit from the increased and improved gas and central heating supplies. Few ethnic minority households will be affected by land acquisition for the Project. For those affected by land acquisition, mitigation measures are covered under the short resettlement plan. Other than the land acquisition, no adverse impacts or significant changes to their livelihoods or culture are anticipated. The social survey shows that affected Mongolians are not economically vulnerable compared to the main stream population (net income per capita of Han and Mongolian nationality is CNY3,300 and 3,200 respectively). Therefore, further action is not required.</p>	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
Other Risks/ Vulnerabilities	<input type="checkbox"/> Significant <input type="checkbox"/> Not significant <input checked="" type="checkbox"/> None		<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

POVERTY IMPACT RATIO ANALYSIS

A. Methodology

1. The poverty impacts of the Project are assessed by evaluating the expected distribution of net economic benefits among different groups. The approach takes only the direct project benefits into account in assessing poverty impact. The direct project benefits include resource cost savings, revenue, consumer surplus, and the local environmental benefits from reducing pollutant emissions and water pollution. The methodology involves three steps: (i) estimate the present value of net financial and economic benefits by participating group; (ii) for each group, deduct the financial benefits from the economic benefits to give the distribution of net economic benefits; and (iii) assign the net economic benefits (NEB), accruing to the poor, according to the proportion of each group that is poor. A poverty impact ratio expressing the proportion of NEB accruing to the poor can be calculated by comparing the NEB to the poor with the NEB of the Project as a whole.¹ The analysis used constant 2004 prices, a standard conversion factor of 0.93, and a discount rate of 12%. Tradable commodities were valued at border prices at the prevailing exchange rate. Nontradable commodities were valued at shadow prices, using a mix of standard and specific conversion factors. Net financial benefits (NFB) and NEB are expressed in yuan (CNY).

B. Benefit Distribution

2. The NFB are equal to sales revenue of CNY5.926 million minus capital costs of CNY1.682 million, operating costs of CNY3.594 million, labor costs of CNY449 million, and income taxes of CNY309 million. The NFB of the Project shows a loss of CNY108 million in net present value at a 12% discount rate (Table A12). The NEB of the Project expressed at the domestic price level are CNY866 million. They are equal to gross benefits of CNY6,771 million (including consumer surplus and environmental benefits) minus capital costs of CNY1.723 million, operating costs of CNY3.745 million, and labor costs of CNY437 million (wages valued at the shadow price of labor for both skilled and unskilled labor). The difference between the NEB and NFB is distributed by groups. The difference of CNY974 million is made up of (i) consumer surplus of CNY302 million (mainly in terms of the difference between the without-project cost of gas and heating supply and the with-project expenditure on gas and heating plus the value of gas and heating supply consumed but not paid for; (ii) the environmental benefits of CNY543 million from efficiency improvement, closure of small coal-fired boilers, and disposal of wastewater; (iii) the difference between financial and economic cost of capital investment and operating costs of CNY41 million and CNY151 million, respectively (mainly due to government taxes and duties, overvaluation of the exchange rate, and other price distortions); (iv) loss to skilled labor of CNY49 million (current wages less opportunity cost of labor); (v) gain of unskilled labor of CNY61 million; and (vi) income taxes of CNY309 million.

3. The differences between the NEB and NFB give rise to losses and gains among the project participants. Considering the overall result of NFB of negative CNY108 million and NEB of CNY866 million for the Project, the NEB exceeds the NFB by CNY974 million. Skilled labor will lose CNY49 million and unskilled labor gain CNY61 million at the project wage levels, which are lower (higher) than the opportunity costs, while consumers will gain from their consumer surplus of CNY302 million. The investor (project companies) of the Project will lose CNY108 million at a discount rate of 12%. Since this is a public sector loan and project companies are state-owned enterprises or guaranteed by the Government, the CNY108 million losses could be

¹ The poverty impact ratio is based on the distribution of project net benefits. This differs from the project classification criterion of the Asian Development Bank, which is expressed in terms of the number of beneficiaries.

considered as the Government's financial loss from investing in the Project (unable to invest in a project with 12% financial return). The environmental benefits of CNY543 million and income taxes of CNY309 million will be considered as the gains to the Government from a national perspective. Subtracting the gains of CNY41 million from capital costs and CNY151 million from operating costs results in a net economic gain to the Government of CNY660 million.

C. Poverty Impact Ratio

4. The differences between the financial and economic values, and the consequent gains and losses for different project participants, provide the basis for considering the impact of the Project on the poor. The poor account for 7.5% of the people living in the project area.² The incremental gas and better heating supply could benefit the urban poor more as their consumption is projected to increase faster because of their current low consumption levels. The government of the Inner Mongolia Autonomous Region (GIMAR) agreed to ensure that project areas consider establishing heating assistance programs for the poor with adequate annual government budget. Cost savings resulting from the efficiency improvement of the Project will be passed on to the poor in the form of heating bill discounts. These programs will be designed to alleviate the affordability problems in the project areas. Based on the projected share of urban consumers, their consumption pattern, number of the poor living below the poverty line, projected cost savings, and the estimated tariff reduction, the share of the consumer surplus going to the poor is estimated at 7.0%.

5. From a national perspective, the gains of CNY660 million (the gains of the Government) are mainly the environmental benefits and income taxes with the Project. Some Government losses are from capital investment and operating costs (CNY41 million and CNY151 million, respectively). The loss is further offset by the financial losses of CNY108 million (at 12% discount rate). A 2001 Asian Development Bank (ADB) publication indicates that the poor are disproportionately affected by environmental degradation and benefit more from environmental improvement.³ Without the Project, the poor would not have information about and access to, or could not afford more efficient (less-polluting) equipment and fuels. The water, gas distribution, and heating supply networks are usually less well functioning or absent in the poorer sections of the areas. Based on the household survey, most non-poor have access to existing water, gas, and heating supplies. The inadequate water, gas, and heating supply to the poor increase the exposure of the poor to daily doses of pollutants because of using coal and poor quality water for domestic consumption, as well as the risk of accidents. Therefore, the reduction of local environmental pollution will benefit the poor substantially more. Based on the household survey, demand forecast, and discussions with the Executing Agency—GIMAR, the local environmental protection agency, and the project preparatory technical assistance (TA) consultants, this analysis estimates that the share of the government's net benefits (environmental benefits) going to the poor living below the poverty line will be 17%.

6. The direct employment effect of the Project during construction is an important project benefit. The local currency portion of the Project is about 58% of the project cost. Of the 58%, the nonequipment portion is substantial. Part of that will benefit the rural poor in the project area by direct employment. Since the poor are normally unskilled labors, they will be the beneficiaries of the Project as the current wages would be higher than their opportunity costs. Based on the projected labor employed in the Project through a special employment program for the poor, particularly in gas distribution and central heating supply subcomponents, 15% of the surplus for unskilled labor will go to the urban poor.

² The poverty lines used in the poverty analysis are the official urban poverty lines in the project areas.

³ ADB. 2001. *Moving the Poverty Reduction Agenda Forward in Asia and the Pacific*. Manila.

7. The requirement of a project disproportionately benefiting the poor translates into (i) an economic internal rate of return of 12% or above, and (ii) a poverty impact ratio significantly greater than the poor's share in GDP, which is usually lower than the number of poor in the project areas. Table A12 shows that the NEB directly accruing to the poor are CNY117 million. The Project's poverty impact ratio, which expresses the proportion of NEB of the Project accruing to the poor, is 13.5%; this is higher than the ratio of the poverty population in the project area of 7.5%. The calculation of poverty impact ratio is based on the direct benefits of the Project. All other indirect benefits are not captured in the poverty impact ratio.

D. Conclusion

8. The analysis concludes that the Project will support pro-poor economic growth. The risk analysis on the poverty impact ratio calculation, together with the analysis on the probability of overall project failure, concludes that the probability of a negative outcome for the poor is minimal.

Table A12: Benefit Distribution and Poverty Impact Analysis
(Present values at 12%, in CNY million)

Item	Accounts			Beneficiaries			
	Financial Accounts	Economic Accounts	Difference	Consumers	Economy	Labor	Total
A. Distribution of Project Benefits							
Benefits							
Output	5,926	6,228	302	302			
Local Environmental Benefits	—	543	543		543		
Total Benefits	5,926	6,771	845	302	543		
Costs							
Capital Costs	1,682	1,723	(41)		(41)		
Operating Costs	3,594	3,745	(151)		(151)		
Labor-skilled	101	150	(49)			(49)	
Labor-Unskilled	348	287	61			61	
Income Taxes	309	—	309		309		
Total Costs	6,034	5,905	129				
Net Benefits	(44)	929	973	302	660	12	974
B. Poverty Impact							
Beneficiaries							
Difference in Financial and Economic Accounts				302	660	12	974
Net Financial Benefits					(108)		(108)
Total				302	552	12	866
Proportion of Poor				7%	17%	15%	
Benefits to Poor				21	94	2	117
Poverty Impact Ratio							13.5%

— = not available, () indicates negative value.

Note: To express the economic benefits and costs in units of domestic prices, a ratio of the shadow to the official exchange rate of 1.075 is used in this analysis.

Source: Asian Development Bank estimates.

SUMMARY RESETTLEMENT PLAN

A. Introduction

1. The proposed Inner Mongolia Autonomous Region Environment Improvement Project will finance the construction of (i) a gas transportation system from Changqing gas field to Wuhai and Bayannur municipalities, (ii) a central heating system in Wuhai and Bayannur, and (iii) two wastewater treatment plants in Bayannur. The resettlement plan covers all three components and is based on the project feasibility study. Since relatively few people will be affected by the Project, the Executing Agency, the government of Inner Mongolia Autonomous Region (GIMAR), and project implementation agencies (PIAs) conducted detailed village-level impact assessments. The resettlement plan will be revised after the completion of the detailed measurement survey and submitted to the Asian Development Bank (ADB) for approval prior to commencement of land acquisition.

B. Scope of Land Acquisition

2. The Project will affect 18 townships and 23 administrative villages in 12 counties, in Wuhai, Erdos, and Bayannur municipalities. According to the impact survey during the feasibility study, a total 51.56 hectares (ha) of land will be acquired, of which 32% (16.36 ha) is farmland. Sixty-eight percent is wasteland and sandy land (35.19 ha). A total of 10.21 ha will be occupied by the gas transportation system, 33.36 ha by the central heating system, and 7.69 ha by wastewater treatment plant. Another 653.45 ha will be occupied temporarily for an average period of 90 days during construction. Based on per capita farmland in affected villages, 133 people (30 households) will be affected by the permanent land acquisition and an additional 175 are estimated to be affected by the temporary land occupation. As well as the land acquisition, other affected assets include trees and electricity poles that have to be removed. No housing relocation is expected under the Project. All land and other assets will be compensated at replacement value.

C. Policy Framework and Entitlements

3. For people unavoidably affected, the resettlement objective is to achieve equal or better income and living standards in line with the PRC Land Administration Law (1998) and ADB's policy on involuntary resettlement.¹ The project management office (PMO) under GIMAR will ensure that any people losing land, housing, other assets, or income sources will be assisted to fully restore their income and living standards. In 2000, GIMAR issued a land administration decree to implement the 1998 Land Administration Law, and in 2004 issued a special decree concerning land compensation, which stipulates the regulations for land compensation, resettlement subsidies, young crop compensation, and other measures to carry out resettlement. According to the policy and basic socioeconomic conditions among project counties, detailed compensation rates will be agreed upon for each affected county. For the resettlement plan, a comprehensive compensation rate for land compensation including young crops has been estimated at ranging from CNY1,531 per ha to CNY2,459 per ha for cultivated land; and from CNY306 per ha to CNY699 per ha for wasteland. People losing land temporarily during construction will receive a payment equivalent to production value foregone for the period of loss, which is expected to be 1 year. The Project will arrange construction work occupying the farm land to take place during the winter so as to reduce the impact on production. The land used temporarily will also be restored by the contractor to the original condition.

¹ ADB. 1995. *Involuntary Resettlement*. Manila.

D. Resettlement Strategy

4. Efforts to minimize resettlement effects have been made after consultations with local officials during the setting of the alignment for the feasibility study. The selected alignment will avoid towns, villages, and high-yield crop and fruit gardens. Heating source sites are arranged as much as possible on land not in use in urban planned areas or established heating source plants. Heating stations are arranged in established boilers or reserved land in urban plans. Pipe will be laid along the established roads in areas. Therefore, no houses will be demolished. Efforts have been made to place wastewater treatment subprojects to minimize the use of cultivated land. The wastewater treatment subproject will occupy collective wasteland. For those unavoidably affected, the resettlement strategy is to replace losses of land, other assets, infrastructure, and income.

5. Higher than average compensation rates and various rehabilitation measures are proposed. GIMAR will ensure that the resettlement entitlements are provided to those affected before ground clearance. A land compensation and resettlement subsidy will be paid directly to the affected individuals. Compensation for young crops and other assets will be provided directly to people losing those assets. Compensation for infrastructure such as electrical and communication fixtures will be paid to the government departments concerned, for restoration.

E. Institutional Arrangements

6. GIMAR will assume overall responsibility for implementing resettlement according to the approved resettlement plan. A project leading group for resettlement within the PMO and PIAs will be directly responsible for coordination of the planning, implementation, financing, and reporting of land acquisition and resettlement for the Project. Both leading group and resettlement offices, each comprising three staff members will be established in three areas, with two staff members for 12 affected counties (districts). The county resettlement offices will take primary responsibility for the resettlement consultation, implementation, and timely delivery of entitlements, with assistance from concerned townships and villages.

F. People Affected by the Project

7. A total of 133 people (30 households) will be affected by the permanent land acquisition and an additional 175 are estimated to be affected by temporary land occupation. Among those affected by the permanent land acquisition, 16 Mongolians will be affected by the Project. No Mongolian village is located in the project area. Since Mongolians have been closely integrated in the current social system with no distinctive isolation or barriers, the compensation and rehabilitation adopted for affected Mongolians will be the same as those for Hans. The social survey shows that almost no difference of income between Mongolians and Hans among those affected by the permanent land acquisition (net income per capita of Hans and Mongolians is CNY3,300 and CNY3,200, respectively).

8. No economically vulnerable people, including elderly living alone, disabled, and households headed by women are among those affected by permanent land acquisition. Average annual net income per capita of those affected is CNY3,549 or \$438 as compared to the national poverty line of CNY637 or \$78.55 per capita per year. All those affected have income sources from nonagricultural activities, which range from 6% to 72% of their total gross income.

G. Consultation and Grievance Redress

9. The 1998 Land Law and document 28, 2004 requires disclosure and consultation with people affected by a project. The people affected have been notified about the key elements of the resettlement plan during meetings and interviews. During detailed resettlement planning, further consultations arranged by township and village officials will discuss specific impacts in each village and how they will be addressed.

10. In February 2006, GIMAR and relevant county resettlement offices distributed a resettlement information booklet to all affected townships and villages. The information booklet contains the resettlement scope, expected time frame, compensation rates for land and other assets, other assistance to replace assets, and the grievance redress mechanisms. The county, township, and village officials will ensure that any concerns raised by the people affected are quickly addressed.

11. In case of grievances, all complaints will be processed based on Government Regulation Number 431 on Grievance and Redress effective 1 May 2005. Affected people will submit their oral or written complaint first to the village committee or the township resettlement office. If their complaint is not settled in 2 weeks, they can seek redress at the county resettlement office within 1 month. If still unresolved within 2 weeks, a project leading group for resettlement within the PMO/PIAs will try to achieve a solution. The final redress will be sought, if necessary, in the civil courts, in accordance with the Civil Procedures Act.

H. Monitoring and Reporting

12. The plan for internal and external monitoring and evaluation is included in the resettlement plan. The GIMAR and PIAs will engage a qualified domestic monitoring agency to carry out independent resettlement monitoring and evaluation. The independent monitoring agency will ascertain the extent to which the affected people have (i) received their full entitlements on time; and (ii) fully restored their livelihoods, income levels, and living standards. It will also conduct a baseline survey prior to resettlement, semiannual monitoring and evaluation during resettlement, and evaluation 1 year after completion of land acquisition. The household survey will include a representative number of those severely affected by loss of land and those classified as a minority and economically vulnerable. The independent external monitoring agency will provide ADB and GIMAR with copies of the monitoring and evaluation reports to be prepared twice a year during resettlement implementation and once a year after resettlement completion.

13. A quarterly reporting system will be established in the project resettlement office in GIMAR and PIAs. GIMAR and PIAs will report to ADB on the progress of land acquisition through resettlement progress reports. After completion of land acquisition, GIMAR and PIAs will prepare a resettlement completion report and submit to ADB.

I. Finance and Implementation Schedule

14. The budget estimate is CNY26.95 million or \$3.3 million, for all costs including compensation, payments for other assets for public infrastructure and trees, fees for resettlement administration, monitoring and evaluation, and contingencies. GIMAR will guarantee to supplement the resettlement budget, as necessary, to meet any shortfall that emerges in achieving the resettlement objectives.

15. The resettlement implementation schedule has been prepared based on the project construction timetable agreed to by GIMAR with ADB (Table A13). Land acquisition is expected to commence by May 2006 and be completed by September 2006. GIMAR will update the resettlement plan after completion of the detailed measurement survey and submit it to ADB for approval prior to commencement of land acquisition.

Table A13: Work Plan and Schedule for Resettlement Planning
(as of 20 March 2006)

Item	Schedule	Responsible Agency
1. Resettlement leading group office set up	1 Sep 2005 (completed)	County Government
2. Resettlement office set up	Jan 2006 (completed)	County Government
3. Distribute resettlement information brochure	1 Feb 2006 (completed)	County RO
4. Publicizing compensation standards	Feb 2006 (completed)	County RO
5. Approval of feasibility study	31 Mar 2006	Submitted by PMO and approved by DRC, Financial Bureau, Construction Bureau
6. Confirm affected scope based on Feasibility Study	Apr 2006	County RO
7. Discuss and finalize compensation standards with affected people	Apr 2006	County RO
8. Prepare and conduct detail measurement survey for preliminary design (land measurement)	May 2006	County RO
9. Publicizing survey result and inform affected people	Jun 2006	County RO
10. Pay compensation for land acquisition to affected individuals to their bank account	Jul 2006	County RO
11. Approval of preliminary design	Jul 2006	Conducted by DI and approved by DRC, Financial Bureau, Construction Bureau
12. Conduct detailed design (within 1 week of the approval date from preliminary design)	Jul–Aug 2006	Conducted by DI
13. Complete application procedure to obtain land use permit from GIMAR (LAB)	Aug 2006	Project Owner and LAB of County
14. Restoration of special infrastructures	Aug 2006 -	Special Infrastructure Units
15. Commencement of civil works	Sep 2006 -	IAS
16. Resettlement monitoring and evaluation (mobilization of external monitoring)	Jul 2006 ~ Dec 2008	Resettlement Monitoring and Evaluation Institutions

DI = design institute, DRC = Development and Reform Commission, GIM = Government of Inner Mongolia Autonomous Region, IAs = implementing agencies, LAB = Land Administration Bureau, PMO = project management unit, RO = resettlement office.

Source: Resettlement Plan for Inner Mongolia Autonomous Region Environment Improvement Project, GIMAR