Technical Assistance Consultant's Report

Project Number: 37049
January 2007

Indonesia: Integrated Citarum Water Resources Management Project
(Financed by the Technical Assistance Special Fund

Prepared by Phase 3 Consultant Team

Indonesia

For Directorate General of Water Resources
Ministry of Public Works

Asian Development Bank

GOVERNMENT OF REPUBLIC INDONESIA
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF WATER RESOURCES

Asian Development Bank
TA -4381 (INO)
Integrated Citarum Water Resources Management Program
Phase 3

Report on Roadmap and Program Development

January 2007

Revision 1

Contents

Abbreviations

ADB	Asian Development Bank
AMDAL	Indonesian system of environmental assessment
AP	affected person
AWP	annual work programs
BOD	biological oxygen demand
CC	Case Composer
CPFPG	Compensation Policy Framework and Procedural Guidelines
CRB	Citarum River Basin
CSP	Country Strategy and Program
DGWR	Directorate General of Water Resources of the Ministry of Public Works
DST	decision support tool
EA	Executing Agency
EARF	Environmental Assessment and Review Framework
ETC	East Tarum Canal
GOI	Government of Indonesia
GRDP	non-government organisation
IA	Implementing Agency
ICWRMP	Integrated Citarum Water Resources Management Program
IWRM	integrated water resources management
JICA	Japan International Cooperation Agency
MCV	Model Conservation Village
MFF	Multi-Tranche Financing Facility
MOA	Multi-Objective Analysis
MPW	Ministry of Public Works
NGO	non-government organisation
NTC	North Tarum Canal
NWRSC	National Water Resources Steering Committee
O&M	operation and maintenance
PA	Protected Area
PES	payments for environmental services
PIM	participatory irrigation management
PIU	Project Implementation Units
PJT-II	Jasa Tirta Public Corporation II
PMCU	Program Management and Coordinating Unit
ppm	parts per million
PPTA	Project Preparatory Technical Assistance
PROKASIH	Indonesian clean rivers program
PWRS	Provincial Water Resources Service
ROW	right-of-way
RPMCU	Roadmap Planning Monitoring and Coordination Unit
RRP	Report and Recommendation of the President
SEA	strategic environmental assessment
TA	technical assistance
TOR	Terms of Reference
WA	water allocation
WLM	waste load model
WQ	water quality
WTC	West Tarum Canal
WWTP	wastewater treatment plant

Currency

Currency Unit	–	Indonesian rupiah (IDR)
IDR1.00	=	$0.00011
$1.00	=	IDR9,100

Acknowledgements

This report, which describes the processes, activities and results of PPTA Phase 3 the, is effectively the mission report of the Phase 3 Team leader. Each of the international team members have prepared their own mission report. However, significant contributions to this report were made by team members: Ramon Abracosa, Roger Jackson, Jeremy Bird, Rieks Toxopeus, Teunis op ten Noort, Tan Bock Thiam, Darrell Kitchener and Romeo Cleto.

In addition, excellent support to the Team Leader was given by the Indonesian consultant staff, especially Tony Bambang Trihartanto and Sri Hernowo, and the project office staff.

Finally, the enthusiasm, guidance and tireless efforts of the ADB Mission Leader, Chris Morris helped the Team Leader and the rest of the Phase 3 team continue on to the end, when at times the task seemed impossible.

1 Background

1.1 Introduction

The water resources of the rivers and groundwater systems in the Citarum River Basin are critical to social and economic development of the country. They are essential for urban and industrial development (particularly in Jakarta and Bandung areas) including export industry, agricultural production through major irrigation systems, rural water supplies, electricity generation though hydropower, and fisheries. While the water resources of the Citarum River Basin are relatively abundant, competition for these resources has increased significantly over the past 20 years leading to a situation of acute water stress and depletion of aquifers in some places. Rapid urbanization has significantly increased the exposure to flood risk. Environmental degradation has reached a level that compromises public health and livelihoods, particularly for the urban and rural poor, and incurs additional economic and financial costs related to the source of bulk water supply and its treatment. A management focus on integrated water resources management (IWRM) and sustainability of the water resource has been emphasized in the 2004 Water Law. The Water Law introduces the concept of management within the boundaries of a river basin and reflects the principles of decentralization and devolvement of authority to local levels as promoted by the program of regional autonomy. Preparations for its implementation are at a preliminary stage.

Water has been a major area of the Asian Development Bank's (ADB) assistance to Indonesia, totalling over $1.5 billion in loans and technical assistance (TA). Improving sustainable use of water resources in-line with the ADB "Water for All" policy, together with a strong commitment to build capacity of local government agencies, are key elements of ADB's operational partnership. In particular this partnership stresses the need to continue implementation of policy reforms, overcome weak coordination among agencies and develop guidance for cooperative working. Sustainability of economic growth and pro-poor development are key pillars of the Country Strategy and Program (CSP) that will be complemented by strengthening capacity for IWRM in the basin.

1.2 Project History

In 2003 the Government of Indonesia (GOI) requested financial support from ADB to prepare an IWRM project in the Citarum River Basin. Initially the main objective of the assistance was aimed at preparing a loan project for the rehabilitation of deteriorated irrigation and water supply facilities within the basin. The ADB responded to the request, and agreed to carry out a Project Preparatory Technical Assistance (PPTA) called the Integrated Citarum Water Resources Management Program[1] (ICWRMP). This aims to find effective and sustainable solutions through the integration of: demand-

[1] The original name was the Integrated Citarum Water Resources Management *Project*. However, with the change in funding modality and broader scope now envisioned, the term "program" is considered more appropriate.

side planning; supply-side planning; operation and maintenance (O&M) of the water control infrastructure; watershed management; environmental management; risk management with the improvement of the facilities; institutional strengthening; gender considerations and public participation. The PPTA is intended as the first step in implementing the loan project and was included in ADB's 2004 country assistance program for Indonesia.

The initial Terms of Reference (TOR) specified that the purpose of the TA was to assist the Government to carry out a study for the Integrated Citarum Water Resources Management Project and include the following activities;

1. Update the IWRM plan for the Citarum River Basin;
2. Strengthen the institutional capacity for IWRM;
3. Review government policy on raw water tariffs and O&M of water supply systems by Jasa Tirta Public Corporation II (PJT II), and recommend the appropriate level of tariff with future responsibility of PJT II;
4. Prepare a regulatory framework for IWRM, including roles and responsibilities of stakeholders; and
5. Formulate an IWRM project for the Citarum River basin, for possible loan funding by ADB.

A consortium of consultants, led by the Japanese firm Nippon Koei Co. Ltd. carried out two phases of the PPTA, commencing in early 2005, and their work culminated with the submission of a Final Report in March 2006[2]. After a quite structured process of problem identification, project identification and prioritization, the report recommended, among other things, that a total of eighteen priority projects be included in the loan project. These projects are described in Chapter 7 of this report.

However, three circumstances have led to a rethinking of the outcomes of Phases 1 and 2. Firstly, ADB has introduced a number of new funding modalities that are more client-focused, and one of these is the Multi-Tranche Financing Facility (MFF). This modality allows loan funds to be provided to the borrowing government in a number of tranches (stages) that can be timed to better reflect the state of readiness and rate of progress of the proposed projects, as well as changing circumstances over time. This provides greater flexibility to the borrowing government, as well as lower costs, as commitment fees do not accrue on unallocated tranches. Accordingly, GOI agreed that the MFF arrangement would be appropriate for the ICWRMP. In order to plan for this new flexible style of loan, a strategic plan, or "roadmap", needed to be developed to show what inter-ventions would likely be needed in the future to achieve stakeholder objectives for water resource management in the Citarum River Basin. Development of such a roadmap was not included in the original TOR for the PPTA.

Secondly, concern was expressed by some stakeholders, and mainly those in the upper part of the basin, that although there had been stakeholder consultation during the first phase of the PPTA, there was too much emphasis on infrastructure rehabilitation and development in its outcomes. There was a quite widely held opinion that environmental and social issues were not adequately addressed and that there was a preponderance of attention to be paid to the lower basin.

Thirdly, GOI has plans to establish new institutional arrangements for the management of the water resources of basin in accordance with Water Law

[2] *Integrated Citarum Water Resource Management Project: Final Report for Phases 1 and 2*, Nippon Koei, March 2006.

7/2004. These include the establishment of Basin Water Council, for cross-sectoral coordination, and an implementing unit for water resources planning and management, or *Balai Besar*. This is expected to have a significant impact on the functioning of existing agencies operating in the basin.

These circumstances led ADB to approve a third phase of the PPTA that would:

1. Review the work done in the first two phases of the project in the light of the changed circumstances described above;
2. Assist the stakeholders in the basin determine suitable objectives for water resource management in the basin over the projected life of the loan (now generally agreed to be 15 years):
3. Develop a roadmap (to the year 2021) that would set out a timetable of suitable interventions (projects) to achieve the agreed objectives, noting that not all of these would be necessarily funded by ADB, but may be executed with the financial assistance of other donors, or indeed with the government's own funds;
4. Determine which interventions might be funded by ADB under the MFF loan, and what should be included in the first and succeeding tranches;
5. Assist the government to prepare, to the greatest possible extent given the limited time available, a number of priority projects that will be included in the first tranche.
6. Assist in the preparation of the RRP for loan fact-finding, appraisal and eventual approval.

Accordingly, a number of international and national consultants were recruited to undertake this work, some through Nippon Koei, and some directly by ADB. Nippon Koei continued to provide administrative, logistical and technical support. The third phase commenced on 17 July 2006. This report documents the approach and results of the Phase 3 work, which was completed on 15 December 2006.

2 Personnel and Inputs

The following international consultants were mobilised to undertake the work in Phase 3.

Table 1: International Consultants

Name	Position	Employed By
Dr Geoff Wright	Phase 3 Team Leader MFF Planner	ADB
Mr Norio Takayanagi	Phase 1&2 Team Leader Resources Person	Nippon Koei
Mr Roger Jackson	Project Programmer (WSS/Groundwater)	ADB
Mr Jeremy Bird	Institutional Policy Specialist	ADB
Mr Rieks Toxopeus	Program Development Specialist	ADB
Mr Teunis op ten Noort	River Basin Modeller Water Quality Expert	ADB
Mr Tan Bock Thiam	Economist and Financial Specialist	ADB
Mr Romeo Cleto	Sociologist Resettlement Expert	Nippon Koei
Mr Ramon Abracosa	Environmental Specialist	Nippon Koei
Dr Darrell Kitchener	Biodiversity Specialist	ADB
Dr John Ackers	Sedimentation Specialist	ADB

The following national consultants were also employed as part of the project team:

Table 2: National Consultants

Name	Position	Employed By
Pak Tony Bambang Trihartanto	Facilitator Stakeholder Liaison	ADB
Pak Sri Hernowo	Institutional Specialist Planner	ADB
Ibu Ratih Widyaningsih	Environmental Specialist	ADB
Pak Rimun Wibowo	Resettlement Specialist	ADB
Pak Iwan Setiawan	Database/GIS Specialist	ADB
Ibu Etty Riani	Ecologist	ADB
Iskander Nugraha	Water Resources Modeller	Wiratman Associates

In addition, the following ADB staff made a significant contribution to the TA:

Table 3: ADB Specialists

Name	Position
Mr Chris Morris	Mission Leader Senior Water Resources Specialist
Mr Nasimul Islam	Environmental Specialist
Ms Sari Aman-Wooster	Social Specialist
Mr Christophe Gautrot	Legal Specialist
Mr Chong Chi Nai	Principal Procurement Specialist
Ms Marla Huddleston	Senior Social Development/Resettlement Specialist

A list of the various reports prepared by the team members is given in Annex 1.

3 Approach

It was clear that a significant amount of valuable work had been done in Phases 1 and 2, and even though circumstances had changed somewhat, the bulk of this was like to still be relevant. A primary consideration then was to maximise the use of that previous work, so as to avoid duplication of effort.

In addition, the approach taken in Phase 3 was largely to apply a strategic planning approaches that basically asks three questions:

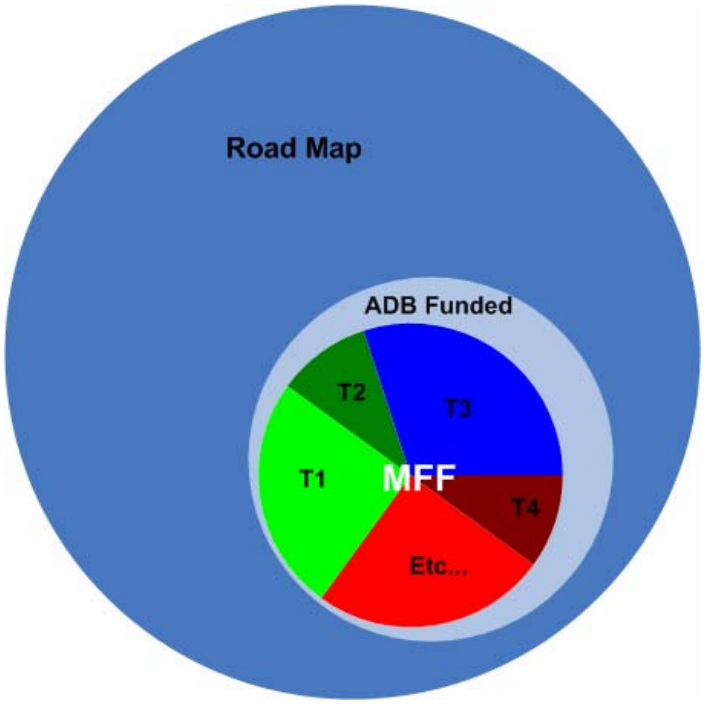
- *Where do we want to go (with water resource management in the basin)?*
- *Where are we now (that is, what are the existing issues/problems)?*
- *How can we get from where we are now to where we want to go (the "road" we need to take)?*

This can be achieved using the following "vision-oriented" approach:

- Reaffirm and more clearly define a shared vision of stakeholders for the future of the Citarum River Basin (to the year 2020);
- Compare the present status of water resources in the basin to the vision, in order to identify the strategic direction that needs to be taken (the "road" so to speak);
- Formulate objectives in a number of key areas that would, if achieved, lead to the fulfilment of the vision;
- Develop a set of interventions (projects) the successful implementation of which would achieve the objectives in each key area, incorporating as far as possible the projects identified in Phases 1 and 2;
- Design a set of "packages" of project that could be funded under the proposed tranches under the MFF.

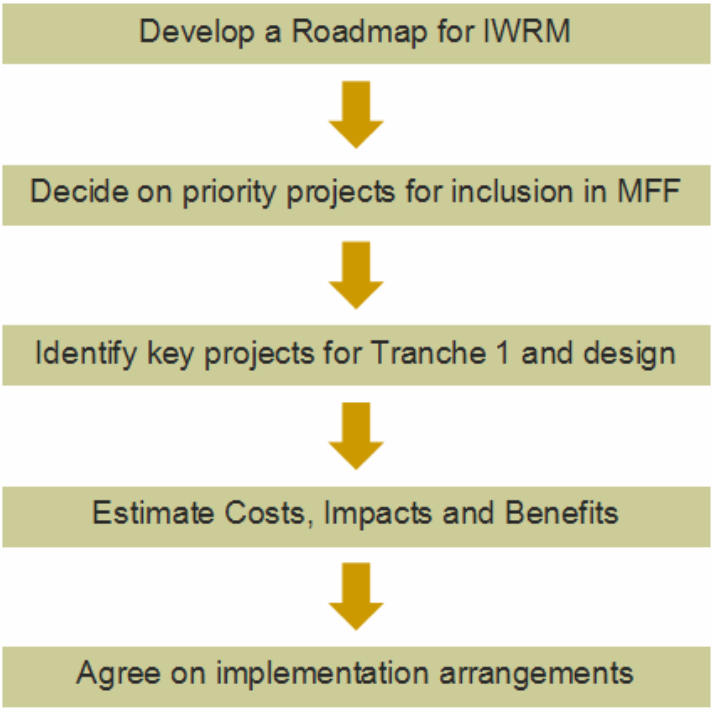
The relationship between the road map and the MFF needs to be clarified. The road map attempts to cover all necessary (strategic) interventions in the water sector required over the next 10 – 15 years. As such, it "belongs" to GOI, not ADB, since ADB could not provide funding for all these interventions. While ADB is likely to fund many of the interventions, through the MFF and perhaps other funding modalities (for example, through grants for technical assistance (TA) projects), other donors and GOI itself may (and should) fund others. This is shown in Figure 1.

Figure 1: Relationship between Road Map and MFF



The process for roadmap and MFF development for the Citarum River Basin is shown in Figure 2.

Figure 2: MFF Development Process



This roadmap formulation process has been successfully applied to plan ADB interventions in the water sector in Central Asia (TA 6099-REG) and for institutional strengthening for improved water resources management in the Tonle Sap Basin in Cambodia (TA 4212-CAM). However, in these cases, the scope of the interventions envisaged in the respective roadmaps was more restricted than for the Citarum River Basin. Therefore, while the methodology remains applicable, there was greater complexity, as the scope of interventions proposed in the present case is extremely broad.

The roadmap itself was, from the outset, seen as belonging to GOI, to guide the way ahead towards IWRM in the Citarum River Basin. As ADB has agreed to assist in the implementation of the roadmap, through the proposed MFF, additional work was required to identify: (i) the projects that might be included for funding under the MFF, and (ii) more immediately, what should be included in the first tranche.

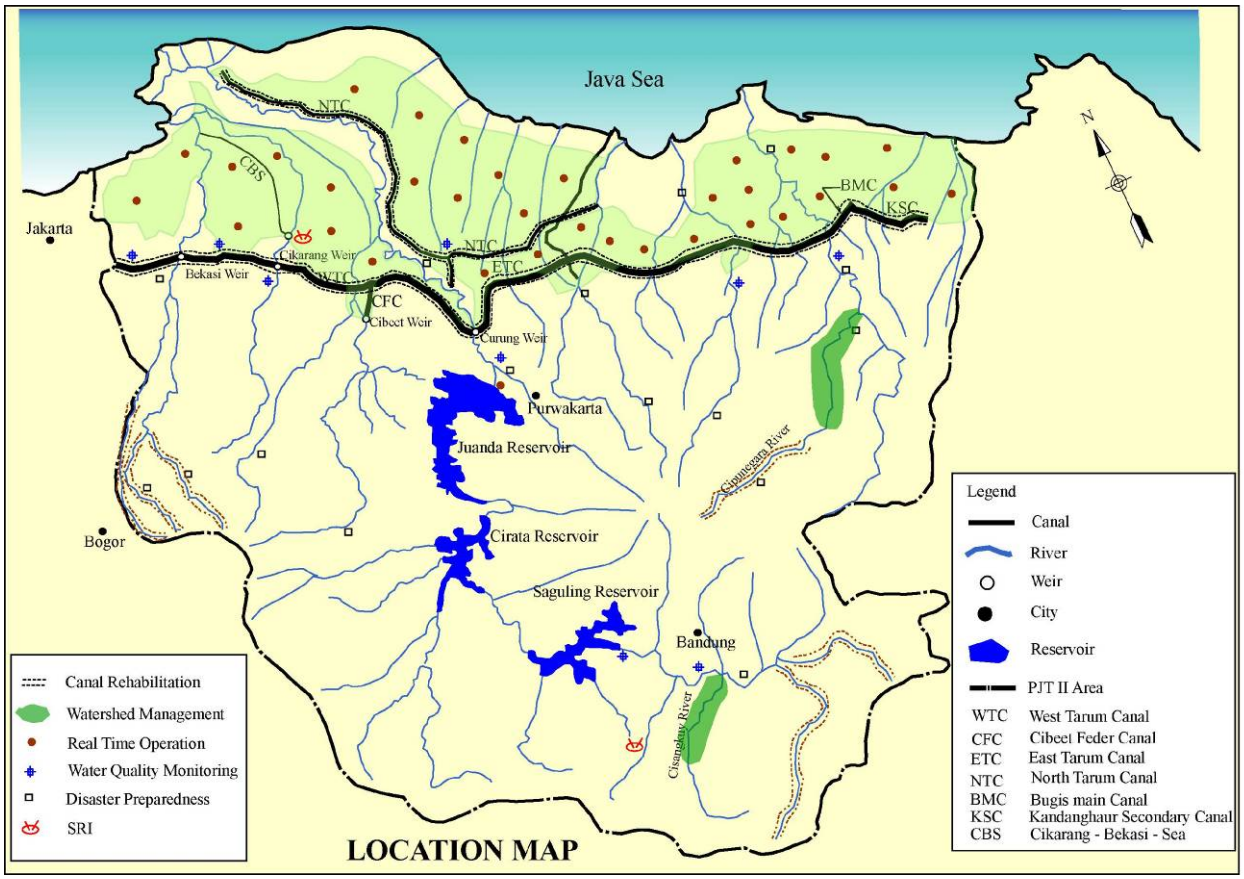
The execution of the work was undertaken in a very participatory way, with stakeholders having ample opportunity to contribute, and take ownership of the outcomes. Participation of stakeholders was facilitated by three formal workshops held at critical times, and numerous meetings with individual stakeholder representatives in the public sector (at national, provincial and district levels), of non-government organisations (NGOs) and the private sector.

4 Program Area Description

4.1 Extent

Although the proposed roadmap focuses on the Citarum River Basin, the "basin" area defined for the purposes of the proposed program includes the Citarum River hydrologic basin, as well as a number of smaller river basins to the east and west that are hydraulically, if not hydrologically, linked to the Citarum River. The program area is shown in Figure 3. The basin is entirely in West Java Province.

Figure 3: Program Area



4.2 Topography and River Network

The Citarum River is the largest river in western Java, the region which contains Jakarta, the capital of Indonesia. The river originates in the mountain range near the southern coast of Java that includes many high volcanic peaks including Mount Wayang (elevation 2,200m), and travels in a generally north-westerly direction for about 270km until it empties into the Java Sea east of Jakarta. Its drainage area is about 6,600km^2. The upstream reaches of the river run in mountainous to gently undulating hilly lands for about 200km, while the lower 70km stretch drains a vast flat alluvial plain.

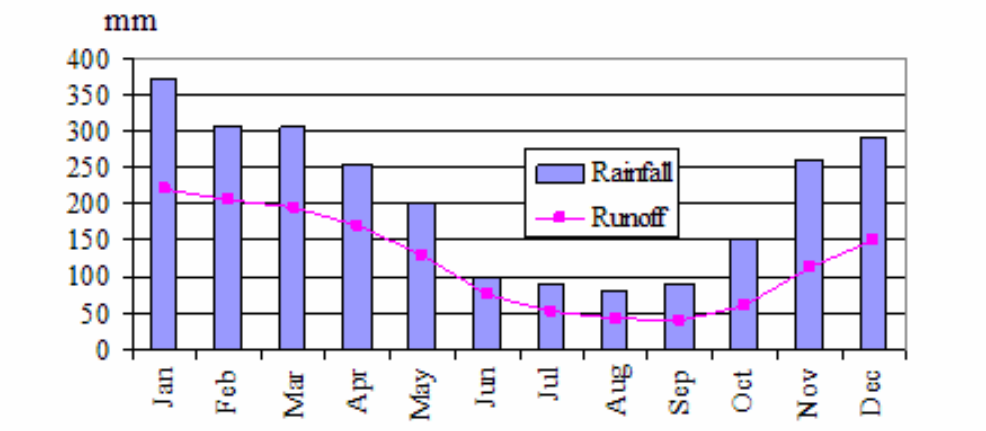
4.3 Water Resources

The climate of the program area is characterised by two distinct seasons: rainy season and dry season. The rainy season occurs during the months of November to April, while the dry season occurs during the remaining months. January is the wettest month, while August is the driest month. Naturally, runoff follows the same seasonal pattern.

The average annual rainfall varies from 1500 mm in the coastal areas to 4000 mm in the mountainous areas in the upper part of the basin. There are 24 river gauging stations within the basin. This total runoff from the catchments is generally considered to be adequate to supply demands for all uses well into the future. However, the spatial distribution of surface water resources is not uniform, and shortages do occur from time to time in certain areas.

Monthly distribution of rainfall and runoff in the program area are illustrated and shown in Figure 4.

Figure 4: Average Seasonal Rainfall and Runoff

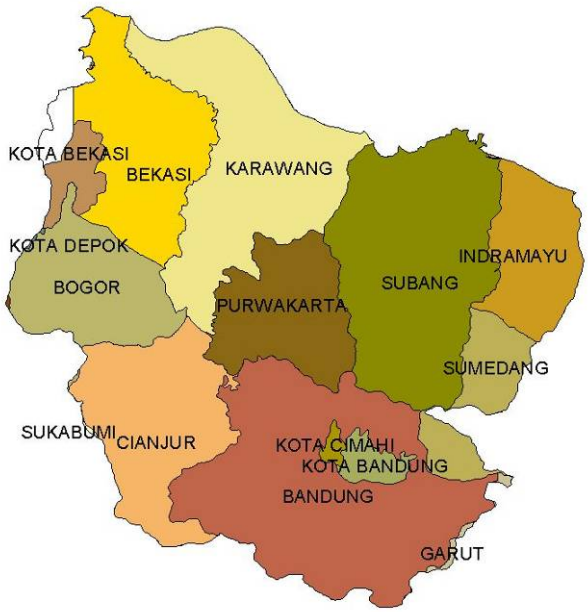


Groundwater occurs extensively across the river basin, but is most intensively exploited in the Bandung area. The total number of bores there is estimated to be well in excess of 5,000, with depth between 60 m and 200 m below ground level. Groundwater is the preferred source for domestic water supply in rural and many urban areas and also for industrial purposes due to the easy accessibility, relative inexpensive treatment and generally of good quality. Over-exploitation of groundwater resources has become a serious issue around Bandung (see Section 5.5).

4.4 Administrative Areas

The entire program area is covered by the territory of West Java Province. Within the program area there are a total of fourteen districts, although three of these cover a quite insignificant area. The district boundaries are shown in Figure 5.

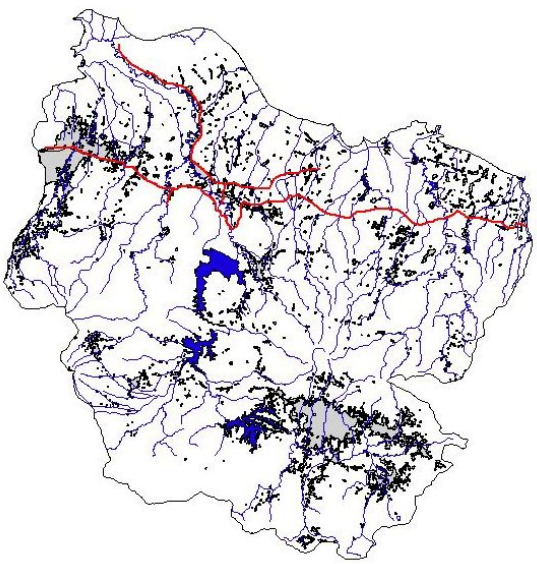
Figure 5: District Boundaries Within the Program Area



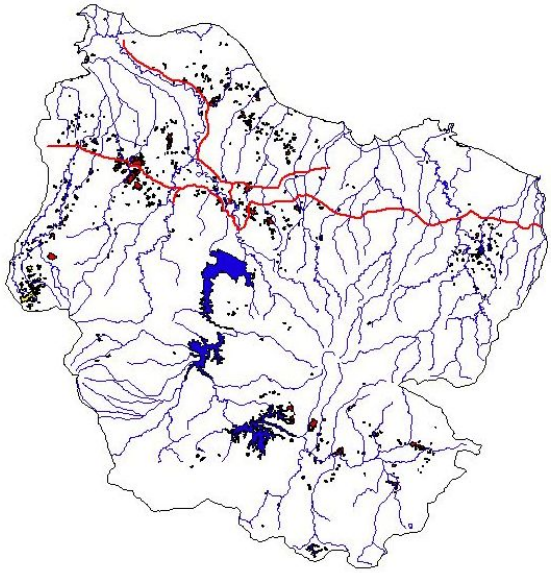
4.5 Settlements and Industry

The program area covers 9 districts and 2 cities. Of the 9 districts, 5 lie wholly within the program area. Figure 6 shows the administrative boundaries. The population in 2003 was 17.8 million, with 4.1 million households – 30% derived livelihood from agriculture, 25% from industry, and 45% from services. The population in the program area is projected to rise to 21.3 million by 2010. The dynamism of the region's economy is shown by 2003 data indicating West Java Province's gross regional domestic product (GRDP) growth rate (4.97%) outperforming that of Jakarta (4.39%).

Figure 6: Land Use



Settlements



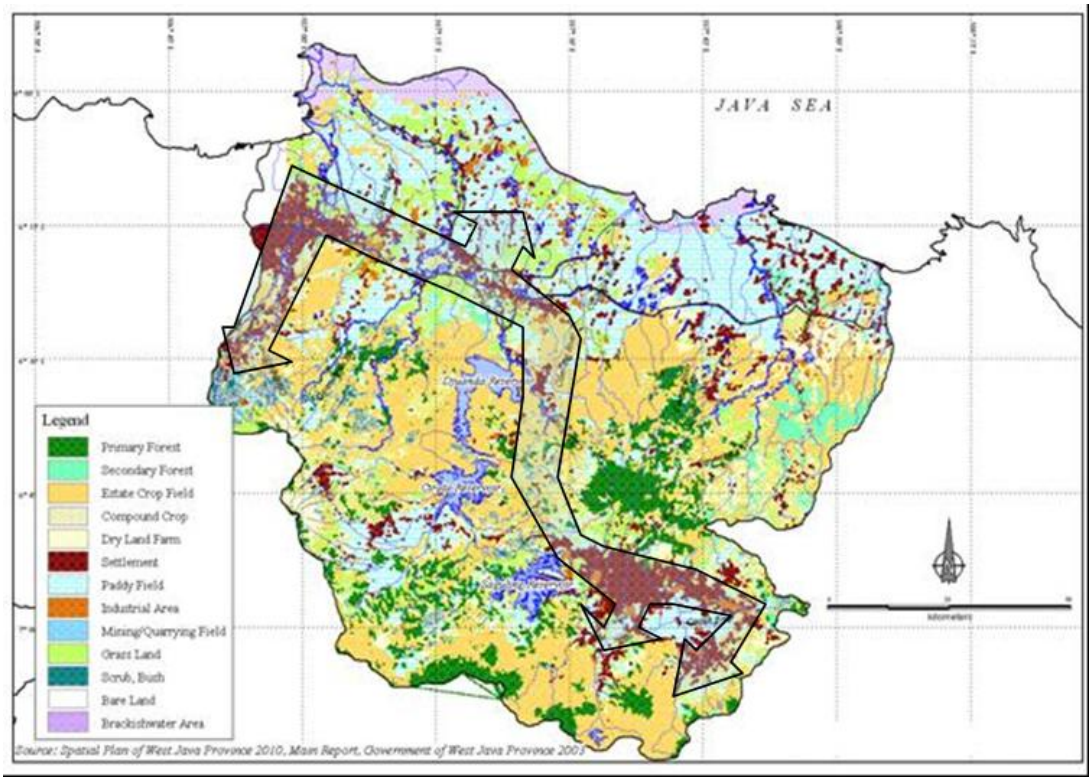
Industrial Establishments

The Bekasi and Bandung regions are the most heavily populated and urbanised. Bekasi essentially acts as a satellite city of Jakarta, absorbing most of the industrial and population expansion to the east. The catchment of the Bekasi River is rapidly transforming into numerous housing subdivisions and industrial estates – with development pressure coming from both the north (Jakarta) and south (Bogor). Paddy fields to the north of Bekasi are also being converted to residential and industrial uses.

The Bekasi area in particular has been experiencing rapid population growth and urbanisation. A 2000 census shows that 22% of Bekasi City residents and 18.5% of Bekasi District residents are migrants that have moved into the area only within the last five years of the census.

Industrial locations are generally interwoven with settlements and there is no clear zoning or separation of these land uses in the region. Although settlements and industry make up only 8.2% of the program area, their impact on land use change in the region is significant. The mixed industry-settlement land uses are clustered along a rapidly urbanising corridor defined by the recently completed expressway linking Jakarta and Bandung, which passes through Bekasi, Karawang and Purwakarta. The arrowheads in the urban corridor depicted in Figure 7 show the direction of urban sprawl stimulated by the new highway corridor. In the coming years, urbanization will take place both in the form of continued expansion toward the upper catchments (in Bekasi and Bandung) and via a more recent but accelerating expansion toward the coast in Karawang.

Figure 7: Rapidly Developing Urban and Transport Corridor



Bekasi City and Bekasi District, for example, are projected to grow in terms of population by 20% in 2010, compared with Year 2005 figures (around 2 million each). Karawang's population, too, is projected to grow from 1.97 million in 2005 to 2.15 million in 2010 (9% growth). Between 2000 and 2005, Karawang's population grew by 11%. In the Upper Citarum region settlement areas increased from 25,000 ha in 1992 to 46,000 ha in 2001. This corresponded with a 40% decline in paddy field areas, from 12,500 ha in 1992 to 75,000 ha in 2001. As in Bekasi, the upper basin is experiencing a rapid conversion of paddy fields into settlements.

The pattern of urbanisation in the region has a significant impact on the water supply system, not only because of the projected increased demand, but also because much of the domestic and industrial water supply to Bekasi and Jakarta passes through the same corridor (West Tarum Canal). Settlements and commercial establishments are gradually encroaching on the canal easements, threatening both water quality and water supply security.

4.6 Agriculture and Forestry

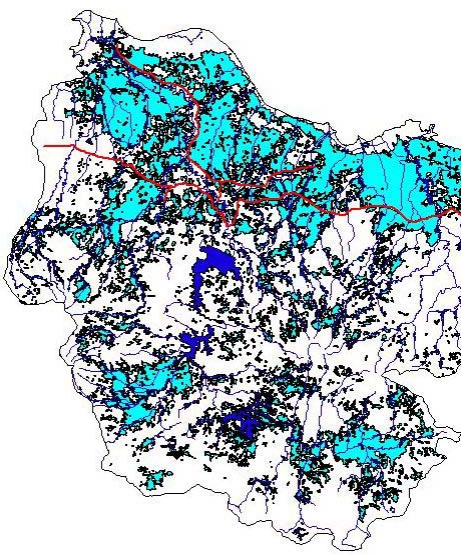
The area is a key rice producer for the country. There are a total of 390,000 ha of irrigated paddy fields, with 240,000 ha served by the Jatiluhur reservoir and canal system in the lower basin. Land devoted to rice production make up nearly half (47.5%) of the program area, with 70% of these fully irrigated. Rain-fed areas cover 43,000 ha, or about 10% of the land use. See Figure 8.

In the Upper Citarum watershed around Bandung District, hilly land farming is pervasive and many of the farmers still prefer to plant vegetables and annual crops that do not provide adequate cover and protection from soil

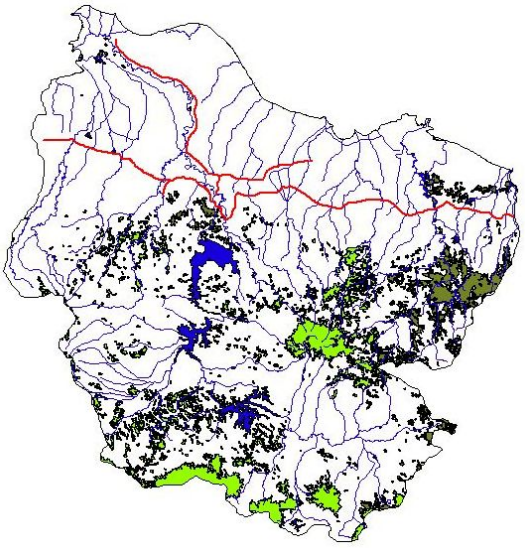
erosion. The population density in Bandung District is 32 persons per ha, growing at 3.45% annually. By the year 2010, the population in the district is projected to reach 7.4 million. Forty percent of the population is engaged in agriculture. In the Upper Citarum as a whole, land used for upland farming increased from 6,000 ha in 1992 to 37,000 ha in 2001.

In the Upper Citarum, the expansion of urban settlements is taking place largely through conversion of the surrounding paddy fields. On the other hand, the expansion of the upland farming areas (which increased by 31,000 ha from 1992 to 2001) is taking place at the expense of the forest. Thus, forested areas in the Upper Citarum has declined from 35,000 ha in 1992 to 19,000 ha in 2001 (45% reduction).

Figure 8: Agriculture and Forest Map



Rice Producing Areas



Primary and Secondary Forest Areas

The remaining forests cover only about 10.2% of the program area—100,600 ha of primary forest, and 34,800 of secondary forest—far less than the 30% mandated in the Forestry Law (#41, 1999). While nearly all of the remaining primary forests are designated for protection and conservation, secondary forests are still considered as production forests where harvesting of forest products and timber is allowed. Much of the remaining primary forest is in fragmented condition, reducing their viability as an ecosystem and making them vulnerable to continuing encroachment and conversion for upland farming. Creating corridors to link these fragmented forests is important for ensuring their ability to support biodiversity.

5 Re-Assessment of Basin Issues

5.1 Introduction

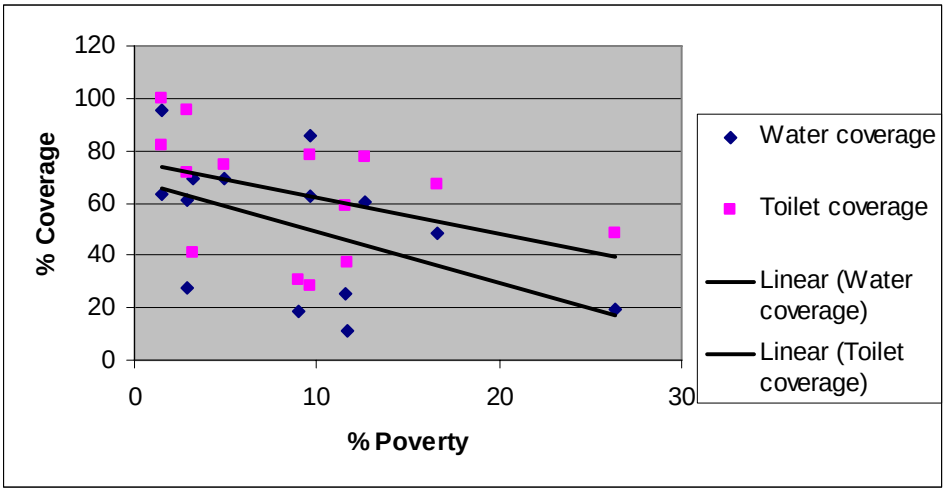
During Phase 3, work was undertaken to re-assess the basin issues to confirm the answer to the “Where are we now?” question. This assessment is not at odds with the assessment made in Phase 1 of the PPTA, but perhaps presents a strategic view.

5.2 Poverty

The situation regarding poverty and access to water supply and health facilities in the 15 districts and municipalities that lie fully or partially in the Citarum river basin, based on SUSENAS 2004 data, can be summarised as follows:

- A poverty headcount of 2.8 million or 9.7% of the basin population with poverty levels of the total populations ranging from 1.5% to 4.8% in the municipalities (which are totally urban) and 2.9% to 26.4% in the districts (which have a mix of urban and rural populations). In some districts poverty is more prevalent in the urban population compared to the rural population, in other districts it is the reverse—there is no clear pattern.
- Access to clean water in the municipalities varies 77-97% of total population (poor and non-poor), whereas in the districts it is lower and lies in the range 37-87%; coverage is significantly lower amongst the poor in all areas except Bekasi and Cianjur where levels between poor and non-poor are similar.
- Coverage of households with toilets in the municipalities varies 94-100% of total population, whereas in the districts it is 53-89%; in many areas coverage is significantly lower amongst the poor, but in others (Bekasi, Depok, Cianjur and Subang) coverage is similar between poor and non-poor.
- The comparison between poverty and coverage of households with clean water and household with toilets shows that there is a general trend between low poverty and high coverage of water and toilet facilities, and higher poverty and lower coverage of facilities (see Figure 9).

Figure 9: **River Basin Poverty and Coverage of Households with Clean Water and Toilets**



5.3 Institutional Arrangements

Indonesia's 2004 Water Law provides the enabling framework for IWRM. Implementation of IWRM within a river basin context is being promoted through establishment of river basin management units or *Balai / Balai Besar.* In view of its strategic importance to the country, a combined basin comprising the Citarum, Cisadane-Ciliwung, and Cidurian-Ciujung-Cidanau rivers has been designated as one planning unit under the policy guidance of a single Basin Council. It will be managed initially through three sub-basin *Balai Besar*. The *Dewan Air* or Basin Council will represent national, provincial, district and other stakeholders, incorporating a balance between government and non-government representatives.

Recently, a range of water management responsibilities (such as water quality management) have been delegated by GOI to the *kabupaten* (district government bodies), in a move to devolve decision-making closer to the "grass roots". While this is an admirable aim, it has its problems, for instance: the number of *kabupaten* is large and their technical capacity to discharge their responsibilities effectively is very limited in many cases; (ii) "fragmentation" of decision-making can lead to inconsistencies in water policies from one area to the next; and a high degree of coordination is required at higher levels.

Despite attempts to improve the institutional framework for river basin and water resource management, there appears to be general agreement that (i) current institutional arrangements are highly sectoral with limited effective coordination and (ii) although regulatory frameworks and standards are generally in place (e.g. for water quality or licensing), enforcement is weak. Consideration of the organizational functions inherent in integrated water resources management demonstrates that:

- Responsibilities of the Directorate General of Water Resources of the Ministry of Public Works (DGWR), Provincial Water Resources Service (PWRS), Jasa Tirta Public Corporation II (PJT II), West Java Irrigation Project and the Citarum River Water Resources Irrigation Project are limited to in-stream activities (related mainly to surface water irrigation, flood and drought management, and so on) and have little influence in off-stream aspects that have been identified as some of the key

problems facing the basin (deterioration of the watershed, pollution control, waste disposal, groundwater exploitation, and so on);

- The current focus of the provincial and basin coordination mechanisms also tends to concentrate on these in-stream areas; and
- Groundwater is the responsibility of provincial and district agencies responsible for mineral resources – not water resources.

5.4 Surface Water Management

Average annual demand from the Jatiluhur Reservoir has increased from 140 m^3/sec in 1996 to 156 m^3/sec in 2004. In 1996, the Jatiluhur system supplied adequate water releases for irrigation and domestic/industrial supply (through the West, North and East Tarum Canals). However, in 2001, the system reportedly failed to meet water needs for 1.5 months during the dry season; and in 2005, it failed to meet water needs for 5 months.

Inflow into Saguling Reservoir has been decreasing. Between 1986 and 1991, dry season flow into the Saguling reservoir was 38% of the average annual flow. This percentage went down to 36% between 1992 and 1997, and declined further to 34% starting in 1998. Watershed degradation is seen as the principal cause. Denuded catchments have reduced capacity to capture rainwater, resulting in high peak flows during the rainy months. In turn, the lower water retention capacity reduces the amount of water available for release as “base flow” during the summer months.

It is not certain to what extent water scarcity at the source (catchment areas and reservoir storage) is the real problem. The common view is that, catchment runoff and reservoir storage volumes are adequate, but the poor condition of the water distribution system results in a lot of water being lost or wasted, thereby failing to meet water needs at the users’ end. This is particularly true for the lower basin area. The evidence is that hydraulic control structures in the lower basin are defective or are malfunctioning due to lack of maintenance. Nonetheless, continued watershed degradation combined with increasing water demands for agriculture, industry and drinking water are bound to create water scarcity problems in the coming years.

5.5 Groundwater Management

A considerable portion of the region’s water demand, in particular that of Jakarta and Bandung, is supplied by groundwater. The rate of groundwater extraction is believed to be considerably under-estimated, since a large portion of the extraction activities are not registered. Actual abstraction is believed to be at least three times the quantity reflected in official records.

As early as 1997, a study by the Japan International Cooperation Agency (JICA) had estimated groundwater abstraction in the Jakarta metropolitan area to be around 8 m^3/sec. This is about half of the surface water supplied to the metropolitan area by the West Tarum Canal (WTC). As reported in the JICA study, domestic use accounted for almost 90% of total groundwater abstraction in Jakarta. As a result, groundwater is thought to have exceeded sustainable levels. In both Jakarta and Bandung, over-exploitation of groundwater is reported to have caused land subsidence. In turn, this has caused structural damage to some buildings and, more significantly, exacerbated local drainage and flooding problems.

In Bandung, an estimated 90% of the population, and 98% of the industries, rely on groundwater. Modelling studies done in 2002 suggest that recorded groundwater extraction is only about one-third of the actual amount. The

lowering of the groundwater level is reportedly up to 5 meters per year in some places. The cumulative water level decline since 1920 has been 85 m. In 2005, it was estimated that land subsidence had reached 0.8 m. In order to get clean water, industrial wells have to be drilled to beyond 150 m.

Industrial groundwater abstraction in Bandung has also had a devastating effect on shallow wells on which numerous households depend. Most industrial and domestic effluents—particularly for industrial establishments that are not covered by the PROKASIH (clean rivers) program--are not properly treated, and the infiltration of polluted water has caused deterioration in the water quality of shallow wells, indicated by black and yellowish water colour.

5.6 Erosion and Sedimentation

Watershed erosion is a serious problem in the upper river basin where hillsides are steep and the catchment denuded. Even on steep slopes, farmers cultivate non-perennial crops which do not provide adequate ground cover from the heavy monsoon rains. The soils, derived from volcanic tuff, are easily erodible and are prone to land slides. High peak flows have also increased the rate of river bank erosion.

Hydrologic flow regimes have been adversely changed by land degradation, notably the loss of adequate forest cover and the prevalence of hillside farming in the upper catchments. The degraded catchments have reduced capacity to capture rainwater, resulting in high peak flows during the rainy months which carry large amounts of eroded soil. At the entrance to Saguling Reservoir, the ratio of wet season high flows to dry season low flows has increased from 3.4 recorded in 1992 to 7.4 in 2003. As a result, landslides and mud flows are frequent during the rainy season. Figure 10 shows the extent of degraded areas in the basin (around 25% of the basin area). These areas have erosion rates in excess of 60 tonnes per ha per year.

Wet season floods carry large amounts of sediment into the three reservoirs, especially at Saguling. Here, the average annual sediment inflow was estimated at 8 million m^3 (based on bathymetric surveys of the reservoir conducted in 2004 by Indonesia Power, a state-owned company). Relative to the Saguling reservoir's catchment area, the sediment load is equivalent to an erosion rate of 3 mm per year, nearly times the original design rate. A similar alarming rate of watershed erosion is reported for the Cirata reservoir.

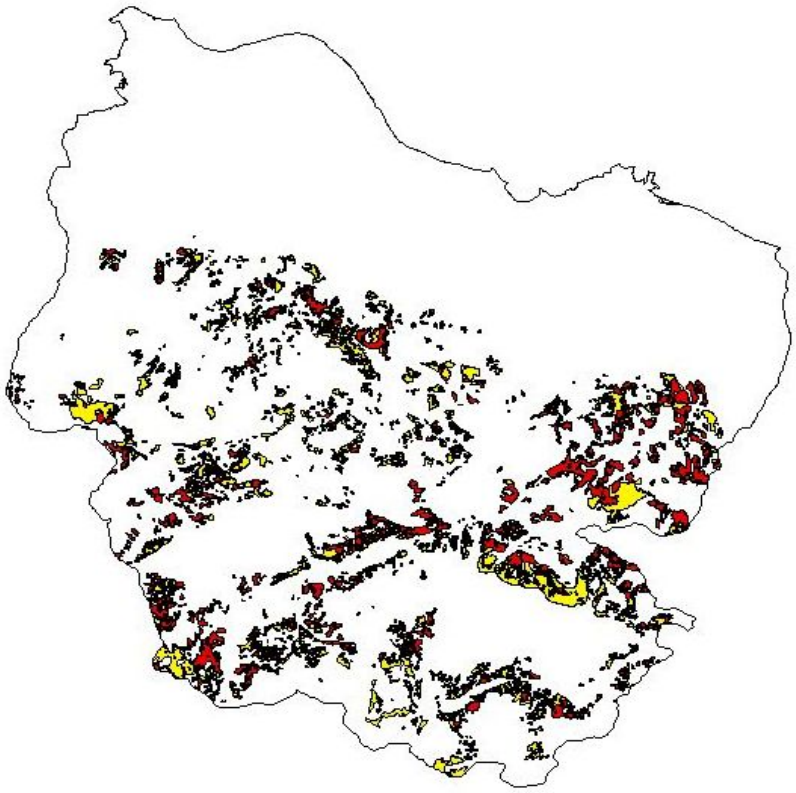
The three cascading reservoirs (Saguling, Cirata and Jatiluhur) were built to regulate flows, provide hydropower, and store/supply water for irrigation, industrial and domestic use. They also trap sediments. However, the rate at which sediments are being deposited in the reservoirs is rapidly reducing storage capacity and shortening their useful life.

In the lower Citarum basin, regulated discharges coming from the Jatiluhur reservoir combine with the flow from the Cikao River. The latter transports considerable quantities of sediment into the Curug diversion weir. Although much of the sediment is prevented from entering the canals (WTC, NTC and ETC), the large quantities of sediment are transported downstream by the Citarum River. The Cibeet River, which joins the Citarum River, adds a significant volume to the latter's sediment load. This load is then deposited in the delta where it silts up the river outlet and exacerbates flooding.

Within the WTC, sediment is brought into the canal at the confluence with the Cibeet, Cikarang and Bekasi Rivers. Occurring mainly during the rainy season, the sediment load has silted up the canal bed and caused reduction

in canal conveyance capacity. Whereas the source of sediment load in the upper basin is watershed denudation due to upland farming, the sediment load from the Cibeet and Bekasi Rivers come from land conversion to support urban development activities taking place in the catchment.

Figure 10: Extent of Degraded/Eroded Areas



5.7 Flooding

Flooding is a consequence mainly of changes in the river flow regime, in turn caused by changes in watershed conditions. As water retention capacity of the river catchments is reduced by denudation and land conversion for urban development, flood peaks have increased. As mentioned above, the ratio of wet season peak flows to dry season low flows in the upper basin has increased from 3.4 in 1992 to 7.3 in 2003. The increased flood frequency and severity are also invariably associated with destructive landslides and mud flows. In the upper basin (Bandung area), recent severe flooding and mud flows occurred in February 2005 affected an area covering 2,000 ha. The flooding submerged parts of the area for 7 days and up to 2 meters deep – 50,000 inhabitants had to be evacuated.

Flooding around Bandung has become more frequent and severe. Here, however, there is no single cause. The problem is due to a combination of: (i) watershed denudation, (ii) effects of past re-alignment/straightening of the Citarum River (through cut-offs) which, while alleviating flooding upstream, increase peak flows downstream, (iii) localized land subsidence due to groundwater over-pumping that impair drainage, and (iv) clogging of drainage canals and streams by garbage. Flood-prone areas around Bandung are located in the south area of the city along the Citarum River.

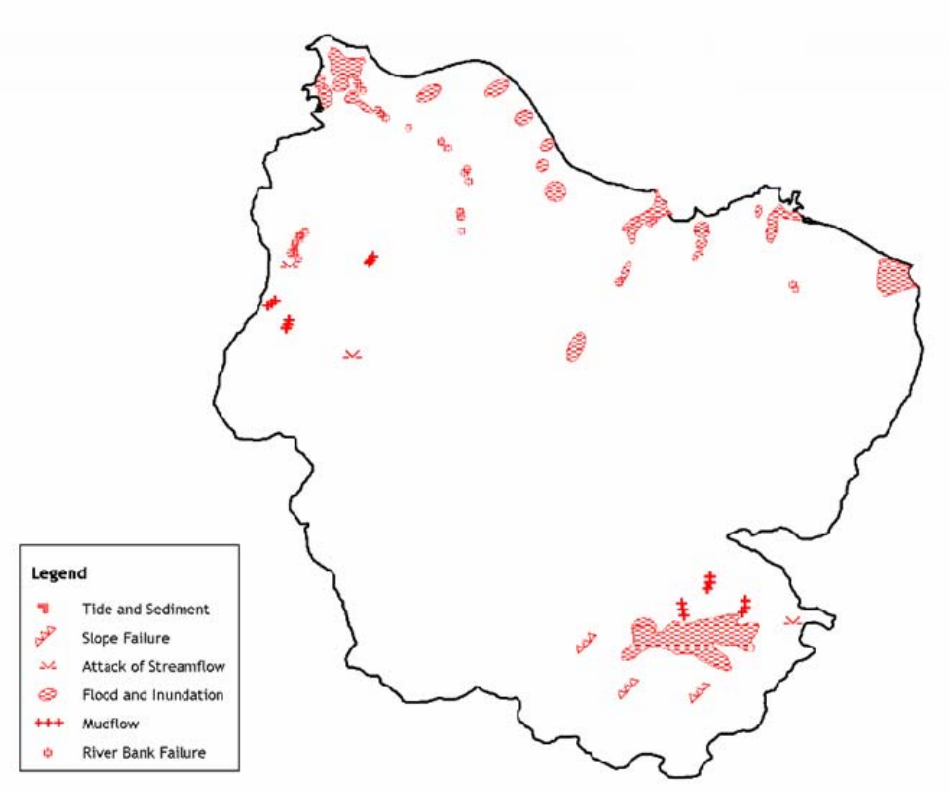
Currently, measures to reduce or mitigate flooding problems in the upper basin are being undertaken through the Upper Citarum Flood Control Project. Remediation measures include re-greening/reforestation and introduction of structural erosion control measures in the watershed, as well as improvement of the urban drainage system around Bandung.

At the lower basin (near Jakarta) where the Cikeas and Cileungsi Rivers join to become the Bekasi River, converging floodwaters from the two tributaries have caused perennial flooding in Bekasi City. Already naturally prone to flooding due to the area's location downstream of the confluence of two rivers, the flooding problem is expected to worsen as more of Bekasi's upper catchment is subjected to land conversion for urban and industrial development.

Along the lower Citarum River levees and other flood control works built during the Dutch period help confine flooding within the river's meander zone and provide protection to the surrounding settlements. However, large areas of the flood zone within the levees have been planted with crops and fruit trees that have the effect of retarding flood flow, contributing to high water levels. In addition, a long term effect of the river embankments has been to raise the river bed due to sediment accumulation, since the levees prevent the spilling of sediments onto the surrounding plain. Consequently, floodwater levels inside the levees have risen above the level of the surrounding land, putting the population at risk in case of levee failure.

At the Citarum River mouth, the build-up of deposited sediments has created sand dunes that impede floodwater discharge. Combined with the effect of high tides, the constricted river outlet causes perennial inundation of the lower basin near the delta as the water is forced to back up into the alluvial plain. The extent of areas affected by flooding and related landslides and mudflows is shown in Figure 11.

Figure 11: Flooding and Related Problems in the Basin



5.8 Water Pollution

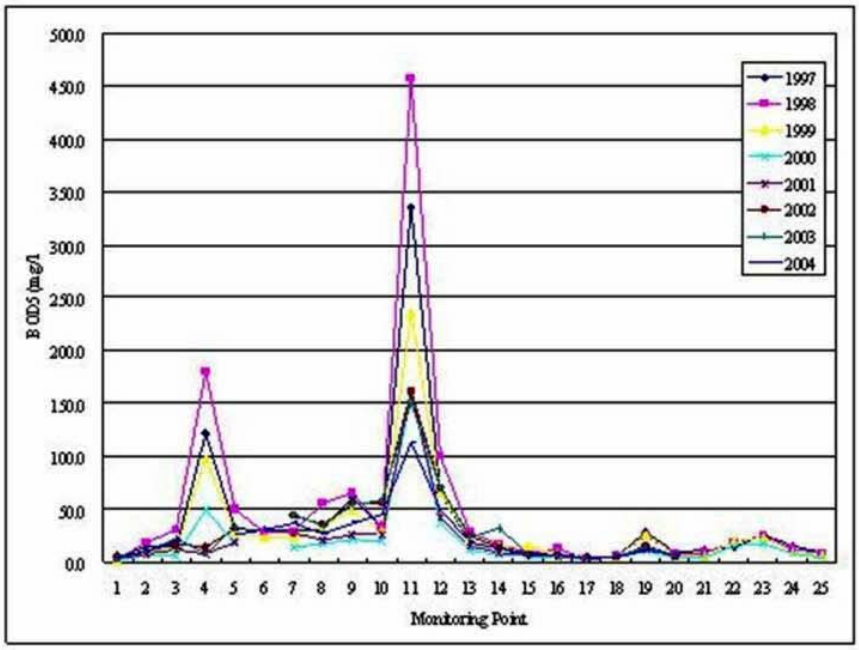
The population within the program area is growing at more than 3% annually, attributed in part to influx of migrants drawn in by the region's rapid pace of development. The combined effects of untreated domestic sewage, solid waste disposal and industrial effluents have significantly increased pollution loads in the Citarum River system. In the upper basin, river water that is polluted by domestic and industrial wastes from the Bandung metropolitan area is funnelled into the Saguling reservoir. At the inlet to the reservoir, water quality monitoring in the late 1990s showed average annual BOD concentrations as high as 300 mg/l. Control measures taken reduced the BOD load to 200 mg/l by year 2000, and further reduced to 55 mg/l during subsequent years. However, as reported by *Indonesia Power* in 2004, BOD concentrations at the Saguling reservoir inlet have still gone up to as high as 130 mg/l during the dry season. In recent years, the BOD concentrations in the Cikapunding River (a major tributary of the Saguling River that flows through Bandung) were still reported to reach as high as 100 mg/l. Figure 13 gives a profile of the BOD levels in the Citarum River.

Figure 12: Pollution in the Citarum River at Bandung

Runoff from farmed hillside areas, in addition, bring in massive amounts of plant nutrients (nitrogen and phosphorus) that induce eutrophication in the reservoirs. At Saguling where the problem is most significant, nitrogen loading has been estimated at 33,350 tonnes per year, and for phosphorus, 4,370 tonnes per year. Algal blooms and their subsequent decay have been blamed for the regular occurrence of fish kills and considerable damage to the floating fish cage industry (although some fish kills have been attributed to other causes, for example, viruses and bacteria). In turn, the uncontrolled expansion of fish cage operations is exacerbating the effects of polluted water coming into the reservoir. Improper or excessive fish feeding in the floating cages adds to the waste load as unconsumed feed accumulates on the reservoir bed. When these organic deposits are disturbed and resuspended (for example, at the start of the rainy season when increased inflows induce mixing in the reservoir) oxygen demand becomes excessive. This is thought to be a key factor in causing perennial fish kills.

Figure 13: BOD Profile of the Citarum River

Point No.	Monitoring Point
1	Wangisagara
2	Majalaya
3	Citarik Sapan
4	Ciganitri
5	Sapan
6	Cikapundung Dayeuh Kolot
7	Cisangkuy Dayeuh Kolot
8	Margahayu
9	Cibeureum Bridjul
10	Nanjung
11	Cimahi Nanjung
12	Batujajar
13	Saguling Inlet
14	Saguling Outlet
15	Cirata Inlet
16	Cirata Outlet
17	Jatiluhur Inlet
18	Jatiluhur Outlet
19	Cikao
20	Curug Weir
21	Bendung Walahar
22	Tanjung Pura
23	Tunggak Jati
24	Rengasdengklok
25	Muara Gembong



Whereas pollution of the (upper basin) Saguling reservoir poses a serious threat to the viability of fishery activities and potential future use of the reservoir to supply water to Bandung, the pollution in the lower basin – particularly in the downstream portion of the West Tarum Canal – poses an even more urgent water quality problem. The WTC supplies 80% of Jakarta's (surface) raw water supply, and hence is vital to the well-being of 8 million inhabitants. On its route to Jakarta, the WTC intersects the Bekasi River which drains an area rapidly being developed for residential and industrial use. At the Bekasi River's confluence with the WTC, the average annual BOD concentration in 2004 was 48 mg/l (measured at the weir site). The pollution load in the Bekasi River is caused by untreated household sewage, industrial wastewater, and solid waste dumped along the river banks.

Figure 14: Solid Waste Dumping – West Tarum Canal

Lack of proper solid waste management contributes to both pollution and flooding. Garbage deposited along canals and riverbanks contribute to the high BOD. They also clog drains and accumulate on riverbeds reducing discharge capacity. According to the *PD Kebersihan* of Bandung City, average daily solid waste generation is 6,500 m^3/day, of which an estimated 1,500 m^3/day is not collected and properly disposed. Thus the annual uncollected garbage that invariably ends up accumulating in the drainage system and rivers amounts to 500,000 m^3. According to the Saguling Dam office, the estimate inflow of solid waste into the reservoir is 250,000 m^3 per year.

Along the West Tarum Canal, reduction in conveyance capacity is due both to sediment deposits and the prolific growth of aquatic plants (which create friction in water flow). Apart from contributing to the bottom detritus, aquatic plants trap silt and accelerate canal shallowing. Plant growth is promoted by the use of the canal as toilet and bathing/washing area for residents, which adds substantial quantities of plant nutrients in the water.

Residential and commercial establishments along the canal are dense particularly downstream of the waterway from Cikarang and Bekasi to Jakarta. There is open access to the canal (only the Jakarta portion is fenced). Where the canal width has narrowed and more land has been exposed on the water side of the road embankment, food stalls, scavenging shops, and other small-scale commercial establishments have sprouted. Wastewater and garbage from these establishments are disposed of directly into the canal.

5.9 Watershed Condition and Biodiversity

One of the primary tools in watershed management and restoration of watershed ecological function is reforestation or re-greening of degraded

lands. There have been seven attempts to 're-green' parts of the Basin since 1976. All these, including the recent Citarik Upland Plantation and Land Development Project, have failed in this regard. It is widely considered these failures are because projects have not sufficiently educated villagers about the importance of their role in such activities, have not empowered villagers and have tried to accomplish reforestation in short time frames. In summary, watershed management as it relates to conservation of biodiversity, either directly or through improved habitat (land, water and forest) management, ultimately depends in large part on engaging a large number of villages in conservation efforts. Some feel that poverty is the root cause of villagers disinterest in improving their stewardship of the environment. Others consider it is because the population explosion and subsequent urbanization and peri-urbanization have fragmented village structures and organizations. This fragmentation has resulted in loss of village 'unity' and subsequent lack of empowerment. This lack, coupled with inadequate land tenure arrangements and access to land, offers villagers no incentive to protect land.

Figure 15: Deforestation of Steep Hillsides in the Upper Citarum

Implementation of watershed management activities as they relate to biodiversity conservation will largely take place at the level of groups of villages. As such the umbrella management body to assist village activities (empowerment, assistance with support funds, mentoring, monitoring & evaluation) that is needed is at the scale of a sub watershed. The challenge is to link such sub-watershed management bodies to proposed Citarum River Basin umbrella management authorities (*Dewan* and *Balai Besar*).

Villager activities in the upper watersheds are a major threat to both the quantity and quality of water available to down-stream users. Management

of natural resources important to biodiversity needs to include a system of reward 'payments for environmental services' (PES) to encourage upland villagers mitigate activities that are inimical to water, forests and protected area services. In return, their communities would receive benefits for their surrendering traditional uses of these natural resources.

The greatest threat to biodiversity in the twelve protected areas in the basin comes from villagers that live in their proximity. Key management scenarios need to focus on involvement of villagers in management planning and implementation. While some protected areas, such as Gunung Gede Pangrango National Park, have a strategic management plan, there is a general absence of functionable action plans to drive focused management and little knowledge of their biodiversity. Further, for protected areas, there are: (i) insufficient human resources and capacity to effectively manage them; (ii) insufficient awareness among communities and provincial government of benefits, costs, and responsibilities of management; absence of significant sustainable economic incentives for communities, local government or the private sector to support management of their surrounding watershed; and (iii) lack of stakeholder involvement in their management.

5.10 West Tarum Canal

West Tarum Canal is seen as a very high priority by GOI for inclusion in the MFF. However, while in an engineering sense, the rehabilitation of the canal is relatively straightforward, significant social and environmental issues must be addressed.

The rehabilitation of WTC will require physical works and will involve displacement of people from homes and lands, albeit without certificate, including the acquisition of other assets, such as structures and trees. It is, however, believed that the rehabilitation of WTC (and other existing water conveyance systems, such as the East and North Tarum Canals, if these were to be rehabilitated in future), will not require widening of the present surface width of the canal and the works will likely be confined within the established and acquired right-of-way (ROW) of the waterway and its ancillary facilities. Therefore, acquisition of private land[3] may not be required in the rehabilitation of WTC.

System improvement of WTC will mainly require dredging and removal of silt, and the rehabilitation of ancillary structures (i.e. flumes that double as canal crossing for people, sluice gates, etc). However, a number of fixed structures, such as houses and shops, are found along the inner slope of the canal embankments; they will have to be removed. Additionally, wooden and bamboo platforms used for toilet, bath and for laundry abound on the water surface of the canal. These too have to be removed.

[3] Here private land refers to land that is covered by formal legal rights (*hak milik*), and customary and traditional rights (*adat* or *ulayat*).

Figure 16: Informal Settlements along West Tarum Canal

With regard to the dredging and removal of silt, an estimated 1.4 million m^3 of silt and earth will be removed from WTC. Disposal of these dredged materials is, however, a potential resettlement issue. Project authorities will, and has actually done so in the past, stockpile re-usable dredged earth on the embankments of WTC as a temporary staging area. Said re-usable earth will be used in fortifying or fixing segments of the embankments needing repair. On the other hand, un-suitable dredged materials, such as silt, will be dumped in former river beds that came to be as a result of the re-channelling of the river following the construction of the Curug Weir, the Cibeet Weir, and the Cikarang Weir. Over the years, local residents have developed these ex-river beds into productive farmlands using dredged materials dumped thereat from previous maintenance activities for raising and levelling the ground. The dumping of 1.4 million m^3 particularly in the ex-river beds will deprive farmers a cropping season, at the minimum.

The following resettlement issues have been identified and will have to be addressed based on the Compensation Policy Framework and Procedural Guidelines (CPFPG) developed with the assistance of the PPTA to be adopted by the Government and concurred with by ADB: (i) use of the shoulder of the inspection road for the temporary stock-piling of re-usable dredged materials; (ii) loss of use of areas of the ex-river beds which residents have made productive over the years with the planned dumping of spoils thereat; (iii) acquisition of a number of structures on the embankments and which are concentrated at bridges and road crossings, including platforms on stilts above the water and which are used for toilet, bath, and laundry; and (iv) possible disruption, if not total cutting-off, of the water supply of individual households that tap water directly from the canals with the use of rubber hoses.

There are associated social issues that need to be addressed in the system improvement of WTC. These issues revolve around health and sanitation in

the locality and these are rooted to poverty. While for instance owners of toilet and washing facilities in WTC will be compensated at replacement cost for these structures, these affected persons (APs) and their communities also need to be provided with alternative facilities that are hygienic and that will last. The APs cannot be allowed to rebuild their temporary toilet facilities in the waterway following completion of civil works in WTC; it is not just the health of these APs that is at risk but also those of water users in Jakarta. Another health issue that requires a sustainable alternative with the clearing of WTC of obstructions concerns the need to provide communities adjacent to the embankments with safe household water. Water hoses connected to individual houses abound in the entire stretch of the canal. The third health-related issue concerns the risk of sexually-transmitted diseases (for example, HIV/AIDS) spreading during rehabilitation works on WTC since sections of the inspection road at Bekasi have many karaoke bars.

The aforementioned are called *associated* social issues because, while they are not brought about directly by the project, these health and sanitation concerns will worsen and might actually be exacerbated during the execution of the rehabilitation works.

5.11 Water Quantity and Quality Monitoring

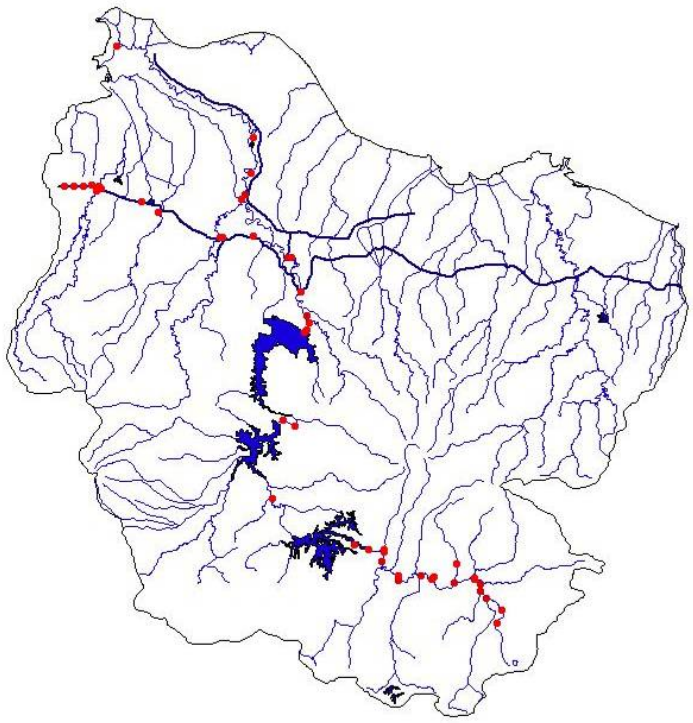
There are more than 160 rainfall gauging stations within the program area. Some of the stations have been in operation since the Dutch period. Several agencies are in charge of monitoring rainfall. The mean annual rainfall in the region varies from 2000 to 5000 mm. The upstream areas of the Ciherang and Cilamaya Rivers, including the watershed of the Ciputnegara River, receive the heaviest annual rainfall exceeding 4,000 mm. The coastal alluvial plains received the lowest rainfall.

Twenty four river gauging stations monitor flows of the Citarum River and adjoining rivers. Daily flow data for these stations are available for the period 1994 to 2004. The most recent flow data for the Citarum River are reported in the *Pola Operasi Citarum*, dated 2005, issued by the Coordination Committee for Water Management of Citarum River.

Surface water provides only for part of the basin's water needs. A considerable portion of the region's water demand, in particular that of Jakarta and Bandung, is supplied by groundwater. The rate of groundwater extraction is believed to be considerably under-estimated, since a large portion of the extraction activities are not registered nor monitored. Actual abstraction is believed to be at least three times the quantity reflected in official records.

Under the PROKASIH (clean rivers) program there are supposed to be 75 water quality monitoring stations along the Citarum River and its main tributaries. Only a fraction of these stations are currently being monitored by PJT II, which maintains a laboratory at Curug (manned by 15 staff). Due to budgetary constraints, PJT II's monthly monitoring is currently limited to 25 points along the Citarum River, and 11 along the WTC. Additional stations are being monitored by the Bandung-based *Puslitbang Pengairan* which monitors 10 stations, BPLDH-West Java province (7 stations), and a number of district government units through their role in the PROKASIH program. It is unclear which institution is consolidating results from the various monitoring activities. The location of the water quality sampling stations of PJTII and *Puslitbang Pengairan* is shown in Figure 17.

Figure 17: Location of Water Quality Monitoring Stations



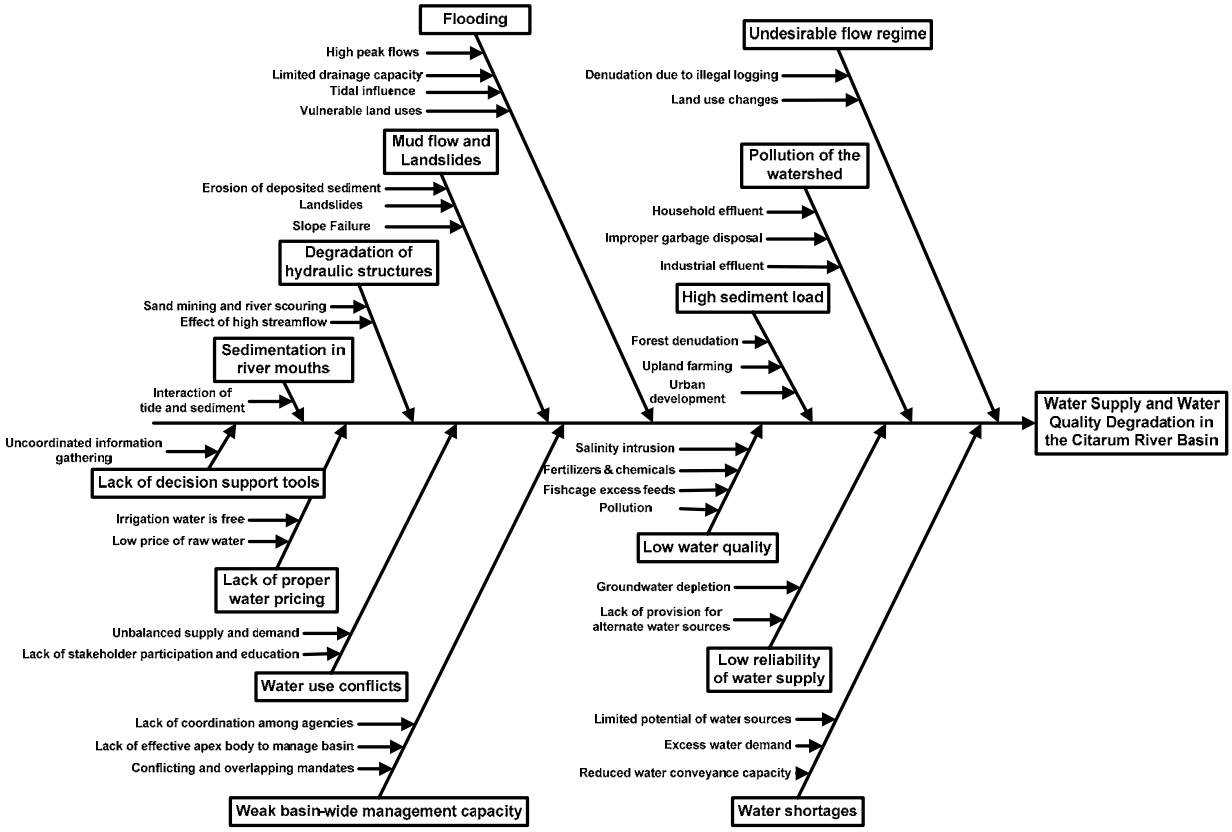
PJT II operates an accredited laboratory and industries routinely send effluent water samples to the its lab for analysis of specific parameters, which is paid for by industries. There are reportedly 105 such requests received every month, on average. The PJT II laboratory fees are half the cost charged by private laboratories. On the other hand, the subsidized fees of the lab may be a factor that discourages more private water quality laboratories from offering services.

A sediment survey of WTC was carried out in late 2005 during Phase I of the PPTA. Ten samples were taken along the canal. Although positive values observed for copper, nickel, chromium and mercury (heavy metals), these were found to be below Japanese Environmental Quality Standards (EQS) for soil analysis to detect contamination. However, the average value for lead was found to exceed the Japanese standard. Other heavy metals (cadmium and arsenic) have not been detected in the canal sediments. It is suspected that the lead found in the sediments originated from atmospheric fallout due to pervasive use of leaded fuel over the past several decades (the phase out of leaded fuel in Indonesia was completed in 2005). A 1998 study reported that lead contamination found in Jakarta soil samples ranged from 77 to 223 ppm.

5.12 Issues Analysis

In order to better understand the issues and their relationships, the “problem tree” analysis approach was used. Actually, this same approach had been used in Phase 1, but as a result of the re-assessment of basin issues, it was updated, and the result is shown in Figure 18.

Figure 18: Problem Tree



6 Key Areas for IWRM

6.1 Definition of Key Areas

In order to make it easier to set objectives for IWRM and develop strategies and specific projects to achieve those objectives, it is convenient to identify a small number of key areas. The key areas group and categorise the issues being faced for water resource management and possible solutions. The issues were described in Chapter 5.

In developing the key areas for the Citarum River Basin, the following considerations have been taken into account.

A fairly small number of key areas is desirable, but at the same time, for clarity it should be possible for the main issues/activities to be assigned to a single key area to the greatest extent possible. However, it is inevitable that there will be overlaps among the key areas, as these are quite "fuzzy".

IWRM is seen to be an approach, rather than a specific activity (or set of activities), and should represent the "sum" of all the water resource-related activities that cover all key areas. In other words, IWRM is not considered as a key area in its own right.

To the extent that it suits the purposes of roadmap development, the key areas should correspond to GOI's categorisation of water resource management activities, and in particular, those contained in the Water Law. The law specifies five "missions" for water resource management in Indonesia (that are just key areas by another name), namely:

- Conservation of water
- Utilisation of water
- Disaster mitigation
- Community empowerment
- Development of information technology

However, the terminology in the Water Law is not straightforward (at least in the English translation). The first two missions cover institutional arrangements, water resource development and utilisation, and water sharing. "Conservation" (Section 3) is used more broadly than normal and encompasses anything related to ensuring that the water resource is fit for purpose, such as: (a) maintaining and managing the catchment; (b) water preservation which includes storing water, promoting efficient and effective utilization and controlling use of groundwater; (c) water quality and pollution control. "Exploitation" (Section 4) includes: (a) water resources administration; (b) water supply (seems to include master planning and allocation including definition of priority uses); (c) utilization or use of water, including operation; and (d) development (investigation, project planning and feasibility, and implementation).

It is considered that these definitions are somewhat confusing, and should be simplified for the purposes of the roadmap. Therefore the recommended key areas are as described in the following sections.

6.2 Institutions and Planning for IWRM

In the definition of this key area, the term “institutions” is used in its broadest sense, that is, dealing with organisations, as well as legislation, policies and other protocols that define the relations among those organisations. Planning for IWRM (and in particular in this context, river basin planning) is seen as a mechanism for promulgating and implementing policies of government, and as such is included in this key area. Accordingly, the following activities are included:

- Organisation restructuring;
- Organisational capacity building;
- Policy development;
- Legislation;
- Planning for IWRM[4];
- Regulation (such as licensing of water utilisation and wastewater discharge);
- Setting of water tariffs;
- Institutions for participatory irrigation management (PIM).

6.3 Water Resource Development and Management

This key area includes those activities that are related to exploiting water resources – that is, increasing water availability to authorised users, and operating and maintaining the infrastructure developed in the process. The main activities included are:

- Project planning, including “master planning” (that is, planning that focuses on development of infrastructure, and distinct from broader basin planning);
- Construction of infrastructure for storing and delivering water (including reservoirs, canals and pipeline systems);
- Operation and maintenance of infrastructure;
- Promoting efficient and effective utilization of water;
- Drilling of wells for use of groundwater.

6.4 Water Sharing

This key area is often overlooked, particularly where water resources are plentiful relative to demand. It covers the process of establishing and protecting water rights and allocating water among competing uses and users, as well as setting priorities for water entitlement during times of shortage. Such allocations may be among sectors (irrigation, urban water supply and hydropower, for example), or geographically (upstream/ downstream and inter-basin transfers). It does not include water use registration and licensing, which is a regulatory mechanism to assist in managing water rights and allocations, and thus comes under the key area for Institutions and Planning for IWRM.

[4] As distinct from project planning.

6.5 Environmental Protection and Enhancement

In this key area are included activities for the protection of the environment (that has an impact on water management), such as rivers, lakes, wetlands, forests and other natural ecosystems, and rehabilitation (enhancement) of already degraded environments (aquatic and terrestrial).

Out of all the key areas, this one probably is the most difficult to define clearly, as environmental protection and enhancement normally must be achieved by a combination of structural and non-structural measures that may include infrastructure (for instance, wastewater treatment plants), improved institutional (regulatory) arrangements, community participation, and so on.

Enhancement of environment management capacity in the organisations charged with this responsibility is included under the institutional key area. Water quality and environmental monitoring and research activities are included in “Data, Information and Decision Support”.

Provisions for mitigating the potential adverse effects of water development projects (for example, the impacts of dredging) are built into the projects themselves.

Legislation and other regulatory processes aimed at minimising adverse impacts are included in an environment assessment and review procedure, and therefore come under “institutions”.

6.6 Disaster Management

In this context, “disaster” includes only those disasters related to water, such as floods and mud flows. While drought must also be classified as a water-related disaster, the strategic response to drought mitigation is through increasing water availability, which is included above under the water resource development key area. Activities related to disaster management under this definition include:

- Planning and construction of structural measures to control flood and mud flows, such as levees (dikes), flood control reservoirs and so on; and
- Development and implementation of disaster preparedness plans.

6.7 Community Empowerment

Involvement of the community in planning and implementation of IWRM activities is essential. It may be considered as a “foundation” key area, as it supports the five “pillar” key areas described above. There is a strong feeling among stakeholders that empowerment of the community to participate should be an important theme of ICWRMP. In this context, community empowerment includes:

- Education and awareness raising (capacity building) of communities and individuals on water management issues;
- Activities aimed at providing information to all that need it on water resource management and related activities;
- Implementing measures to facilitate participation of the community in water planning and management; and
- Developing community-based “self-help” programs and specific projects to provide local improvement in water supply, the environment, water quality and so on.

6.8 Data, Information and Decision Support

This key area is another “foundation” key area, as data is fundamental to all aspects of water resource management as such it includes:

- Data collection, including: surface and groundwater quantity and quality; other natural resources data, such as soils, geology, land cover, ecosystems and so on; and socio-economic data, such as population, poverty, land use, and so on;
- Data archiving and management, including collation of data from various sources, validation, computerisation, and so on;
- Data sharing and dissemination among government agencies, research establishments and so on, and providing public access to data.
- Research to increase knowledge in such fields as catchment processes, demography, and so on, as well as the development of new technologies for water conservation and environmental protection.
- Development and implementation of decision support tools, including GIS systems, hydrologic and hydraulic models, and other analytical tools.

7 Interventions Identified in Phases 1 & 2

7.1 Process

A highly structured procedure, based on Multi-Objective Analysis (MOA), was used to identify sub-projects (interventions) for inclusion in the loan project. This basically involved undertaking a problem analysis, identifying a range of candidate sub-projects to address the problems and ranking the candidates according to a set of agreed criteria by the MOA procedure. This procedure allowed stakeholder contribution in a structured way and led to a list of 18 sub-projects recommended to be included in the loan project. The details are documented in the Interim Report (August 2005) of the consultants. The process was a valid one, although there was perhaps more of an emphasis on problem-solving than on working towards achieving agreed objectives.

In addition to the identification of projects, in Phase 1 the consultants investigated and made recommendations on important associated issues, such as what institutional arrangements should be put in place to facilitate better policy making, planning and coordination (see the Final Report of the consultants). However, since the circumstances have changed since that report was submitted in March 2006, it was deemed necessary to review the institutional aspects of river basin management in Phase 3. Current issues for institutional arrangements are described in Section 5.3. In the end it was decided that the institutional issues would be addressed by a parallel technical assistance funded by ADB[5].

7.2 Issues Analysis

During Phase I of the PPTA, an assessment of the water resource and environment management problems in the basin was conducted by the PPTA team, and this was used to draw up a package of measures to counter the primary causes of the problems. The five “missions” mandated by the Water Law were used as a framework for basin-wide problem assessment. The “problem tree”[6] analysis identified 11 main problems, 27 causes and 97 countermeasures. The countermeasures were then grouped into a long list of 18 projects. These were then ranked using multiple criteria that took into account social, environmental, economic-financial, institutional and technical considerations. The problem assessment and criteria to be used for prioritising alternative project were presented for validation by basin stakeholders during consultations (“beneficiary consultation meetings”).

Using the set of criteria adopted for project prioritisation, the PPTA team applied a weighted scoring methodology (known as “multi-objective analysis“ (MOA) for systematically ranking the long list of projects.

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[5] Concept Note: Institutional Support for Integrated Water Resources Management in the 6 Ci’s Basin

[6] Similar to the one shown in Figure 18.

7.3 Sub-Projects Recommended

Table 4 shows the 18 sub-projects recommended as a result of the MOA process.

Table 4: Component Projects Recommended in Phase 1

	PROJECT TITLE	DESCRIPTION
1	System service improvement WTC	Rehabilitation of West Tarum Canal and associated structures, and institutional strengthening for effective management
2	System service improvement ETC	Rehabilitation of East Tarum Canal and associated structures, and institutional strengthening for effective management
3	System service improvement NTC	Rehabilitation of North Tarum Canal and associated structures, and institutional strengthening for effective management
4	Irrigation modernization WTC	Improvement of water supplies to irrigators in the WTC irrigation area by rehabilitation of secondary and tertiary canals and water control structures and development of a real-time irrigation management system
5	Irrigation modernization ETC	Improvement of water supplies to irrigators in the ETC irrigation area by rehabilitation of secondary and tertiary canals and water control structures and development of a real-time irrigation management system
6	Irrigation modernization NTC	Improvement of water supplies to irrigators in the NTC irrigation area by rehabilitation of secondary and tertiary canals and water control structures and development of a real-time irrigation management system
7	Productive Reforestation	Reforestation of degraded catchments by planting productive trees in the Upper Citarum, Upper Cipamingkis, and Upper Bekasi sub-basins
8	Integrated Management of Disaster	Disaster mitigation in the Bandung low lands, Upper Bekasi, Lower Citarum, Lower Cibeet, Lower Ciheran, Lower Cilamaya, and Lower Cipunegara areas through river improvement works, development of a disaster forecasting and warning system, and improving disaster preparedness
9	Upgrading of Water Source - Upper Cipunegara	Construction of a dam and inter-basin diversion to provide increased water supplies in the Cipunegara River, and improved watershed management in the catchments
10	Upgrading of Water Source - Cipancuh	Upgrading of Cipancuh Dam and associated works
11	Upgrading of Water Source - Ciherang	Construction of Ciherang Dam and associated works
12	Upgrading of Water Source - Ciputarua	Construction of Ciputarua Dam and associated works
13	Enhancement of System Reliability	Increasing reliability of supply to Jakarta through a new conveyance system, and institutional strengthening for better management of the system
14	Integrated Erosion Management	Provision of structural erosion control works and a forecasting and warning system for mud flows and landslides in the Upper Citarum, Upper Bekasi, and Upper Cipunegara areas

	PROJECT TITLE	DESCRIPTION
15	Management of Domestic Effluent	Construction of new sewerage systems to service domestic users in Bandung City, Bekasi City, Municipalities of Cikarang and Karawang, and implementation of new tariff arrangements
16	Management of Industrial Effluent	Construction of new sewerage systems to service domestic users in Bandung City, Bekasi City, Municipalities of Cikao and Cilamaya, and along WTC and implementation of new tariff arrangements
17	Solid Waste Management	Implementation of structural and non-structural measures for improved solid waste management in Bandung City and Bekasi City, and along WTC
18	Water Supply System	Construction of improved water offtake and reticulation systems for water supply to Bandung(City and District), Municipalities of Puruwakarta, Karawang and Sumedang

7.4 Adequacy of Original Loan Project Composition

At the Tripartite Meeting held in March 2006, concern was expressed by the stakeholders, and particularly those from the upper basin, that the focus of the project as designed in Phases 1 and 2 was (i) biased towards the lower basin, with a strong emphasis on infrastructure rehabilitation for irrigation and Jakarta water supply in the lower basin; and (ii) concentrating too much on water supply, with lesser attention paid to other water resource management issues, such as catchment management, community empowerment, and so on.

An analysis has been done to see if the perceptions of stakeholders were accurate, and how well the sub-projects proposed in Phases 1 and 2 addressed the key areas for IWRM identified (see Chapter 6). This is shown in Table 5.

Actually, the perceptions of stakeholders were reasonably accurate. As can be seen from Table 5, most of the proposed sub-projects deal primarily with water resource develop, while other issues take a secondary or minor role. Actually, this is not unexpected, given that (at least initially) the task of the PPTA was to prepare a “traditional” ADB loan project, and this result should not be construed as a failure on the part of Nippon Koei to satisfy their terms of reference.

However, given the stakeholder aspirations for a project that deals widely with a broad range of water resource management issues in the Citarum River Basin, and the recent availability of the MFF funding modality that provides good flexibility to be able to achieve this, the eighteen sub-projects need to be “repackaged” in some cases, and added to, if the desired outcomes are to be achieved. The roadmap approach is appropriate for identifying new and/or modified sub-projects that meet these requirements.

Table 5: Key Areas Covered by Previously Proposed Sub-Projects

Phase 1 Sub-Project ↓		Institut-ions	Water Resource Dev't and Mgt	Water Sharing	Environ-mental Protect-ion	Disaster Manage-ment	Commun ity Empow-erment	Data and Informat-ion
1	System Service Improvement – West Tarum Canal	○	◉	◉	○			
2	System Service Improvement – East Tarum Canal	○	◉	◉	○			
3	System Service Improvement – North Tarum Canal	○	◉	◉	○			
4	Irrigation Modernisation – West Tarum Canal	○	◉					○
5	Irrigation Modernisation – East Tarum Canal	○	◉					○
6	Irrigation Modernisation – North Tarum Canal	○	◉					○
7	Productive Reforestation	○			◉		◉	○
8	Integrated Management of Disaster				○	◉	◉	◉
9	Upgrading of Water Source (Upper Cipunegara)	○	◉					
10	Upgrading of Water Source (Cipancuh)	○	◉					
11	Upgrading of Water Source (Ciherang)	○	◉					
12	Upgrading of Water Source (Ciputarua)	○	◉					
13	Enhancement of System Reliability	○	◉					
14	Integrated Erosion Control					◉	○	○
15	Management of Water Environment against Domestic Effluent	○			◉		○	○
16	Management of Water Environment against Industrial Effluent	○			◉		○	○
17	Solid Waste Management	○			◉		○	
18	Raw Water Supply	○	◉					

Legend: ◉ Primary focus
◉ Secondary focus
○ Minor consideration

8 Development of the Roadmap

8.1 Introduction

The process for the development of the roadmap follows the basic methodology of strategic planning, as outlined in Chapter 3. Fundamentally, the approach is to ask the following three questions:

- ***Where do we want to go (with water resource management in the basin)?***
- ***Where are we now (that is, what are the existing issues/problems)?***
- ***How can we get from where we are now to where we want to go (the "road" we need to take)?***

Much has been written about the current issues for water resource management in the basin, and the key issues have already been highlighted in previous chapters.

The roadmap itself is simply a set of strategies (and projects/actions to implement those strategies) that define the path between the present situation with respect to water resources in the basin and the desired outcomes (or vision) for the future – that is, what needs to be done to achieve the objectives.

Importantly, the roadmap is seen to belong to the government, not ADB, so specific projects/actions may be funded from a variety of sources, both national and from international assistance. It might be assumed, however, that the MMF loan being prepared would be the greatest source of funding.

8.2 Agreeing a Shared Vision

Having a common vision for the future is an important first step in developing a roadmap. It should define the "destination" that is desired. This contrasts with "project-oriented" and "problem-oriented" approaches that are often taken. To summarise:

- The "project-oriented" approach begins with preparation of projects.
- The "problem-oriented" approach concentrates on solving problems, therefore looks first at "where we are now".
- The "vision-oriented" approach starts by clearly defining the vision: "where we want to go".

At a workshop held on 29 August 2006, a broad range of basin stakeholders put forward their views on what should be achieved in the future for the Citarum River Basin, and discussed what should be the "vision". As a result of the discussion, the workshop participants generally agreed that the vision should be:

"Working together for benefits and sustainability in the Citarum Basin"

However, while this vision statement is simple and concise, it does not give a good "picture" of the future state of the basin desired by the stakeholders (what would one want to see if one did a tour of the basin in 2020), and might by considered a slogan, rather than a vision statement. The words "benefits" and "sustainability" by themselves are very general and vague.

Hence it is difficult to infer appropriate objectives that might achieve this "vision".

A recommended alternative is:

"The government and community working together for clean, healthy and productive catchments and rivers, bringing sustainable benefits to all people of the Citarum River Basin."

Regardless of the vision adopted, the clear message from the stakeholders is that achieving sustainability should be part of the long term strategy for the basin. This confirms an important outcome of the World Bank funded 1997 study that produced an "integrated water management plan" for the Citarum River Basin[7]. The planning study considered two alternative strategies for water resource development, namely:

- **Short-term compliance strategy:** To meet future water demands at the lowest possible cost; and
- **Sustainable growth strategy:** To meet future water demands, with active and sustainable groundwater management, and an active set of pollution control measures and policies.

The sustainable growth strategy was recommended and accepted as the appropriate way forward. The conclusions and recommendations of the study are still basically relevant.

8.3 A Strategic Framework

The vision needs to be supported by appropriate interventions in each of the key areas (identified in Chapter 6) if integrated water resource management is to be implemented and the vision realised.. This can be represented by the diagram shown in Figure 19.

Figure 19: Strategic Framework for Water Resource Management

[7] *Integrated Water Management Plan for the Citarum River Basin*, Java Irrigation Improvement and Water Resources Management Project, Consultant's Report, June 1997.

8.4 Key Area Objectives

The objectives for each key area are shown in Table 6. It is implicitly assumed that achievement of all the objectives over the planning period (taken to be 15 years) will give an outcome approaching the vision that has been developed. Note that the key areas are defined in Chapter 6.

Table 6: Key Area Objectives

KEY AREA	OBJECTIVES
Institutions and Planning for IWRM	▪ To have effective organisational frameworks, clearly defined responsibilities and working partnerships with other stakeholders in place for the Citarum River Basin, encompassing both 'in-stream' and 'off-stream' aspects.
	▪ To have an effective coordination mechanism for water resources management in the basin.
	▪ To have a harmonious and comprehensive legal framework for effective water resources management in the basin.
	▪ To have transparent, effective and holistic water resources planning mechanisms linked to spatial planning, and inclusive of stakeholder needs and aspirations
	▪ To have effective regulatory (licensing) mechanisms in place and operating for surface and groundwater utilisation and wastewater discharge.
	▪ Agencies concerned with water management to have appropriate technology for effective and sustainable water resource management.
	▪ Decision makers, technical experts and other key stakeholders to have the capacity to effectively carry out their responsibilities with regard to water resources planning and management, including procedures for EIA and review (EARP) of projects.
Water Resource Development and Management	▪ To have new or improved sources of water for domestic, irrigation, industry, hydropower, and other uses developed, consistent with water availability and sustainability.
	▪ For all people in the basin to have access to adequate water supply and sanitation.
	▪ To have all water supply infrastructure capable of operating at design capacity.
	▪ To have sustainable asset management practices in place for all water-related infrastructure in the basin.
Water Sharing	▪ To have an equitable water sharing arrangement among the upper and the lower basin and transboundary water resources (water supply to Jakarta).
	▪ To have clearly defined water rights for all authorised water users.
	▪ To have all conflicts over utilisation of the water resources of the basin resolved quickly and satisfactorily.
Environmental Protection	▪ To have comprehensive land use plans in place, and adhered to, in order to minimise the impacts of human activities on the environment.

KEY AREA	OBJECTIVES
	▪ To have forest protection measures in place and have no further reduction in the existing forest area.
	▪ To have priority catchments improved through reforestation and adoption of appropriate land use and agricultural practices to minimise erosion.
	▪ To maintain biodiversity, without further degradation.
	▪ To have minimal pollution from domestic, industrial and agricultural sources entering the waterways of the basin.
	▪ To provide adequate water share for ecological maintenance (environmental flows), for example, minimum dry season flow to prevent salinity intrusion, sedimentation and pollutant accumulation near coastal areas.
Disaster Management	▪ To have effective disaster preparedness plans in place for floods and mud flow events.
	▪ To have appropriate works in place to minimise the physical impacts of floods and mud flow events.
	▪ To have effective drought management plans in place where available water falls seasonally below design expectations.
Community Empowerment	▪ To have a high level of awareness of local communities about conservation, utilisation and protection of natural resources (including their rights and responsibilities) in the basin.
	▪ Local communities to have the opportunity and forum to participate meaningfully in the planning and management of the water resources of the basin.
	▪ To have the enabling conditions (institutional, financial and capacity) in place for local community involvement in provision of local water supply and sanitation services, watershed management and waste management
Data and Information	▪ To have a comprehensive database on land and water resources in place and in a form that is accessible to all that need it to facilitate sustainable management of the basin's water resources.
	▪ To use community participatory methods where ever applicable for data collection and verification.
	▪ To have effective arrangements in place for "custodianship" of the different water and catchment related datasets.
	▪ To have effective data sharing arrangements in place among agencies within the basin and with central agencies.
	▪ To have suitable models and decision support tools developed and operational to assist rational decision making about water resource management.
	▪ To have research programs in place to fill gaps in knowledge about water-related processes and scenarios.

8.5 Proposed Roadmap

The roadmap is essentially a planned program of interventions that will, if successfully implemented, lead to the achievement of the objectives. In many cases, projects to be included in the roadmap had already been identified by previous studies and Phase 1 of the PPTA. In other cases, it became apparent that interventions were required that had not been identified previously, but will be essential for achieving the objectives. A total of almost 80 interventions were identified, with a total base cost of around $3.3 billion, proposed for a 15 year time frame. The roadmap document is included as Annex 2.

It is an ambitious program, and crosses a number of sectors. However, such a complex program is necessary simply because the problems are numerous and inter-related. It is probable that, if this program was to be successfully implemented, it would be one of the most comprehensive basin IWRM programs anywhere in the world.

8.6 Government Endorsement of the Roadmap

The development of a roadmap through stakeholder consultation has been an important step in the process of preparing the MFF. Its existence will be a compelling argument to the ADB Board when the Report and Recommendation of the President (RRP) is submitted for approval. However, at the end of the PPTA in December 2006, the roadmap has no official GOI endorsement, and hence has no status as a basin planning tool for the Citarum River Basin. Accordingly, the relevant agencies (perhaps Ministry of Public Works and Bappenas) need to take the initiative to submit the roadmap through the appropriate channels to have it endorsed by GOI. It needs to be "owned" by GOI, and not seen to be an ADB artefact.

It is recognised that the roadmap is a "living document" – that is it will need to be revised over time in the light of changing circumstances. An appropriate agency (probably Bappenas) needs to be assigned the ongoing task of reviewing and updating the roadmap, in consultation with the line agencies that will be involved in its implementation.

8.7 Sequencing of Interventions

It is difficult at this time to be definitive about the actual sequencing of roadmap interventions. Clearly, the highest priority interventions need to be done first. But there are also constraints on capacity (financial and human resource related) to implementation. These need to be taken into account. However, the PPTA team has made judgements, based on stakeholder consultation, of what should (a) be funded by the MFF, and (b) in what order. This is discussed in more detail below.

8.8 Funding of Roadmap Interventions

At a cost of $3.3 billion, funding for the implementation of the roadmap could not possibly come from ADB alone. The MFF ($500 million) will go some way towards assisting GOI in implementation, as will a number of grants to fund specific technical assistance (for example, studies, institutional support, and so on). However, it is expected that GOI will use the roadmap as a means of attracting other multilateral and bilateral donors to participate in this important program. In addition, GOI should allocate funds for roadmap interventions that are less attractive to international donors, and given the emphasis on community empowerment in many of the inter-

ventions proposed, it could be expected that a significant contribution (in-kind and cash) from the community will be forthcoming.

9 Designing the Overall Investment Program

9.1 Basis for Selecting MFF Components

Having developed the roadmap, and gained reasonably broad acceptance of it as a planning tool, the next step was to select the project "components" for MFF funding. This was based on:

- Project priorities identified during Phase 1
- Stakeholder consultations in Phase 3
- Other studies and information
- Base costs should total the MFF amount of $500,000 million.

9.2 Recommended Investment Program

Table 1 shows the components recommended for the entire MFF (loan funded only). These are grouped by key area. It is envisaged that the MFF will be implemented in four tranches. These do not have to be "sequential" but may well overlap, depending on the urgency and importance of implementing the components of the MFF.

An indicative Design and Monitoring Framework for the MFF is given in Annex 3, while an indicative implementation schedule is given in Annex 4. This will need to be firmed up during Appraisal, but in any case, under the MFF modality there is flexibility in the design and timing of tranches beyond Tranche 1, so the Design and Monitoring Framework and the implementation schedule should be used as a guideline only.

Table 7: Indicative Investment Program Components (Projects)

Key Area	Component Projects (Outputs)
Institutions and Planning for Integrated Water Resource Management	*No specific projects – this key area is being addressed by parallel grant-funded technical assistance*
Water Resource Development and Management	Rehabilitation of West Tarum Canal
	Water Supply Options and Improved Groundwater Management for Bandung
	Upgrading of water source for Bandung and other uses by inter-basin transfer
	System Service Improvement for East Tarum Canal
	System Service Improvement for North Tarum Canal
	Upgrading of Water Source for Irrigation (Upper Cipunegara)
	Cisankuy Irrigation Improvement
	Curug Run-of-River Power Plant
	Raising of Cirata Dam
	Development and Implementation of Preferred Bulk Water Supply Options for Bekasi and Karawang
Water Sharing	Development and implementation of a water entitlements and licensing system for surface water users
	Review of allocation priorities and optimization of operating rules for key sub-basins, including the operation of the river / reservoir system as a whole
Environmental Protection	Roll-Out of System Rice Intensification
	Development and Implementation of a Basin River Quality Improvement Strategy and Action Plans
	Improvement in water quality in Saguling, Cirata and Jatiluhur Reservoirs through management of fish farming and other polluting activities
	Development and Implementation of Integrated Coastal Zone Management Strategy and Action Plan for Citarum Coastline
Disaster Management	*No projects – this key area is being adequately addressed by other donors*
Community Empowerment	Support for Community- and NGO-Driven Initiatives for Improved Water Supply and Sanitation
	Development and implementation of an Information, Education and Awareness Strategy (IEAS) for capacity building of communities across the basin for improved participation in water resources policy development, planning and management
Data, Information and Decision Support	*No specific projects – this key area is being addressed by parallel grant-funded technical assistance and in several sub-components funded as part of the investment program*

10 MFF Tranche 1

10.1 Selection Criteria

In developing a “package” of sub-projects for funding under Tranche 1 of the MFF, the following criteria should be used.

The sub-projects should:

1. Have high government priority, and hence be included in the roadmap;
2. Together cover a range of key areas and not concentrate on a single key area;
3. Together address upper basin, as well as lower basin water management issues;
4. Be supported by a range of stakeholder groups, and not only “special interest” groups;
5. Have (at least) adequate economic returns;
6. Have built-in environmental and social safeguards;
7. Be at a sufficiently advanced stage of preparation (including feasibility studies, procurement documents and GOI readiness) that they can be commenced with minimal delay after approval by ADB;
8. Not be proposed for funding by other donors.

To some extent, satisfying all these criteria has proved to be fairly difficult, as the focus of the PPTA changed in mid-2006,, and consultation and preparation time in Phase 3 has been limited, compared to what is normal for a PPTA for a loan of this magnitude.

10.2 Recommended Composition of Tranche 1

After stakeholder consultation and considerable preparation work by the Phase 3 team, the subprojects proposed are summarised in Table 8. The recommended Design and Monitoring Framework for Tranche 1 is given in Annex 5. The implementation schedule is given in Annex 6.

Of these components, ADB has agreed to fund the Institutional strengthening and the preparation of Tranche 2 as grant-funded technical assistance, while Global Environment Facility (GEF) funds have been sought for the productive reforestation and protected area management projects.

Project profiles for the MFF-funded components are given in Annex 10. Details of the two GEF-funded components can be found in the proposals put prepared for GEF. A concept note on the institutional strengthening component has also been prepared under other arrangements.

Two of the components should take priority in terms of recruitment. Firstly, the project management component, establishing the Program Management and Coordination Unit (see Section 12.1), will be essential to get the program “up and running”. Secondly, the West Tarum Canal rehabilitation will the longest of the components and therefore on the critical path for the overall program. Terms of reference (TOR) for these two components have been prepared and are given in Annex 11.

Table 8: Summary of Proposed Tranche 1 Package

Component Project	Outputs
Program Management	• Liaison with executing agencies and other relevant stakeholders • Coordination among projects • Identify the need for and coordinate implementation of minor studies (up to $400,000 total) to improve knowledge of water issues in CRB • Monitoring and reporting of project performance • Capacity building for NGOs involved in the component projects of Tranche 1 • Coordination of preparation for Tranche 2
Institutional Strengthening for IWRM	• Assistance in establishing the Water Resources Council (covering Citarum and eastern Basins), river basin management office and support unit(s) and ongoing support and capacity building • Development of an Internet-based metadatabase (data inventory) for water, land and related data in the CRB • Design and implementation of a decision support tool, including a basin hydrologic model, for use by relevant agencies for policy and planning • Development of an annual "state of the basin" reporting system • Development of a strategic river basin plan (*pola*) that will facilitate improved and more integrated water resource management
Rehabilitation of West Tarum Canal	• West Tarum Canal restored to its design capacity • Water quality improved through exclusion of inflows of polluted water from crossing stream through construction of siphons • Water control structures restored to full operational status • Environmental impacts minimized, and in particular through proper disposal of dredged material • Social disruption for those living along the canal minimized, and in particular access to water supply and sanitation maintained and improved if necessary • Capacity of PJT II for ongoing management of the canal improved.
Water Supply Options and Improved Groundwater Management for Bandung	• The stakeholder forum for Bandung Sub-Basin formed and operating effectively according to its mandate (to be defined during the project) • Broad stakeholder agreement achieved for preferred option(s) for increasing surface water supplies for Bandung • Improved groundwater monitoring network in place • A high level of compliance with regulations for sustainable groundwater management in Bandung achieved
Roll-Out of System Rice Intensification in Three Districts	• Adoption of System of Rice Intensification (SRI) in the project area accelerated. • About 10,000 ha of paddy land in three districts will have: o increased rice yield by an average of 45% o reduced need for irrigation water by 45% o increased labour use by 35% o increased net income by 55% o increased gross margin by 50%

Component Project	Outputs
Support for Community- and NGO-Driven Initiatives for Improved Water Supply and Sanitation	• Strengthened community capabilities to develop, co-finance, build, operate, and maintain community-based water supply and sanitation facilities • Development of sanitation and facilities by providing a subsidy for latrine constructions for the poorest 10% of households • Development of simple drainage, washing platforms, soak pits, bashing and washing facilities • Health impacts of project investments in water supply and sanitation maximized and the incidence of water borne and water related diseases reduced through improved practices
Development and Implementation of a Basin River Quality Improvement Strategy and Action Plans	• Policies and procedures for water quality management • Improvements to water quality monitoring and data management • Strengthening of organizational capacity • Preparation of basin-wide River Water Quality Improvement Strategy (RWQIS) • Preparation and implementation of area-based pollution sources management action plans
Protected Area Management for Biodiversity [Phase 1] (GEF Funded)	• A conservation management action plan developed and implemented through stakeholder participation for seven protected areas. • Management zones defined- and best management practices followed in these protected areas based on surveys of representative wildlife present in their major habitats. • People in selected Model Conservation Villages adjacent to these protected areas develop village action plans and and are engaged in the conservation of protected area biological values.
Productive Reforestation of Degraded Catchments [Phase 1] (GEF Funded)	• A re-forestation spatial plan completed with wide stakeholder acceptance. • Model Conservation villages near priority areas for reforestation receive relevant education and information; gain conditional legal tenure of degraded Perum Perhutani lands; develop village nurseries and; re-forest degraded lands. • A reward system (Payment for Environmental Services) established that supports and encourages improved environmental stewardship by upper catchment villagers. • Land use spatial planning capacity at level of kabupaten and below improved. • Biodiversity and land degradation information and databases made compatible with existing CRB management databases.
Project Preparation for Tranche 2	For each project being prepared: • Prepare feasibility study (if required) • Prepare scope of project and estimate resources and costs • Prepare TOR and other tender documentation

11 Cost Estimates and Financing

A full economic and financial analysis is given in Annex 7. Only a summary of the financial analysis is given here.

The estimated total investment cost for Tranche 1, including contingencies and IDC for the Project is $97.31 million. The total base cost is estimated at $78.04 million while the total base cost with contingencies is $93.25 million (Table 9).

Table 9: Cost Estimates and Financing Plan for Tranche 1

Project Components	Total ($ Million)	Expenditure by Financier			
		ADB TA	GEF	ADB Loan	GOI
1. Program Management	2.57				2.57
2. Institutional Strengthening for IWRM	2.40	2.40			
3. Water Supply Options for Bandung /a	4.81			3.08	1.73
4. Rehabilitation of West Tarum Canal	42.93			27.48	15.46
5. Roll Out of System Rice Intensification /b	4.17			2.67	1.50
6. Community-Driven WSS	5.64			3.61	2.03
7.Basin Water Quality Improvement Strategy	6.42			4.11	2.31
8. Productive Reforestation of Degraded Catchments	4.04		4.04		
9. Project Area Management Biodiversity	4.02		4.02		
10. Program Preparation for Tranche 2	1.04	1.04			
Total Base Cost	**78.04**	**3.44**	**8.06**	**40.94**	**25.60**
Physical Contingencies	3.90			3.90	
Price Contingencies	11.31			11.31	
Total Base Cost and Contingencies	**93.25**	**3.44**	**8.06**	**56.15**	**25.60**
Interest During Implementation	2.87			2.87	
Commitment Charges	1.19			1.19	
Total Project Cost	**97.31**	**3.44**	**8.06**	**60.22**	**25.60**
% of Total Project Cost	**100%**	**4%**	**8%**	**62%**	**26%**
ADB and GOI Share of non-grant project cost	**100%**			**70%**	**30%**

The estimated total investment cost for MFF, including contingencies and IDC for the Project is $830.13 million (Table 10).

Table 10: Cost Estimates and Financing Plan for Investment Program

Tranche	Total ($ Million)	Expenditure by Financier			
		ADB TA	Co-finance	ADB Loan	GOI
A. Tranche 1 - 2007 to 2011	**97.31**	**3.44**	**8.06**	**60.22**	**25.60**
B. Tranche 2 - 2009 to 2015					
1. Upgrading Water Source for Bandung	190.00		10.00	66.24	113.76
2. System Service Improvement - East Tarum Canal	61.53			24.69	36.84
3. Roll Out of Rice Intensification - Phase 2	5.00			2.01	2.99
4. Other projects	19.10	4.00	5.00	10.10	
5. Contingencies	68.91			68.91	
6. IDC and Commitment Charges	27.56			27.56	
Sub-Total	**372.10**	**4.00**	**15.00**	**199.51**	**153.59**
C. Tranche 3 - 2013 to 2017					
1. System Service Improvement - North Tarum Canal	55.60			22.31	33.29
2. Upgrading of Water Source for Irrigation (Upper Cipunegara)	60.00		10.00	50.00	
3. Curug Run of the River Power Plant	6.00			2.41	3.59
4. Other projects	15.50	4.00	5.00	6.50	
5. Contingencies	34.28			34.28	
6. IDC and Commitment Charges	13.71			13.71	
Sub-Total	**185.09**	**4.00**	**15.00**	**129.20**	**36.88**
D. Tranche 4 - 2017 TO 2021					
1. Rising of Cirata Dam	20.10			8.07	12.03
2. Cisankuy Irrigation Improvement	56.00		5.00	17.47	33.53
3. Bulk Water Supply Options for Bekasi and Karawang	50.00		10.00	40.00	
4. Other projects	4.00	4.00			
5. Contingencies	32.53			32.53	
6. IDC and Commitment Charges	13.01			13.01	
Sub-Total	**175.64**	**4.00**	**15.00**	**111.07**	**45.56**
Total Project Cost	**830.13**	**15.44**	**53.06**	**500.00**	**261.64**
% of Total Project Cost	**100%**	**2%**	**6%**	**60%**	**32%**
ADB and GOI Share	**100%**			**66%**	**34%**

Annex 8 provides an investment plan summary that shows the relationship among roadmap, investment program (MFF) and Tranche 1.

12 Implementation Arrangements

12.1 Investment Program Planning, Coordination and Management

In order to maximise the benefit of ADB support to the Citarum River Basin, as described in this report, the Roadmap and Investment Program implementation will be planned, managed and coordinated at three levels:

1. **Roadmap** by a Roadmap Planning Monitoring and Coordination Unit (RPMCU) under Bappenas coordinating with the National Water Resources Steering Committee and supporting the CRB Water Council in planning, coordinating and monitoring across national and provincial agencies;
2. **Investment Program** DGWR as EA through the establishment of a Program Management and Coordinating Unit (PMCU) in the CRB *Balai Besar* ; and
3. On a day-to-day basis through Project Implementation Units (PIUs) in each Implementing Agency (IA).

A proposed Project Organization Chart is given in Annex 9. The project activities need to be coordinated in a flexible, transparent, and open manner. The RPMCU and PMCU should assist in ensuring all basin stakeholders are involved in Citarum River Basin planning and monitoring activities. Annual work programs (AWPs) are a necessity due to government disbursement mechanisms, these should be initiated by PIUs and consolidated by the PMCU.

The PCMU should be staffed by a small group of international and national consultants, supplemented by staff seconded from the implementing agencies (for the duration of the relevant components). This will have the benefits of:

- Providing additional staff to undertake the work of the PMCU – professionals that are familiar with the particular characteristics (physical and institutional) relevant to each component;
- Improving liaison between the PMCU and the individual PIUs;
- Building the capacity of IA staff through “on-the-job” work experience alongside international and national consultants.

12.2 Executing and Implementing Agencies

It is recommended that implementation of the Tranche 1 various components be the responsibility of national level PIUs as shown in Table 11.

The Directorate-General Water Resources (DGWR) in the (MPW) is the logical choice as the Tranche 1 Executing Agency (EA) and should be responsible for overall management coordination and monitoring of the activities under the PMCU and the guidance of National Water Resources Steering Committee (in Bappenas).

Specifically, the PMCU should:

- Ensure that AWPs are submitted by the PIU in a timely manner and in a standard format;
- Review and consolidate, for all PIUs, the AWPs and corresponding budget estimates;
- Prepare and submit reports to ADB and NWRSC;
- Compile the results of project monitoring and evaluation, and convey the consolidated results to the implementing agencies and the ADB;
- Liaise and coordinate with other donor agencies on complementary activities;
- Organise coordination meetings and workshops, and issue invitations to the implementing agencies at the national, provincial, and district levels as appropriate; and
- Arrange for representatives of the implementing agencies to assist the ADB's review missions. Routine communications from ADB on the Investment Program will be addressed to the PMCU.

Table 11: Project Implementation Arrangements

Component Projects (Outputs)	Implementing Ministry	Implementing Agency (PIU)
Rehabilitation of West Tarum Canal	Directorate General of Water Resources (DGWR), Ministry of Public Works	PIU CRB Balai Besar, Coordination Directorate of Irrigation
Water Supply Options and Improved Groundwater Management for Bandung	DGWR, Ministry of Public Works and Ministry for Mines and Energy	(i) PIU CRB Balai Besar, Coordination Directorate of Irrigation (ii) PIU National DG, MME
Roll-Out of System Rice Intensification in Three Districts	Indonesia Agency for Agriculture Research and Development, Ministry of Agriculture	PIU Assessment Institute for Agricultural Technology (AIAT), West Java.
Support for Community- and NGO-Driven Initiatives for Improved Water Supply and Sanitation	Directorate General of Communicative Disease (DGCD), Ministry of Health	PIU DGCD, Directorate Water Borne Disease
Development and Implementation of a Basin River Quality Improvement Strategy and Action Plans	DGWR, Ministry of Public Works and Ministry of the Environment	(i) PIU CRB Balai Besar, Coordination Directorate of SDA (ii) PIU DG Watersheds
Biodiversity	Directorate General of Watershed Conservation (DGWC), Ministry of Forestry	PIU DGWC
Land Degradation	Directorate General of Watershed Conservation (DGWC), Ministry of Forestry	PIU DGWC

13 Impacts and Benefits

13.1 Policy Impact and Institutional Benefits

While the basin-wide institutional issues are not to be addressed directly by this investment program, it will have a significant impact on river basin management policy, and will promote change in several institutional areas[8]. The development of the roadmap for IWRM under the PPTA provides an important tool for GOI to direct future investments in sectors related to water and land management in the Citarum River Basin. The fact that GOI requested ADB to fund part of that roadmap through the ICWRMP that is highly multi-sectoral represents a policy shift from the "traditional" single-sector program and project loans of the past.

Additionally, many of the proposed component projects under the investment program include policy development, planning and organizational strengthening. This is true for both relevant government organizations at national, provincial and district level, as well as NGOs and the community at large.

The benefits of these initiatives, although difficult to quantify, are like to be substantial if the program is successfully implemented. Strengthened institutions and a firm policy basis for IWRM will lead to a more effective and holistic approach to water and land management at the basin level and below in the Citarum River Basin. In turn, increased water availability, cleaner and healthier rivers and catchments will lead to higher productivity for agriculture and industry, provide greatly improved water supply and sanitation in urban, peri-urban and rural areas, and better quality of life for the inhabitants of the basin. But in addition, this new multi-sectoral approach to river basin management will have the potential to be a model for river basins elsewhere in Indonesia and provide an example for other countries in the region that have embraced river basin management as a concept, but may be struggling to implement it effectively.

13.2 Economic Benefits and Impacts (for Tranche 1 only)

The project main quantifiable benefits are those arising from: (i) the additional 19.6 m^3/sec of water for Jakarta, Curug and Bekasi: and (ii) the additional 4.5 m^3/sec of water for paddy cultivation.

Some 10 m^3/sec of water will be available to meet the domestic need of some 4.5 million residents[9] of Jakarta and Bekasi. Currently piped water is priced at a range of Rp800 to Rp10,000 per m^3: the lower rate for low income areas, and the highest rate for high rise buildings with an average water charge of Rp5,000 per m^3 or Rp5 per litre. Many of the middle and

[8] The parallel institutional project funded as an ADB Technical Assistance (described elsewhere in this report) will have as its primary focus institutional reform and strengthening, both for organizations dealing with river basin management, and the legal, policy and planning basis for IWRM.

[9] Assuming a water requirement of 200 litres/person/day.

high income families rely on bottle water which priced at about Rp1,000 per litre. The poor are not able to purchase bottle water and must rely mainly on piped water for their daily needs.

The rest of the additional water will be used mainly to meet the needs of the industrial sector. Water is an essential input for virtually all industries; in particular the textile, food and service sectors. Without the additional water, growth of these industries will be severely curtailed.

The rehabilitation of WTC will provide sufficient water to cultivate 117,600 ha of paddy as compared with 91,800 ha in the without project situation. This will increase paddy cropping intensity from 1.53 to 1.93. The Project will increase the annual paddy cropped area by 25,800 ha by 2025. A total of 25,800 farmers, each cultivating (2 crops per year) an average of 0.5 ha of paddy land will benefit from this increase in crop area.

The SRI component in this project will accelerate the adoption of System of Rice Intensification in the project area. In total, some 45,800 paddy farmers will benefits from the Project and their net farm income will be raised by more than 35%. In addition some 15,000 landless farmers or labourers will also benefit from the increase farming activity and their net income is expected to be raised by 40%.

13.3 Other Benefits not Considered in Economic Analysis

- **Strengthening of Water Institutions.** The Project will strengthen several institutions involved in formulating and implementing effective programs in water conservation, its use and improvement in sanitation for the Citarum river basin.
- **Water Supply and Sanitation.** The project will formulate an action plan to increase the use of surface water for Bandung while reducing its reliance on groundwater. In addition, 236 villages (with a population of 20,000) will be supplied with clean water, sanitation facilities and solid waste disposal. The economic benefits of providing clean water and sanitation facilities are high. The World Bank estimates that the returns from such project are 5 to 20 times the actual investments[10].
- **Restoring Degraded Land.** A total of 36,000 farmers will be assisted to plant fruit trees and other economic crops in their riverine areas to reduce soil erosion and to restore the fertility and productivity of their farm land. The loss in agricultural productivity caused by soil erosion has been estimated at 4 to 7% per year[11].
- **Maintaining Biodiversity.** Seven model villages will be assisted to implement action plan to promote the regeneration of their flora and fauna. A total of 1,000 farmers will participate in this component.
- **Improving River Quality.** A number of mitigation measures will be implemented to reduce the pollution and silt load in the river system. This will lead to improvement in the quality of river water and reduce the cost of water treatment. Public toilets located in the canals will be relocated, with the human waste treated in septic tanks.

13.4 Environmental Benefits and Impacts

A strategic environmental assessment (SEA) was first carried out as part of the basin roadmap development process. It helps to integrate environ-

[10] World Bank, 2004. Global Analysis on Sanitation Investments.

[11] ADB, 1996. Economic Evaluation of Environmental Impact, page 238.

mental management concerns into the basin plan and facilitated public information and involvement in planning. The SEA influenced program planning by incorporating the following program design criteria: (i) balanced concern for water utilisation and water quality management; ii) attention to both human use concerns and ecological protection objectives; (iii) inclusion of capacity development for environment management and strengthening of the environmental regulatory system; (iv) inclusion of community participation and empowerment activities; and (v) management of water as an economic resource.

The SEA also established a tiered approach to environmental assessment and planning. The Environmental Assessment and Review Framework (EARF) specifies procedures for examining more closely the impacts of projects to be included under each MFF tranche to ensure: (i) consistency with the basin wide assessment framework and (ii) compliance with ADB and GOI environmental assessment requirements for individual projects. The IEE for Tranche 1 was done as a next tier of the SEA, based on the EARF.

The investment program's Tranche 1 package is expected to generate significant environmental benefits in terms of more efficient and equitable water resources utilization (both surface water and groundwater); adequate supply to meet growing water demand from households and industry; water quality improvement; rehabilitation of watersheds that ensure water supply sustainability and that also enhances socio-economic well-being of communities; and overall improvement of institutional capacity for participatory basin management.

Environmental safeguards are incorporated into the package both as pro-active measures to protect and sustain water resources and to preserve basin ecosystem functions (including biodiversity), as well as mitigation measures to deal with any adverse impacts arising from some activities (notably, WTC rehabilitation).

The extended, three-phase process of developing/designing the program has been influenced significantly by stakeholder views and preferences. A more balanced mix of project activities has been incorporated into the roadmap—addressing quantity and quality as inseparable issues in water resource management, introducing complementary solutions that combine engineering and institution-building, allowing for basin management objectives to encompass overall ecological protection, and taking into account the interests/sentiments of stakeholders in the upper and lower parts of the basin.

For purposes of compliance with ADB environmental assessment guidelines, no additional study or full environmental impact assessment is needed to further assess the potential environmental impacts of Tranche 1. However, individual projects associated with potential adverse impacts, specifically the West Tarum Canal rehabilitation and construction of communal septic tanks, must comply with the review and clearance procedures under Indonesia's AMDAL system.

14 Modelling and Decision Support Systems

14.1 Introduction

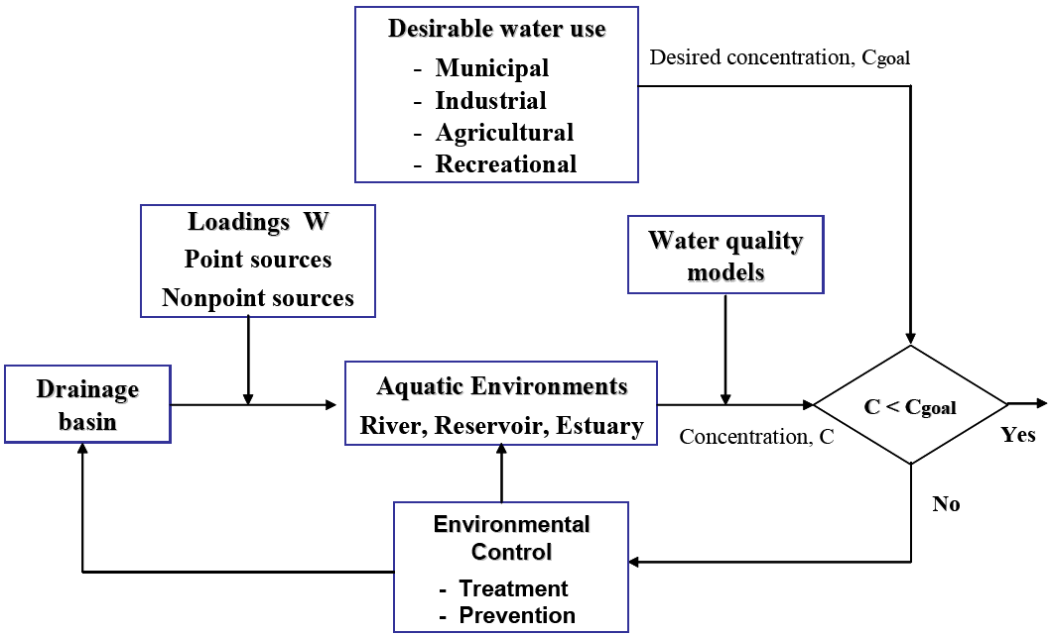
As it has turned out, modelling and decision support tool (DST) development has not been specifically included in the MFF program. However, these tools are fundamental to effective planning and management of the Citarum River Basin, and so need to be included in one of the technical assistance projects that will run in parallel with the MFF. During Phase 3, substantial preliminary work was undertaken to examine options for modelling and DST development and because of its importance, this chapter provides a summary. A much more complete description of the work done, and the results, is given in the Main Report on Data and Modelling and its annexes by Teun op ten Noort prepared during Phase 3 (see Annex 1).

14.2 Water Quality Modelling

14.2.1 Objectives of Water Quality Modelling

The objective of water quality (WQ) modelling in Citarum River Basin, where the problems are important, is to decide where and what measures should and could be taken to improve the water quality in the river and reservoirs. The principle is indicated in Figure 20.

Figure 20: Role of WQ Modelling in IWRM



14.2.2 General Considerations Related to WQ Modelling

For a good understanding it is necessary to realise that all WQ models should include a water allocation (WA) component. The WA component can be relatively simple, such as a water balancing model (MIKE Basin, RIBASIM, or IQQM[12]) or a fully hydrodynamic model describing the detailed movement of water such as Mike11, SOBEK, or HEC-RAS. So, in the following discussion, where WQ models are discussed, the WA component - by simple balance, full hydrodynamics or some intermediate lag function - is implicitly included.

The modelling of WQ in surface waters can be classified into two different categories: riverine (in-stream) processes; and lake (reservoir) processes. In the recent past some attempts to model the water quality in the Citarum River Basin, covering both riverine and lake processes, were made with very sophisticated models, needing large amounts of data (hydrological, hydraulic, chemical, biological). These models could only made to perform with many assumptions and simplifications, casting doubt on their usefulness.

It is with this in mind, future work under the ICWRMP “umbrella” should follow a more basic approach, in line with the specifically felt needs within PJT-II, to develop models for the assessment of the carrying capacity of a river in order to support the evaluation of effluent discharges to a river. It is one of the responsibilities of PJT-II to give a technical recommendation with regard to the development of a new industry or any other facility that will use surface water and return it as (treated) wastewater to the same stream.

It should be appreciated that many WQ processes are coupled and time dependent. This implies that the residence time in the river reaches is usually too short for those processes to fully develop. They do develop, however, in reservoirs where the residence time is considerable (say, greater than 100 days). Thus it is not useful to apply sophisticated models in the river reaches. This holds in particular for the relatively short stretch of the Citarum between Bandung and Saguling reservoir, and to a lesser extent between Djuanda reservoir and Curug in the Citarum and between Curug and the main drinking water intakes of Jakarta in the West Tarum Canal.

A far better approach for those river and canal reaches - where most of the pollution is collected - would be to develop so-called “waste load models” (WLMs), to see where the wastes originate from and how significant the loads are. The WQ monitoring that is being done at the moment - however important - is merely to indicate whether the standards defined for that stretch of the river are met or not. They give an indication where problems exist, that is where waste load models should be developed.

A WLM can be nothing more than spreadsheet detailing more or less what the waste loads (qualitative and quantitative) are at various points in the basin. Since the (influence of the) residence times in the river system are negligible, a simple calculation gives the concentrations in the particular river reaches. The more simple in-stream WQ models as shown below perform routing of individual pollution constituents through the river system, besides the WA calculations. Hence, it is important that these models (WA + WQ components) have at least a flow routing component to simulate the lag times in each reach (known as the “residence time”).

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[12] These and other models are briefly described below.

An inventory of industries, their treatment processes and pollution loads in the Citarum River Basin should be put into a GIS to become really useful.

14.2.3 Simple and Coupled WQ Models

In simple WQ models the interaction between the various polluting constituents is not modelled. These models do include simple process parameters, usually decay coefficients, and may be sufficient for river reaches where residence times are relatively short and full processes would not really exist. It can be considered as a form of "constituent" routing, similar to "flow" routing through the river reach. By monitoring these reaches one can obtain an idea of the carrying capacity of the river, whether the standards are exceeded and an indication of where problems do occur. As already mentioned, for the source of the problems it is actually more useful to set up a waste load model.

WQ models where various processes are coupled, are much more complicated (see for instance Figure 21 and Figure 22) and only useful for water bodies where residence times are considerable, say greater than 100 days. Thus such a model is only useful in the Citarum reservoirs, and has already been applied in the past for an *ad hoc* study. In general these models require large amounts of data to be of any use and can produce very detailed results.

Figure 21: Interaction Among WQ Processes

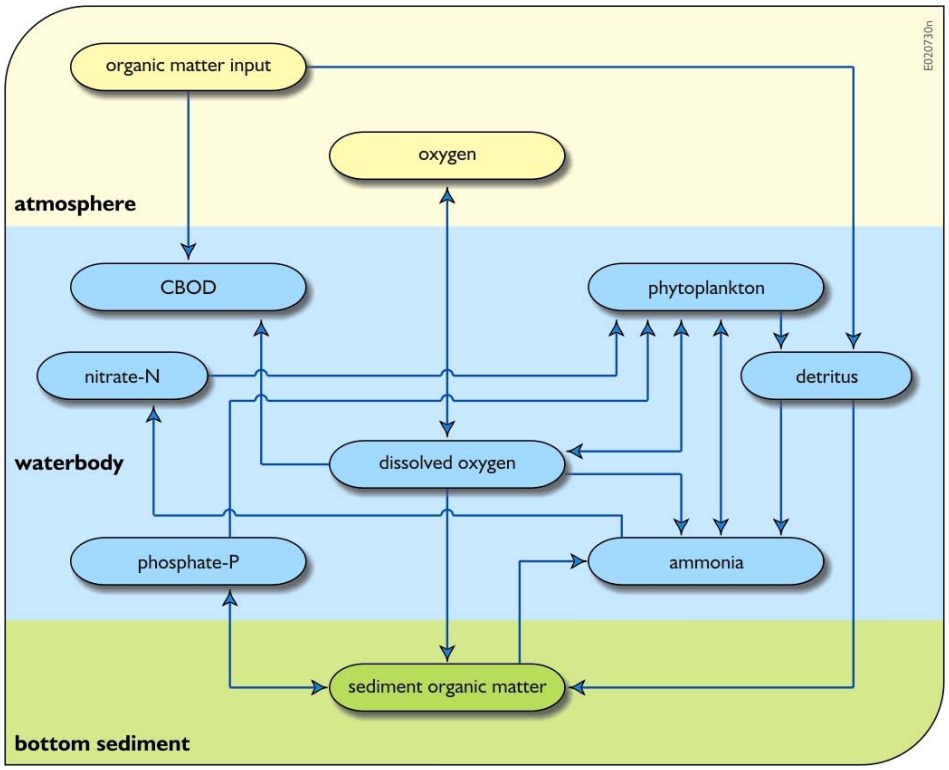
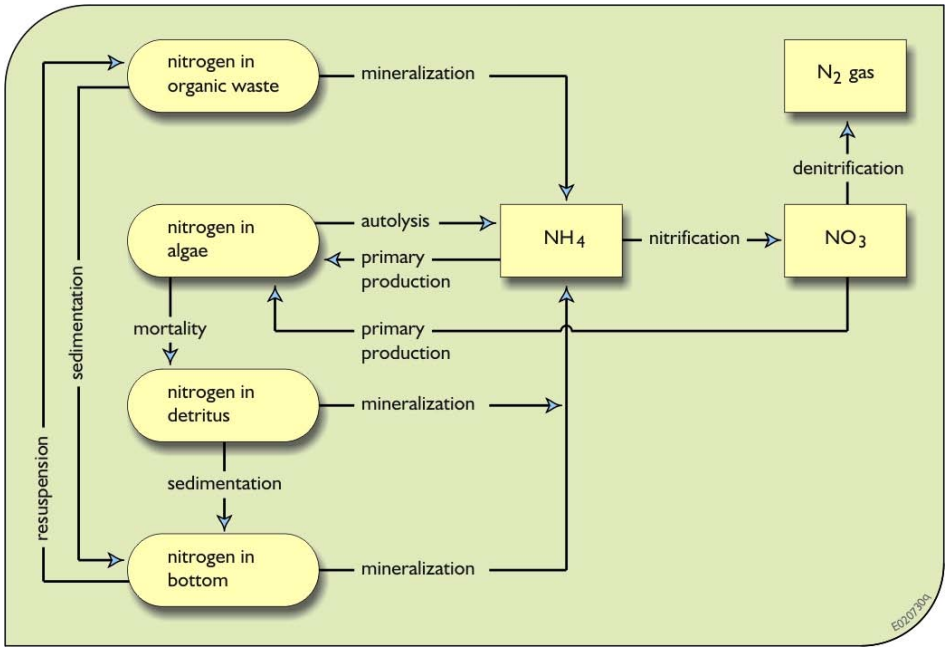


Figure 22: Interaction Among WQ Processes: the Nitrogen Cycle



In Figure 23 and Figure 24 particulars of some well-known WQ models are given for comparison purposes. However, in the context of IWRM for ICWRMP only models that run in the Windows operating system are discussed in the following.

Figure 23: Some Well-Known WQ Models: Basic Information

	Model	QUAL2E	SMPTOX3	HSPF	WASP5	EXAMS	CEQUALRIV1	CEQUALW2	CEQUALICM	HEC5Q	SALMONQ	MIKE11
Water body type	Stream, river	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Lake, reservoir	N	N	N	Y	Y	N	Y	Y	Y	N	N
	Estuary	Y	N	N	Y	N	Y	Y	Y	N	N	N
Dimension	1-D, Branching	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	2-D, X/Y	N	N	N	Y	Y	N	N	Y	N	N	N
	2-D, X/Z	N	N	N	Y	Y	N	N	Y	N	N	N
	3-D, Box	N	N	N	Y	Y	N	N	Y	N	N	N
Time	Steady	Y	Y	N	N	Y	N	N	N	N	N	N
	Quasidynamic	Y	N	Y	Y	Y	N	N	N	N	Y	Y
	Dynamic	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y
Hydrodynamics	Input	Y	Y	Y	Y	Y	N	N	N	N	N	Y
	Simulated	N	N	Y	Y	N	Y	Y	Y	Y	Y	Y
	Control struct.	N	N	Y	N	N	Y	Y	Y	Y	Y	Y
Transport	Advection	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Dispersion	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
	Benthic exchange	N	Y	Y	Y	Y	N	Y	Y	N	Y	Y
Loading	Input, steady	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Input, variable	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Simulated	N	N	Y	Y	N	N	N	N	N	Y	Y
Other	Preprocessor	Y	Y	N	Y	Y	N	N	N	N	Y	Y
	Postprocessor	Y	Y	Y	Y	Y	N	N	N	N	Y	Y

Figure 24: Some Well-Known WQ Models: Variables and Processes

	Model	QUAL2E	SMPTOX3	HSPF	WASP5	EXAMS	CEQUALRIV1	CEQUALW2	CEQUALICM	HECSQ	MIKE11	SALMONQ
Chemical processes	First-order decay	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
	Process kinetics	N	N	Y	Y	Y	N	N	N	N	N	N
	Daughter products	N	N	Y	Y	Y	N	N	N	N	N	N
	Sorption	N	Y	Y	Y	Y	N	N	N	N	Y	N
Sediment processes	Input rates	N	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
	Noncohesive processes	N	N	Y	N	N	N	N	N	N	Y	N
	Cohesive processes	N	N	Y	N	N	N	N	N	N	Y	N
Water quality processes	Temperature	Y	N	Y	N	N	Y	Y	Y	Y	Y	Y
	Salinity	Y	N	Y	N	N	Y	Y	Y	Y	Y	Y
	Bacteria	N	N	Y	N	N	Y	Y	Y	Y	Y	Y
	DO-BOD	Y	N	Y	Y	N	Y	Y	N	Y	Y	Y
	DO-Carbon balance	N	N	N	N	N	N	Y	Y	N	N	N
	Nitrogen cycle	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
	Phosphorus cycle	Y	N	Y	Y	N	Y	Y	Y	Y	Y	Y
	Silicon cycle	N	N	N	N	N	N	Y	Y	N	Y	Y
	Phytoplankton	Y	N	Y	Y	N	Y	Y	3	Y	Y	Y
	Zooplankton	N	N	Y	N	N	N	N	Y	N	Y	N
	Benthic algae	N	N	Y	N	N	N	N	N	N	Y	Y
	Simulate SOD	N	N	N	Y	N	N	Y	Y	N	N	N

14.2.4 Recommendation for Modelling Approach

Although PJT-II has indicated that they prefer public domain (license free) software, for water resources management planning purposes more dedicated software is required that lets the user(s) easily run various scenarios, present results in various formats and levels, and is GIS-based or linked. Also, since based on the results, important investment decisions are being taken one should not shy away from commercial software that can do the job.

It is, however, imperative that proper funding for the software, including maintenance and training, is ensured during the whole of MMF. Thus it should be very clear what organisation is responsible for building and maintaining the (integrated) model.

Thus ICWRMP is really looking for the combination of a detailed WA model which includes a WQ component for planning purposes, and is linked or better integrated with GIS. Unfortunately, no such model presently exists. Therefore ICWRMP should limit its choice to the following combination for IWRM planning:

A. Pollution sources and quantities
- Simple Waste Load Model (spreadsheet) + GIS

B. In-stream modelling (WA only for reservoirs)
- Model that can do detailed WA calculations, and WQ routing (non-coupled processes)
- Model that is integrated or at least linked to GIS

C. Reservoir modelling (WQ only)

- One of the more complicated models mentioned above (coupled processes)

The order in which a WQ planning study would be executed, would be A – B – C, in an iterative manner. However, the modelling parts of A, B and C could be developed independently and or later added. Since WA is still the most important part of IWR planning, of immediate interest are the software packages that fulfil requirement B, which are:

- WEAP
- IQQM
- RIBASIM
- MIKE Basin

Each model has its advantages and disadvantages. WEAP and MIKE Basin are fully GIS integrated which requires that a good GIS for the Citarum River Basin is readily available. Both RIBASIM and IQQM, do not require GIS, although schemes and various results (for example, "movies" in RIBASIM) can be shown graphically. Of all these models, RIBASIM is the only one that can fairly easily be updated and extended with its built-in WQ module. There is good local experience available and it is also inexpensive. It also has all the detailed WA requirements, which WEAP and IQQM in particular are missing.

The conclusion must be that for the B-part RIBASIM is the most efficient solution, it will cost the least both in time and money building on the already available local experience.

14.3 Decision Support Tool

14.3.1 What is a Decision Support Tool?

A Decision Support Tool (DST) is a tool which helps organising the assumptions, opinions and conclusions of (a group of) persons about the measures to take (or not to take!) such that a complex situation can develop in a required way.

Actually, a DST is:

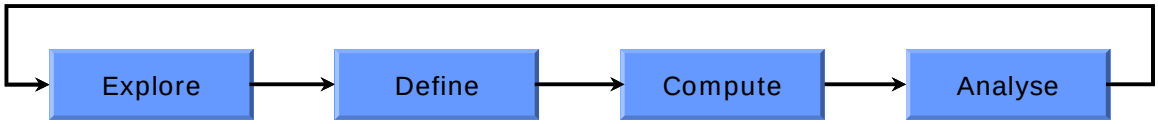
- a tool which helps to decide, or rather supports the discussion on alternatives in a structured manner;
- based on models, simplified calculation rules and explicit links, and
- is capable of showing the relative sensitivities of various parameters.

A DST is not:

- capable of taking a decision;
- the only basis for decision taking;
- necessarily a good representation of the reality.

The application of a DST consists of four main steps in an iterative process as shown in Figure 25. The steps "Explore" and "Define" are often combined to one step called "Compose".

Figure 25: Main Steps in the Application of a DST



Any DST consists of a number of elements. It should be realised that in all cases of IWRMP the movement of water is the prime driving force affecting the whole river basin system with is a interaction between three overlapping domains, namely:

- Landuse
- Water Management
- Socio-economy

A DST takes elements from these domains (and their links) into account and makes them manageable. So, by definition there is no general DST - it is tailor-made for each application. And even then, as more data and more sophisticated models become available, the DST has to be adapted to include these, but only if this higher degree of sophistication yields better, significantly more accurate results. Thus, ideally, a DST is a dynamic model that has to be revised or updated from time to time.

The degree of detail of the underlying models (or rules) depends not only on the objectives but foremost on the availability of data of sufficient quality. For instance, if there are no good data available dissolved oxygen in the river - one of the most important parameters related to its "health" – one has to seriously consider if including this parameter in a model will add to a better understanding of the water quality in the river basin.

Every modern DST consists of a number of modules with different objectives, often overlapping each other as shown in Figure 26 for a general case, and Figure 27 for a DST for WRM:

- a DST management module (Case Composer with its own database and presentation tool)
- GIS and its database
- a number of databases (hydrological, socio-economic, fisheries, and so on)
- a number of models, decision rules, and so on.

Figure 26: Common Components of Many DSTs

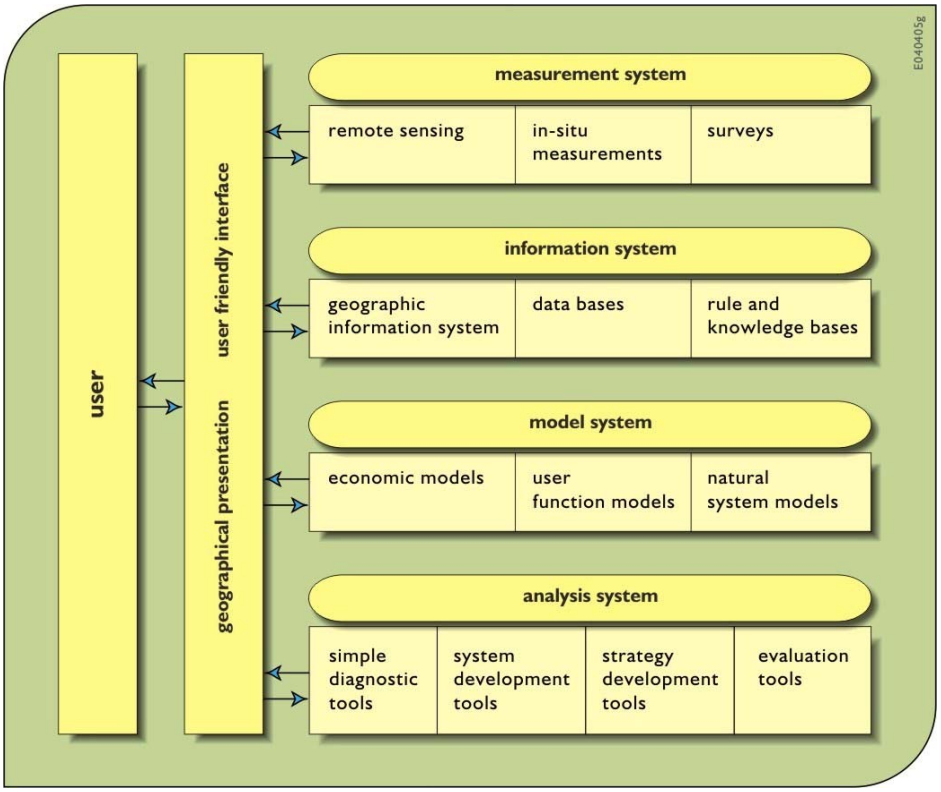
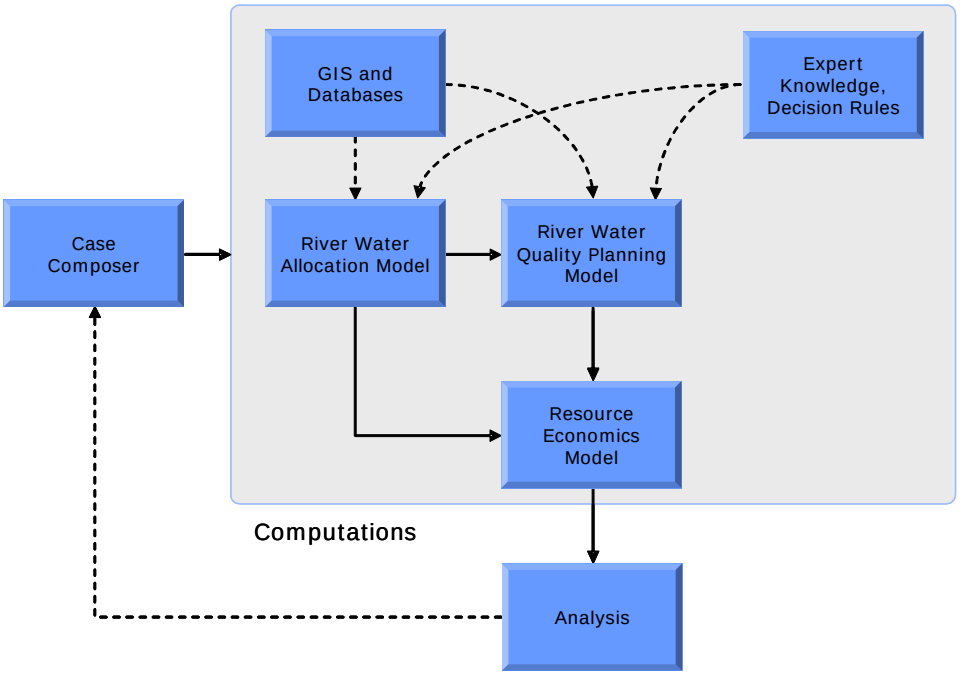


Figure 27: Common Modules of a DST for IWRM in a River Basin



14.3.2 Management of the DST

A Case Composer (CC) is the heart of the DST. It organises the order of execution of the other modules, according to a number of tailor-made script files. It uses its own database (for example, MS Access), where the parameters of the various cases (projects and scenarios) are maintained. With a CC various cases to study (compute) are defined. A CC also contains utilities to present results in tabular and/or graphical form.

14.3.3 The GIS and Its Database

The GIS presents the spatial information as thematic maps, based on various layers. The GIS can include all kinds of documents: Word, Excel, photos and so on. For instance a layer "Cities" in the database contains also the projection of the total inhabitants for the various time horizons under consideration. The GIS allows one to draw lines, points and polygons on a map, thus indicating project locations on a map of the river basin.

By making a special layer for projects, one can indicate more than one project, where a project is the human spatial intervention, which has a direct influence on the river, for example the location of a wastewater treatment plant. If there is a link between the GIS and the water (WA and/or WQ), the CC keeps automatically track.

14.3.4 Databases

Each DST contains also a (large) number of other databases, most of them concerning time series that could be linked to the models, GIS and always to the CC.

Examples of these databases are:

- Hydrological (discharges, levels, for instance, HYMOS, TIDEDA, and HYDSTRA);
- Hydraulics (cross-sections, long-sections, weirs, gates, and so on);
- Water quality parameters at a number of locations;
- Climatological (rainfall, evaporation, temperature, wind, sunshine, and so on);
- Socio-economic (population, industry, fisheries, administrative boundaries, and so on)
- Physico-chemical (water quality standards, and so on);
- Ecological.

14.3.5 Models and Calculation Rules

A DST also contains a number of models and calculation rules. Examples of models are, water allocation and water quality. Simple calculation rules take the place where sophisticated models do not sufficiently contribute to the objective. For instance, in the case of BOD5 input calculations, the rule that one person produces 38g BOD per day is probably adequate to describe the process for planning purposes.

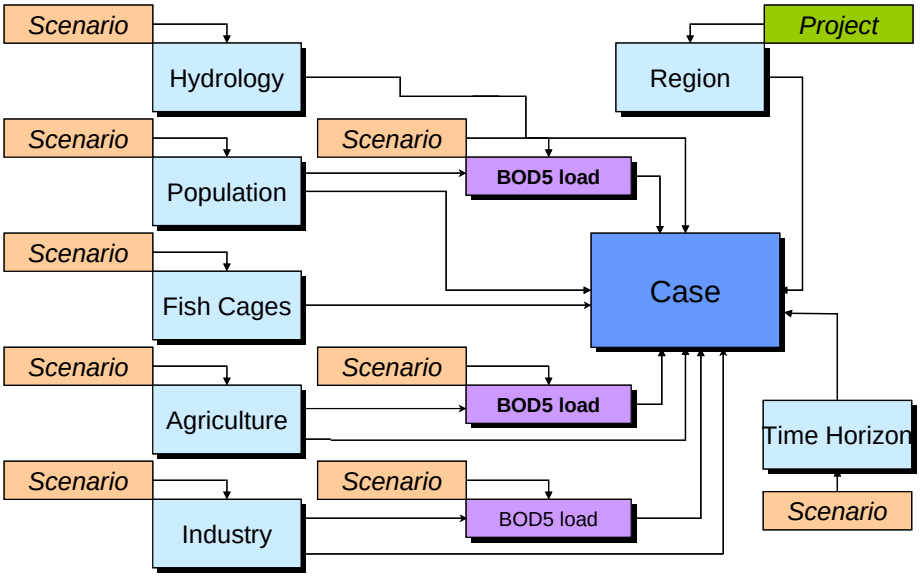
14.3.6 Cases, Scenarios, Measures and Plans

A DTS uses a special terminology. The central, primary element the DST acting on is a "case". Cases are composed from a combination of scenarios, measures, strategies and projects. These are managed in an orderly structured way by the Case Composer. Thus a case is a combination of:

- a selection of scenario developments;
- a selection of measures (a strategy, project)

A diagram showing typical inputs to compose a case is shown in Figure 28.

Figure 28: How a Case is Composed in a DST



A **scenario** is a combination of:

- autonomous developments of variables inside the study area, for example land use, population growth, and industrial development;
- autonomous developments of variables "outside" the study area, setting the boundary conditions, for example rainfall, river inflows, and sea levels.

These autonomous developments inside the study area - although continuous processes that could be modelled and included separately - are usual included the form of "snapshots" values at preset time horizons, for example 2010, 2015, 2020, 2025.

A **project** is the "translation" of a measure. Similarly a plan is the "translation" of a strategy. Measures and strategies in the context of a DST are defined as follows:

- a **measure** consists of proposed interventions regarding the objects in the study area, for example, land use (area), public awareness (society), infrastructure (WWTPs), but also legal and institutional.
- a **strategy** is a combination of measures in the study area in order to put into effect a certain desired development, for example, towards a clean river, or towards a better (natural) environment.

As can be appreciated, sometimes there can be discussions if developments have to be labelled as scenarios or as measures. This is a matter of perspective: for instance, is a change in land use driven by autonomous decisions by farmers (scenario) or by a government law (measure)? A DST handles both the same way. However, scenarios are processed *before* measures, so the *sequence of implementation* is the determining factor.

14.3.7 Analyses

Normally, one is interested in how the river system would look like in a future situation. Since it is not known beforehand, and cannot really forecast a long time ahead, the boundary conditions such as rainfall (of which we know that the past series will not be repeated in the same manner), the approach is the following:

- Develop an input data set (rainfall, evaporation, and so on) of sufficient length (ideally > 40 years) containing wet and dry periods.
- Select the inside developments at the preset time horizon (demands, pollution, and so on).
- Run the model(s) for the 40 year of rainfall data, keeping the inside developments constant.

It is now possible to see how often in these 40 years, preset levels of demands, pollution, and so on, could not be met, and draw a conclusion from it for a project, for example increase a WWTP's capacity for that time horizon. Or, on the other hand, one may just come to the conclusion that the foreseen capacity of the WWTP is too high.

A DST might also include a multi-criteria analysis[13] (MCA) tool to rank (score) the results of various cases, depending on the weight of predetermined key values to be included in the MCA.

14.4 DST for the Citarum River Basin

14.4.1 Objective

The objectives of a DST-Citarum are:

- to serve as a platform on which all current modelling activities can be integrated and analysed.
- to serve as an aid for the river basin manager, that can be used to optimize the integrated water management of the Citarum River Basin.

14.4.2 What to Include?

The list below is just a tentative suggestion and will need to be adjusted and extended according the wishes of the potential users and stakeholders.

Scenarios

- Different time horizons
  - Short term
  - Medium term
  - Long term
- Climate change:
  - Sea level rise
  - Change in precipitation
  - Change in river run-off
- Rural and urban developments:
  - Irrigation/agricultural area
  - Population growth

[13] This is basically the same technique as that known as “multi-objective analysis” that was used in Phase 1 of the PPTA for selection of projects.

- Groundwater abstraction
- Rural waste loads
- Waste loads from Bandung, Purwakarta, (others?)

- Economics:
  - Market developments
  - Resource economics: Rice crops, fish prices, (peak) power production

Measures[14]

- River basin management
  - Dam construction
  - Dam operation (Citarum reservoir cascade)
  - Land use
  - Dike (re)construction
  - Dredging (WTC)
  - Infrastructure (siphons, rehabilitation of main offtake gates, cross-regulators, etc)
  - Improvement of WWTPs at industries/industrial estates
  - Construction of WWTPs Bandung, Purwakarta
- Coastal management
  - Dredging
  - Infrastructure

Analyses

After processing each case, the user may analyse the results in various ways: tables, graphs and maps. To compare cases and find out which solution is the most promising, the DST-Citarum must include a Multi Criteria Analysis (MCA) tool. The MCA tool presents scores of the different case, depending on the weight of the key values which are included in the MCA.

A decision on which key values to be included in the MCA module of DST-Citarum has to be taken at the design stage. An example of such a key value may well be the maximum DO concentrations at public water supply intakes, of the reservoir inflows, or maximum and minimum flows at critical points in the system.

[14] These will come from the roadmap.

15 Conclusions and Recommendations

15.1 Conclusions

Phase 3 of the Integrated Citarum Water Resource Management Project has built on the work done in Phases 1 and 2 to expand the scope of the planned program of interventions in order to achieve a more "integrated" result. In particular, the strategic approach used to develop the "roadmap" identified a much more comprehensive range of interventions needed to achieve the stakeholder vision of:

"The government and community working together for clean, healthy and productive catchments and rivers, bringing sustainable benefits to all people of the Citarum River Basin."

The roadmap has the potential to be a valuable planning tool for the Government of Indonesia in the future development and management of the water and land resources of the Citarum River Basin. It is not meant to be an ADB roadmap.

After considerable stakeholder consultation, from the roadmap, a list of high priority interventions were selected for inclusion in the program to be funded under the MFF. This program is highly multi-sectoral, covering a broad range of intervention types from biodiversity protection, to irrigation rehabilitation, and institutional strengthening. If implemented, this program will very likely be the most comprehensive river basin development and management program ever funded by ADB under a single funding modality.

A key philosophy in the design of the program has been that, to the greatest extent possible, the interventions to be funded under the MFF will be stake-holder-driven. The MFF funding modality gives the flexibility to modify later stages of the program in line with changing environmental circumstances (physical, social and economic), as well as stakeholder needs and expectations.

The program is complex and will be very challenging, as many agencies will need to be involved in its implementation. However, one must say that complex problems (as presently exist in the Citarum River Basin) require complex solutions. The efforts required to implement the program will be very well rewarded.

15.2 Recommendations

The following recommendations are made as a result of Phase 3 of the PPTA:

1. A roadmap for achievement of a stakeholder vision for the future of the Citarum River Basin has been developed after extensive consultation. GOI should take steps to formalise/ratify this to become part of government policy.
2. The roadmap is not intended to be a static document and needs to be regularly updated to reflect changing circumstances. GOI should establish a small unit (perhaps in Bappenas) to monitor progress on roadmap implementation, evaluate effectiveness of the interventions

(towards achieving the vision), and recommend amendments to the roadmap to improve its effectiveness.

3. The program proposed for the MFF in this report had still not been formally agreed to at the end of the PPTA. This should happen as soon as practicable, with modifications to the program if necessary. Priority should be given to finalising Tranche 1.
4. Other donor support should be sought by GOI to implement interventions in the roadmap not included in ADB and GEF funded projects for the Citarum River Basin (MFF and parallel technical assistance).
5. A “State-of-the-Basin” reporting system should be developed and implemented to assist with monitoring roadmap implementation, as well as for more general monitoring and evaluation purposes. Ideally this work should take place as part of the institutional strengthening technical assistance proposed to be carried out in parallel to the MFF.
6. As modelling and decision support tools will be essential for effective planning and management of the Citarum River Basin into the future, these should be developed as a matter of urgency, again as part of the institutional strengthening technical assistance proposed to be carried out in parallel to the MFF. The principles and recommendations made in Chapter 14 of this report should be adopted.
7. The appropriate organisation for implementing the “State-of-the-Basin” reporting system and managing and operating the modelling and decision support tools should be identified and these responsibilities assigned to a specific group within that organisation. If necessary, suitably qualified and experienced staff should be recruited for this purpose. Ideally, this group will have close links with the Citarum Water Resources Council.

Annex 1 Reports Prepared by the PPTA Phase 3 Team

Report Name	Author(s)	Date
Phase 3 Consultant Reports		
Poverty, Water Supply and Sanitation, and Health	Roger Jackson	20/9/2006
Report on Bandung Water Supply, Ground water and Rural Water Supply and Sanitation for Riparian Communities	Roger Jackson	13/8/2006
Institutional Issues in Moving Toward ICWRMP in Citarum River Basin	Jeremy Bird	31/10/2006
Concept Note: Institutional Support for Integrated Water Resources Management in the 6 Ci's Basin	Jeremy Bird	5/12/2006
Main Report on Data and Modelling	Teun op ten Noort	15/11/2006
• Annex I – Outline for a DST Set Up to Support IWRM in the Citarum Basin		
• Annex II – SWS Citarum Pollution Control Action Plan and TOR		
• Annex III- Outline for a Data Catalogue Set up for IWRM in the Citarum Basin		
WQ Management - Institutional Assessment	Ramon Abracosa	31/8/2006
CRB Pollution Load Assessment	Ramon Abracosa	
Report on West Tarum Canal	Rieks Toxopeus	25/9/2006
Review of Hydraulics and Related Issues (West Tarum Canal)	John Ackers	
Documents Prepared for ADB		
Procurement Capacity Assessment Report and Recommendations	Chong Chi Nai	8/12/2006
Procurement Plan	Chong Chi Nai	8/12/2006
Strategic Environmental Assessment (SEA)	Ramon Abracosa	1/12/2006
Summary Initial Environmental Examination (IEE)	Ramon Abracosa, Nasimul Islam	7/12/2006
Initial Environmental Assessment (IEE) of Tranche 1	Ramon Abracosa, Nasimul Islam	7/12/2006
Environmental Assessment and Review Framework (EARF)	Ramon Abracosa, Nasimul Islam	7/12/2006
Draft Summary Poverty Reduction And Social Strategy	Romeo Cleto	31/10/2006
Compensation Policy Framework Procedural Guidelines	Marla Huddleston, Romeo Cleto	8/12/2006
Draft Periodic Financing Request	Christophe Gautrot	15/12/2006
Draft Financial Framework Agreement	Christophe Gautrot	15/12/2006
Draft Project Report	Geoff Wright, Chris Morris	15/12/2006
Documents Prepared for GEF		
Project Identification Form (PIF) for Citarum River Basin (Integrated) Land and Biodiversity Conservation Project	Darrell Kitchener	8/12/2006
Project Development & Preparation (PDFB) for Citarum River Basin (Integrated) Land and Biodiversity Conservation Project	Darrell Kitchener	8/12/2006

Annex 2 Roadmap for IWRM in the Citarum River Basin

ROADMAP FOR INTEGRATED WATER RESOURCE MANAGEMENT IN THE CITARUM RIVER BASIN

FOREWORD

The process for the development of a roadmap for the Citarum River Basin has followed the basic methodology of strategic planning. Fundamentally, the approach has been to ask the following three questions:

- *Where do we want to go (with water resource management in the basin)?*
- *Where are we now (that is, what are the existing issues/problems)?*
- *How can we get from where we are now to where we want to go (the "road" we need to take)?*

Much has been written about the current issues for water resource management in the basin, and the key issues are well documented in a variety of documents produced in the last decade. The problems are numerous and cover a variety of areas, including severe deterioration of water quality, deforestation and degradation of upland catchments, mining of groundwater and degradation of water control infrastructure. These problems have severe economic and social cost consequences to the people of the basin.

The roadmap itself is simply a set of strategies (and projects/actions to implement those strategies) that define the path between the present situation with respect to water resources in the basin and the desired outcomes (or vision) for the future – that is, what needs to be done to achieve the objectives.

This has been achieved using the following "vision-oriented" approach:

- Reaffirm and more clearly define a shared vision of stakeholders for the future of the Citarum River Basin (to the year 2020);
- Compare the present status of water resources in the basin to the vision, in order to identify the strategic direction that needs to be taken (the "road" so to speak);
- Formulate objectives in a number of key areas that would, if achieved, lead to the fulfilment of the vision;
- Develop a set of interventions (projects) the successful implement-ation of which would achieve the objectives in each key area.

The roadmap is seen as belonging to the Government of Indonesia, and not to the Asian Development Bank or any other donor, even though ADB is committed to assisting the government to implement the roadmap interventions through a major loan and associated technical assistance. As such, the roadmap is an important tool in the dialogue between GOI and donors that will allow donor assistance to be targeted at the critical issues, and to minimise overlaps and gaps.

Close to 70 interventions have been identified as necessary for the achievement of the objectives (and hence the vision) for the Citarum River Basin. These have come from a variety of sources. The costs that have been assumed for each these come from those sources (factored into 2006 dollar terms) and can only be considered as indicative, and of course must be firmed up during project preparation.

VISION FOR THE YEAR 2021

**“The government and communities working together
for clean, healthy and productive catchments and rivers,
bringing sustainable benefits to all people of the Citarum River Basin.”**

STRATEGIC FRAMEWORK

A strategic framework was developed in consultation with a broad range of basin stakeholders to ensure that an integrated approach to the formulation of the roadmap would be ensured. This is represented in the "house" diagram (below), where the vision for the basin is supported by activities in a number of key areas, five of which are seen to be "pillars", with a foundation of two cross-cutting key areas – the "foundation".

KEY AREAS

KEY AREA	DEFINITION	OBJECTIVES
Institutions and Planning for IWRM	In the definition of this key area, the term "institutions" is used in its broadest sense, that is, dealing with organisations, as well as legislation, policies and other protocols that define the relations among those organisations. Planning for IWRM (and in particular in this context, river basin planning) is seen as a mechanism for promulgating and implementing policies of government, and as such is included in this key area. Accordingly, the following activities are included: ▪ Organisation restructuring; ▪ Organisational capacity building; ▪ Policy development; ▪ Implementing the legislative framework; ▪ Planning for IWRM; ▪ Regulation (such as licensing of water utilisation and wastewater discharge); ▪ Setting of water tariffs; ▪ Institutions for participatory irrigation management (PIM).	• To have effective organisational frameworks, clearly defined responsibilities and working partnerships with other stakeholders in place for the Citarum River Basin, encompassing both 'in-stream' and 'off-stream' aspects. • To have an effective coordination mechanism for water resources management in the basin. ▪ To have a harmonious and comprehensive legal framework for effective water resources management in the basin. ▪ To have transparent, effective and holistic water resources planning mechanisms linked to spatial planning, and inclusive of stakeholder needs and aspirations ▪ To have effective regulatory (licensing) mechanisms in place and operating for surface and groundwater utilisation and wastewater discharge (including tariffs). ▪ Agencies concerned with water management to have appropriate technology for effective and sustainable water resource management. ▪ Decision makers, technical experts and other key stakeholders to have the capacity to effectively carry out their responsibilities with regard to water resources planning and management, including procedures for EIA and review (EARP) of projects.
Water Resource Development and Management	This key area includes those activities that are related to exploiting water resources – that is, increasing water availability to authorised users, and operating and maintaining the infrastructure developed in the process. The main activities included are: ▪ Project planning, including "master planning" (that is, planning that focuses on development of infrastructure, and distinct from broader basin planning); ▪ Construction of infrastructure for storing and delivering water (including reservoirs, canals and pipeline systems); ▪ Operation and maintenance of infrastructure; ▪ Promoting efficient and effective utilization of water; ▪ Drilling of wells for use of groundwater.	▪ To have new or improved sources of water for domestic, irrigation, industry, hydropower, aquaculture, leisure and other uses developed, consistent with water availability and sustainability. ▪ For all people in the basin to have access to adequate water supply and sanitation. ▪ To have all water supply infrastructure capable of operating at design capacity. ▪ To have sustainable asset management practices in place for all water-related infrastructure in the basin.

KEY AREA	DEFINITION	OBJECTIVES
Water Sharing	This key area is often overlooked, particularly where water resources are plentiful relative to demand. It covers the process of establishing and protecting water rights and allocating water among competing uses and users, as well as setting priorities for water entitlement during times of shortage. Such allocations may be among sectors (irrigation, urban water supply and hydropower, for example), or geographically (upstream/ downstream and inter-basin transfers). It does not include water use registration and licensing, which is a regulatory mechanism to assist in managing water rights and allocations, and thus comes under the key area for Institutions and Planning for IWRM.	▪ To have an equitable water sharing arrangement among the upper and the lower basin and transboundary water resources (water supply to Jakarta). ▪ To have clearly defined water utilization rights for all authorised water users. ▪ To have all conflicts over utilisation of the water resources of the basin resolved quickly and satisfactorily.
Environmental Protection	In this key area are included activities for the protection of the environment (that has an impact on water management), such as rivers, lakes, wetlands, forests and other natural ecosystems, and rehabilitation (enhancement) of already degraded environments (aquatic and terrestrial). Out of all the key areas, this one probably is the most difficult to define clearly, as environmental protection and enhancement normally must be achieved by a combination of structural and non-structural measures that may include infrastructure (for instance, wastewater treatment plants), improved institutional (regulatory) arrangements, community participation, and so on. Enhancement of environment management capacity in the organisations charged with this responsibility is included under the institutional key area. Water quality and environmental monitoring and research activities are included in "Data, Information and Decision Support". Provisions for mitigating the potential adverse effects of water development projects (for example, the impacts of dredging) are built into the projects themselves. Legislation and other regulatory processes aimed at minimising adverse impacts are included in an environment assessment and review procedure, and therefore come under "institutions".	▪ To have comprehensive land use plans in place, and adhered to, in order to minimise the impacts of human activities on the environment. ▪ To have forest protection measures in place and have no further reduction in the existing forest area. ▪ To have priority catchments improved through reforestation and adoption of appropriate land use and agricultural practices to minimize erosion. ▪ To maintain and, where possible, enhance biodiversity, without further degradation. ▪ To have minimal pollution from domestic, industrial and agricultural sources entering the waterways of the basin. ▪ To provide adequate water share for ecological maintenance (environmental flows), for example, minimum dry season flow to prevent salinity intrusion, sedimentation and pollutant accumulation near coastal areas, and protect river and coastal fisheries.
Disaster Management	In this context, "disaster" includes only those disasters related to water, such as floods and mud flows. Activities related to disaster management under this definition include: ▪ Planning and construction of structural measures to control flood and mud flows, such as levees (dikes), flood control reservoirs and so on; and ▪ Development and implementation of disaster preparedness plans. ▪ Development and implementation of drought management plans	▪ To have effective disaster preparedness plans in place for floods and mud flow events. ▪ To have appropriate works in place to minimise the physical impacts of floods and mud flow events. ▪ To have effective drought management plans in place where available water falls seasonally below design expectations.

KEY AREA	DEFINITION	OBJECTIVES
Community Empowerment	Involvement of the community in planning and implementation, monitoring and evaluation of IWRM activities is essential. It may be considered as a "foundation" key area, as it supports the five "pillar" key areas described above. There is a strong feeling among stakeholders that empowerment of the community to participate should be an important theme of ICWRMP. In this context, community empowerment includes: ▪ Education and awareness raising (capacity building) of communities and individuals on water management issues; ▪ Activities aimed at providing information to all that need it on water resource management and related activities; ▪ Implementing measures to facilitate participation of the community in water planning and management; and ▪ Developing community-based "self-help" programs and specific projects to provide local improvement in water supply, the environment, water quality and so on.	▪ To have a high level of awareness of local communities about conservation, utilisation and protection of natural resources (including their rights and responsibilities) in the basin. ▪ Local communities to have the opportunity and forum to participate meaningfully in the planning and management of the water resources of the basin. ▪ To have the enabling conditions (institutional, financial and capacity) in place for local community involvement in provision of local water supply and sanitation services, watershed management and waste management
Data and Information	This key area is another "foundation" key area, as data is fundamental to all aspects of decision-making in water resource planning and management as such it includes: ▪ Data collection, including: surface and groundwater quantity and quality; other natural resources data, such as soils, geology, land cover, ecosystems and so on; and socio-economic data, such as population, poverty, land use, and so on; ▪ Data archiving and management, including collation of data from various sources, validation, computerization, and so on; ▪ Data sharing and dissemination among government agencies, research establishments and so on, and providing public access to data. ▪ Research to increase knowledge in such fields as catchment processes, demography, and so on, as well as the development of new technologies for water conservation and environmental protection. ▪ Development and implementation of decision support tools, including GIS systems, hydrologic and hydraulic models, and other analytical tools.	▪ To have a comprehensive database on land and water resources in place and in a form that is accessible to all that need it to facilitate sustainable management of the basin's water resources. ▪ To use community participatory methods where ever applicable for data collection and verification. ▪ To have effective arrangements in place for "custodianship" of the different water and catchment related datasets. ▪ To have effective data sharing arrangements in place among agencies within the basin and with central agencies. ▪ To have suitable models and decision support tools developed and operational to assist rational decision making about water resource management. ▪ To have research programs in place to fill gaps in knowledge about water-related processes and scenarios.

PROPOSED INTERVENTIONS

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
Institutions and Planning for IWRM	1.1	Institutional strengthening for integrated water resources management	• Assistance in establishing apex management body for the basin (Citarum Basin Water Resources Council) and support unit(s), for improved coordination and policy development. • Ongoing support and capacity building for the Council and support unit(s).	1.8	PPTA Phase 3
	1.2	Policy development for appropriate water pricing, water allocation and balanced stakeholder participation	• Review of current water pricing policies and development of new pricing structures that better reflect cost of delivery and provide incentives for rational water use. • Review of current policy instruments for water allocations among water uses (across sectors and upstream/downstream). • Review of current policies on stakeholder (and particularly, community) participation in planning and management of water resources and development of new policies and mechanisms for a more balanced approach (for all stakeholders, such as government agencies, NGOs and the community at large).	0.8	PPTA Phase 3
	1.3	Development of an enhanced Citarum River Basin Plan for IWRM	• Review of existing plans for water resources development and management in the Citarum River Basin. • In collaboration with stakeholders, development of a strategic river basin plan that will facilitate improved and more integrated water resource management. • Development and implementation of a mechanism for monitoring the implementation of the river basin plan by line agencies with that responsibility, and reporting progress to government to take corrective action if required.	0.9	PPTA Phase 3
	1.4	Improvements to organisational capacity for environmental assessment	• Setting up of a programmatic AMDAL approach for the basin; training and guides for project planners and stakeholders in project impact assessment, review and monitoring following the EARP. • Capacity building for managers and technical staff responsible for implementing the AMDAL approach.	0.5	PPTA Phase 3
			Estimated Total Cost	**4.0**	**million USD**

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
Water Resource Development and Management	2.1	Upgrading of Water Source for Irrigation (Upper Cipunegara)	• Construction of a dam and reservoir on the Cibeber River. • Rehabilitation of the existing irrigation water distribution system. • Construction of a diversion weir on the Cipunegara River and a diversion tunnel to convey water to a point upstream of the reservoir to increase inflows to enable the irrigated area to be increased. • Possible small-scale hydropower development as part of the water diversion system. • Strengthening of institutions for Participatory Irrigation Management among farmers. • Development of plans for improved management of the watershed upstream of the reservoir.	60.0	PPTA Phase 1 Sub-Project #9
	2.2	Upgrading of Water Source for Irrigation (Cipancuh)	• Construction of the Cipancuh Dam and auxiliary structures, including addition of moveable steel gates to the top of the spillway crest, and raising of dam wall to increase flood freeboard. • Strengthening of institutions for Participatory Irrigation Management among farmers. • Development of plans for improved management of the watershed upstream of the reservoir.	65.7	PPTA Phase 1 Sub-Project #10
	2.3	Upgrading of Water Source for Irrigation (Ciherang)	• Construction of the Telagaherang Dam and auxiliary structures. • Rehabilitation of the existing irrigation water distribution system. • Strengthening of institutions for Participatory Irrigation Management among farmers. • Development of plans for improved management of the watershed upstream of the reservoir.	56.4	PPTA Phase 1 Sub-Project #11
	2.4	Cisankuy Irrigation Improvement	• Improved (more efficient) operation of Cisankuy Reservoir. • Improved cropping patterns in the Cisankuy area, to save water.	65.5	Master Plan 1997
	2.5	Raising of Cirata Dam	• Undertake feasibility study. • Do detailed engineering design. • Construct dam and associated works.	20.1	Master Plan 1997

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	2.6	Investigation of bulk water supply options for Bandung urban area	• Establishment of a stakeholder-driven selection process of options to improve the availability of bulk water supplies to Bandung to meet the DMI demand to 2025. • Execution of rapid surveys and pre-feasibility studies (review and update any previous feasibility studies) in order to arrive at a short-list of the most viable potential options. • Preparation of detailed feasibility studies (including costing, environmental impact assessment, and resettlement action plans, etc) leading to the preparation of SPARs (subproject appraisal reports).	1.2	PPTA Phase 3
	2.7	Implementation of preferred bulk water supply alternatives for Bandung urban area	• Detailed engineering design on selected option(s). • Preparation of tender documents; contract awards. • Construction and commissioning.	0	PPTA Phase 3 (Costs assumed to be accounted for in schemes proposed below)
	2.8	Upgrading of water source for Bandung and other uses by inter-basin transfer	• Construction of Cibutarua Weir • Construction of Santosa Reservoir on the Cilaki River. • Construction of a 4.5 km diversion tunnel. • Construction of a reservoir upstream of Tamiang Cangkir Weir, needed to compensate irrigation downstream of Cibutarua Weir • Development of an inter-district agreement regarding cost allocation and ongoing financial arrangements for diverted water.	190.0	PPTA Phase 1 Sub-Project #11
	2.9	Development of the surface water of the upper catchment of the Cikapundung River	• Review of previous investigations into construction of five reservoirs in the upper catchment of the Cikapundung River to enhance surface water availability for Bandung and surrounding area.. • Undertake feasibility study of preferred option. • Do detailed engineering design. • Construct dams and associated works.	34.7	Master Plan 1997
	2.10	Construction of Sukawana Reservior on the Cimahi River	• Review of previous investigations into construction of Sukawana Reservior on the Cimahi River. • Undertake feasibility study. • Do detailed engineering design. • Construct dam and associated works.	7.2	Master Plan 1997

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	2.11	Investigation of bulk water supply options for Bekasi and Karawang	• Establishment of a stakeholder-driven selection process of options to improve the availability of bulk water supplies to Bekasi and Karawang to meet the DMI demand to 2025. • Execution of rapid surveys and pre-feasibility studies (review and update any previous feasibility studies) in order to arrive at a short-list of the most viable potential options. • Preparation of detailed feasibility studies (including costing, environmental impact assessment, and resettlement action plans, etc) leading to the preparation of SPARs (subproject appraisal reports).	1.0	PPTA Phase 3
	2.12	Implementation of preferred bulk water supply alternatives for Bekasi and Karawang	• Detailed engineering design on selected option(s). • Preparation of tender documents; contract awards. • Construction and commissioning.	50.0	PPTA Phase 3
	2.13	Development of an action plan for sustainable groundwater management in the Citarum River Basin	• Review and document available information on groundwater situation in the Citarum River Basin, including availability and current use. • Review previous studies on groundwater management options. • In conjunction with the bulk water supply options study, prepare an action plan for effective and sustainable groundwater management. • Review existing regulatory instruments for groundwater management and recommend improvements, including mechanisms for compliance management (enforcement).	0.6	Master Plan 1997 (modified by PPTA Phase 3)
	2.14	Implementation of the action plan for sustainable ground-water management in the Citarum River Basin	[Depends on outcomes of the action plan development study – costs indicative only]	5.0	PPTA Phase 3
	2.15	Improved implementation of regulations for sustainable groundwater management in Bandung	• Review of existing regulatory framework for groundwater management in the Bandung area. • Evaluation of existing implementation of regulation and identification of deficiencies. • Development of strategies and an action plan for improved effectiveness of regulation of groundwater use, including recommendations for changes to the existing regulatory framework. • Development of a monitoring and evaluation mechanism. • Capacity building of agencies involved in groundwater management.	0.6	PPTA Phase 3
	2.16	Improvement of Raw Water Supply for Bandung❖	• Provision of new intake and conveyance facilities for reticulation of water supply. • Review of current water pricing policies and development of new pricing structures that better reflect cost of delivery and provide incentives for rational water use in the Bandung area.	32.8	PPTA Phase 1 Sub-Project #18

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	2.17	Rehabilitation of the West Tarum Canal for improved water resource utilization	• Detailed engineering design. • Removal and disposal of sediments from the canal bed, strengthening of embankments. • Separation of Cikarang and Bekasi river flows from the main canal through construction of by-passes (inverted siphons). • Capacity building of PJT II for improved management and operation of WTC. • Implementation of stakeholder-driven selection process of water supply and sanitation options for riparian communities along West Tarum Canal.	41.4	PPTA Phase 1 Sub-Project #13 (revised during Phase 3)
	2.18	West Tarum “Canal 2” Project	• Review of previous investigations into options for piping water from Jatiluhur Reservoir to Jakarta. • Feasibility study of preferred option. • Detailed engineering design. • Construction.	860.0	Master Plan 1997
	2.19	Irrigation Modernisation – West Tarum Canal	• Rehabilitation of canal network (secondary and tertiary canals) and water control structures. • Installation of off-take measurement apparatus. • Strengthening of institutions for Participatory Irrigation Management among farmers.	50.9	PPTA Phase 1 Sub-Project #4
	2.20	System Service Improvement and Irrigation Modernisation – East Tarum Canal	• Rehabilitation of the East Tarum Canal, including removal and disposal of sediments, and repair and strengthening of embankments. • Rehabilitation of secondary and tertiary canals and water control structures. • Installation of off-take measurement apparatus. • Strengthening of institutions for Participatory Irrigation Management among farmers.	126.2	PPTA Phase 1 Sub-Projects #2 and #5
	2.21	System Service Improvement and Irrigation Modernisation – North Tarum Canal	• Rehabilitation of the North Tarum Canal, including removal and disposal of sediments, and repair and strengthening of embankments. • Rehabilitation of secondary and tertiary canals and water control structures. • Installation of off-take measurement apparatus. • Strengthening of institutions for Participatory Irrigation Management among farmers.	95.1	PPTA Phase 1 Sub-Projects #3 and #6

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	2.22	Development of strategies and options for demand management and water conservation with respect to industrial and domestic use	• Development and implementation of strategies and actions for water conservation awareness raising among the community and industries. • Development and implementation of strategies and actions for industrial water recycling (including regulatory and technological measures), and assistance to industries to install recycling technology. • Development and implementation of strategies and actions for minimisation of losses from water reticulation systems. • Review of current water pricing policies and development of new pricing structures that better reflect cost of delivery and provide incentives for rational water use.	0.5	PPTA Phase 3
	2.23	Development of improved asset management and O&M procedures for hydraulic infrastructure	• Development of an asset register and monitoring system for hydraulic infrastructure and a system for prioritization of maintenance activities. • Introduction of clear and accountable operating plans for the delivery of bulk water to irrigation and DMI users	1.0	PPTA Phase 3
	2.24	Rajamandala Run-of-River Power Plant (Citarum River below Saguling Reservoir)	• Review of previous investigations into options for power generation. • Feasibility study of preferred option. • Detailed engineering design. • Construction.	164.3	Master Plan 1997
	2.25	Curug Run-of-River Power Plant	• Review of previous investigations into options for power generation. • Feasibility study of preferred option. • Detailed engineering design. • Construction.	6.0	Master Plan 1997
			Estimated Total Cost	**1936.2**	**million USD**
Water Sharing	3.1	Review of allocation priorities and optimization of operating rules for key sub-basins, including the operation of the river / reservoir system as a whole	• Review of the effectiveness of existing water sharing arrangements (including water exported to Jakarta). • Development of an updated policy for water sharing among water users in the basin, as well as Jakarta, including an effective conflict/dispute resolution mechanism. • Determination of environmental flow requirements to maintain water quality, as well as flushing flows for sediment and salinity reduction in lower reaches. • Development of updated and appropriate operating rules for key sub-basins, including the operation of the river / reservoir system as a whole. • Review of allocation priorities and clear procedures for sharing water during periods of drought .	0.9	PPTA Phase 3
			Estimated Total Cost	**0.9**	**million USD**

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
Environmental Protection	4.1	Development and implementation of conservation action plans for model conservation villages in Citarum River Basin	• Select model conservation villagers using supplied criteria. • Appoint initially 15 conservation village mentors. • Mentors to be the conduit for the delivery of WSM educational material. • Mentor to receive orientation and programmatic training from a selected LSM/NGO. • Mentor to assist develop village conservation action plans. • Mentor to assist develop village and community nurseries. • Mentor to assist with reforestation of village lands and *Perum Perhutani* lands. • Mentor to assist with implementation of other aspects of the conservation village action plans (sanitation, household pollution etc). • Mentor to assist with tenure arrangements with *Perum Perhutani.*	0	PPTA Phase 3
	4.2	Watershed management community educational program for CRB	• WSM education to the community delivered through the model conservation village network and *pesantren*. • Appoint an NGO/LSM to design WSM educational course and source materials. • This NGO/LSM to orient a group of conservation village mentors and supply them with programmatic training and educational material. • Conservation village mentors supply WSM education material to villagers. • The NGO/LSM supplies WSM material direct to *pesantren*. • Model conservation village education program, spatial plans and action plans tied to recognition of importance of existing PAs and other CRB conservation domain.	0	PPTA Phase 3

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	4.3	Productive Reforestation (1): Spatial planning for reforestation	• Review all existing laws relating to protection of forests in upper catchment areas, particularly on steep slopes >42 degrees, and evaluate their legal suitability to provide protection. • Review existing mosaic of spatial plans in CRB, evaluate the extent to which they are harmonious, and recommend a process for greater integration of these plans at all levels. • Establish a small group (GIS /remote sensing specialist, spatial planner and landscape ecologist) in the CRB Council to work with and advise kecamatan, kabupaten, BP DAS, Bappedalda and Bappeda to produce integrated functional spatial plans. • Map accurately Perhutani, degraded lands, road, river and DAS boundary reserves and PAs. • Map major spring catchment areas, this to require selected hydrological surveys of important springs. • Link these above areas for ecological functional integrity. • Gain multi-stakeholder acceptance for reforestation spatial plan brokered by CRB Council, as well as allowing for broad public scrutiny. • Identify priority areas for rehabilitation by reforestation.	30.0	PPTA Phase 1 Sub-Project #7 (enhanced during Phase 3)
	4.4	Productive Reforestation (2): Implementation	• Review and report on the appropriate re-forestation methods in different topographic profiles within the area planned for re-forestation to achieve multiple-purposes. Namely, to: consolidate soil profiles, provide a structurally and floristically rich vegetation to support biodiversity values and; most importantly, provide sustainable crops to enhance livelihoods for villagers. • Institutional strengthening for coordination among local governments and the basin management organization for watershed management. • Development of effective land use controls with incentives. • Implementation of effective compliance management (enforcement). • Establishment of a farm credit system. • Training and community development.	0	PPTA Phase 3
	4.5	Improvement to village land tenure arrangements with *Perum Perhutani*	• Broker MOU contract conditions between villagers and *Perum Perhutani* that provides long tenure (>30 years) but mandates planting mixed trees that will prevent erosion but provide farmers with a standing crop. • Advise villagers of the most appropriate reforestation techniques. Broker prioritization for Forest villagers (*desa hutan*) to be given priority for such leases.	0	PPTA Phase 3

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	4.6	Alternative livelihoods for displaced upland forest villagers	• Conduct a field survey of the upland villagers (38,000 families) displaced under the program *"Larangan tumpang sari di kemiringan >42 degrees, 20 May 2003"*, to ascertain suitable sustainable alternative livelihoods. • Broker preferences for this group of villagers for *Perum Perhutani* lands and facilitate preferred livelihoods on this leasehold land.	0	PPTA Phase 3
	4.7	Protected area management in CRB	• Develop conservation management action plans for the selected protected areas through stakeholder forums focused on selected conservation targets (objectives) as follows: o undertake information 'mining'; o form stakeholder groups; o develop action plans (targets, threats, practical solutions); o prepare adaptive management plans. • Conduct rapid biodiversity surveys of three taxonomic groups selected by the action planning process. • Conduct habitat mapping in each of these five groups of protected areas. • Conduct village resource utilization survey of the villages adjoining these protected areas. • Establish village conservation groups specific to the selected protected areas and involve these groups in collaborative management of these protected areas.	0	PPTA Phase 3
	4.8	Alternative finance mechanisms for sustainable community watershed management activities in CRB	• Review Payment for Environmental Services (PES) practices in Indonesia. • Develop an action plan for implementation of PES in the CRB and modify the plan following stakeholder review. • Review options for micro-credit facilities for villagers in CRB, including a Basin 'Trust Fund' or other rolling funds.	0	PPTA Phase 3
	4.9	Riparian zone management to reduce sediment loads in rivers	• Determine vegetation floristics and structure most effective in reducing stream sedimentation. • Determine width of zone required to minimize sediment loads. • Identify critical river reaches that contribute high sediment loads to the river. • Identify land use practices of local farmers that exacerbate riparian erosion and sedimentation (for example, stock grazing on river banks). • Develop action plans for improved riparian management in pilot (critical) river reaches. • Implement pilot vegetation plantings and improved land management practices according to action plans developed. • Review results of pilots. • Implement improved management in other critical riparian zones across the basin.	0	PPTA Phase 3

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	4.10	Integrated Erosion Management for Upper Bekasi River, Upper Citarum River and Upper Cipunegara River	• Development and implementation of effective land use controls in steep slope areas and incentive systems for farmers to adopt sustainable agricultural practices. • Erosion and landslide control works in critical areas, including construction of hillside works (planting, terracing, grass coverage, drainage channels, retaining walls, and so on).	20.0	Part of PPTA Phase 1 Sub-Project #14
	4.11	Development and (initial) implementation of a River Quality Improvement Action Strategy Plan for the basin	• Prepare strategic options for the River Quality Improvement Action Strategy including technical, institutional, and legal aspects and focusing on both incentive and enforcement measures, and drawing lessons from existing programs. • Raise awareness of the issues and possible solutions at political levels and within industry and communities and generate commitment among Kabupatens for implementation of the Strategy • Based on the content of the agreed Action Plan, implement investment, institutional strengthening and compliance components.	0	PPTA Phase 3
	4.12	Development and (initial) implementation of a Water Pollution Control Plan for the Bandung area	• Data collection and mapping. • Institutional aspects, regulations, law enforcement. • Improvements in the operation and efficiency of the existing WWTPs (factories and hospitals). • Community and awareness program for waste disposal. • Construction of pilot community sanitation centers, simplified community sewerage systems, and school sanitation systems. • Capacity building. • Development of water pollution control plan, and investment projects for implementation under Tranche 2 and succeeding tranches.	0	PPTA Phase 3
	4.13	Sewerage and wastewater treatment upstream of Saguling Reservoir	• Detailed engineering design for the rehabilitation of existing sewerage and wastewater treatment facilities, and for the construction of new facilities. • Preparation of tender documents; contract awards. • Construction and commissioning.	325.0	Master Plan 1997

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	4.14	Development and (initial) implementation of a Water Pollution Control Plan for the Bekasi and Karawang areas	• Data collection and mapping. • Institutional aspects, regulations, law enforcement. • Improvements in the operation and efficiency of the existing WWTPs (factories and hospitals). • Community and awareness program for waste disposal. • Construction of pilot community sanitation centers, simplified community sewerage systems, and school sanitation systems. • Capacity building. • Development of water pollution control plan, and investment projects for possible implementation under later tranches.	0	PPTA Phase 3
	4.15	Development and implementation of a solid waste management strategy and action plans for the Bandung, Bekasi, Cikarang and Karawang areas	• Implementation of improved enforcement (compliance management) of existing laws and regulations regarding solid waste disposal, and strengthening of regulatory mechanisms as required. • Public education on waste disposal issues. • Establishment of equitable and effective cost sharing mechanisms for collection and disposal of solid waste. • Establishment of separated collection systems and improved recycling processes for solid waste. • Development of appropriate land-fill areas and practices for disposal of non-recyclable waste. • Establishment of monitoring and conservation systems for land-fill areas and recycling stockpiles.	13.7	PPTA Phase 1 Sub-Project #17
	4.16	Introduction of System Rice Intensification (SRI) practices in the upper and lower basin to conserve water and improve productivity	• Participatory Rural Appraisal for 3 districts and 16 sub-districts • Training of Trainers for 800 farm leaders • Training for 20,000 farmers • Implementation of SRI in 80 demonstration plots • Farmer empowerment – 660 sessions of training • Production of organic fertilizer – distribution of 400 units • Acquisition and distribution of 10,000 decomposer kits • Acquisition and distribution of 50,000 kg of selected seeds • Monitoring and reporting	4.2	PPTA Phase 3

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	4.17	Improvement in water quality in Saguling, Cirata and Jatiluhur Reservoirs through management of fish farming and other polluting activities	• Identify sources and extent of pollution in Saguling, Cirata and Jatiluhur Reservoirs. • Determine the economic impacts of pollution on other uses of water (such as hydropower. • Identify actions needed to reduce pollution. • Identify possibilities for alternative livelihoods for fish farmers and others that may be impacted by controls on fish farming and other polluting activities. • Develop and implement an action plan for reducing pollution.	2.0	PPTA Phase 3
	4.18	Integrated coastal zone management strategy and action plan for Citarum coastline	•	0.6	PPTA Phase 3
	4.19	Implementation of ICZM Action Plan	[Depends on outcomes of the action plan development study]	20.0	PPTA Phase 3
			Estimated Total Cost	**415.5**	**million USD**
Disaster Management	5.1	Integrated Management of Water-Related Disaster (basin-wide)	• Review effectiveness of existing disaster management strategies and coordination arrangements and make recommendations for improvements, particularly in relation to introduction of basin water resources council. And support units • Development and implementation of effective land use controls in disaster prone areas. • Relocation of households in disaster prone areas. • Development and implementation of effective controls on sand and gravel extraction. • Public awareness campaigns on disaster preparedness. • Institution strengthening (capacity building) for agencies responsible for: monitoring; emergency response; evacuation; rescues; and restoration. • Establishment of a flood forecasting system. • Develop contingency plans for industrial accidents affecting contamination of the river system,	40.0	PPTA Phase 1 Sub-Project #8
	5.2	Cipunegara Sub-Basin Flood Management	• Investigate flood management options for the Cipunegara Sub-Basin • Develop recommendations for flood management and mitigation of flood impacts • Implement recommendations	10.0	PPTA Phase 3

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	5.3	Bekasi Sub-Basin Flood Management	• Investigate flood management options for the Bekasi Sub-Basin • Develop recommendations for flood management and mitigation of flood impacts • Implement recommendations	10.0	PPTA Phase 3
	5.4	Disaster (mud flow and landslide) management for Upper Bekasi River, Upper Citarum River and Upper Cipunegara River	• Development and implementation of mud flow and landslide forecasting and warning/evacuation measures. • Relocation of dwellings from disaster-prone areas. • Enhancement of public awareness regarding disaster preparedness.	13.4	Part of PPTA Phase 1 Sub-Project #14
	5.5	Strategic options for flood mitigation in Bandung	• Review past flood mitigation studies for the Bandung area, and assess current appropriateness. • Develop new flood mitigation measures if necessary. • Update recommendations regarding appropriate flood mitigation measures to be implemented for Bandung.	0.3	PPTA Phase 3
	5.6	Implementation of recommended options for flood mitigation in Bandung	[Depends on outcomes of the strategic options study]	20.0	PPTA Phase 3
	5.7	Review of dam safety for dams in the basin	• Review current standards for dam safety in Indonesia, and make recommendations on improvements, if necessary. • Review current institutional arrangements for dam safety auditing, reporting and follow up, and make recommendations on improvements, if necessary. • Review all dams subject to dam safety requirements with regard to compliance with safety standards and make appropriate recommendations for improvement.	1.2	PPTA Phase 3
			Estimated Total Cost	**94.9**	**million USD**
Community Empowerment	6.1	Development of an Information, Awareness and Education Strategy (IEAS) for capacity building of communities across the basin for improved participation in water resources policy development, planning and management	• Identification of key stakeholders in the basin (target groups) and behaviours with regard to activities impacting on water resource management. • Identification of messages and knowledge that needs to be communicated to each target group. • Identification of an community participation strategy for different aspects of water resources planning and management and relevant and available communication channels. • Development of the IEAS and action plan based on a “social marketing” approach, and to include school education as a key element.	1.5	PPTA Phase 3

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	6.2	Implementation of the Information, Awareness and Education Strategy	[Depends on outcomes of the IEAS development study]	1.0	PPTA Phase 3
	6.3	Support for community- and NGO-driven initiatives for water supply and sanitation for rural and peri-urban communities	• Identification of potential NGOs who can facilitate community participation in all project cycles. • Socialization and awareness-raising, assessment of community needs. • Selection of communities based on socioeconomic and health criteria and other indicators. • Confirmation of community commitment and willingness to participate. • Formation of community implementation teams. • Community problem identification and analysis of technical options. • Provision of skills training based on communities' priorities, assets and needs to generate income and employment opportunities • Provision of access to capital and markets to directly implement skills acquired • Formulation of community action plans and proposals. • Disbursement of funds and construction of approved schemes. • O&M of completed schemes, and socialization and training support on hygiene behavioural change • Facilitate the implementation of identified health, water and sanitation related projects/programs.	10.5	PPTA Phase 3
	6.4	Establishment of, and ongoing support for a Stakeholder Forum for Bandung Sub-Basin under Citarum Basin Water Resources Council or Citarum Balai Besar	• Work with the Citarum Basin Water Resources Council or Citarum Balai Besar to determine the composition and mandate of the stakeholder forum. • Legally and practically establish the forum. • Provide ongoing support (financial and advisory) to the forum for up to two years.	0.3	PPTA Phase 3
			Estimated Total Cost	**13.3**	**million USD**

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
Data and Information	7.1	Improvements to water quality monitoring in rivers and reservoirs	• Delineate water quality management areas (e.g., by sub-watersheds) based on predominant land use and nature of water quality concerns/threats; identify key water quality parameters for each area; incorporate into existing clean rivers program (PROKASIH and SUPERKASIH). • Develop a plan for water quality monitoring in each water quality management area reflecting the priority parameters--i.e., instill monitoring as a management activity--ensuring that water quality monitoring data are actually used to support improvement programs (e.g., regulatory enforcement, incentives, community awareness/participation) • Develop standardized protocols/guidelines for water and sediment sampling, laboratory analysis, reporting and data banking (including as input to decision support tools). • Establish a water quality laboratory recognition/accreditation scheme (with a reference laboratory to conduct audits and provide recognition); attract private sector investments in laboratory services. • Undertake capacity building (human resources and technology) for selected key laboratories.	0	PPTA Phase 3
	7.2	Improvements to groundwater monitoring network in the Bandung area	• Provision of monitoring equipment, increasing the network of monitoring wells (60 additional wells are estimated to be needed). • Improvement to groundwater database(s) and computer models.	3.0	PPTA Phase 3
	7.3	Improvements to water and natural resource data management and dissemination	• Review existing database arrangements in the various agencies that collect water and other natural resource data in the basin. • Recommend improvements to data management, including: institutional arrangements (introduction of the “custodianship” concept); data management policy; and introduction of new technology. • Recommend improvements to policies and processes for data sharing and dissemination, including the establishment of a publicly accessible website where data can be accessed.	0.5	PPTA Phase 3
	7.4	Land degradation and biodiversity database for CRB	• Provide necessary hardware and software, and training in their use to technicians that will be responsible for developing and maintaining the databases. • Establish comprehensive Land Degradation and Biodiversity database files (both in MoF) that are compatible with requirements of the CRB Council and other natural resource managers. • Develop suitable Internet based data access systems so that the information can be readily accessed by the planners, researchers and conservation managers for the Council.	0	PPTA Phase 3

KEY AREA	Intervention		MAIN OUTPUTS / ACTIVITIES	COST ($ million)	SOURCE
	7.5	Development of an on-line flow forecasting system on unregulated rivers	• Undertake hydrologic investigations to confirm operational and economic benefits of flow forecasting. • Determine key sites for forecasting. • Examine technological options. • Acquire and/or develop hardware and software. • Install system and commission. • Provide training to system operators to maximize benefits from the system.	1.6	Master Plan 1997
	7.6	Establishment of an annual "state of the basin" report	• Review of "state of the basin" reporting procedures in other countries. • Development and implementation of an appropriate process to produce and disseminate a "state of the basin" report to identify problem areas, cause/sources and needed remedies	0.3	PPTA Phase 3
	7.7	Development of an integrated water quality and quantity model for basin planning studies, and a decision support tool for improved policy and decision making	• Identify potentially useful modelling packages that might be used to develop an integrated river basin water quantity/quality model for the Citarum, and select the most suitable (against agreed criteria). • Assemble data, develop the model, then calibrate and verify. • Design and implement a decision support tool for use by relevant agencies for policy and planning, that uses the water quantity/quality model as a key element for analysing scenarios.	0.6	PPTA Phase 3
	7.8	Institutional strengthening and capacity building of water research organizations	• Identify key research institutions, including universities, government institutes and so on, working in the field of water research, particularly for the Citarum River Basin. • Undertake a needs analysis for capacity building, both for human resources development and technology, required to undertake effect water-related research. • With the selected organizations, identify critical knowledge gaps in the water field in the Citarum River Basin. • Prepare and implement appropriate training programs in selected organizations. • Procure and install appropriate new technology.	3.0	PPTA Phase 3
	7.9	Benchmarking of water and natural resource data collection and management agencies	• Identify key water and natural resource data collection and management agencies that in some way contribute to databases in the basin. • Review best practices from agencies overseas for data collection, management and dissemination. • Benchmark identified agencies against best practices. • Make appropriate recommendations for improvement of data collection, management and dissemination practices.	0.6	PPTA Phase 3
			Estimated Total Cost	**9.6**	**million USD**

Annex 3 Design and Monitoring Framework – Total Investment Program

INTEGRATED CITARUM WATER RESOURCE MANAGEMENT PROJECT
MULTI-TRANCHE FINANCING FACILITY (LOAN-FUNDED COMPONENTS ONLY)
PROPOSED DESIGN AND MONITORING FRAMEWORK

DESIGN SUMMARY	PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
IMPACT			
By the year 2021, poverty, health and living standards in the Citarum River Basin improved	• To achieve a measurable decrease in poverty levels in the basin's communities by the end of the project (2021) • To have GDP growth in the basin at least maintained at 2007 levels without further degradation of environmental status to the year 2021. • By 2021 to have achieved significant improvements in water quality in the rivers and reservoirs of the basin, and specifically in the Bandung sub-basin	• Review of annual statistics on poverty as published by the Bureau of Statistics • Review of annual economic statistics as published by the Bureau of Statistics • Review of "state of the basin" report (to be prepared)	• Improvements in water resource management will directly lead to increase in standard of living and health in communities in the basin, and hence contribute significantly to the alleviation of poverty • The government (at national, provincial and district levels) maintain a strong commitment to implementing integrated water resource management in the basin
OUTCOME			
Improved and integrated water resource management in place, with government and the community working in partnership to achieve a shared vision	• To have appropriate and effective institutional arrangements in place for integrated water resource management in the basin [*Note that assistance to put those arrangements in place will be provided through an ADB grant to fund a technical assistance that will run in parallel with Tranche 1*] • To have effective partnerships between government agencies at national, provincial and district level in place to implement planned water and land management activities to be funded under the MFF loan • To have the community empowered and capable to play a vital role in the management of water and land resources • To have water control infrastructure in place to manage the water resource in such a way as to provide equitable access to good quality water by all authorised water users • To have comprehensive and accessible databases in place to provide decision-makers, water managers and technical experts with the best information to undertake their responsibilities for water resource management	• Legislation and policy documents released by GOI • Minutes of meetings of the Citarum Basin Council and other key organisations in the management of the water resource of the CRB • Progress and final reports of individual projects funded under the loan • Survey of communities meant to benefit from activities funded under the loan • Published information on available databases related to water, land and related resources	• Institutional arrangements to be put in place under new legislation provides a robust framework for IWRM and clearly separates resource management and development/ operational responsibilities • The government agencies at national, provincial and district level have the resolve to involve the community meaningfully in all stages of water resource planning and management • The community is willing to participate effectively in all stages of water resource planning and management • Agencies are truly willing to share information for the benefit of all valid users

	DESIGN SUMMARY	PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
OUTPUTS				
Tranche 1 (Q3 2007 – Q4 2011)				
1.1	**Rehabilitation of West Tarum Canal**	• West Tarum Canal restored to its design capacity • Water quality improved through exclusion of inflows of polluted water from crossing stream through construction of siphons • Water control structures restored to full operational status • Environmental impacts minimised, and in particular through proper disposal of dredged material • Social disruption for those living along the canal minimised, and in particular access to water supply and sanitation maintained and improved if necessary	• Project completion report(s) • Post-completion surveys of water quality parameters along the canal • Measurement of canal flow rates • Post-completion survey of local communities	• Design capacity agreed to is adequate for future water supply needs of Jakarta and irrigation • Agreement with informal settlers will be reached on resettlement and compensation arrangements
	Sub-Components: • Detailed engineering design • Tendering • Construction of improvement works • Associated activities			**Cost: $42,900,000**
1.2	**Water Supply Options and Improved Groundwater Management for Bandung**	• The stakeholder forum for Bandung Sub-Basin formed and operating effectively according to its mandate (to be defined during the project) • Broad stakeholder agreement achieved for preferred option(s) for increasing surface water supplies for Bandung • Improved groundwater monitoring network in place • A high level of compliance with regulations for sustainable groundwater management in Bandung achieved	• Records of forum meetings • Feedback from stakeholders gained form workshops and other consultations • Ministry of Mines and Energy records • Post-project surveys	• Strong commitment from local stakeholders to establish the forum and to participate meaningfully • Willingness of local authorities to support the stakeholder forum and recognise its value in providing advice • Broad acceptance of the need for better management of the limited groundwater resources and willingness to comply with regulations
	Sub-Components: • Development of options for increase in surface water supplies • Improved implementation of regulations for sustainable groundwater management in Bandung • Improvements to groundwater monitoring network • Establishment of, and ongoing support for, a stakeholder forum for Bandung Sub-Basin			**Cost: $4,800,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
1.3	**Roll-Out of System Rice Intensification [Phase 1 - Three Districts]**	• Increase in rice yield of greater than 60% • Reduction in need for irrigation water of 45%. • Increase in income of rice farmers of at least 90%. • Increase in labour demand of at least 30%	• District Agriculture Services records • Farmer surveys • Appraisal reports	• The MOF at national, provincial and district level are fully committed to implementing this component. They will provide all the trained staff that will undertake the training program for farmers. • Farming communities willing to participate this component are identified early in this program. • The SRI model that will be used has been proven successful and sustainable in other main paddy growing areas in Indonesia. • All the material required including seed, organic digester and organic manure are made available to the participating farmers. • Supply of organic manure is increased at all project sites. • Farmers are trained on integrated pest management leading to a reduction in the use of chemicals and pesticides. • The project will monitor all aspects of this program and identify key problems and take immediate action to resolve them immediately. • Farmers organizations are trained to continue this project activity after the initial work carried out by the project staff.
	Sub-Components: • Identification and appraisal of target areas • Capacity building • Progressive implementation of SRI • Management, monitoring and reporting			**Cost: $4,170,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
1.4	**Support for Community- and NGO-Driven Initiatives for Improved Water and Catchment Management**	• Capacity of participating communities (and particularly the community implementation teams) enhanced to a level that enables effective development and implementation of action plans • Action plans developed in participating communities that will lead to improved water and catchment management and can be implemented locally • Appropriate financing mechanism that will enable participating communities to have access to sufficient funds for implementation of their action plans • Action plans implemented successfully within agreed time and budget • Project completed on time and on budget to the agreed standard of quality	• Project progress and financial reports • Survey of participating communities • Feedback from trainers • Project completion reports	• Continued support by GOI for the community-based approach • Continued support by people in local communities • Appropriate financing mechanism can be developed and agreed to by GOI • Continued support by people in local communities and contribution of labour and other in-kind inputs • Funding is made available in a timely manner and is used wisely in accordance with the agreed action plans • Sufficient numbers of local project managers are available • Project management is effectively undertaken
	Sub-Components: • Capacity building of local communities • Assistance to develop village WSS plans • Implementation of plans and ongoing support • Programs aimed at behavioural change			**Cost: $5,640,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
1.5	**Development and Implementation of a Basin River Quality Improvement Strategy and Action Plans**	• Key new policies and procedures for water quality management in place and being implemented effectively • Improved water quality monitoring system in place and being effectively operated and maintained • A water quality and pollution source database management system in place and being effectively operated and maintained • Appropriate (and well-calibrated and validated) issue-specific water quality models in place and being effectively operated and maintained (*these should link with the basin-wide water quantity/quality model – see Output 6.2*) • An Internet-based WQM information system to link the district environmental agencies with other key agencies • Environmental agencies at all levels, universities and research organizations have the capacity to undertake water quality management activities within their mandate • Community awareness and understanding of water quality issues, and how they can contribute to improved water quality, is raised • Multi-agency/stakeholder planning and coordination system for water quality management in place under the Water Resources Council • Basin-wide River Quality Improvement Strategy developed, promulgated and being effectively implemented through action plans • Water quality management action plans - combining cooperation, regulatory and incentive instruments – in place and being implemented effectively	• Project progress reports • Project completion report • GOI policy documents • GOI publications related to water quality records (several agencies) • Post-project survey of organisations and the community • Records (including minutes of meetings) held by the Water Resources Council	• Government agencies at all levels will adopt the new policies and procedures • Agencies responsible for water quality monitoring and management will effectively operate and maintain the data systems • Organisations have the desire to improve their capacity for water quality management • Responsibilities for implementing the RWQIS are clearly assigned • Organisations with the mandate to implement the RWQIS undertake their responsibilities effectively and coordinate amongst each other • Responsibilities for implementing the action plans are clearly assigned, and sufficient GOI funds are made available • Organisations with the mandate to implement the action plans undertake their responsibilities effectively and coordinate amongst each other • Local project managers are made available to manage the various activities of the project • Project management is effectively undertaken
	Sub-Components: • Policies and procedures for water quality management • Improvements to water quality monitoring and data management • Strengthening of organizational capacity • Preparation of basin-wide River Water Quality Improvement Strategy (RWQIS) • Preparation and implementation of area-based pollution sources management action plans			**Cost: $6.420,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
1.6	**Program Management**	• Executing agencies and other relevant stakeholders well informed about program progress • Executing agencies and other relevant stakeholders participating effectively in setting the direction of the program and its projects • Projects well coordinated, with opportunities for information exchange maximised, and conflicts among projects minimised • Priority information needs identified, and minor studies undertaken on time and within budget that redress those needs • All monitoring and reporting undertaken in accordance with agreed procedures • Procedures for preparation of PFR for Tranche 2 followed and documentation prepared in accordance with ADB standards	• Minutes of meetings and workshops with executing agencies and other relevant stakeholders • Program status reports • Minutes of periodical coordination workshops • Final reports of studies • Reports produced • Documentation submitted for approval of Tranche 2 • Surveys of NGO representatives • Reports describing activities of NGOs with respect to the project	• GOI continues to support the execution of the projects and facilitates stakeholder support for their preparation • There is a willingness by those involved in each of the component projects under this tranche to cooperate and share information • Stakeholders provide sufficient information to identify priority knowledge gaps • Local organisations can be found to undertake the studies effectively • NGOs are willing to be trained and participate • Monitoring and reporting procedures are agreed in advance and adhered to • Consultants, local counterparts and GOI officials work together effective to prepare the documentation • ADB and GOI requirements are made clear and do not change
	Sub-Components: • Liaison with executing agencies and other relevant stakeholders • Coordination among projects • Identify the need for and coordinate implementation of minor studies (up to $400,000 total) to improve knowledge of water issues in CRB • Monitoring and reporting of project performance • Capacity building for NGOs involved in the component projects of Tranche 1 • Coordination of preparation for Tranche 2			**Cost: $2,570,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
Tranche 2 (Q1 2010 – Q4 2015)				
2.1	**Upgrading of water source for Bandung and other uses by inter-basin transfer**	• All civil and associated works completed on time and budget, to agreed quality standards • All systems commissioned and meeting agreed service standards • Inter-district agreement regarding cost allocation and ongoing financial arrangements for diverted water negotiated and finalized • All necessary social and environmental safeguards are put in place	• Project completion report • Inter-district agreement	• This project is the recommended option for surface water supply augmentation in the Bandung Water Supply Options Study (Tranche 1) • The “donor” district is agreeable to the inter-basin transfer at a fair and reasonable cost • All necessary social and environmental safeguards are identified and implemented • A high level of technical design is achieved for the project • Qualified and skilled contractors are selected for the civil and associated works, and undertake the construction to agreed quality standards • Effective construction supervision is carried out
	Sub-Components: • Construction of Cibutarua Weir • Construction of Santosa Reservoir on the Cilaki River • Construction of a 4.5 km diversion tunnel • Construction of a reservoir upstream of Tamiang Cangkir Weir, needed to compensate irrigation downstream of Cibutarua Weir • Development of an inter-district agreement regarding cost allocation and ongoing financial arrangements for diverted water			**Cost: $190,000,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
2.2	**System Service Improvement and Irrigation Modernization – East Tarum Canal**	• All civil and associated works completed on time and budget, to agreed quality standards • East Tarum Canal restored to its design capacity • Water control structures restored to full operational status • Environmental impacts minimised, and in particular through proper disposal of dredged material • Social disruption for those living along the canal minimised, and in particular access to water supply and sanitation maintained and improved if necessary	• Project completion report(s) • Post-completion surveys of water quality parameters along the canal • Measurement of canal flow rates • Post-completion survey of local communities	• All necessary social and environmental safeguards are identified and implemented • A high level of technical design is achieved for the project • Qualified and skilled contractors are selected for the civil and associated works, and undertake the construction to agreed quality standards • Effective construction supervision is carried out
	Sub-Components: • Rehabilitation of the East Tarum Canal, including removal and disposal of sediments, and repair and strengthening of embankments • Rehabilitation of secondary and tertiary canals and water control structures • Installation of off-take measurement apparatus • Strengthening of institutions for Participatory Irrigation Management among farmers			**Cost: $126,200,000**
2.3	**Development of strategies and options for demand management and water conservation with respect to industrial and domestic use**	• Water conservation awareness among community and industries in the CRB (and particularly in the Bandung and Bekasi areas) raised • Community behaviour towards water use and hygiene changed • Losses from water reticulation systems substantially reduced • New pricing structures that better reflect cost of delivery and provide incentives for rational water use developed and implemented	• Post-project surveys • Measurement of water losses in reticulation systems • Documentation on water pricing policies	• Communities are receptive to behavioural change • GOI is willing to make rational decisions on water pricing and implement them
	Sub-Components: • Development and implementation of strategies and actions for water conservation awareness raising and behavioural change among the community and industries • Development and implementation of strategies and actions for industrial water recycling (including regulatory and technological measures), and assistance to industries to install recycling technology • Development and implementation of strategies and actions for minimisation of losses from water reticulation systems • Review of current water pricing policies and development of new pricing structures that better reflect cost of delivery and provide incentives for rational water use			**Cost: $500,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
2.4	**Development and implementation of a water entitlements and licensing system for surface water users**	• A system of surface water entitlements and licensing (to manage compliance with entitlements) appropriate to the Citarum situation developed and in place • Staff in the relevant agencies having the necessary technology and capable of operating and maintaining the licensing system • Licence compliance systems in place and operating effectively	• Approved policy documents on water entitlements and licensing • Post-implementation audits of system operation in relevant agencies • Records of licences, including non-compliance and actions taken.	• GOI is willing to actively pursue the development and implementation of a system of surface water entitlements and licensing • Relevant agencies are willing to actively manage compliance with licensing conditions, including prosecution and sanctions as may be necessary • Surface water users are generally willing to cooperate and see the benefits of the system, including more equitable sharing of water amongst users
	Sub-Components: • Examination of existing arrangements for managing surface water extractions across the basin • Review water entitlement allocation and management mechanisms in other countries, both developed and developing • Design a system of surface water entitlements and licensing (to manage compliance with entitlements) appropriate to the Citarum situation • Prepare an implementation plan for the surface water licensing system, including agency responsibilities, technology and human resource requirements, and training program, and schedule of activities • In accordance with the implementation plan developed previously, implement the licensing system within the relevant agencies, including: o Acquisition and installation of hardware and software o Preparation of forms and other standard documentation o Training of staff o Awareness raising program for water users o Implementation of licensing procedures • Progressive “roll-out” of the system, starting with major users of bulk water			**Cost: $2,400,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
2.5	**Review of allocation priorities and optimisation of operating rules for key sub-basins, including the operation of the river / reservoir system as a whole**	• An approved GOI policy on allocation of water amongst users in the CRB in place, including clear procedures for sharing water during periods of drought • An effective conflict/dispute resolution mechanism in place and operating • Environmental and flushing flows agreed to and implemented in reservoir operating protocols • Updated and appropriate operating rules for key sub-basins developed and being followed	• Government approved policy documents • Reservoir operation records • Streamflow monitoring records	• Consensus can be obtained among agencies representing different water user groups about water allocation priorities • GOI is prepared to change allocation priorities if necessary • Reservoir operators comply with new protocols
	Sub-Components: • Review of the effectiveness of existing water sharing arrangements (including water exported to Jakarta) • Development of an updated policy for water sharing among water users in the basin, as well as Jakarta, including an effective conflict/dispute resolution mechanism • Determination of environmental flow requirements to maintain water quality, as well as flushing flows for sediment and salinity reduction in lower reaches • Development of updated and appropriate operating rules for key sub-basins, including the operation of the river / reservoir system as a whole • Review of allocation priorities and clear procedures for sharing water during periods of drought			**Cost: $900,000**
2.6	**Development and implementation of an Information, Education and Awareness Strategy for capacity building of communities across the basin for improved participation in water resources policy development, planning and management**	• IEAS and action plan completed • Implementation of action plan • Increase in community awareness of water resource management issues	• Project documentation • Post-project survey of the community	• Communities are receptive to awareness raising activities • Media (newspapers, radio, TV) support awareness-raising activities • Education authorities agree to modify curricula to include teaching of water and environment related principles
	Sub-Components: • Identification of key stakeholders in the basin (target groups) and behaviours with regard to activities impacting on water resource management • Identification of messages and knowledge that needs to be communicated to each target group • Identification of an community participation strategy for different aspects of water resources planning and management and relevant and available communication channels • Development of the IEAS and action plan based on a “social marketing” approach, and to include school education as a key element • Implementation of action plan			**Cost: $1,500,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
2.7	**Program Management**	• Monitoring and reporting systems, including financial systems, in place and operating effectively • All ADB and GOI monitoring and reporting requirements satisfied • Effective coordination among component projects • Effective information exchange among component project teams • Tranche 3 component projects prepared effectively	• Project reports and other documentation • Audit reports • Minutes of coordination and stakeholder meetings	• GOI continues to support the execution of the projects and facilitates stakeholder support • There is a willingness by those involved in each of the component projects under this tranche to cooperate and share information • Monitoring and reporting procedures are agreed in advance and adhered to • Consultants, local counterparts and GOI officials work together effective to prepare the documentation • ADB and GOI requirements are made clear and do not change
	Sub-Components: • Liaison with executing agencies and other relevant stakeholders • Coordination among projects • Monitoring and reporting of project performance • Coordination of preparation for Tranche 3			**Cost: $2,400,000**
Tranche 3 (Q3 2013 – Q4 2017)				
3.1	**System Service Improvement and Irrigation Modernisation – North Tarum Canal**	• All civil and associated works completed on time and budget, to agreed quality standards • North Tarum Canal restored to its design capacity • Water control structures restored to full operational status • Environmental impacts minimised, and in particular through proper disposal of dredged material • Social disruption for those living along the canal minimised, and in particular access to water supply and sanitation maintained and improved if necessary	• Project completion report(s) • Post-completion surveys of water quality parameters along the canal • Measurement of canal flow rates • Post-completion survey of local communities	• All necessary social and environmental safeguards are identified and implemented • A high level of technical design is achieved for the project • Qualified and skilled contractors are selected for the civil and associated works, and undertake the construction to agreed quality standards • Effective construction supervision is carried out
	Sub-Components: • Rehabilitation of the North Tarum Canal, including removal and disposal of sediments, and repair and strengthening of embankments • Rehabilitation of secondary and tertiary canals and water control structures • Installation of off-take measurement apparatus • Strengthening of institutions for Participatory Irrigation Management among farmers			**Cost: $95,100,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
3.2	**Improvement in water quality in Saguling, Cirata and Jatiluhur Reservoirs through management of fish farming and other polluting activities**	• Action plan for reducing pollution developed and implemented • Social safeguards (including alternative livelihoods for affected fisherfolk and others) developed and put in place	• Project completion report • Site surveys • Water quality measurements	• Support from PLN and PJT II • Affected fisherfolk and others are willing to accept resettlement and alternative livelihoods
	Sub-Components: • Identify sources and extent of pollution in Saguling, Cirata and Jatiluhur Reservoirs • Determine the economic impacts of pollution on other uses of water (such as hydropower) • Identify actions needed to reduce pollution • Identify possibilities for alternative livelihoods for fish farmers and others that may be impacted by controls on fish farming and other polluting activities • Develop and implement an action plan for reducing pollution			**Cost: $1,500,000**
3.3	**Development and Implementation of Integrated Coastal Zone Management Strategy and Action Plan for Citarum Coastline**	• Strategy and action plan for ICZM developed • Improvements made to policies and legislation that will lead to a more integrated approach to CZM • Monitoring, data collection and databases for CZM improved • ICZM action plan implemented, including development of spatial plans	• Project documents • Site surveys • Key agency records	• Coastal communities support initiatives to improve coastal zone planning and management
	Sub-Components: • Identify key issues for resource management in the CRB coastal zone • Review existing policies and legislation regarding management of natural and man-made resources in the coastal zone • Recommend improvements to policies and legislation that will lead to a more integrated approach to CZM • Review existing knowledge base for coastal zone resources and recommend improvements to monitoring and data collection, using GIS • Identify key sites where interventions are required to address local resource management issues • Identify strategies required to achieve ICZM • Develop an action plan to implement the agreed strategies, including spatial planning • Implement the ICZM action plan			**Cost: $10,900,000**

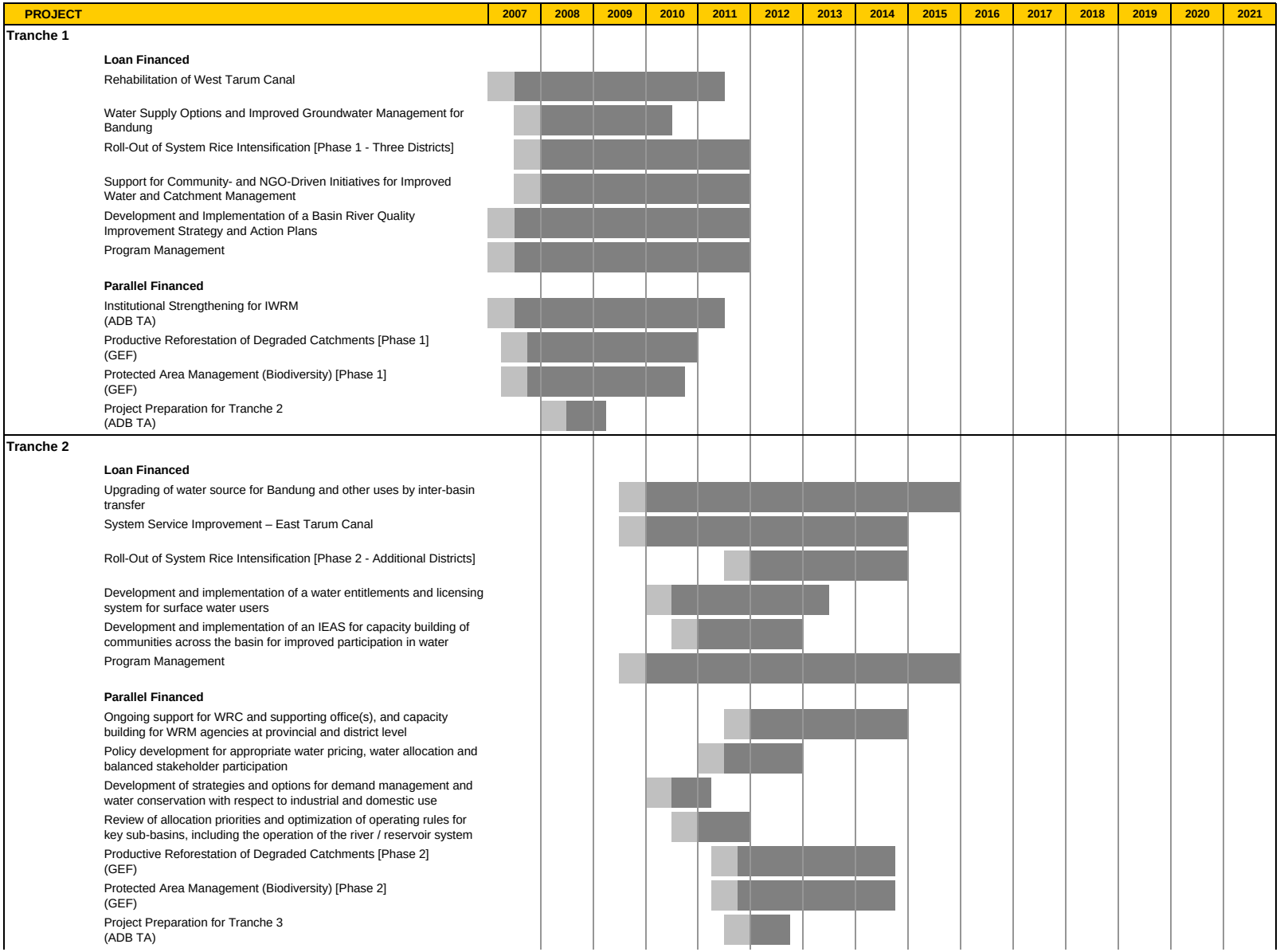
DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
3.4	**Program Management**	• Monitoring and reporting systems, including financial systems, in place and operating effectively • All ADB and GOI monitoring and reporting requirements satisfied • Effective coordination among component projects • Effective information exchange among component project teams • Tranche 4 component projects prepared effectively	• Project reports and other documentation • Audit reports • Minutes of coordination and stakeholder meetings	• GOI continues to support the execution of the projects and facilitates stakeholder support • There is a willingness by those involved in each of the component projects under this tranche to cooperate and share information • Monitoring and reporting procedures are agreed in advance and adhered to • Consultants, local counterparts and GOI officials work together effective to prepare the documentation • ADB and GOI requirements are made clear and do not change
	Sub-Components: • Liaison with executing agencies and other relevant stakeholders • Coordination among projects • Monitoring and reporting of project performance • Coordination of preparation for Tranche 4			**Cost: $1,500,000**
Tranche 4 (Q1 2018 – Q4 2021)				
4.1	**Raising of Cirata Dam**	• All civil and associated works completed on time and budget, to agreed quality standards • All systems commissioned and meeting agreed service standards • All necessary social and environmental safeguards are put in place	• Project completion report	• All necessary social and environmental safeguards are identified and implemented • A high level of technical design is achieved for the project • Qualified and skilled contractors are selected for the civil and associated works, and undertake the construction to agreed quality standards • Effective construction supervision is carried out
	Sub-Components: • Undertake feasibility study • Do detailed engineering design • Construct dam and associated works, and commission			**Cost: $20,100,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
4.2	**Development and Implementation of Preferred Bulk Water Supply Options for Bekasi and Karawang**	• Detailed feasibility studies (including costing, environmental impact assessment, and resettlement action plans, etc) and preparation of SPARs completed • Detailed engineering design on selected option(s) completed • Construction and commissioning of selected option(s) completed on time and on budget	• Project progress reports and completion report • Site inspection reports	• All necessary social and environmental safeguards are identified and implemented • A high level of technical design is achieved for the project • Qualified and skilled contractors are selected for the civil and associated works, and undertake the construction to agreed quality standards • Effective construction supervision is carried out
	Sub-Components: • Establishment of a stakeholder-driven selection process of options to improve the availability of bulk water supplies to Bekasi and Karawang to meet the DMI demand to 2025 • Execution of rapid surveys and pre-feasibility studies (review and update any previous feasibility studies) in order to arrive at a short-list of the most viable potential options • Preparation of detailed feasibility studies (including costing, environmental impact assessment, and resettlement action plans, etc) leading to the preparation of SPARs (subproject appraisal reports) • Detailed engineering design on selected option(s) • Preparation of tender documents; contract awards • Construction and commissioning of selected option(s)			**Cost: $50,000,000**
4.3	**Cisankuy Irrigation Improvement**	• All civil and associated works completed on time and budget, to agreed quality standards • All systems commissioned and meeting agreed service standards • All necessary social and environmental safeguards are put in place • Improved cropping patterns in the Cisankuy area identified and implemented	• Project progress reports and completion report • Site inspection reports	• All necessary social and environmental safeguards are identified and implemented • A high level of technical design is achieved for the project • Qualified and skilled contractors are selected for the civil and associated works, and undertake the construction to agreed quality standards • Effective construction supervision is carried out
	Sub-Components: • Undertake feasibility study for Cisankuy Reservoir • Detailed engineering design • Construct and commission dam and associated works • Develop improved cropping patterns in the Cisankuy area, to save water			**Cost: $65,500,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
4.4	**Program Management**	• Monitoring and reporting systems, including financial systems, in place and operating effectively • All ADB and GOI monitoring and reporting requirements satisfied • Effective coordination among component projects • Effective information exchange among component project teams • High quality program completion report submitted on time	• Project reports and other documentation • Audit reports • Minutes of coordination and stakeholder meetings	• GOI continues to support the execution of the projects and facilitates stakeholder support • There is a willingness by those involved in each of the component projects under this tranche to cooperate and share information • Monitoring and reporting procedures are agreed in advance and adhered to • Consultants, local counterparts and GOI officials work together effective to prepare the documentation • ADB and GOI requirements are made clear and do not change
	Sub-Components: • Liaison with executing agencies and other relevant stakeholders • Coordination among component projects • Monitoring and reporting of project performance, including financial • Preparation and submission of program completion report			**Cost: $1,200,000**

Annex 4 Indicative Implementation Schedule – Total Investment Program

INTEGRATED CITARUM WATER RESOURCE MANAGEMENT PROJECT
INDICATIVE MULTITRANCHE FINANCING FACILITY PROGRAM (INCLUDING PARALLEL FINANCED PROJECTS)



PROJECT	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Tranche 3															
Loan Financed															
System Service Improvement – North Tarum Canal															
Upgrading of Water Source for Irrigation (Upper Cipunegara)															
Curug Run-of-River Power Plant															
Improvement in water quality in Saguling, Cirata and Jatiluhur Reservoirs through mgt of fish farming and other polluting activities															
Development and Implementation of Integrated Coastal Zone Management Strategy and Action Plan for Citarum Coastline															
Program Management															
Parallel Financed															
Mini- and Micro- Hydropower Basin Study															
Review and updating of River Basin Plan ("Pola")															
Project Preparation for Tranche 4															
Tranche 4															
Loan Financed															
Raising of Cirata Dam															
Cisankuy Irrigation Improvement															
Development and Implementation of Preferred Bulk Water Supply Options for Bekasi and Karawang															
Program Management															
Parallel Financed															
Investigation of water supply and sanitation options for urban areas (apart from Bandung, Bekasi and Karawang)															
Development of an on-line flow forecasting system on unregulated rivers															

Annex 5 Design and Monitoring Framework – Tranche 1

INTEGRATED CITARUM WATER RESOURCE MANAGEMENT PROJECT
MULTITRANCHE FINANCING FACILITY – TRANCHE 1 (INCLUDING PARALLEL FINANCED PROJECTS)
DESIGN AND MONITORING FRAMEWORK

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
IMPACT				
Improved and more integrated water resource management in place, with government and the community working in partnership towards a shared vision (to be fully achieved if all the "roadmap" interventions are completed successfully)		• To have appropriate and effective institutional arrangements in place for integrated water resource management in the basin [*Note that assistance to put those arrangements in place will be provided through an ADB grant to fund a technical assistance that will run in parallel with Tranche 1*] • To have effective partnerships between government agencies at national, provincial and district level in place to implement planned water and land management activities to be funded under the MFF loan • To have comprehensive and accessible databases in place to provide decision-makers, water managers and technical experts with the best information to undertake their responsibilities for water resource management	• Legislation and policy documents released by GOI • Minutes of meetings of the Water Resources Council and other key organisations in the management of the water resource of the CRB • Progress and final reports of individual projects funded under the loan • Survey of communities meant to benefit from activities funded under the loan • Published information on available databases related to water, land and related resources	• Institutional arrangements to be put in place under new legislation provides a robust framework for IWRM and clearly separates resource management and development/ operational responsibilities • The government agencies at national, provincial and district level have the resolve to involve the community meaningfully in all stages of water resource planning and management • The community is willing to participate effectively in all stages of water resource planning and management • Agencies are truly willing to share information for the benefit of all valid users
OUTCOMES				
1	Successfully implemented Tranche 1			
2	Effective and robust institutional arrangements in place, including a Water Resources Council (WRC) and supporting office(s), for effective and integrated water resource management	• Water Resources Council and supporting office(s) established and operational • Clear separation of "resource manager" and "operator" responsibilities implemented among water resource agencies in the CRB	• GOI policy documents relating to the formation and operation of the WRC • Minutes of meetings of WRC	• Proposals for new institutional arrangements follow best practice principles and do not allow vested interests to dominate • Adequate representation of non-government stakeholders is implemented in the new arrangements

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
3	Improved reliability of water supply and reduced adverse environmental impacts caused by over-exploitation of groundwater in the Bandung area	• Groundwater extractions reduced to sustainable rates (no further drawdown at the end of the project)	• Groundwater monitoring records from enhanced network of monitoring wells	• Local authorities have the determination to effectively manage compliance with groundwater extraction regulations • The majority of groundwater users cooperate
4	Improved reliability of water supply to Jakarta and irrigation areas supplied by West Tarum Canal	• Bulk water supplied to Jakarta at a rate of ??? m/s, ??% of the time • Bulk water supplied to West Tarum Canal Irrigation Area at a rate of ??? m/s, ??% of the time	• Flow records held by PJT II	• Construction of WTC rehabilitation works is carried out according to plans and specifications
5	Improved water use efficiency and increased yields for rice irrigation in three districts in the Citarum River Basin	• Water use for rice production in project areas reduced by 45% • Rice yields increased by 45% in project areas	• Production records held by Department of Agriculture	• Continued support by GOI for adoption of SRI • Continued support by farmers for adoption of SRI • SRI roll-out is carried out effectively
6	Significant increase in the number of community- and NGO-driven initiatives for improved water and catchment management in the Citarum River Basin	• The number of successful community- and NGO-driven initiatives for improved water and catchment management increased to ??	• Project final reports • Post-project survey	• GOI continues to support the “bottom-up” approach to implementing initiatives for improved water and catchment management • Appropriate funding mechanisms can be put in place to allow loan funds to flow to qualifying communities to implement their action plans • A sufficient number of communities are willing to participate
7	Improved water quality in the waterways and reservoirs of the Citarum River Basin	• Average values for key water quality parameters at nominated points in the basin reduced to acceptable levels (compared to Indonesian WQ standards), or at least 50% of present levels, if that cannot be achieved.	• Water quality monitoring records routinely collected	• A good water quantity / quality model for the basin can be developed • Actions that have the greatest impact in improving water quality can be identified • The actions identified for amelioration of degraded water quality can be successfully implemented

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
8	Processes for productive reforestation of degraded catchments, led by local communities, are in place and beginning to operate effectively	• Productive reforestation action plans successfully developed and implemented in 30 model villages • Processes in place that can be followed by other villages	• Project reports • Post-implementation survey of model villages	• Continued support by GOI for the community-based approach • Continued support by farmers and contribution of labour and other in-kind inputs
9	Processes for improved management of protected areas, led by local communities, are in place and beginning to operate effectively	• Protected land management action plans successfully developed and implemented in 15 model villages • Processes in place that can be followed by other villages	• Project reports • Post-implementation survey of model villages	• Continued support by GOI for the community-based approach • Continued support by farmers and contribution of labour and other in-kind inputs
10	Preparation for Tranche 2 successfully completed	• All documents prepared to ADB requirements	• Documents prepared for submission	• Consultants, local counterparts and GOI officials work together effective to prepare the documentation • ADB requirements are made clear and do not change
OUTPUTS				
Component Project 1: Program Management				
1.1	Liaison with executing agencies and other relevant stakeholders	• Executing agencies and other relevant stakeholders well informed about program progress • Executing agencies and other relevant stakeholders participating effectively in setting the direction of the program and its projects	• Minutes of meetings and workshops with executing agencies and other relevant stakeholders	• GOI continues to support the execution of the projects and facilitates stakeholder support for their preparation
1.2	Coordination among projects	• Projects well coordinated, with opportunities for information exchange maximised, and conflicts among projects minimised	• Program status reports • Minutes of periodical coordination workshops	• There is a willingness by those involved in each of the component projects under this tranche to cooperate and share information
1.3	Identification of the need for and coordination of implementation of minor studies (up to $400,000 total) to improve knowledge of water issues in CRB	• Priority information needs identified, and minor studies undertaken on time and within budget that redress those needs	• Final reports of studies	• Stakeholders provide sufficient information to identify priority knowledge gaps • Local organisations can be found to undertake the studies effectively
1.4	Capacity building for NGOs involved in the component projects of Tranche 1	• Capacity of involved NGOs developed to a level that enables effective participation in the project	• Surveys of NGO representatives • Reports describing activities of NGOs with respect to the project	• NGOs are willing to be trained and participate

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
1.5	Monitoring and reporting of project performance, including financial management	• All monitoring and reporting undertaken in accordance with agreed procedures	• Reports produced	• Monitoring and reporting procedures are agreed in advance and adhered to
1.6	Coordination of preparation for Tranche 2	• Procedures for preparation of PFR for Tranche 2 followed and documentation prepared in accordance with ADB standards	• Documentation submitted for approval of Tranche 2	• Consultants, local counterparts and GOI officials work together effective to prepare the documentation • ADB and GOI requirements are made clear and do not change
	Main Activities: • Liaison with executing agencies and other relevant stakeholders • Coordination among projects • Identification of the need for and coordination of implementation of minor studies (up to $400,000 total) to improve knowledge of water issues in CRB • Monitoring and reporting of project performance • Coordination of preparation for Tranche 2			**Financed by MFF** **Cost: $2,570,000**
Component Project 2: Institutional Strengthening for IWRM				
2.1	Capacity Building and Support	• The Water Resources Council (covering Citarum and eastern Basins), river basin management office and support unit(s) all established, staffed and operating effectively	• Minutes of meeting of the Water Resources Council • Inspections of river basin management office and support unit(s) and interviews with management and staff	• The Water Resources Council has a strong and meaningful mandate (not just a “talkfest”) • The Council has a very “neutral” role, without bias towards any sub-sector or geographical location within its mandated area • GOI establishes an effective technical and administrative support mechanism for the Council
2.2	Data and Modelling	• An integrated river basin water quantity/quality model for the Citarum is developed and being used to support decision making for integrated water resource management	• Project completion report and other technical reports • Inspections of river basin management office and support unit(s) and interviews with management and staff	• The model(s) will be properly operated and maintained, and used to support decisions/ recommendations made by the Council
2.3	"State-of-the-Basin" Reporting	• An annual "State-of-the-Basin" Report is produced and disseminated widely	• Annual "State-of-the-Basin" Reports	• The "State-of-the-Basin" will address the key environmental and water resource management issues in the basin and give an accurate depiction of those issues

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
2.4	Basin Planning - Development of Pola	• An integrated water resource management plan for the basin ("pola") developed, led by the Water Resources Council • Responsibilities for implementation of the pola clearly assigned	• Minutes of meeting of the Water Resources Council • Plan documents	• There is participation by a broad range of stakeholders in the development of the pola • Responsibilities for implementing the pola are clearly assigned • Organisations with the mandate to implement the pola undertake their responsibilities effectively and coordinate amongst each other
	Main Activities: • Assistance in establishing the Water Resources Council (covering Citarum and eastern Basins), river basin management office and support unit(s) for improved policy development and coordination • Ongoing support and capacity building for the Council, river basin management office and support unit(s) • Establish a land degradation and biodiversity database for CRB, consolidating existing data from various organisations • Develop an Internet-based metadatabase (data inventory) for water, land and related data in the CRB • Identify potentially useful modelling packages for an integrated river basin water quantity/quality model for the Citarum, and select the most suitable • Assemble data, develop the model, then calibrate and validate/verify • Design and implement a decision support tool for use by relevant agencies for policy and planning • Review of "state of the basin" reporting procedures in other countries • Development of an appropriate process to produce and disseminate a "state of the basin" report to identify problem areas, cause/sources and needed remedies • Produce annual "state of the basin" reports • Review of existing plans for water resources development and management in the Citarum River Basin • Building on the roadmap and in collaboration with stakeholders, develoment of a strategic river basin plan (pola) that will facilitate improved and more integrated water resource management • Development and implementation of a mechanism for monitoring the implementation of the river basin plan by line agencies with that responsibility, and reporting progress to government			**Financed by ADB TA** **Cost: $2,400,000**
Component Project 3: Water Supply Options and Improved Groundwater Management for Bandung				
3.1	Options for increase in surface water supplies	• Broad stakeholder agreement achieved for preferred option(s) for increasing surface water supplies for Bandung	• Project reports, including minutes of stakeholder workshops	• Consensus among the wide variety of stakeholder groups can be achieved
3.2	Feasibility studies and detailed engineering designs for preferred surface water supply option(s)	• Feasibility studies and detailed engineering designs successfully completed, meeting required standards	• Final feasibility studies and DED reports and drawings	• Consultants undertake the feasibility studies and designs competently

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
3.3	Improved implementation of regulations for sustainable groundwater management in Bandung	• A high level of compliance with regulations for sustainable groundwater management in Bandung achieved	• Groundwater extraction records kept by provincial Department of Environmental Hydrogeology	• Local authorities have the determination to effectively manage compliance with groundwater extraction regulations • The majority of groundwater users cooperate
3.4	Improvements to groundwater monitoring network	• Improved groundwater monitoring network in place	• Project completion report(s)	• Technical specifications for installation of wells and recording equipment are followed by local contractors
3.5	Establishment of, and ongoing support for, a stakeholder forum for Bandung Sub-Basin	• The stakeholder forum for Bandung Sub-Basin formed and operating effectively according to its mandate (to be defined during the project	• Minutes of forum meetings	• There is strong support in the local Bandung area for the concept of a stakeholder forum • The stakeholder forum concept is supported by the local authorities
3.6	Project Management	• Project completed on time and on budget to the agreed standard of quality	• Project completion report(s)	• Consultants and local counterparts undertake the management of the project competently
	Main Activities: • Work with the Citarum Basin Water Resources Council to determine the composition and mandate of the stakeholder forum • Legally and practically establish the forum • Provide ongoing support (financial and advisory) to the forum for up to two years • Establishment of a forum-led selection process for options to improve the availability of bulk water supplies to Bandung to meet the DMI demand to 2025. • Execution of rapid surveys and pre-feasibility studies (review and update any previous feasibility studies) in order to arrive at a short-list of the most viable potential options. • Preparation of detailed feasibility studies (including costing, environmental impact assessment, and resettlement action plans, etc) leading to the preparation of SPARs (subproject appraisal reports). • Review of existing regulatory framework for groundwater management in the Bandung area. • Evaluation of existing implementation of regulation and identification of deficiencies. • Development of strategies and an action plan for improved effectiveness of regulation of groundwater use, including recommendations for changes to the existing regulatory framework. • Development of a monitoring and evaluation mechanism. • Capacity building of agencies involved in groundwater management • Identification of optimal locations for monitoring wells • Provision of monitoring equipment, increasing the network of monitoring wells (60 additional wells are estimated to be needed) • Improvement to groundwater database(s) and computer models			**Financed by MFF** **Cost: $4,800,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
Component Project 4: Rehabilitation of West Tarum Canal				
4.1	Detailed engineering design	• Detailed engineering design successfully completed, meeting required standards	• Final DED report and drawings	• Consultants undertake the design competently
4.2	Construction contractors selected by tendering	• Fair and equitable selection process and successful contractors selected on merit	• Tendering process records	• There is the intention of GOI to make the selection process fair and equitable
4.3	Construction of improvement works	• West Tarum Canal restored to its design capacity • Water quality improved through exclusion of inflows of polluted water from crossing stream through construction of siphons • Water control structures restored to full operational status • Environmental impacts minimised, and in particular through proper disposal of dredged material	• Project completion report(s) • Post-completion surveys of water quality parameters along the canal • Measurement of canal flow rates	• Construction of improvement works is carried out on time, within budget and to specified quality standards
4.4	Associated activities	• Social disruption for those living along the canal minimised, and in particular access to water supply and sanitation maintained and improved if necessary • Capacity of PJT II and its staff strengthened to a level where WTC can be effectively and efficiently maintained	• Post-completion survey of local communities	• Social safeguards are adequate and appropriate to local communities
4.5	Project Management	• Project completed on time and on budget to the agreed standard of quality	• Project completion report(s)	• Consultants and local counterparts undertake the management of the project competently

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
	Main Activities: • Procurement of DED/Construction Supervision Consultant • Detailed engineering design • Prequalification of contractors • Tendering, selection of contractors and contract negotiation • Mobilisation, pre-construction survey and setting out • Construction supervision • Removal and disposal of sediments from the canal bed, strengthening of embankments • Separation of Cikarang and Bekasi river flows from the main canal through construction of by-passes (inverted siphons) • Capacity building of PJT II for improved management and operation of WTC • Implementation of stakeholder-driven selection process of water supply and sanitation options for riparian communities along West Tarum Canal			**Financed by MFF** **Cost: $42,900,000**
Component Project 5: Roll-Out of System Rice Intensification in Three Districts				
5.1	Identification and appraisal of target areas	• Appropriate target irrigation areas identified, according to demand-responsive criteria, and appraised accurately	• Appraisal reports	• Sufficient irrigators are willing to participate in the SRI roll-out
5.2	Capacity building	• Capacity of trainers and farmers to implement SRI raised to the appropriate level through effective training	• Reports on training • Surveys of people trained	• Enough potential trainers are available and willing to participate • Farmers are enthusiastic enough to undertake training and apply the lessons learned • Farmers are trained on integrated pest management leading to a reduction in the use of chemicals and pesticides • Farmers organizations are trained to continue this project activity after the initial work carried out by the project staff
5.3	Progressive implementation of SRI	• Program for progressive implementation adhered to – 10,000 ha by the end of the project • Procurement and distribution of supplies undertake according to agreed timetable	• Progress reports • Project completion report	• Continued support by GOI for adoption of SRI • Continued support by farmers for adoption of SRI • Adequate supply of organic fertilizer and other supplies

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
5.4	Management, monitoring and reporting	• Timely monitoring and reporting carried out	• Project progress reports	• Sufficient numbers of local project managers are available • Project management is effectively undertaken
	Main Activities: • Participatory Rural Appraisal for 3 districts and 16 sub-districts • Training of Trainers for 800 farm leaders • Training for 20,000 farmers • Implementation of SRI in 80 demonstration plots • Farmer empowerment – 660 sessions of training • Production of organic fertilizer – distribution of 400 units • Acquisition and distribution of 10,000 decomposer kits • Acquisition and distribution of 50,000 kg of selected seeds • Monitoring and reporting			**Financed by MFF** **Cost: $4,170,000**
Component Project 6: Support for Community- and NGO-Driven Initiatives for Improved Water Supply and Sanitation				
6.1	Capacity building and planning	• Capacity of participating communities (and particularly the community implementation teams) enhanced to a level that enables effective development and implementation of action plans • Action plans developed in participating communities that will lead to improved water and catchment management and can be implemented locally • Appropriate financing mechanism that will enable participating communities to have access to sufficient funds for implementation of their action plans	• Project progress and financial reports • Survey of participating communities • Feedback from trainers	• Continued support by GOI for the community-based approach • Continued support by people in local communities • Appropriate financing mechanism can be developed and agreed to by GOI
6.2	Implementation and ongoing support	• Action plans implemented successfully within agreed time and budget	• Project completion reports	• Continued support by people in local communities and contribution of labour and other in-kind inputs • Funding is made available in a timely manner and is used wisely in accordance with the agreed action plans

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
6.3	Management, monitoring and reporting	• Project completed on time and on budget to the agreed standard of quality	• Project completion reports	• Sufficient numbers of local project managers are available • Project management is effectively undertaken
	Main Activities: • Identification of potential NGOs who can facilitate community participation in all project cycles • Socialization and awareness-raising, assessment of community needs • Selection of communities based on socioeconomic and health criteria and other indicators • Confirmation of community commitment and willingness to participate • Formation of community implementation teams • Community problem identification and analysis of technical options • Provision of skills training based on communities' priorities, assets and needs to generate income and employment opportunities • Provision of access to capital and markets to directly implement skills acquired • Formulation of community action plans and proposals • Disbursement of funds and construction of approved schemes • O&M of completed schemes, and socialization and training support on hygiene behavioural change • Facilitate the implementation of identified health, water and sanitation related projects/programs			**Financed by MFF** **Cost: $5,640,000**
Component Project 7: Development and Implementation of a Basin River Quality Improvement Strategy and Action Plans				
7.1	Improved policies and procedures for water quality management	• Key new policies and procedures for water quality management in place and being implemented effectively	• Project completion report • GOI publications	• Government agencies at all levels will adopt the new policies and procedures
7.2	Improvements to water quality monitoring and data management	• Improved water quality monitoring system in place and being effectively operated and maintained • A water quality and pollution source database management system in place and being effectively operated and maintained • Appropriate (and well-calibrated and validated) issue-specific water quality models in place and being effectively operated and maintained (*these should link with the basin-wide water quantity/quality model – see Output 6.2*) • An Internet-based WQM information system to link the district environmental agencies with other key agencies	• Project completion report • GOI publications related to water quality records (several agencies)	• Agencies responsible for water quality monitoring and management will effectively operate and maintain the data systems

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
7.3	Strengthening of organizational capacity	• Environmental agencies at all levels, universities and research organizations have the capacity to undertake water quality management activities within their mandate • Community awareness and understanding of water quality issues, and how they can contribute to improved water quality, is raised	• Project reports • Post-project survey of organisations and the community	• Organisations have the desire to improve their capacity for water quality management
7.4	Basin-wide River Water Quality Improvement Strategy (RWQIS)	• Multi-agency/stakeholder planning and coordination system for water quality management in place under the Water Resources Council • Basin-wide River Quality Improvement Strategy developed, promulgated and being effectively implemented through action plans	• Records (including minutes of meetings) held by the Water Resources Council • Post-project survey of organisations	• Responsibilities for implementing the RWQIS are clearly assigned • Organisations with the mandate to implement the RWQIS undertake their responsibilities effectively and coordinate amongst each other
7.5	Prepared and implemented area-based pollution sources management action plans	• Water quality management action plans - combining cooperation, regulatory and incentive instruments – in place and being implemented effectively	• Records (including minutes of meetings) held by the Water Resources Council • Post-project survey of organisations	• Responsibilities for implementing the action plans are clearly assigned, and sufficient GOI funds are made available • Organisations with the mandate to implement the action plans undertake their responsibilities effectively and coordinate amongst each other
7.6	Management, monitoring and reporting	• Timely monitoring and reporting carried out	• Project progress and financial reports	• Local project managers are made available to manage the various activities of the project • Project management is effectively undertaken
	Main Activities: • Prepare guidelines/procedures for establishing institutional mechanisms to manage water quality • Prepare guidelines/procedures for assessment of pollution sources, delineating water quality management areas and preparing action plans • Assess performance and effectiveness in the Citarum basin of existing cooperation-based programs and identify complementary regulatory measures • Policy study and recommendations on use of incentives/pollution charges for water quality management, including procedural guidelines for implementation • Design and develop a basin-wide water quality monitoring program based on concept of water quality management areas • Design and develop a water quality and pollution source database management system, with capability for mapping pollution sources			**Financed by MFF** **Cost: $6.420,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
	• Develop appropriate water quality modeling techniques, including calibration, testing and demonstration in key water quality management areas • Design and develop an Internet-based WQM information system to link the district environmental agencies with other key agencies • Facilitate knowledge building through universities and research organisation activities, including research, sponsorships and seminars • Implement community and media training in water quality information systems, monitoring and reporting • Equip district environment staff with basic water quality monitoring equipment (on site testing and sampling kits) • Implement an integrated water quality monitoring and reporting system based on action plans (which identify priority pollutants, sources, control measures, targets) • Identify key stakeholders (including universities and research organisations, and conduct a survey of technical knowledge and capabilities • Identify opportunities for involvement of universities and research organisations to participate in the development and implementation of the water quality improvement strategy • Design and implement a training program on the various guidelines for district environment protection agencies • Design and develop a basin-wide information campaign for raising public awareness of water quality management issues • Set up multi-agency/stakeholder planning and coordination system (under Water Resources Council) for water quality management • Identify strategic policy issues, such as objectives and standards for water quality • Delineate and prioritise water quality management areas and mobilize area stakeholders, including technical support units from the districts/province and Balai Besar			
Component Project 8: Productive Reforestation of Degraded Catchments [Phase 1]				
8.1	Spatial planning for reforestation	• An accurate spatial map prepared of degraded lands for reforestation and accepted by key stakeholders • Priority areas for reforestation identified on spatial map and accepted by key stakeholders	• Existing spatial maps on road, river, catchment boundary reserves; government critical land, fresh water spring, protected area, village boundary, soil and; topographic maps • Minutes of stakeholder meetings	• Existing base maps are accurate to allow an accurate reforestation spatial plan to be developed • Stakeholders will be prepared to accept the plan and give up land for reforestation
8.2	Village action plans for reforestation	• 148 villages receive focused education on importance of reforestation for management of local areas and the CRB • 37 project mentors established to serve 148 villages • Aspects of action plans developed in 148 model villages that identify their specific contribution to the CRB reforestation plan	• Minutes of village stakeholder action planning meetings • Village action plans	• Background education provided to villagers is focused • Villagers interested in forming conservation action plans • Villagers will engage with the reforestation activities

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
8.3	Implementation of action plans	• Specific area to be reforested by 148 model villages identified in reforestation spatial map. • Areas to be replanted by each village mapped with GPS and located on reforestation map. • Nurseries adequate to reforest each village component of the reforestation spatial map developed by model villages. • Tenure agreements signed between each village and with appropriate government agency. • 70% of leased areas by each model village replanted with mixed trees as a dominant vegetation	• Village action plan maps. • Village spatial maps. • Legal tenure agreements. • Monitoring reports of leasing agreements. • Reports of project consultants employed to advise and assist with reforestation and best farming practices	• Villager interest in developing village maps, nurseries and utilizing government lands for reforestation through lease agreements. • Villagers have the capacity to carry out reforestation and protect their plantations from vandals. • Project model village mentors have the capacity to assist implement activities.
8.4	Institutional development	• Project spatial plans inculcated into provincial, districts and village spatial plans. • Spatial planning staff from the province and districts trained by programmatic activities working with the Project planning team. • Accuracy of spatial plans improved such that positions within spatial zones can readily be located with GPS	• Provincial, district and village spatial plans. • Project supervisor reports on trainees. • Post project survey of accuracy of locations in spatial plans	• Government spatial planners are interested in participating in the project exercises. • Spatial planners in programmatic training remain in their posts to influence later iterations of their spatial plans
8.5	Improvement to village land tenure arrangements with *Perum Perhutani*	• Land tenure arrangements for periods of >30 years available to farmers	• Tenure agreement documents	• leases on their land for periods >30 years to encourage villagers to plant trees and not annual crops
8.6	Alternative livelihoods for displaced upland forest villagers	• 3000 Upland farmers assisted to establish mixed tree farms in government lands	• Tenure agreements with government agencies	• Conflicts between displaced upland farmers and local farmers for leases to reforest government land.

DESIGN SUMMARY	PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
Main Activities: • Review all existing laws relating to protection of forests in upper catchment areas, particularly on steep slopes >42 degrees, and evaluate their legal suitability to provide protection • Establish a small group (GIS /remote sensing specialist, spatial planner and landscape ecologist) in the CRB Council to work with and advise relevant agencies • Review existing mosaic of spatial plans in CRB, evaluate the extent to which they are harmonious, and recommend a process for greater integration of these plans at all levels • Map accurately Perhutani, degraded lands, road, river and basin boundary reserves and protected areas • Map major spring catchment areas, this to require selected hydrological surveys of important springs • Identify priority areas for rehabilitation by reforestation and formulate reforestation spatial plan • Gain stakeholder acceptance for reforestation spatial plan brokered by the Water Resources Council, as well as allowing for broad public scrutiny • Select 120 conservation villages not near PAs and evaluate their suitability for this program • Review and report on the appropriate reforestation methods in different topographic profiles within the area planned for reforestation • Engage and place 30 village mentors • Train mentors • Facilitate the development of village action plans • Assist to develop village nurseries • Advise villagers on appropriate reforestation techniques and build capacity • Assist to implement village action plans, monitor and evaluate • Institutional strengthening for coordination among local governments and the basin management organization for watershed management • Development of effective land use controls with incentives • Implementation of effective compliance management (enforcement) • Broker MOU contract conditions between villagers and Perum Perhutani that provides long tenure (>30 years) • Broker prioritization for forest villagers to be given priority for such leases • Conduct a field survey of the upland villagers (38,000 families) displaced to ascertain suitable sustainable alternative livelihoods • Broker preferences for this group of villagers for Perum Perhutani lands and facilitate preferred livelihoods on this leasehold land • Subsidise 3000 farmers for one year to establish alternatives			**Financed by GEF** **Cost: $4,040,000**

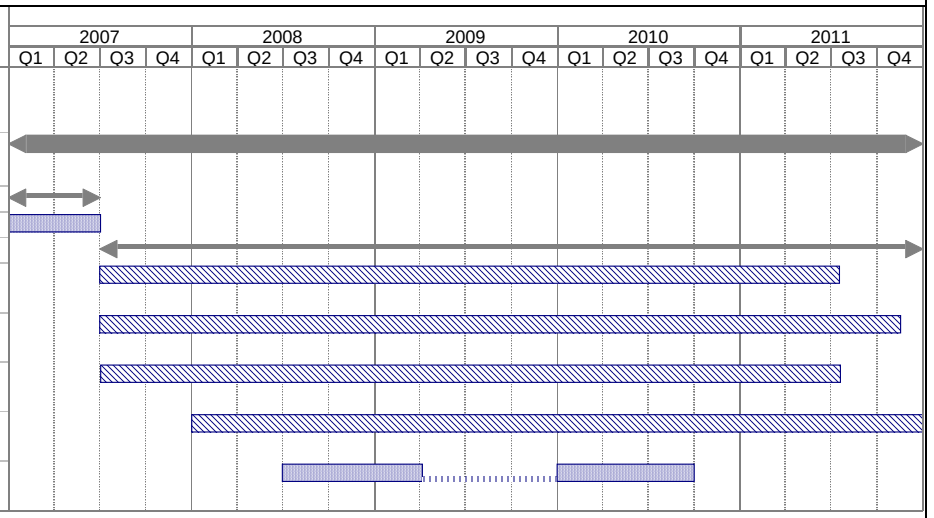
DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
Component Project 9: Protected Area Management for Biodiversity [Phase 1]				
9.1	Data gathering, investigations and overall planning	• Action plans documents completed in 7 protected areas (PAs). • Habitat maps completed in 7 PAs • Assessments of 6 taxonomic groups completed in 7 PAs. • Reports on resource utilization in 7 PAs by surrounding villagers completed. • Stakeholder action plans completed in 7 PAs and 28 Model conservation villages around these PAs	• PA management action plan reports. • Consultant reports on habitat mapping, taxonomic groups surveyed and resource utilization. • Model conservation village action plan reports	• Protected area management engages proactively with model conservation villages. • Field conditions, field worker health and PA support allows completion of activities during the project period. • Villagers participate in resource utilization surveys
9.2	Implementation of action plans	• Villagers represented on 7 PA management boards. • Management zones and associated regulations established. • Adaptive management plan implementation commenced. • Illegal removal of timber and wood and extraction of non timber forest products in PAs declines 50% and; encroachment 80%	• PA annual reports and strategic planning documents • Post project survey of resource utilization of PAs by villages surrounding PAs	• PA management prepared to include villagers on their management boards. • Sufficient funds and expertise available to implement high priority aspects of action plans. • Poor villagers can subsist without removing natural resources from PAs
9.3	Project management and sub-component coordination	• LD and BD focal areas under a single PMU. • Stakeholders represented on several collaborative forums. • Villagers represented on PA management boards	• Report to GEF • Reports of various collaborative forums. • PA annual reports	• Stakeholders prepared to participate in several forums and be present of PA management board
	Main Activities: • Develop conservation management action plans for the selected protected areas through stakeholder forums focused on selected conservation targets (objectives) • Habitat mapping in selected protected areas • Conduct rapid biodiversity surveys of three taxonomic groups selected by the action planning process • Conduct village resource utilization survey of the villages adjoining these protected areas • Establish village conservation groups specific to the selected protected areas (model conservation villages - MCVs) • Build capacity of MCV communities through training • Develop village action plans in the MCVs • Involve village conservation groups in collaborative management of protected areas according to agreed action plans • Monitor and review action plan implementation • Project management and sub-component coordination			**Financed by GEF** **Cost: $4,020,000**

DESIGN SUMMARY		PERFORMANCE	DATA SOURCES	ASSUMPTIONS AND RISKS
Component Project 10: Project Preparation for Tranche 2				
10.1	System Service Improvement – East Tarum Canal	• Project documentation prepared to standards required by ADB • Documents submitted in a timely fashion	• Review of project outputs	• GOI continues to support the execution of the projects and facilitates stakeholder support for their preparation • Consultants engaged to prepare the documentation carry out their tasks to the required standards
10.2	Development and implementation of a water entitlements and licensing system for surface water users			
10.3	Development and implementation of an IEA for capacity building of communities across the basin for improved participation in water resources policy development, planning and management			
10.4	Ongoing support for WRC and supporting office(s), and capacity building for WRM agencies at provincial and district level			
10.5	Policy development for appropriate water pricing, water allocation and balanced stakeholder participation			
10.6	Development of strategies and options for demand management and water conservation with respect to industrial and domestic use			
10.7	Review of allocation priorities and optimization of operating rules for key sub-basins, including the operation of the river / reservoir system as a whole			
10.8	Productive Reforestation of Degraded Catchments [Phase 2]			
10.9	Protected Area Management (Biodiversity) [Phase 2]			
	Main Activities: For each project being prepared: • Prepare feasibility study (if required) • Prepare scope of project and estimate resources and costs • Prepare TOR and other tender documentation			**Financed by ADB TA** **Cost: $1,400,000**

Annex 6 Proposed Implementation Schedule – Tranche 1

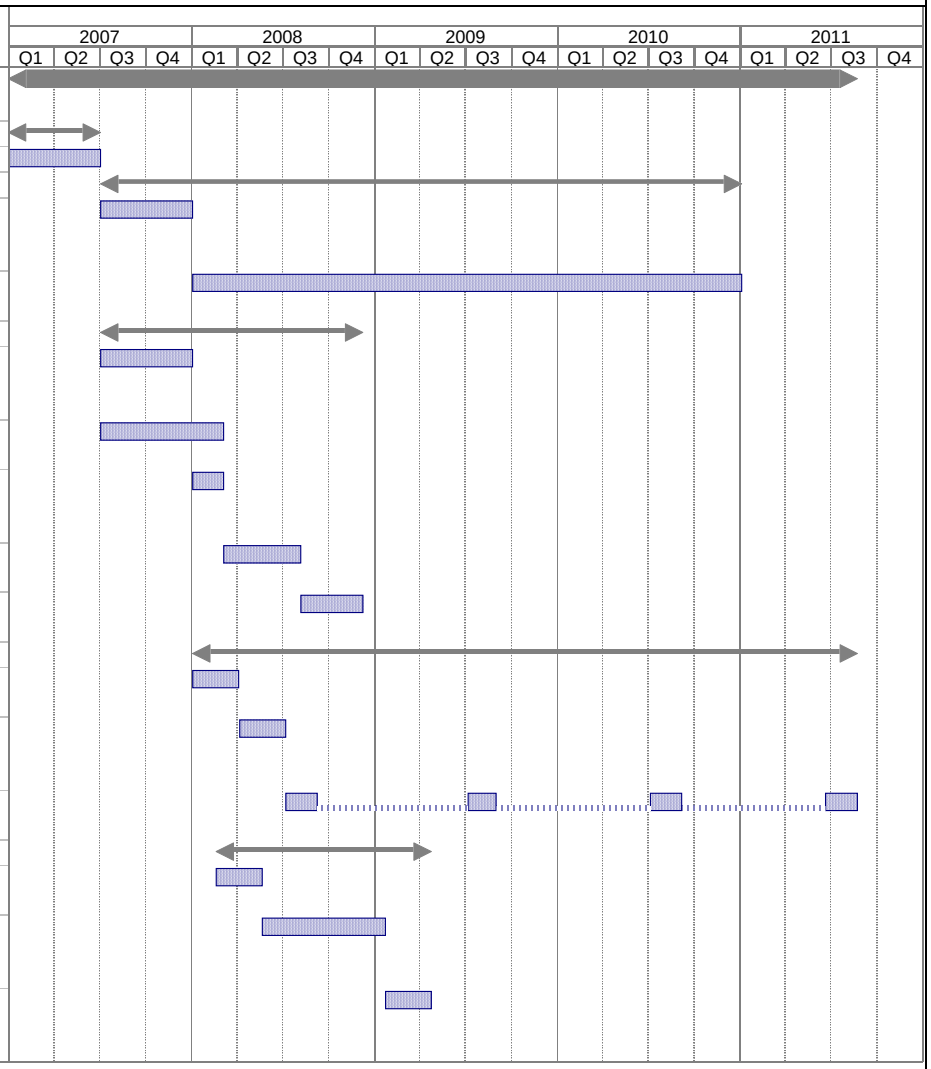
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
0	**Total Tranche 1**	**60 months**	**79,230**		
1	Program Management	60 months	2,000	AusAID	Balai Besar
1.1	Procurement of Consultants				
1.1.1	Procure consultants	6 months			
1.2	Program Management		2000		
1.2.1	Liaison with executing agencies and other relevant stakeholders	48 months intermittent			
1.2.2	Coordination among projects	52 months intermittent			
1.2.3	Identify the need for and coordinate implementation of minor studies (up to $400,000 total) to improve knowledge of water issues in CRB	48 months intermittent			
1.2.4	Monitoring and reporting of project performance	48 months intermittent			
1.2.5	Coordination of preparation for Tranches 2 and 3	18 months			



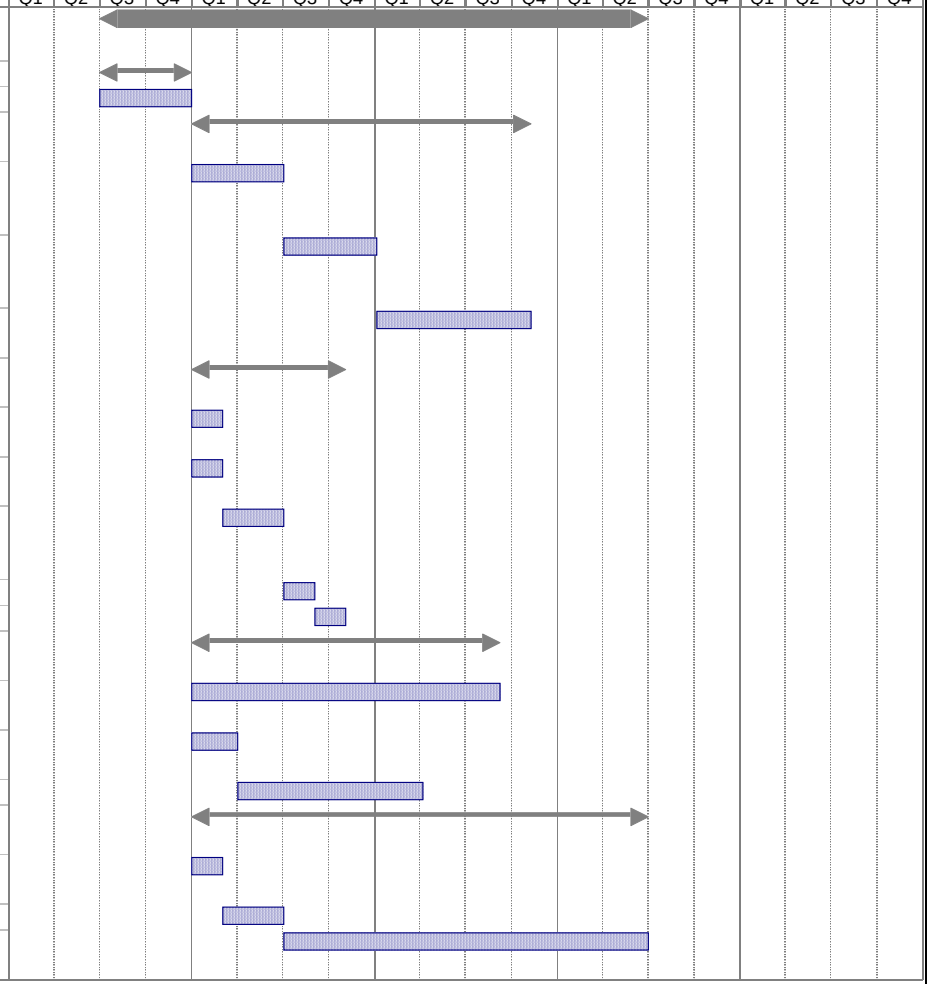
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
2	Institutional Strengthening for Integrated Water Resources Management	48 months	2,400	ADB TA	Balai Besar
2.1	Procurement of Consultants				
2.1.1	Procure consultants	6 months			
2.2	Sub-Component 1: Capacity Building and Support		800		
2.2.1	Assistance in establishing the Water Resources Council (covering Citarum and eastern Basins), river basin management office and support unit(s) for improved policy development and coordination	6 months			
2.2.2	Ongoing support and capacity building for the Council, river basin management office and support unit(s)	36 months			
2.3	Sub-Component 2: Data and Modelling		750		
2.3.1	Establish a land degradation and biodiversity database for CRB, consolidating existing data from various organisations				
2.3.2	Develop an Internet-based metadatabase (data inventory) for water, land and related data in the CRB				
2.3.3	Identify potentially useful modelling packages for an integrated river basin water quantity/quality model for the Citarum, and select the most suitable	2 months			
2.3.4	Assemble data, develop the model, then calibrate and validate/verify	5 months			
2.3.5	Design and implement a decision support tool for use by relevant agencies for policy and planning	4 months			
2.4	Sub-Component 3: "State-of-the-Basin" Reporting		250		
2.4.1	Review of "state of the basin" reporting procedures in other countries	3 months			
2.4.2	Development of an appropriate process to produce and disseminate a "state of the basin" report to identify problem areas, cause/sources and needed remedies	3 months			
2.4.3	Produce annual "state of the basin" reports	8 months			
2.5	Sub-Component 4: Basin Planning - Development of Pola		600		
2.5.1	Review of existing plans for water resources development and management in the Citarum River Basin	3 months			
2.5.2	Building on the roadmap and in collaboration with stakeholders, develoment of a strategic river basin plan (pola) that will facilitate improved and more integrated water resource management	8 months			
2.5.3	Development and implementation of a mechanism for monitoring the implementation of the river basin plan by line agencies with that responsibility, and reporting progress to government	3 months			



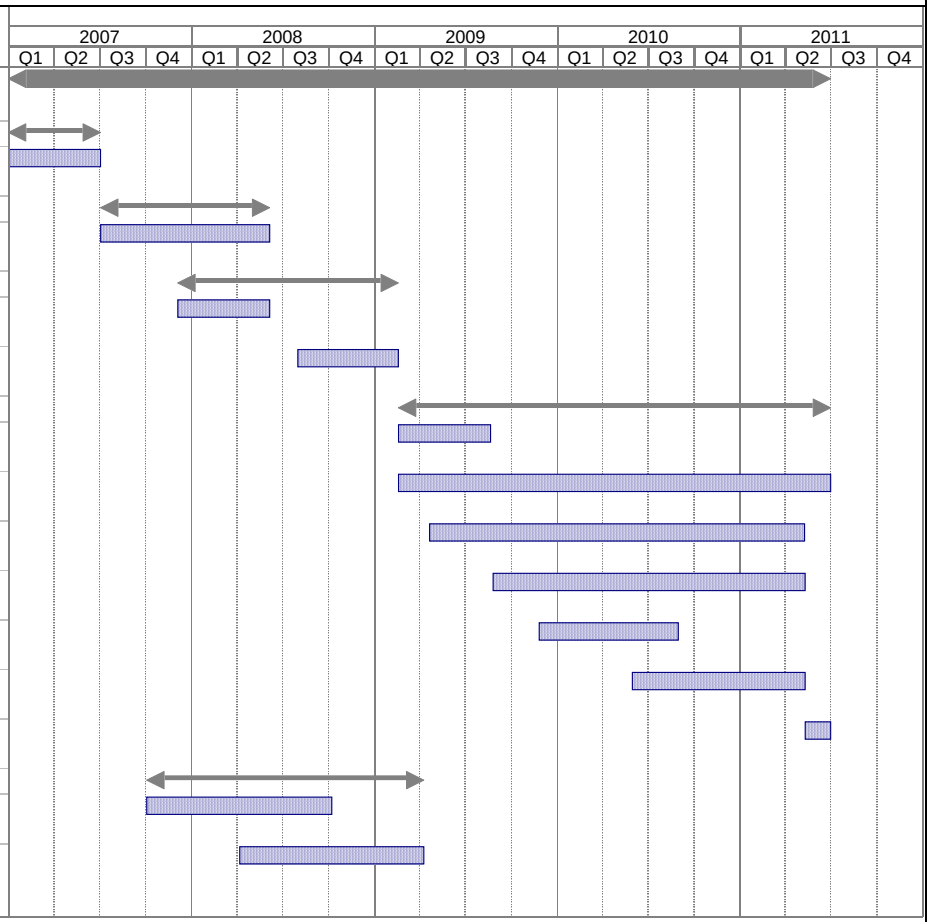
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
3	Water Supply Options and Improved Groundwater Management for Bandung	36 months	5,900	MFF Tranche 1	
3.1	Procurement of Consultants				
3.1.1	Procure consultants	6 months			
3.2	Sub-Component 1: Options for Increase in Surface Water Supplies		2,000		
3.2.1	Execution of rapid surveys and pre-feasibility studies (review and update any previous feasibility studies) in order to arrive at a short-list of the most viable potential options	6 months			
3.2.2	Preparation of detailed feasibility studies (including costing, environmental impact assessment, and resettlement action plans, etc) leading to the preparation of SPARs	6 months			
3.2.3	Detailed engineering design for selected option(s) for Bandung supplementary surface water supply	10 months			
3.3	Sub-Component 2: Improved implementation of regulations for sustainable groundwater management in Bandung		600		
3.3.1	Review of existing regulatory framework for ground¬water management in the Bandung area	2 months			
3.3.2	Evaluation of existing implementation of regulation and identification of deficiencies	2 months			
3.3.3	Development of strategies and an action plan for improved effectiveness of regulation of groundwater use, including recommendations for changes to the existing regulatory framework	4 months			
3.3.4	Development of a monitoring and evaluation mechanism	2 months			
3.3.5	Capacity building of agencies involved in groundwater management	2 months			
3.4	Sub-Component 3: Improvements to groundwater monitoring network		3,000		
3.4.1	Provision and installation of monitoring equipment, increasing the network of monitoring wells	20 months			
3.4.2	Review of existing groundwater databases and models, and identifacion of improvements needed	3 months			
3.4.3	Improvement to groundwater database(s) and computer models	12 months			
3.5	Sub-Component 4: Establishment of, and ongoing support for, a stakeholder forum for Bandung Sub-Basin under Citarum Basin		300		
3.5.1	Work with the Citarum Basin Water Resources Council or Citarum Balai Besar to determine its composition and mandate	2 months			
3.5.2	Legally and practically establish the forum	4 months			
3.5.3	Provide ongoing support (financial and advisory) to the forum for up to two years	24 months			



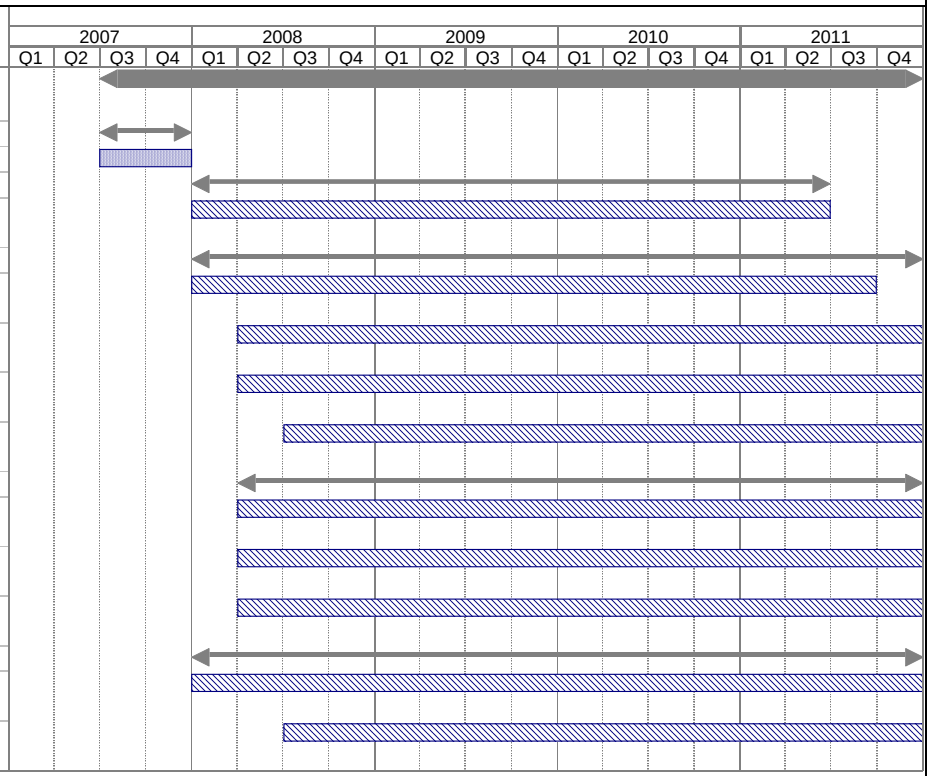
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
4	Rehabilitation of the West Tarum Canal	54 months	43,000	MFF Tranche 1	
4.1	Procurement of Consultants				
4.1.1	Procurement of DED/Construction Supervision Consultant	6 months			
4.2	Sub-Component 1: Detailed Engineering Design				
4.2.1	Carry out detailed engineering design	11 months			
4.3	Sub-Component 2: Tendering				
4.3.1	Prequalification of contracters	6 months			
4.3.2	Tendering, selection of contractors and contract negotiation	6 months			
4.4	Sub-Component 3: Construction of Improvement Works				
4.4.1	Mobilisation, pre-construction survey and setting out	6 months			
4.4.2	Construction supervision	28 months			
4.4.3	Excavation/dredging works	24 months			
4.4.4	Concrete and masonry works	21 months			
4.4.5	Hydro-mechanical equipment procurement and manufacturing	9 months			
4.4.6	Installation of hydro-mechanical equipment	12 months			
4.4.7	Completion and handover	1 month			
4.5	Sub-Component 4: Associated Activities				
4.5.1	Capacity building of PJT II for improved management and operation of WTC	12 months			
4.5.2	Implementation of stakeholder-driven selection process of water supply and sanitation options for riparian communities along West Tarum Canal	12 months			



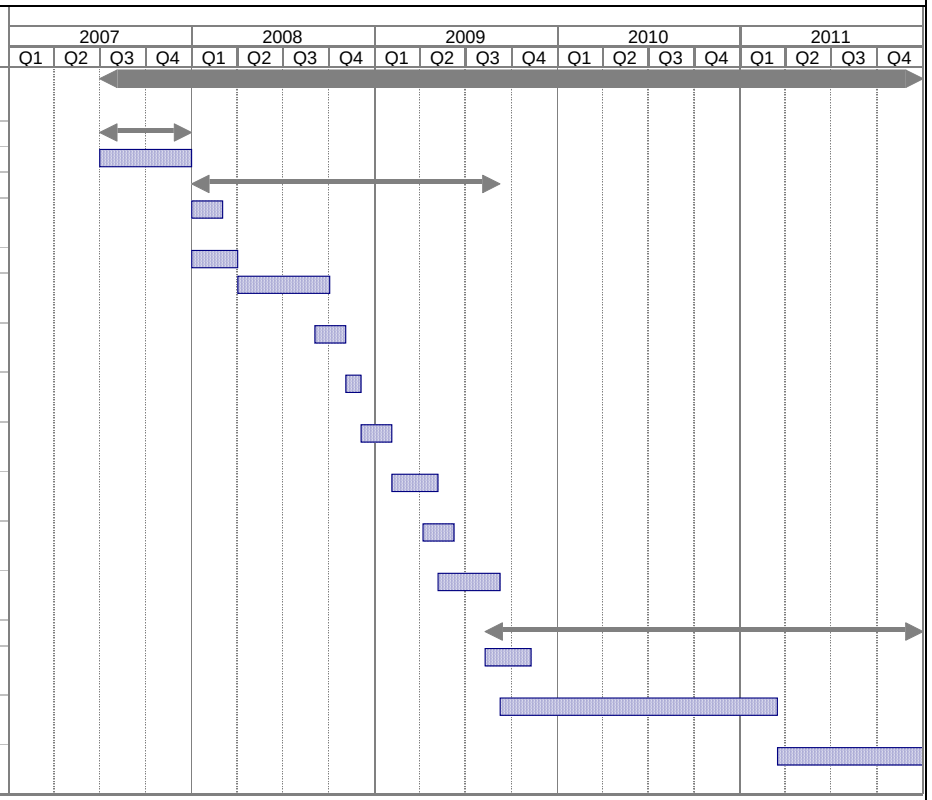
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
5	Roll-Out of System Rice Intensification in Three Districts (two downstream and one upstream)	54 months	4,300	MFF Tranche 1	
5.1	Procurement of Consultants				
5.1.1	Procure consultants	6 months			
5.2	Sub-Component 1: Appraisal of Target Areas		60		
5.2.1	Participatory Rural Appraisal for 3 districts and 16 sub-districts	42months intermittent			
5.3	Sub-Component 2: Capacity Building		1,120		
5.3.1	Training of Trainers for 800 farm leaders	45 months intermittent			
5.3.2	Training for 20,000 farmers	45 months intermittent			
5.3.3	Implementation of SRI in 80 demonstration plots	45 months intermittent			
5.3.4	Farmer empowerment – 660 sessions of training	42 months intermittent			
5.4	Sub-Component 3: Progressive implementation of SRI		2,520		
5.4.1	Production of organic fertilizer – distribution of 400 units	45 months intermittent			
5.4.2	Acquisition and distribution of 10,000 decomposer kits	45 months intermittent			
5.4.3	Acquisition and distribution of 50,000 kg of selected seeds	45 months intermittent			
5.5	Sub-Component 4: Management, monitoring and reporting		600		
5.5.1	Project management	48 months intermittent			
5.5.2	Monitoring and reporting	42 months intermittent			



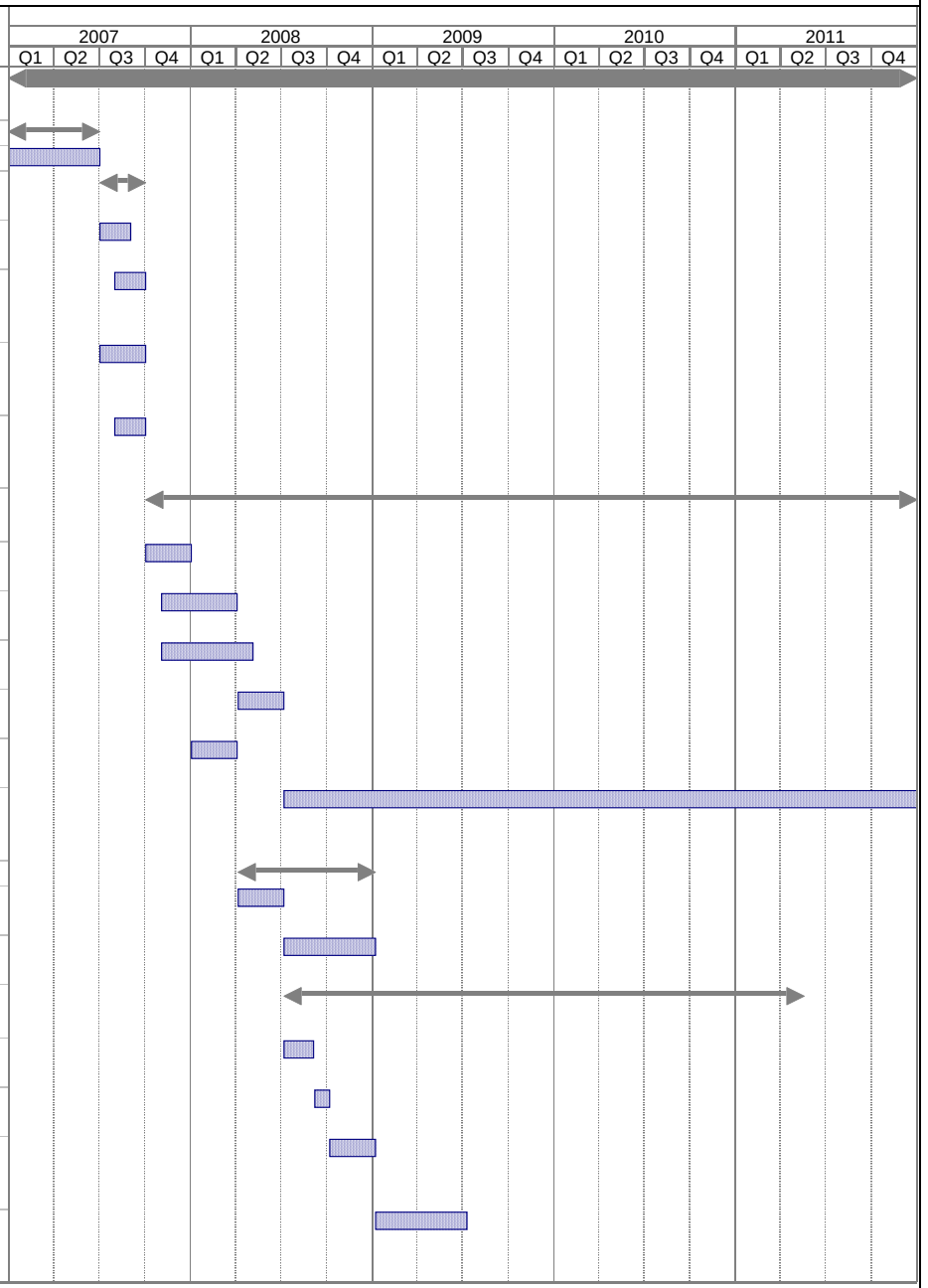
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
6	Support for Community- and NGO-Driven Initiatives for Improved Water and Catchment Management	54 months	6,800	MFF Tranche 1	
6.1	Procurement of Consultants				
6.1.1	Procure consultants	6 months			
6.2	Sub-Component 1: Capacity Building and Planning		800		
6.2.1	Identification of potential NGOs who can facilitate community participation in all project cycles	2 months			
6.2.2	Undertake KAP (knowledge-attitude-practices) surveys	3 months			
6.2.3	Socialization and awareness-raising (including media information campaigns), assessment of community needs	6 months			
6.2.4	Selection of communities based on socio-economic and health criteria and other indicators	2 months			
6.2.5	Confirmation of community commitment and willingness to participate	1 month			
6.2.6	Formation of community implementation teams	2 months			
6.2.7	Provision of skills training based on communities' priorities, assets and needs to generate income and employment opportunities	3 months			
6.2.8	Community problem identification and analysis of technical options	2 months			
6.2.9	Formulation of community action plans and proposals	4 months			
6.3	Sub-Component 2: Implementation and Ongoing Support		6,000		
6.3.1	Provision of access to capital and markets to directly implement skills acquired and plans developed	3 months			
6.3.2	Disbursement of funds and construction of approved schemes	18 months			
6.3.3	O&M of completed schemes, and socialization and training support on hygiene behavioural change	10 months			



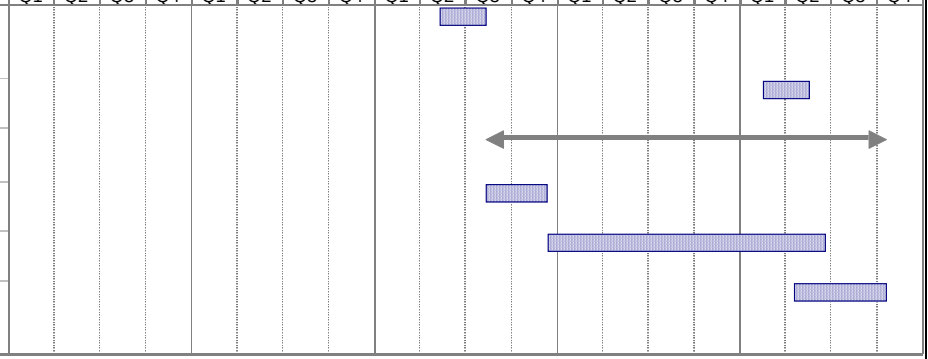
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
7	Development and Implementation of a Basin River Quality Improvement Strategy and Action Plans	60 months	6,100	MFF Tranche 1	
7.1	Procurement of Consultants				
7.1.1	Procure consultants	6 months			
7.2	Sub-Component 1: Policies and Procedures for Water Quality Management		340		
7.2.1	Prepare guidelines/procedures for establishing institutional mechanisms to manage water quality	2 months			
7.2.2	Prepare guidelines/procedure for assessment of pollution sources, delineating water quality management areas and preparing action plans	2 months			
7.2.3	Assess performance and effectiveness in the Citarum basin of existing cooperation-based programs and identify complementary regulatory measures	3 months			
7.2.4	Policy study and recommendations on use of incentives/pollution charges for water quality management, including procedural guidelines for implementation	2 months			
7.3	Sub-Component 2: Improvements to Water Quality Monitoring and Data Management		1,860		
7.3.1	Design and develop a basinwide water quality monitoring program based on concept of water quality management areas	3 months			
7.3.2	Design and develop a water quality and pollution source database management system, with capability for mapping pollution sources	5 months			
7.3.3	Develop appropriate water quality modeling techniques, including calibration, testing and demonstration in key water quality	6 months			
7.3.4	Design and develop an Internet-based WQM information system to link the district environmental agencies with other key agencies	3 months			
7.3.5	Equip district environment staff with basic water quality monitoring equipment (on site testing and sampling kits)	3 months			
7.3.6	Implement integrated water quality monitoring system based on action plans (which identify priority pollutants, sources, control measures, targets)	41 months			
7.4	Sub-Component 3: Development of Organisational Capacity		1,000		
7.4.1	Design and implement a training program on the various guidelines for district environment protection agencies	3 months			
7.4.2	Design and develop a basin-wide information campaign for raising public awareness of water quality management issues	6 months			
7.5	Sub-Component 4: Preparation of Basin-Wide River Quality Improvement Strategy		500		
7.5.1	Set up multi-agency/stakeholder planning and coordination system (under Balai Besar) for water quality management	2 months			
7.5.2	Identify strategic policy issues, such as objectives and standards for water quality	1 month			
7.5.3	Delineate and prioritise water quality management areas and mobilize area stakeholders, including technical support units from the districts/province and Balai Besar	3 months			
7.5.4	Conduct pollution source inventories and pollution load assessments in key water quality management areas (prioritize Bandung and Bekasi)	6 months			



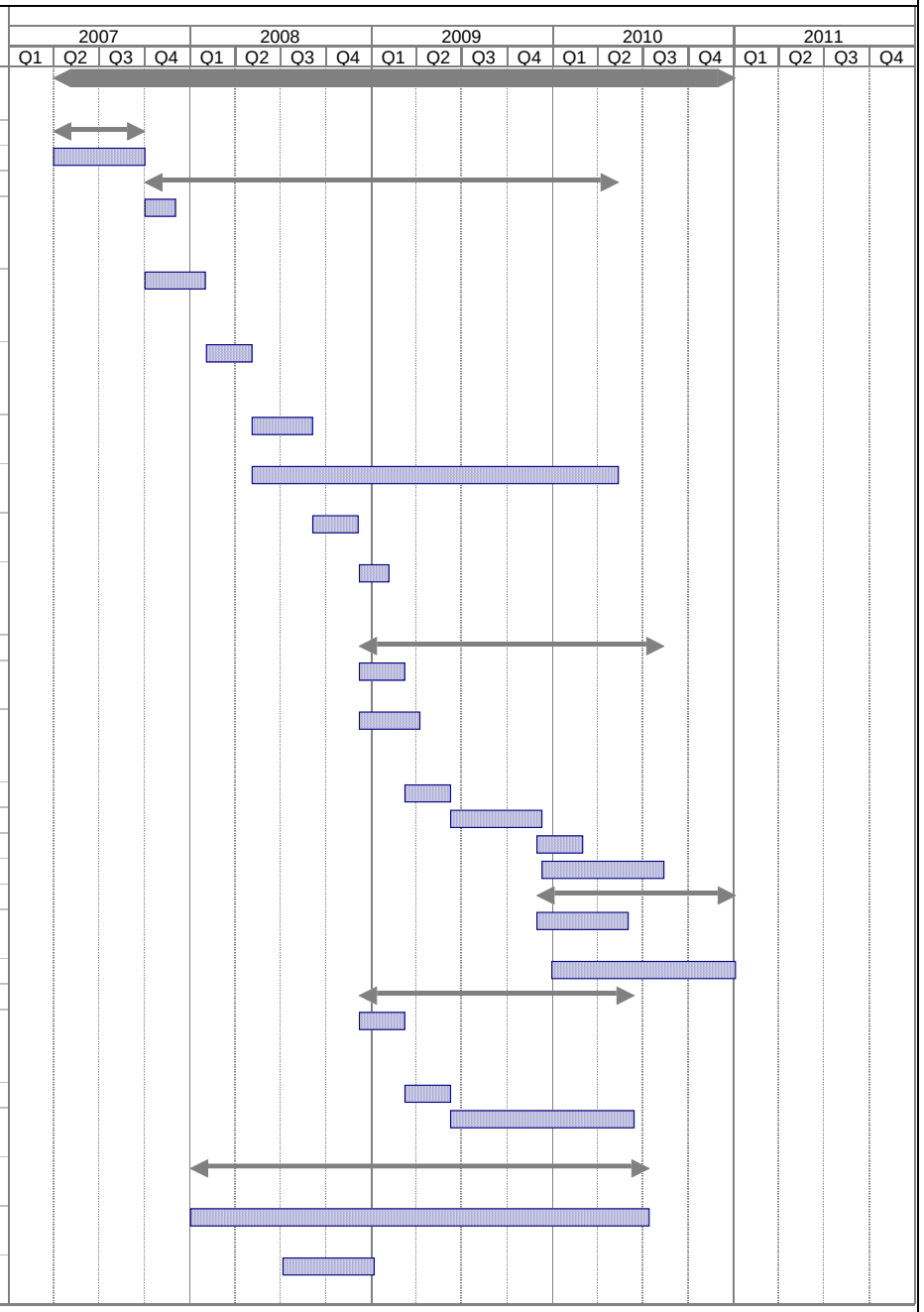
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
7.5.5	Develop a basin-wide River Quality Improvement Strategy for the Basin as a framework for action planning in priority water quality management areas	3 months			
7.5.6	Policy review and re-planning	3 months			
7.6	Sub-Component 5: Preparation and Implementation of Area-Based Pollution Sources Management Action Plans		2,400		
7.6.1	Formulate the area water quality management action plans - combining cooperation, regulatory and incentive instruments	4 months			
7.6.2	Implement area action plans	18 months			
7.6.3	Performance monitoring and evaluation of area action plans and reporting to the Citarum Ware Resources Council through the Balai Besar	6 months			



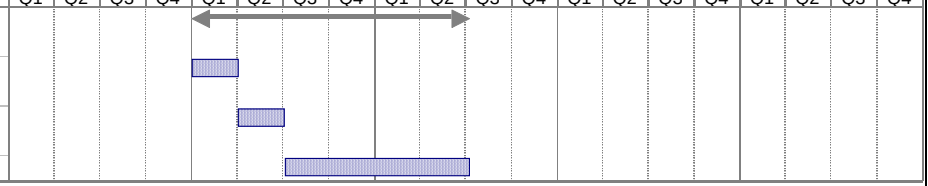
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
8	Productive Reforestation of Degraded Catchments in CRB	45 months	3,930	**GEF**	
8.1	Procurement of Consultants				
8.1.1	Procure consultants	6 months			
8.2	Sub-Component 1: Spatial planning for reforestation		1,100		
8.2.1	Review all existing laws relating to protection of forests in upper catchment areas, particularly on steep slopes >42 degrees, and evaluate their legal suitability to provide protection	2 months			
8.2.2	Establish a small group (GIS /remote sensing specialist, spatial planner and landscape ecologist) in the CRB Council to work with and advise relevant agencies	4 months			
8.2.3	Review existing mosaic of spatial plans in CRB, evaluate the extent to which they are harmonious, and recommend a process for greater integration of these plans at all levels	3 months			
8.2.4	Map accurately Perhutani, degraded lands, road, river and DAS boundary reserves and PAs	4 months			
8.2.5	Map major spring catchment areas, this to require selected hydrological surveys of important springs	24 months			
8.2.6	Identify priority areas for rehabilitation by reforestation and formulate reforestation spatial plan	3 months			
8.2.7	Gain multi-stakeholder acceptance for reforestation spatial plan brokered by the Water Resources Council, as well as allowing for broad public scrutiny	2 months			
8.3	Sub-Component 2: Village action plans for reforestation		**500**		
8.3.1	Select 120 conservation villages not near PAs and evaluate their suitability for this program	3 months			
8.3.2	Review and report on the appropriate reforestation methods in different topographic profiles within the area planned for reforestation	4 months			
8.3.3	Engage and place 30 village mentors	3 months			
8.3.4	Train mentors	6 months			
8.3.5	Facilitate the development of village action plans	3 months			
8.3.6	Assist to develop village nurseries	8 months			
8.4	Sub-Component 3: Implementation of action plans		**630**		
8.4.1	Advise villagers on appropriate reforestation techniques and build capacity	6 months			
8.4.2	Assist to implement village action plans, monitor and evaluate	12 months			
8.5	Sub-Component 4: Institutional development		**300**		
8.5.1	Institutional strengthening for coordination among local governments and the basin management organization for watershed management	3 months			
8.5.2	Development of effective land use controls with incentives	3 months			
8.5.3	Implementation of effective compliance management (enforcement)	12 months			
8.6	Sub-Component 5: Improvement to village land tenure arrangements with Perum Perhutani		**200**		
8.6.1	Broker MOU contract conditions between villagers and Perum Perhutani that provides long tenure (>30 years)	30 months			
8.6.2	Broker prioritization for forest villagers (desa hutan) to be given priority for such leases	6 months			



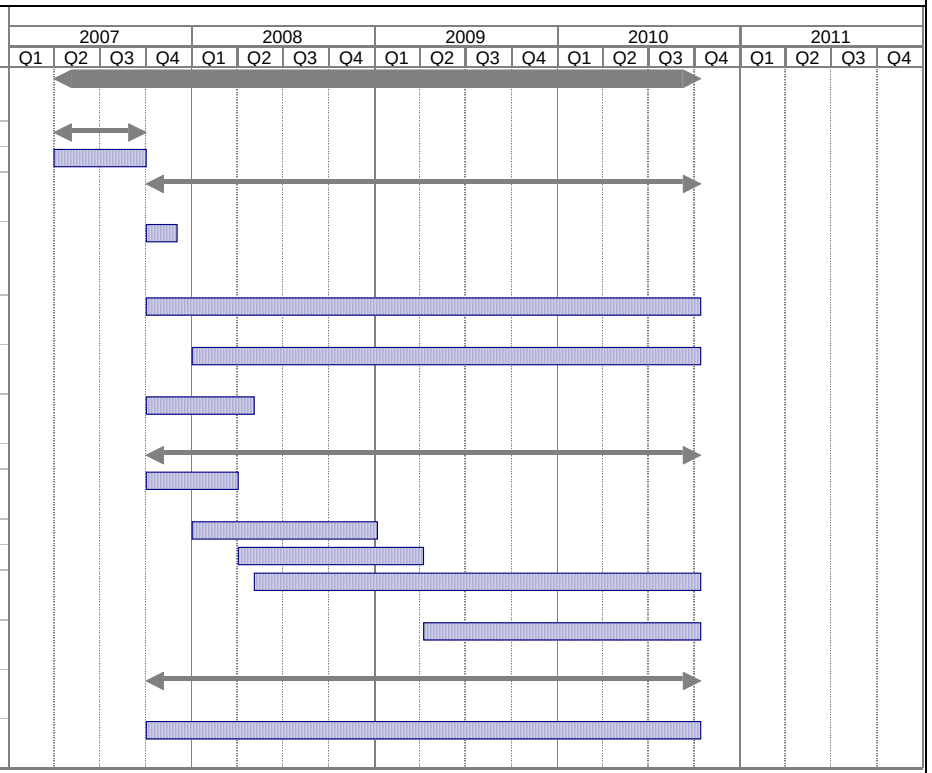
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
8.7	Sub-Component 6: Alternative livelihoods for displaced upland forest villagers		**1,200**		
8.7.1	Conduct a field survey of the upland villagers (38,000 families) displaced to ascertain suitable sustainable alternative livelihoods	3 months			
8.7.2	Broker preferences for this group of villagers for Perum Perhutani lands and facilitate preferred livelihoods on this leasehold land	3 months			
8.7.3	Subsidise 3000 farmers for one year to establish alternatives	12 months			



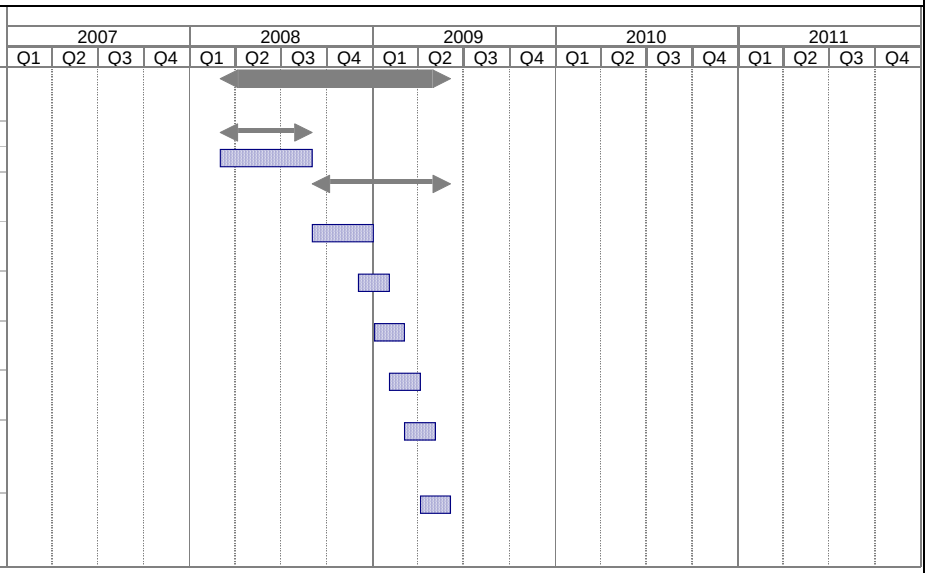
Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
9	Protected Area Management in CRB (Biodiversity)	42 months	4,200	**GEF**	
9.1	Procurement of Consultants				
9.1.1	Procure consultants	6 months			
9.2	Sub-Component 1: Data gathering, investigations and action planning		2850		
9.2.1	Develop conservation management action plans for the selected protected areas through stakeholder forums focused on selected conservation targets (objectives)	2 months			
9.2.2	Habitat mapping in selected protected areas	36 months			
9.2.3	Conduct rapid biodiversity surveys of three taxonomic groups selected by the action planning process	33 months			
9.2.4	Conduct village resource utilization survey of the villages adjoining these protected areas	7 months			
9.3	Sub-Component 2: Implementation		300		
9.3.1	Establish village conservation groups specific to the selected protected areas (model conservation villages - MCVs)	6 months			
9.3.2	Build capacity of MCV communities through training	12 months			
9.3.3	Develop village action plans in the MCVs	12 months			
9.3.4	Involve village conservation groups in collaborative management of protected areas according to agreed action plans	29 months			
9.3.5	Monitor and review action plan implementation	18 months			
9.4	Sub-Component 3: Project management and sub-component coordination		1,050		
9.4.1	Project management and sub-component coordination	36 months			



Integrated Citarum Water Resources Project - Tranche 1

WBS	Task Name	Estimated Duration	Indicative Cost ($'000)	Funding Source	Implementing Agency
10	Project Preparation for Tranche 2 (Indicative Only)	9 months	600	ADB TA	Balai Besar
10.1	Procurement of Consultants				
10.1.1	Procurement of consultants	6 months			
10.2	Feasibility Studies and Preparation of TOR and Tender Documents		600		
10.2.1	System Service Improvement and Irrigation Modernization – East Tarum Canal	4 months			
10.2.2	Improvements to organisational capacity for environmental assessment	2 months			
10.2.3	Development of strategies and options for demand management and water conservation with respect to industrial and domestic use	2 months			
10.2.4	Development and implementation of a water entitlements and licensing system for surface water users	2 months			
10.2.5	Review of allocation priorities and optimization of operating rules for key sub-basins, including the operation of the river / reservoir system as a whole	2 months			
10.2.6	Development and implementation of an IEA for capacity building of communities across the basin for improved participation in water resources policy development, planning and management	2 months			



Annex 7 Indicative Investment Plan Summary

INTEGRATED CITARUM WATER RESOURCE MANAGEMENT PROJECT - INDICATIVE COSTING SUMMARY

Key Areas:	Roadmap Indicative Total Cost ($ '000)	MFF Indicative Total Cost ($ '000)					Tranche 1 Estimated Total Cost ($ '000)				
		ADB Loan	ADB Grant	Co-Financer	GOI	Total	ADB Loan	ADB Grant	GEF	GOI	Total
Institutions and Planning	$10,000		$10,000			$10,000		$2,400			$2,400
WR Development and Management	$2,362,510	$276,420		$5,000	$182,060	$463,480	$28,870			$19,740	$48,610
Water Sharing	$133,000	$2,000		$25,000	$3,000	$30,000	$5,000			$1,810	$6,810
Environmental Protection	$250,000	$3,500		$8,000	$48,500	$60,000			$8,060		$8,060
Disaster Management	$100,000					$0					$0
Community Empowerment	$59,000	$25,000		$10,000	$19,600	$54,600	$7,070			$1,480	$8,550
Data and Information	$20,000	$9,560	$5,440	$5,060		$20,060		$1,040			$1,040
Program Management and Project Preparation	$20,000	$3,520			$8,480	$12,000				$2,570	$2,570
SUBTOTAL	**$2,954,510**	**$320,000**	**$15,440**	**$53,060**	**$261,640**	**$650,140**	**$40,940**	**$3,440**	**$8,060**	**$25,600**	**$78,040**
Contingencies and IDC	$800,000	$180,000				$180,000	$19,270				$19,270
TOTAL	**$3,754,510**	**$500,000**	**$15,440**	**$53,060**	**$261,640**	**$830,140**	**$60,210**	**$3,440**	**$8,060**	**$25,600**	**$97,310**

Annex 8 Economic and Financial Analysis

ECONOMIC AND FINANCIAL ANALYSIS

A. Introduction

1. Financial and economic analysis were undertaken to evaluate the sustainability of the Project. This analysis was undertaken comparing the cost and benefits in the case of with and without project situation. Financial analysis examines its sustainability from the beneficiaries' point of view while economic analysis determines its viability from the social and economic perspective. The two major project benefits that are considered for Tranche 1 is the additional water made available for: (i) domestic, manufacturing and industrial (DMI) uses; and (ii) paddy cultivation.

2. The considerable benefits of environmental improvements including improvements in water quality, health, reduction in soil erosion, reducing the risk of landslide and flooding are not included in the analysis because of difficulties in accurately quantifying these impacts. An important benefit that is not considered in this analysis is the strengthening of the canal banks; a break in the wall can lead to long periods of disruption in the Jakarta pipe water supply causing widespread panic and heath hazards.

B. Major Assumptions

3. The major project activities will be implemented over the period from 2007 to 2011. The economic life of the Project is assumed as 25 years with the full economic benefits realized in 2025 or project year 19. Investment costs including all consultancy, civil works and equipment costs are in constant 2006 prices. The exchange rate used is Rp9,300 to US$1.00 which is the rate used by GOI in preparing their 2007 budget. The World Bank MUV[1] index is used to adjust future commodity prices to constant 2006 prices. Forecast prices of traded commodities are based on World Bank commodity price projections while prices of other commodities are based on prevailing local market prices. Prices for rice, phosphate and potassium fertilizer are based on import parity while those for nitrogenous fertilizer at export parity. The 2015 forecast prices are used for deriving farm-gate commodity and fertilizer prices.

3. The standard conversion factor (SCF) used in this analysis is 0.9 while that for labor is 0.8. The price of labor is Rp25,000 per day which is the prevailing rate in the project area.

C. Major Problems in the Program Area

4. The program area – Citaram Basin - covers the most strategic river basin in the country, with a population of 28 million. The 2 most important urban centers – Jakarta (population 13.2 million) and Bandung (population 4.0 million) are either located within or depend on this basin for its water supply. The total area of irrigated agricultural land is some 300,000 ha producing about some 3.0 million tons of paddy or 6 % of the national output. The Citarum River system also supplies 80% of Jakarta's raw water. Some 10% of the population are living below the poverty line, 50% of households do not have proper toilet facilities and 40% of them do not have access to pipe water.

5. Average annual demand from the Jatiluhur reservoir has increased from 140m^3/sec in 1996 to 156m^3/sec in 2004 and this demand is growing at an annual rate of 5%. However, inflow into the Saguling reservoir has been decreasing. Between 1986 and 1991, dry season flow into the Saguling reservoir was 38% of the average annual flow. This

[1] World Bank, MUV Index 2004.

percentage went down to 36% between 1992 and 1997, and declined further to 34% starting in 1998. Watershed degradation is seen as the principal cause. Denuded catchments have reduced capacity to capture rainwater, resulting in high peak flows during the rainy months. In turn, the lower water retention capacity reduces the amount of water available for release as “base flow” during the summer months.

6. In 1997, groundwater abstraction in DKI Jakarta was $8m^3$/sec or half of the surface water supplied to the metropolitan area by the West Tarum Canal. Domestic use accounted for almost 90% of total groundwater abstraction in Jakarta. Groundwater use has exceeded sustainable levels. In both Jakarta and Bandung, over-exploitation of groundwater have caused land subsidence and structural damage to some buildings and, more significantly, exacerbated local drainage and flooding problems.

7. In Bandung, an estimated 90% of the population, and 98% of the industries, rely on groundwater. The lowering of the groundwater level is reportedly up to 5m/year in some places. The cumulative water level decline since 1920 has been 85m. In 2005, it was estimated that land subsidence had reached 0.8m. In order to get clean water, industrial wells have to be drilled to beyond 150m. Industrial groundwater abstraction has also had a devastating effect on shallow wells on which numerous households depend.

8. Watershed erosion is a serious problem in the upper river basin where hillsides are steep and the catchment denuded. Even on steep slopes, farmers cultivate non-perennial crops which do not provide adequate ground cover from the heavy monsoon rains. The soils, derived from volcanic tuff, are easily erodible and are prone to land slides. High peak flows have also increased the rate of river bank erosion. Hydrologic flow regimes have been adversely changed by land degradation, notably the loss of adequate forest cover and the prevalence of hillside farming in the upper catchments. The degraded catchments have reduced capacity to capture rainwater, resulting in high peak flows during the rainy months which carry large amounts of eroded soil. Landslides and mud flows are frequent during the rainy season. These areas have erosion rates in excess of 60 ton/ha/year. At a conservatively estimate of $10/ha, this would represent a loss of $1.0 million/year for the entire watershed of some 100,000 ha.

9. Flooding is a consequence mainly of changes in the river flow regime, in turn caused by changes in watershed conditions. As water retention capacity of the river catchments is reduced by denudation and land conversion for urban development, flood peaks have increased. The ratio of wet season peak flows to dry season low flows in the upper basin has increased from 3.4 in 1992 to 7.3 in 2003. The increased flood frequency and severity are also invariably associated with destructive landslides and mud flows. Flooding has become more frequent and more severe in recent times in all the major urban centers. The problem is due to a combination of: (i) watershed denudation, (ii) effects of past re-alignment/straightening of the Citarum River (through cut-offs) which, while alleviating flooding upstream, increase peak flows downstream, (iii) localized land subsidence due to groundwater over-pumping that impair drainage, and (iv) clogging of drainage canals and streams by garbage.

10. Along the lower Citarum River levees/embankments built during the Dutch period help confine flooding within the river’s meander zone and provide protection to the surrounding settlements. However, large areas of the flood zone within the levees have been planted with crops and fruit trees that have the effect of retarding flood flow, contributing to high water levels. Also, a long term effect of the river embankments has been to raise the river bed due to sediment accumulation, since the levees prevent the spilling of sediments onto the surrounding plain. Consequently, floodwater levels inside the levees have risen above the level of the surrounding land, putting the population at risk in case of levee failure.

11. At the Citarum River mouth, the build-up of deposited sediments has created sand dunes that impede floodwater discharge. Combined with the effect of high tides, the constricted river outlet causes perennial inundation of the lower basin near the delta as the water is forced to back up into the alluvial plain.

12. The population within the program area is growing at more than 3% annually, attributed in part to influx of migrants drawn in by the region's rapid pace of development. The combined effects of untreated domestic sewage, solid waste disposal and industrial effluents have significantly increased pollution loads in the Citarum River system. In the upper basin, river water that is polluted by domestic and industrial wastes from the Bandung metropolitan area is funneled into the Saguling reservoir. In recent years, the BOD concentrations in the Cikapunding River (a major tributary of the Saguling River that flows through Bandung) were still reported to reach as high as 100 mg/l.

13. Runoff from farmed hillside areas, in addition, brings in large amounts of nutrients (nitrogen and phosphorus) that induce eutrophication in the reservoirs. At Saguling where the problem is most significant, nitrogen loading has been estimated at 33,350 ton/year, and for phosphorus, 4,370 ton/year. Algal blooms and their subsequent decay have been blamed for the regular occurrence of fish kills and considerable damage to the floating fish cage industry. In turn, the uncontrolled expansion of fish cage operations is exacerbating the effects of polluted water coming into the reservoir. Improper or excessive fish feeding in the floating cages adds to the organic waste load as unconsumed feed accumulates on the reservoir bed and through periodic suspension (for example, at the start of the rainy season when increased inflows induce mixing in the reservoir) increases oxygen demand.

14. Pollution in the lower basin - particularly in the downstream portion of the West Tarum Canal - poses an even more urgent water quality problem. The WTC supplies 80% of Jakarta's (surface) raw water supply, and hence is vital to the well-being of 8 million inhabitants. On its route to Jakarta, the WTC intersects the Bekasi River which drains an area rapidly being developed for residential and industrial use. At the Bekasi River's confluence with the WTC, the average annual BOD concentration in 2004 was 48mg/l (measured at the weir site). The pollution load in the Bekasi River is caused by untreated household sewage, industrial wastewater, and solid waste dumped along the river banks.

15. Lack of proper solid waste management contributes to both pollution and flooding. Garbage deposited along canals and riverbanks contribute to the high BOD. They also clog drains and accumulate on riverbeds reducing discharge capacity. Average daily solid waste generation is estimated at 6,500m^3/day, of which about 1,500m^3/day is not collected and properly disposed of. Thus the annual uncollected garbage that invariably ends up accumulating in the drainage system and rivers amounts to something like 500,000m^3. The estimate inflow of solid waste into the reservoir is 250,000m^3/year.

16. Along the West Tarum Canal, reduction in conveyance capacity is due both to sediment deposits and the prolific growth of aquatic plants (which create friction in water flow). Apart from contributing to the bottom detritus, aquatic plants trap silt and accelerate canal shallowing. Plant growth is promoted by the use of the canal as toilet and bathing/washing area for residents, which adds substantial quantities of plant nutrients in the water. Residential and commercial establishments along the canal are dense particularly downstream of the waterway from Cikarang and Bekasi to Jakarta. Wastewater and garbage from these establishments are disposed of directly into the canal.

D. Project Benefits

1. Water For DMI

17. In the without-project situation, silting, damage to the canals and hydro-mechanical equipments is gradually reducing the amount of water available for irrigation and DMI by 0.5% annually, or a fall from 51.1m^3/sec in 2005 to 46.5m^3/sec in 2025 (Table 1). As compared with the without-project situation, the Project aims to increase water available for irrigation by 4.5m^3/sec, for DMI by 19.6m^3/sec and for flushing by (1.0m^3/sec) or a total of 25.1m^3/sec by the year 2025.

19. The Project will increase the water available from the current level of 51.1m^3/sec to 71.6m^3/sec by 2025. The bulk of this increase in water supply will go towards meeting the growing demand for water for DMI in Jakarta, and Curug-Berkasi. The DMI uses will benefit from an increase of 2.5% annually in their water supply (or by 19.6m^3/sec).

19. Without-project, water available for Jakarta will fall from 16.1m^3/sec in 2005 to 14.5m^3/sec in 2015 and to 12.9m^3/sec by 2025. The Project will increase the supply of water to Jakarta and Curug-Berkasi DMI by 2.5% annually. This increase is barely adequate to meet the growing demand for water for all DMI uses and there is a need for consumers to use this water more efficiently.

Table 1: Water Supply from WTC, With and Without Project, m^3/sec

Items	2005	2010	2015	2020	2025
Without Project					
Irrigation	30.0	28.5	27.0	25.5	24.0
DMI Consumers					
DMI – JKT	16.1	15.3	14.5	13.7	12.9
DMI - Curug Bekasi	7.0	6.7	6.3	6.0	5.6
DMI – Total	23.1	21.9	20.8	19.6	18.5
Flushing	5.0	4.8	4.5	4.3	4.0
Total	58.1	55.2	52.3	49.4	46.5
With Project					
Irrigation	30.0	31.1	30.1	29.3	28.5
DMI Consumers					
DMI – JKT	16.1	18.6	21.1	23.6	26.1
DMI - Curug Bekasi	7.0	8.3	9.5	10.8	12.0
DMI – Total	23.1	26.9	30.6	34.4	38.1
Flushing	5.0	5.0	5.0	5.0	5.0
Total	58.1	63.0	65.7	68.7	71.6
With-Without Project					
Irrigation	0.0	2.6	3.1	3.8	4.5
DMI Consumers					
DMI – JKT	0.0	3.3	6.6	9.9	13.2
DMI - Curug Bekasi	0.0	1.6	3.2	4.8	6.4
DMI – Total	0.0	4.9	9.8	14.7	19.6
Flushing	0.0	0.3	0.5	0.8	1.0
Total	0.0	7.8	13.4	19.3	25.1

Source: Nippon Koei: Integrated Citarum Water Resource Management Project, Phase II and Phase III Feasibility Report, 2006.

2. Water for Irrigation

20. The cropping intensity mainly for rice in the lower reaches of the Jatiluhur irrigation system has decreased by 25% in recent years due to the shortage of irrigation water caused by the degradation of the main and the secondary canals. Overall, the water delivery from the Jatiluhur system is inefficient due to (i) seepage from the canals, (ii) evaporation loss, and (iii) delivery loss.

21. Without project, water available for paddy irrigation is estimated to decline from to 30.0m^3/sec in 2005 to 24.0 m^3/sec in 2025 with the cropped area falling from 106,900 ha to 91,803 ha over this period and the cropping intensity declining from 1.78 to 1.53 (Table 2).

22. The rehabilitation of WTC will increase the water available to 28.5m^3/sec sufficient to cultivate 117,600 ha of paddy and restore its cropping intensity to 1.93. The Project will increase the annual paddy cropped area by 25,800 ha by 2025. A total of 25,800 farmers, each cultivating an average of 0.5 ha of paddy land will benefit from this increase in crop area.

23. Compared with the situation in 2005, there will be a shortfall of 1.5m^3/sec of water available for paddy irrigation in the with project situation. This implies that the paddy sector will have to use their water more efficiently. This can be achieved with better controls of the gate operations and lining of field canals.

24. The adoption of the system of rice intensification which reduces the water demand from growing paddy by 40% is beneficial. It is estimated that converting 10,000 ha of paddy cultivation to this system will save 63 million m^3/year of water equivalent to 2.0m^3/sec.

Table 2: Area of Irrigated Paddy and Dryland Crop – With and Without Project

	Without Project					
Item	**2004**	**2007**	**2010**	**2015**	**2020**	**2025**
Total command area- ha	57,900	57,900	57,900	57,900	57,900	57,900
Paddy- wet season - ha	57100	56,022	54,943	53,146	51,349	49,552
Paddy- dry season - ha	46400	45,322	44,243	42,446	40,649	38,852
Dry season cash crop - ha	3400	3,400	3,400	3,400	3,400	3,400
Total cropped area -ha	106900	104,743	102,587	98,992	95,398	91,803
Cropping intensity -paddy	1.79	1.75	1.71	1.65	1.59	1.53
Cropping intensity -all crops	1.85	1.81	1.77	1.71	1.65	1.59
Irrigation water requirement - m^3/s	27.35	26.78	26.21	25.26	24.31	23.36
	With Project					
Item	**2004**	**2007**	**2010**	**2015**	**2020**	**2025**
Total command area- ha	57,900	57,900	57,900	57,900	57,900	57,900
Paddy- wet season - ha	57100	56,022	56,561	57,100	57,100	57,100
Paddy- dry season - ha	46400	45,322	51,211	57,100	57,100	57,100
Dry season cash crop - ha	3400	3,400	3,400	3,400	3,400	3,400
Total cropped area -ha	106900	104,743	111,172	117,600	117,600	117,600
Cropping intensity -paddy	1.79	1.75	1.86	1.97	1.97	1.97
Cropping intensity -all crops	1.85	1.81	1.92	2.03	2.03	2.03
Without SRI						
Irrigation water requirement - m^3/s	27.35	26.78	28.48	30.18	30.18	30.18
With SRI						
Irrigation water requirement - m^3/s	27.35	26.78	27.42	28.06	28.06	28.06

Note: Assuming that irrigated paddy area decline from 52,980 ha/year in 2004/2005 to 45,791 ha in 2024/2025.

Irrigation requirement - 10,000 m^3/ha per crop without SRI.

Irrigation requirement - 6,000 m^3/ha per crop with SRI.

Total savings with SRI is 2.12 m^3/sec or 66.86 million m^3/year.

3. Summary of Project Justification.

25. **Without-project**: (i) water supply from Jatiluhur and WTC decrease by 1.1% annually; (ii) water supply for Jakarta decrease by 1.1% annually: (iii) water supply for paddy farmers decrease by 1.2% annually: (iii) water available for flushing decrease by 1.2% annually; (iv) 35,000 households in Jakarta deprived of pipe water annually; (v) factories in the Jakarta area reduce water usage by 1% annually; (vi) production of paddy from the project area fall by 100,000 tons annually; (vii) annual economic growth rate for Jakarta and its vicinity reduced by 0.5 to 1.0%; and (viii) potential serious conflict on water rights between urban dwellers and farmers in the year 2010.

26. **With-project:** (i) water supply from Jatiluhur and WTC increase by 2.0% annually; (ii) water supply for Jakarta increase by 2.5% annually; (iii) additional 200,000

households in Jakarta provided with pipe water annually; (iv) factories in the Jakarta area increase their water usage by 2.0% annually; (v) production of paddy for the project area increase by 150,000 tons annually; (vi) annual economic growth rate for Jakarta and its vicinity increased by 0.5 to 1.0%; (vii) avoidance of serious conflict on water rights between urban dwellers and farmers.

E. Water Charges

27. Perusahaan Umum Jasa Tirta II (PJT II), a state owned corporation, established by Government Regulation 94/1999, is responsible for conducting self-funding operation and maintenance (O&M) of the Jatiluhur infrastructure project, which includes a dam with an impounding capacity of 3 billion m^3, a 187 MW hydro-electric power station capable of generating 900 million Kwh/year, and canals and irrigation structures capable of irrigating 240,000 ha of paddy fields and supplying 800 million m^3 of water for domestic, manufacturing and industrial (DMI) use. It is also responsible for: (i) collecting from the water users funds for O&M of the Jatiluhur water systems; and (ii) managing the Citarum River basin (conservation, utilization, and flood control mitigation). The management function of PJT II is limited to acting as an operator of the system without having a regulatory function.

28. In 2005, its main source of income was Rp115,990 million[1] from the sale of electricity to PLN and Rp71,170 million from sale of water for a total of Rp187,160 million. Currently, the water users pay to PJT II only 35% the required O&M cost. It charged its users and average of Rp87/m^3. The raw water that is used for Jakarta is sold at only Rp122/m3 or 2.1% of the price that the average consumers pay for their water supply. The water tariff for Jakarta which is set by the Governor of Jakarta is Rp5,923/m^3 for 2006. This rate is set annually and there is a request from PDAM Jaya[2] to raise this rate by 20% for the year 2007.

29. With-project, the price of raw water will have to be raised to Rp250/m3 to provide PJT 2 with adequate funds for its operation and maintenance of the Jatiluhar Project including the canal system. This doubling of water charges will represent only a 1.0% increase in the water charges for DKI uses. In the longer term, the improvements in water quality brought about by this Project will reduce the cost of water treatment and reduce the need to raise water charges to the end uses.

30. Assurances will be obtained from the relevant authorities that this proposed increase in the rate for raw water will be implemented in conjunction with the implementation of this project.

F. Project Components

31. The proposed project has 10 components:

(i) program management;
(ii) institutional strengthening for IWRM;
(iii) water supply option and Improved groundwater management for Bandung;
(iv) rehabilitation of West Tarum canal;
(v) roll out system rice Intensification – phase 1;

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[1] A total of 966.6 million Kwh at Rp120/kwh; 435 million m^3 of raw water to Pam Jaya at Rp122/m^3, 180 million m^3 to PDIM at Rp45/m^3 and 200 million m^3 at Rp50/m^3 to industries. The PDIM and industries draw their water from various points along the canals. However PJT ll annual financial statement showed that in 2005, there collected only 82% of the money due to them.

[2] City owned water company.

(vi) support for community and NGO-driven initiatives for improved water and catchment management;
(vii) development and implementation of a basin water quality improvement strategy and action plan:
(viii) productive reforestation and degraded catchment;
(ix) project area management (biodiversity) phase 1;
(x) program preparation for Tranche 2: and

(i) Project Management

32. The project management component will provide for funding the incremental and other costs related to project implementation, including the provision of Technical Assistance (TA), the undertaking of special studies and the maintenance of continuing liaison (and reporting) as required between the DGWR, MPW and ADB. The Project will support the government, partly through the Project Management component and partly through the Institutional Strengthening component, to discharge this responsibility and will provide operational support and funds for the Project Implementation Units (PIUs) in each District. In practice the PIUs will comprise staff drawn from a number of district government institutions related to water supply, agriculture, environment and health.

33. In DGWR headquarters, the Project will partly fund the establishment of a Project Coordination and Management Unit (PCMU) to coordinate all project activities and perform functions more appropriately undertaken at this level (procurement, accounting etc.). To provide policy guidance for the overall project and to approve work programmes and budgets a Steering Committee would be established within DGWR, and expenses related to the meetings and visits of this committee would be funded by the Project. Some support would also be provided, as an extension of the PCMU's role, to the Provincial administrations to facilitate coordination functions[1].

34. The DGWR will second staff either full or part time, as appropriate for each position, to facilitate project implementation and these staff will be assisted and supported by a Technical Assistance programme. Overall, the Project will provide funding for office accommodation, equipment, vehicles and all operating expenses related to project management.

35. The project management component also includes allowances for contracted studies undertaken by third parties, which are intended to cover baselines, impact evaluations and special subject studies. In addition there are allowances for undertaking the project mid-term and completion assessments, which would be undertaken by project staff assisted by consultants. The estimated cost of this component is $2.56 million.

(ii) Institutional Strengthening for IWRM

36. This component is designed to address the shortcomings of the current institutional arrangements that are characterized by highly sectoral division of work and lack of coordination, as well as weak enforcement. In most cases, the regulatory frameworks and standards are generally in place (e.g. for pollution control). This component, through various interventions will pave the way for improved overall capacity to manage environmental quality in the basin. The long term environmental impact is positive and highly significant.

37. It will focus in strengthening and coordinating the work of various institutions involved with: (i) influence of land use on water demand, flooding and river water quality (e.g.

[1] The staffing and responsibilities of the different management units are described under "Implementation Arrangements".

urbanization, transition from agriculture, land use zoning); (ii) balancing demand and supply side solutions to meet water demand; (iii) influence of land use practices in catchments on sustainability of reservoirs; (iv) effect of groundwater over-pumping on access by the poor and cost of abstraction, land subsidence and contamination of aquifers; (v) influence of waste and wastewater disposal practices on suitability of water for downstream supplies, cost of treatment, public health, river ecosystem, groundwater quality; (vi) inequity of upstream and downstream supply; (vii) insufficient maintenance increases risk of canal breach and interruption of water supply to strategic centres (e.g. Jakarta) and consequent economic loss; (viii) trade off between revenue generation from hydropower and other non-revenue earning use (e.g. dry season irrigation); and (iv) link between Government Policy on absence of irrigation fees and sustainability of infrastructure. The estimated cost of this component is $2.40 million.

(iii) Water Supply Options and Improved Groundwater Management for Bandung.

38, This component will focus on development of water supply options for Bandung, specifically to address its over-dependence on groundwater. The emphasis will be on finding alternative surface water source for industries currently mining the area's deep groundwater. The long term objective is to enable groundwater levels to recover. This will reduce the cost of pumping water for domestic use. Re-allocating groundwater away from industry is also economically advantageous as the cost of treating water for industrial requirements is less than for domestic use.

39. It will formulate an action plan to increase the use of surface water for Bandung while reducing its reliance on groundwater. In addition, 236 villages (with a population of 20,000) will be supplied with clean water, sanitation facilities and solid waste disposal. The economic benefits of providing clean water and sanitation facilities are high. The World Bank estimates that the returns from such project are 5 to 20 times the actual investments[1]. The estimated cost of this component is $4.81 million.

(iv) Rehabilitation of West Tarum Canal (WTC)

40. The main construction items includes the cost of excavation/dredging, rehabilitation of embankment slopes, concrete lining above culvert, and construction of side drains, siphon, link canal, separation wall and bridges. The major cost items for hydro-mechanical works are for the Curug pumping station and the Cibbet weir gate and flushing gate. The estimated cost of this component is $42.93 million.

(v). Roll Out System Rice Intensification in Three Districts

41. SRI differs from the normal irrigated rice system in that it only requires intermittent rather than continuous flooding. In this system, the soil is only kept moist and periodically aerated. This results in a water savings of 40 to 50% and with water becoming a scare commodity; it is likely that this system will be more widely accepted in the future.

42. Together with the reduction in water requirements, the new technology requires changes in cultivation method comprising of: (i) selecting only strong seeds and planting them in plastic trays; (ii) transplanting seedlings to field after 8 to 15 days; (iii) planting seedlings at 30cm spatial intervals; (iv) providing a ditch at the perimeter of plot to drain excess water; (v) reducing the amount of water use to only wet the soil to a depth of 2 cm; (vi) increasing the use of organic fertilizer (in conjunction with reduced levels of chemical

[1] World Bank, 2004. Global Analysis on Sanitation Investments.

fertilizer) to improve the soil structure; (vii) reducing the use of chemicals since the stronger plants are less susceptible to pest and diseases; (viii) increasing weeding rounds by compacting the soil 4 times per crop; and (ix) providing intermittent water supply. The main impact of these changes is the increase in rice yield by 50 to 100% and increasing the labor requirements by 25 to 50%.

43. This system was first tested and evaluated by the Agency for Agricultural Research and Development (AARD) in Sukamandi in West Java in 1999. Paddy yields in this trial increased by 50% in the first year (from 4.1t/ha to 6.2t/ha) and by 100% in the second year. In 2002 to 2004, the MOA expanded this test to 200 locations. The results of testing in Eastern Indonesia in over 1,350 ha showed that paddy yields have consistently increased by more than 180%. Within the project area, the Department of Agriculture, Bandung, has successfully implemented this system to 340 ha of farmers fields in 2005 and their program for 2006 is to expand this system to an additional 400 ha. For 2007, the DGLW of MOA is implementing this program for 3,000 ha in 14 provinces.

44. The main impediment to implement SRI to a larger area is the lack of funds to support a training program to assist farmers to adopt this system. The cost of this training program including demonstration farm and providing some material inputs to farmers is estimated at Rp3.5 to Rp4.0 million/ha.

45. The objective of the SRI component in this project is to accelerate the adoption of System of Rice Intensification (SRI) in the project area. Some 10,000 ha of paddy land will be targeted under this project. The component will: (i) increase rice yield by an average of 45% (from 5.5 to 8.0 t/ha); (ii) reduce the need for irrigation water by 45% (from 18,000 to 11,700 m^3/ha[1]); (iii) increase labor use by 36% (from 70 to 95 person day/ha); (iv) increase total cost of production by 31% (from Rp3.26 to Rp4.28 million/ha); (v) increase net income by 56% (from Rp4.54 to Rp7.06 million/ha) and increase gross margin by 50% (from Rp6.29 to Rp9.44 million/ha). The comparative data for the paddy crop grown under flooded irrigation and SRI is shown in Table 3.

Table 3: Comparison between Irrigated and SRI Paddy
Unit per hectare

Item	Unit	Irrigated Paddy	SRI Rp	% Change
Labor requirement	Person day	70	95	36%
Labor cost	million Rp	1.75	2.38	36%
Fertilizer cost				
- Chemical	million Rp	0.71	0.32	-55%
- Organic	million Rp	0.00	1.00	
Total fertilizer cost	million Rp	0.71	1.32	87%
Total cost	million Rp	3.26	4.28	31%
Yield	Ton	5.50	8.00	45%
Net income	million Rp	4.54	7.06	56%
Benefit/cost ratio	Unit	2.39	2.65	11%
Return/person day	Rp	89,863	99,341	11%

46. This SRI component will be implemented in 3,000 ha in Bekasi district, 3,000 ha in Karawang district and 4,000 ha in Bandung district. A total of 20,000 farmers will benefit from this sub-project. A total of 20,000 farmers will benefit from this component.

[1] JWRMP Study, 1998.

47. The overall savings in water requirement from this sub-project is 63 million m^3/year valued at Rp15.75 billion (at Rp250/m^3 or the same rate as charged for raw water) or $1.70 million per year. This is equivalent to $170/ha/year as compared to the implementation cost of $417/ha. This savings in water is not included as a project benefit for the SRI component as this benefit is included in the raw water sold for DMI uses. However it is important to note that the water savings benefits from adopting SRI is sufficient to justify its adoption even if there is no significant increase in crop yield. The estimated cost of this component is $4.17 million or $417 per ha.

(vi) Support for Community and NGO-driven Initiatives for Improved Water and Catchment Management

48. The main objective of this component is to improve public health and reduce waterborne diseases in rural riparian communities in the upper catchments and along the WRC. This improvement will be brought about by providing these communities with the opportunity to install potable water supply and hygienic sanitation facilities. At the same time, the capacity of participating communities will be enhanced to a level that enables effective development and implementation of village action plan. The estimated cost of this component is $5.64 million.

(vii) Development and Implementation of a Basin Water Quality Improvement Strategy and Action Plan

49. Under this component, the basin will be divided into several water quality management areas; each with its specific nature and problem. The control strategies and water quality parameters monitored for each area would be dictated by the characteristics of the area and the dominant source. In each area, stakeholders will effectively participate in drawing up and implementing solutions.

50. In area with high industrial industries (such as Bandung and Bekasi), an area action plan will be drawn up to deal with pollution problems at the source. Such plans would be oriented around combination of strategies that involve expansion of cooperation schemes under PROKASIH PROPER, strengthening of regulatory (command-and-control) systems, and use of incentives.

51. The environmental impact of this component, although indirect, is highly significant and long lasting. A number of mitigation measures will be implemented to reduce the pollution and silt load in the river system. This will lead to improvement in the quality of river water and reduce the cost of water treatment. Public toilets located in the canals will be relocated with the human waste treated in septic tanks. The estimated cost of this component is $6.42 million.

(viii) Productive Reforestation of Degraded Catchment

52. The Project will take advantage of opportunities to expand design to generate complementary environmental benefits, i.e., rehabilitating degraded land and promoting biodiversity. Along this line, “re-greening” of watersheds will be planned so as to provide the best long-term possibility to protect the water resource quality and quantity and at the same time helping restore other landscape ecological functions. This is based on the premise that the most effective watershed rehabilitation strategies are those that re-establish basic ecosystem processes.

53. This component aims to reduce threats to protected areas in the Citarum River Basin and their surrounding landscape by engaging nearby villages in both improved conservation practice and land stewardship. It will encourage community based reforestation of degraded public lands throughout the Citarum River Basin, including government degraded lands, especially on steep mountain slopes, riparian, road and watershed boundary zones, spring catchments and by 'enrichment' of village gardens and other village lands. It will improve land stewardship through both implementation of village conservation action plans and through community education programs targeted at villages and schools.

54. Reforestation and other land conservation measures by model conservation villagers of Perum Perhutani degraded lands around PAs and throughout the CRB, will assist abate serious upland erosion and reduce sediment loads in streams that are ultimately carried to the water reservoirs that provide 80% of the water requirements of Jakarta. The expected life of these reservoirs will be extended and water quality improved, benefiting aquatic fauna. It will also, when combined with the 'enrichment of village gardens with a greater variety of perennial plants.

55. A total of 36,000 farmers will be assisted to plant fruit trees and other economic crops in their riverine areas to reduce soil erosion and to restore the fertility and productivity of their farm land. The loss in agricultural productivity caused by soil erosion has been estimated at 4 to 7% per year[1]. The estimated cost of this component is $8.04 million.

(ix) Project Area Management (Biodiversity) Phase 1

56. This component will conserve the unique internationally important biological diversity found in the Citarum River Basin remnant patches of the West Java Montane Forest type. It will establish protocols and models of best conservation management design and practice in an Indonesian Model National Park and a variety of other protected area types, and leverage these practices to other Indonesian protected areas. This component will also promote alternative funding mechanisms for biodiversity conservation management in the Citarum River Basin upper watersheds.

57. Sustainable financing mechanisms through payments for environmental services (PES) schemes will be developed to sustain biodiversity conservation and sustainable land management. PES is appropriate in the CRB considering the strong upstream-downstream linkages. The success of PES will have impact on protection of upland watershed functions, including benefits for biodiversity.

58. Seven model villages will be assisted to implement action plan to promote the regeneration of their flora and fauna. A total of 1,000 farmers will participate in this component. The estimated cost of this component is $4.10 million (Table 11).

(x) Program Preparation for Tranche 2

59. This component will fund several feasibility studies and planning for implementation of Tranche 2. The estimated cost of this component is $1.04 million.

[1] ADB, 1996. Economic Evaluation of Environmental Impact, page 238.

G. Total Project Cost and Financing Plan

60. The estimated total investment cost for Tranche 1, including contingencies and IDC for the Project is $97.31 million. The total base cost is estimated at $78.04 million while the total base cost with contingencies is $93.25 million (Table 4).

Table 4: Cost Estimates and Financing Plan for Tranche 1 (million)

Project Components	Total	Expenditure by Financier			
	Million $	ADB -TA	GEF	ADB - Loan	GOI
1. Program Management	2.57				2.57
2. Institutional Strengthening for IWRM	2.40	2.40			
3. Water Supply Options for Bandung /a	4.81			3.08	1.73
4. Rehabilitation of West Tarum Canal	42.93			27.48	15.46
5. Roll Out of System Rice Intensification /b	4.17			2.67	1.50
6. \Improved Water and Catchment Management /c	5.64			3.61	2.03
7.Basin Water Quality Improvement Strategy /d	6.42			4.11	2.31
8. Productive Reforestation of Degraded Catchment	4.04		4.04		
9. Project Area Management Biodiversity Phase 1	4.02		4.02		
10. Program Preparation for Tranche 2	1.04	1.04			
Total Base Cost	**78.04**	**3.44**	**8.06**	**40.94**	**25.60**
Physical Contingencies	3.90			3.90	
Price Contingencies	11.31			11.31	
Total Base Cost and Contingencies	**93.25**	**3.44**	**8.06**	**56.15**	**25.60**
Interest During Implementation	2.87			2.87	
Commitment Charges	1.19			1.19	
Total Project Cost	**97.31**	**3.44**	**8.06**	**60.22**	**25.60**
% of Total Project Cost	**100%**	**4%**	**8%**	**62%**	**26%**
ADB and GOI Share of non-grant project cost	**100%**			**70%**	**30%**

Full name of components

a. Water Supply Options and Improved Ground Water Management for Bandung

b. Roll Out of System Rice Intensification in Three Districts

c. Support for Community and NGO Driven Initiative for Improved Water and Catchment Management

d. Development and Implementation of a Basin Water Quality Improvement Strategy and Action Plan

61. It is estimated that ADB loan will be $60.22 million or 70% of the non-grant project cost while the GOI will provide $25.60 (30%). The proposed financing arrangements at this stage are very tentative and variable and will be firmed up at Appraisal.

62. The total project base cost is $73.19 million and the total cost with contingencies is $86.31 million. Canal rehabilitation is the largest component representing 55% of the base cost.

H. Income With and Without Project[1]

63. The total of 46,000 paddy farmers, each with an average holding of 0.5 ha, will benefit from this Project. Some 26,000 farmers will benefit from having irrigation facilities which will enable them to plant paddy in their existing holding instead of their current practice of cultivating dryland crop. Another 20,000 farmers will benefit from the SRI program which will raise their paddy yield from the existing level of 5.5 tons to 8.0 tons/ha.

64. **System of Rice Intensification.** Currently, the average farm family with 0.5 ha of paddy land (cropped twice yearly) earn an income of Rp7.8 million/year from sale of his paddy crop, Rp0.5 million from sale of other farm produce and receives Rp1.0 million from off-farm work for a total gross income of Rp9.3 million (Table 5). Deducting Rp2.0 million for farm expenses, his yearly net income is Rp7.3 million or Rp1.8 million per capita or 20% above the poverty income level[2] per family. The landless laborer who forms 25% of the farm population currently earns only Rp4.0 million or 33% below the poverty line income. The average per capita income for the farming community is Rp1.6 million or 7% above the poverty line.

65. With Project, the farmer annual net income will be raised to Rp10.1 million with 80% of this income derived from his paddy crop. This income is 40% above the poverty line income assuming that the poverty line income is raised by 20 percent above the existing level. Similarly, the landless laborer income, with additional work from the SRI paddy cultivation will be raised to Rp5.5 million or 25% below the poverty level.

66. With project, the paddy farmer and the community net income will be raised by 38% with the poverty incidence reduced from the current level of 20% to less than 10%.

67. **New Irrigated Areas.** Currently, the average farm family earn an income of Rp5.6 million/year from sale of his dryland crop such as corn, Rp0.5 million from sale of other farm produce and receives Rp1.0 million from off-farm work for a total gross income of Rp7.1 million (Table 6). Deducting Rp1.5 million for farm expenses, his yearly net income is Rp5.6 million or Rp1.4 million per capita or 7% below the poverty income level per family. The landless laborer who forms 25% of the farm population currently earns only Rp4.0 million or 33% below the poverty line income. The average per capita income for the farming community is Rp1.3million or 13% below the poverty line.

68. With Project, the farmer annual net income will be raised to Rp7.8 and this income will place just marginally (4%) above the poverty line income. Similarly, the landless laborer income, with additional work from the paddy cultivation will be raised to Rp5.5 million or 25% below the poverty level.

69. With project, the paddy farmer and the community net income will be raised by 38% with the poverty incidence reduced from the current level of 25% to less than 15%.

I. Financial and Economic Analysis

(i) Benefits Considered in Economic Analysis

70. The main quantifiable benefits are those arising from: (i) the additional 19.6 m^3/sec of water for Jakarta, Curug and Bekasi: and (ii) the additional 4.5 m^3/sec of water for paddy cultivation.

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[1] Preliminary figures which will be updated after the results of the socio-economic survey are completed.

[2] The national poverty line income in 2006 is Rp1.5 million per capita per year or Rp6.0 million ($645) per year for a family of 4.0 members (Source: Badan Pusat Statistik. 2003, figures adjusted to 2006 prices).

71. **Additional Water for Domestic, Municipality and Industrial Use (DMI).** Some 10m^3/sec of water will be available to meet the domestic need of some 4.5 million additional residents[1] of Jakarta and Bekasi. Currently piped water is priced at a range of Rp800 to Rp10,000 per m^3: the lower rate for low income areas, and the highest rate for high rise buildings with an average water charge of Rp5,923/m^3 or Rp5.9/litre. Many of the middle and high income families rely on bottle water which priced at about Rp1,000 to Rp2,000/lite. The poor are not able to purchase bottle water and must rely mainly on piped water, canal or groundwater for their daily need.

72. The rest of the additional water (9.6m^3/sec) will be used mainly to meet the needs of the industrial sector. Water is an essential input for virtually all industries; in particular the textile, food and service sectors. Without the additional water, growth of these industries will be severely curtailed.

73. The financial price of raw water sold to PDAM Jaya and other users is Rp87/m^3. Raw water charges are currently heavily under-priced at less than 35% of its O&M cost. For the financial and economic analysis, the average water tariff used is the proposed rate of Rp250/m^3.

[1] Assuming a water requirement of 200 litres/person/day.

Table 5 : Farmers Income With and Without Project - Rp
System Rice Intensification Project
Farmers

Items	Land Owner 75%	Labor 25%	Total 100%
Without Project - 2007			
Income			
1. Farm Income			
Paddy 5.5 ton at Rp1.42 million/ton	7,810,000		5,857,500
Other Farm Income	500,000		375,000
2. Off-farm Income	1,000,000	1,000,000	1,000,000
Labor at Rp25,000/day *120 days		3,000,000	750,000
Gross Income	9,310,000	4,000,000	7,982,500
Farm Expenses	2,000,000		1,500,000
Net Income	7,310,000	4,000,000	6,482,500
Number family members	4.00	4.00	4.00
Per capita income	1,827,500	1,000,000	1,620,625
With Project - 2015			
1. Farm Income			
Paddy 8.0 ton at Rp1.42 million/ton	11,360,000		8,520,000
Other Farm Income	700,000		525,000
2. Off-farm Income	1,500,000	1,500,000	1,500,000
Labor at Rp25,000/day *160 days		4,000,000	1,000,000
Gross Income	13,560,000	5,500,000	11,545,000
Farm Expenses	3,500,000		2,625,000
Net Income	10,060,000	5,500,000	8,920,000
Number family members	4.00	4.00	4.00
Net Income/capita	2,515,000	1,375,000	2,230,000
% Increase With Project			
Gross Income	146	138	145
Net Income	138	138	138
Net Income/capita	138	138	138

Table 6 : Farmers Income With and Without Project - Rp
Paddy Double Cropping Project
Farmers

Items	Land Owner 80%	Labor 20%	Total 100%
Without Project - 2007			
Income			
1. Farm Income			
Perwija crop - 5 ton corn at Rp1.115 million/ton	5,575,000		4,181,250
Other Farm Income	500,000		375,000
2. Off-farm Income	1,000,000	1,000,000	1,000,000
Labor at Rp25,000/day *120 days		3,000,000	750,000
Gross Income	7,075,000	4,000,000	6,306,250
Farm Expenses	1,500,000		1,125,000
Net Income	5,575,000	4,000,000	5,181,250
Number family members	4.00	4.00	4.00
Per capita income	1,393,750	1,000,000	1,295,313
With Project - 2015			
1. Farm Income			
Paddy 5.5 ton at Rp1.42 million/ton	7,810,000		5,857,500
Other Farm Income	700,000		525,000
2. Off-farm Income	1,500,000	1,500,000	1,500,000
Labor at Rp25,000/day *160 days		4,000,000	1,000,000
Gross Income	10,010,000	5,500,000	8,882,500
Farm Expenses	2,500,000		1,875,000
Net Income	7,510,000	5,500,000	7,007,500
Number family members	4.00	4.00	4.00
Per capita income	1,877,500	1,375,000	1,751,875
% Increase With Project			
Gross Income	141	138	141
Net Income	135	138	135
Net Income/capita	135	138	135

74. **Water for Additional Paddy Cultivation**. The rehabilitation of WTC will provide sufficient water to cultivate 117,600 ha of paddy as compared with 91,800 ha in the without project situation. This will increase paddy cropping intensity from 1.53 to 1.93. The Project will increase the annual paddy cropped area by 25,800 ha by 2025. A total of 25,800 farmers, each cultivating (2 crops per year) an average of 0.5 ha of paddy land will benefit from this increase in crop area.

(ii) Economic Analysis

75. Based on the above, the project wide FIRR and EIRR calculations have taken into account the incremental benefits and costs in an aggregated cash flow, built up in line with physical achievements by year and the phasing of benefits. The project financial internal rate of return (FIRR) and economic internal rate of return (EIRR) was estimated at 16.3% and 19.3% respectively.

76. The FIRR and EIRR sensitivities were examined for: (i) changes in project cost (10% higher), (ii) revenue (10% lower), and (iii) a combination of (i) and (ii). (Table 7). The results of this analysis show that the project is still viable under these all these unfavourable situations.

Table 7. Project EIRR, FIRR and Sensitivity Analysis

Item	Project	
	FIRR(%)	EIRR(%)
Base Case	16.3	19.3
Capital Cost + 10 %	15.0	17.7
Benefit – 10%	14.6	17.5
Capital Cost +10%	13.4	15.9

(iii) Switching Valve

77. The switching values of the main project variables are shown in Table 8. This indicates that the project will remain economically viable at an EIRR of 12.0% even if one of these important variable are changed by: (i) project cost raised by 58%; (ii) incremental benefits reduced by 37%; (iii) proposed water tariff rate reduced by 68%; and (iv) reduction in proposed increased in paddy cropped area by 80%.

Table 8. Switching Value

Item	FIRR	EIRR
Increase in Project Cost	37.0	58.0
Shortfall in Incremental Benefits	24.0	37.0
% Reduction in Water Tariff	42.0	68.0
% Reduction in Cropped Area	60.0	80.0

Note : Switching Value for IRR = 12%

(iv) Weighted Average Cost of Capital

76. The nominal weighted average cost of capital (WACC) is 6.0% which is considerably lower than the project FIRR of 19.3 percent (Table 9).

Table 9: Weighted Cost of Capital

	Project
A. Share of debt (%)	70.00
B. Share of ADB's loan in debt (%)	60.00
C. Interest rate of ADB loan (%)	6.00
D. Share of domestic bank in debt (%)	10.00
E. Interest rate of domestic bank loan (%)	16.00
F. Cost of equity (%)	12.00
G. Inflation rate (%)	6.00
F. Average interest rate of debt (%) (B*C+D*E)	5.20
G. Norminal WACC (%)	6.04
H. Real WACC (%)	0.04

77. Table 10 and 11 show the detailed cost for FIRR and EIRR analysis for Tranche 1.

J. Multitranche Financing Facility Program

78. The estimated total investment cost for MFF, including contingencies and IDC for the Project is $830.13 million (Table 12).

Table 12: Cost Estimates and Financing Plan for MFF (million)

Tranche	Total	Expenditure by Financier			
	Million $	ADB -TA	Co-financier	ADB - Loan	GOI
A. Tranche 1 - 2007 to 2011	**97.31**	**3.44**	**8.06**	**60.22**	**25.60**
B. Tranche 2 - 2009 to 2015					
1. Upgrading Water Source for Bandung	190.00		10.00	66.24	113.76
2. System Service Improvement - East Tarum Canal	61.53			24.69	36.84
3. Roll Out of Rice Intensification - Phase 2	5.00			2.01	2.99
4. Other Components	19.10	4.00	5.00	10.10	
5. Contingencies	68.91			68.91	
6. IDC and Commitment Charges	27.56			27.56	
Sub-Total	**372.10**	**4.00**	**15.00**	**199.51**	**153.59**
C. Tranche 3 - 2013 to 2017					
1. System Service Inprovement - North Tarum Canal	55.60			22.31	33.29
2. Upgrading of Water Source for Irrigation (Upper Cipunegara)	60.00		10.00	50.00	
3. Curug Run of the River Power Plant	6.00			2.41	3.59
4. Other Components	15.50	4.00	5.00	6.50	
5. Contingencies	34.28			34.28	
6. IDC and Commitment Charges	13.71			13.71	
Sub-Total	**185.09**	**4.00**	**15.00**	**129.20**	**36.88**
D. Tranche 4 - 2017 TO 2021					
1. Rising of Cirata Dam	20.10			8.07	12.03
2. Cisankuy Irrigation Improvement	56.00		5.00	17.47	33.53
3. Bulk Water Supply Options for Bekasi and Karawang	50.00		10.00	40.00	
4. Other Components - Tranche 4	4.00	4.00			
5. Contingencies	32.53			32.53	
6. IDC and Commitment Charges	13.01			13.01	
Sub-Total	**175.64**	**4.00**	**15.00**	**111.07**	**45.56**
Total Project Cost	**830.13**	**15.44**	**53.06**	**500.00**	**261.64**
% of Total Project Cost	**100%**	**2%**	**6%**	**60%**	**32%**
ADB and GOI Share	**100%**			**66%**	**34%**

79. It is estimated that ADB loan will be $500 million (or 60% of the project cost), ADB TA $15 million (2%), other co-financier contribution $53 million (6%) and GOI $262 million (32%).The proposed financing arrangements at this stage are very tentative and variable and will be firmed up at Appraisal.

1. Economic Analysis for MFF

80. The project FIRR and EIRR calculations have taken into account the incremental benefits and costs in an aggregated cash flow, built up in line with physical achievements by year and the phasing of benefits. The project FIRR and EIRR was estimated at 12.3% and 17.0% respectively. This FIRR and EIRR are indicative figures and will be confirmed after the feasibility studies identify the actual project cost and benefits. This analysis did not consider the cost and benefit of the SRI component

Table 10: Financial Cost and Benefits of Tranche 1 Project – Rp Million

Year	Program Mag'ment	Inst Strength	Water Option	WTC	Com/NGO Initiative	Water Quality	Degrated Land	Biodiversity	Tranche 2	Total Cost	Total Benefit	Net Benefit
2,007	6,065	2,325	0	16,042	2,418	3,786	1,412	0	0	32,048	0	-32,048
2,008	4,281	10,323	23,831	21,828	5,175	23,020	20,650	18,917	4,849	132,874	0	-132,874
2,009	4,807	4,929	18,637	131,291	6,419	7,063	45,780	10,583	4,789	234,298	0	-234,298
2,010	4,807	2,604	2,297	165,662	21,589	12,206	6,900	8,688	0	224,753	68,872	-155,881
2,011	3,906	2,139	0	89,226	16,830	13,645	0	0	0	125,746	83,658	-42,088
2,012				19,964						19,964	98,444	78,480
2,013				19,964						19,964	113,230	93,266
2,014				19,964						19,964	128,016	108,052
2,015				19,964						19,964	142,802	122,838
2,016				19,964						19,964	153,065	133,102
2,017				19,964						19,964	163,328	143,365
2,018				19,964						19,964	173,592	153,628
2,019				19,964						19,964	183,855	163,891
2,020				19,964						19,964	194,118	174,154
2,021				19,964						19,964	204,381	184,418
2,022				19,964						19,964	214,644	194,681
2,023				19,964						19,964	224,908	204,944
2,024				19,964						19,964	235,171	215,207
2,025				19,964						19,964	245,434	225,470
2,026				19,964						19,964	245,434	225,470
2,027				19,964						19,964	245,434	225,470
2,028				19,964						19,964	245,434	225,470
2,029				19,964						19,964	245,434	225,470
2,030				19,964						19,964	245,434	225,470
2,031				19,964						19,964	220,144	200,180

FIRR	**16.28**	**%**
NPV	**197,933**	**million**

1. Program Management
2. Institutional Strengthening for IWRM
3. Water Supply Options and Improved Ground Water Management for Bandung
4. Rehabilitation of West Tarum Canal

6. Support for Community and NGO Driven Initiative for Improved Water and Catchment Management
7. Development and Implementation of a Basin Water Quality Improvement Strategy and Action Plan
8. Productive Reforestation of Degraded Catchment
9. Project Area Management Biodiversity Phase 1
10. Program Preparation for Tranche 2

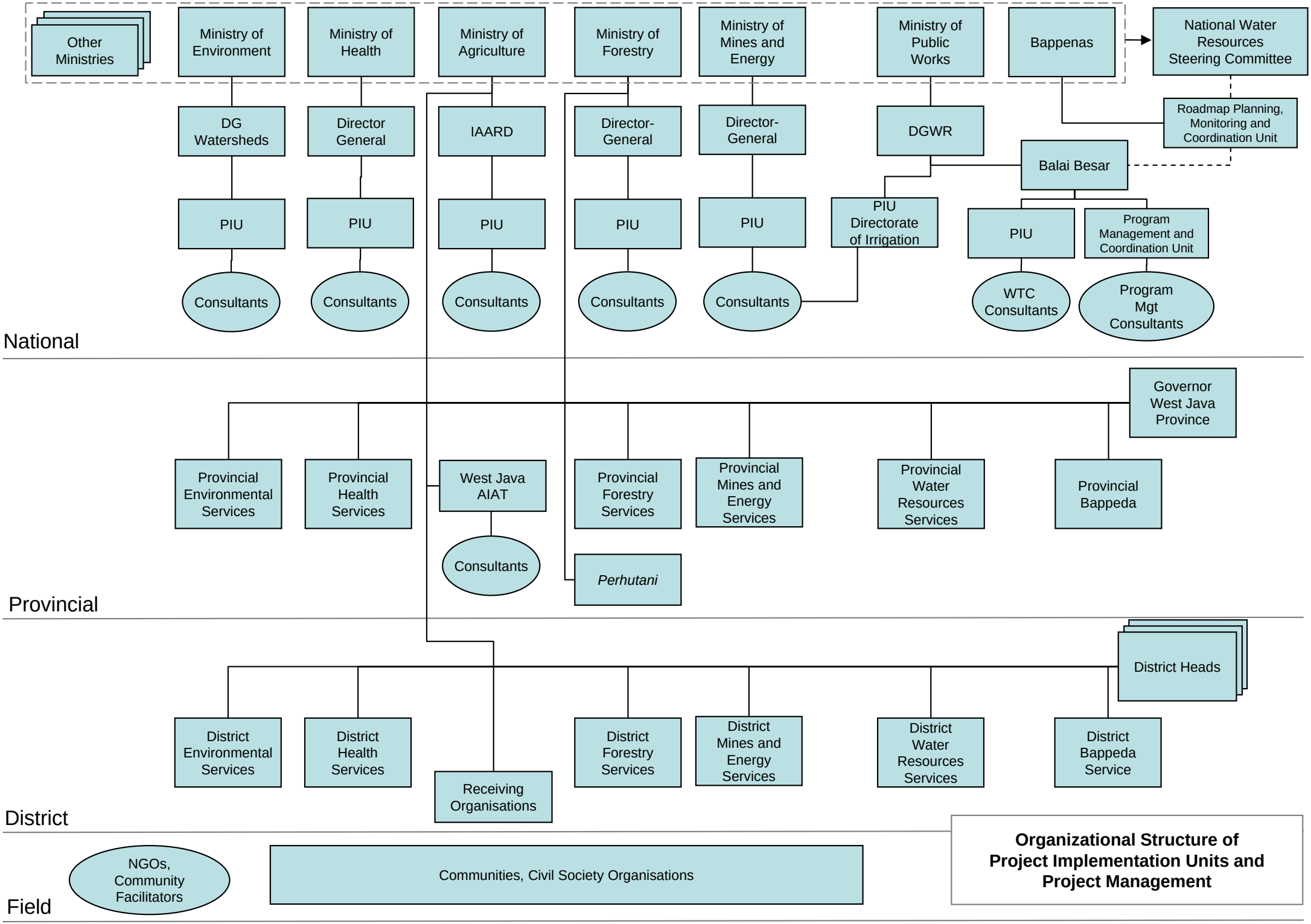
Table 11: Economic Cost and Benefits of Tranche 1 Project – Rp Million

Year	Program Mag'ment	Inst Strength	Water Option	WTC	Com/NGO Initiative	Water Quality	Degrated Land	Biodiversity	Tranche 2	Total Cost	Total Benefit	Net Benefit
2,007	5,459	2,093	0	14,438	2,176	3,407	1,271	0	0	28,843	0	-28,843
2,008	3,853	9,291	21,448	19,645	4,658	20,718	18,585	17,025	4,364	119,587	0	-119,587
2,009	4,326	4,436	16,773	118,162	5,777	6,357	41,202	9,525	4,310	210,868	0	-210,868
2,010	4,326	2,344	2,067	149,096	19,430	10,985	6,210	7,819	0	202,278	74,356	-127,922
2,011	3,515	1,925	0	80,304	15,147	12,281	0	0	0	113,172	90,423	-22,749
2,012				17,967						17,967	106,489	88,522
2,013				19,964						19,964	122,556	102,592
2,014				19,964						19,964	138,622	118,658
2,015				19,964						19,964	154,689	134,725
2,016				19,964						19,964	165,411	145,447
2,017				19,964						19,964	176,133	156,170
2,018				19,964						19,964	186,856	166,892
2,019				19,964						19,964	197,578	177,615
2,020				19,964						19,964	208,301	188,337
2,021				19,964						19,964	219,023	199,059
2,022				19,964						19,964	229,745	209,782
2,023				19,964						19,964	240,468	220,504
2,024				19,964						19,964	251,190	231,227
2,025				19,964						19,964	261,913	241,949
2,026				19,964						19,964	261,913	241,949
2,027				19,964						19,964	261,913	241,949
2,028				19,964						19,964	261,913	241,949

2,029			19,964		19,964	261,913	241,949
2,030			19,964		19,964	261,913	241,949
2,031			19,964		19,964	232,031	212,067

FIRR	**19.18**	**%**
NPV	**310,786**	**million**

Annex 9 Proposed Implementation Arrangements – Tranche 1


Other Ministries
Ministry of Environment
Ministry of Health
Ministry of Agriculture
Ministry of Forestry
Ministry of Mines and Energy
Ministry of Public Works
Bappenas
National Water Resources Steering Committee
Roadmap Planning, Monitoring and Coordination Unit
DG Watersheds
Director General
IAARD
Director-General
Director-General
DGWR
Balai Besar
PIU
PIU
PIU
PIU
PIU
PIU Directorate of Irrigation
PIU
Program Management and Coordination Unit
Consultants
Consultants
Consultants
Consultants
Consultants
WTC Consultants
Program Mgt Consultants
National
Governor West Java Province
Provincial Environmental Services
Provincial Health Services
West Java AIAT
Provincial Forestry Services
Provincial Mines and Energy Services
Provincial Water Resources Services
Provincial Bappeda
Consultants
Perhutani
Provincial
District Heads
District Environmental Services
District Health Services
Receiving Organisations
District Forestry Services
District Mines and Energy Services
District Water Resources Services
District Bappeda Service
District
NGOs, Community Facilitators
Communities, Civil Society Organisations
Field
Organizational Structure of Project Implementation Units and Project Management

Annex 9 Project Profiles – Tranche 1

Integrated Citarum Water Resource Management Project

Component Name	**Program Management**				
Project Area	Citarum River Basin				
Duration	54 months	**Part of MFF**	**Yes**	**Tranche**	**All**
Key Areas Addressed	Program management, liaison and coordination				
Estimated Cost	USD 2.5 million				
Implementing Agency	Balai Besar				

RATIONALE

The Integrated Citarum Water Resource Management Project is a 15 year, multi-sectoral project with a total cost of around $1 billion, planned to be used in four tranches. The project consists of a large number of component projects in different sectors, but there are many inter-relationships among them. This means that strong coordination among the projects is required, along with effective monitoring and reporting mechanisms to allow GOI and ADB to ensure that the funds are being disbursed in accordance with the plans and in a timely way. In addition, information exchange among the component projects will improve performance overall, and minimise wasted effort caused by overlaps.

The inherent flexibility in the MFF modality adds additional complexity to the ICWRMP. After Tranche 1, the indicative project plans initially approved may be modified to some extent in the light of changing circumstances and needs.

Also, the stakeholders of this project are many and varied, from both the public and private sector, and there is an emphasis on community-driven activities to ensure that interventions lead to outcomes that deliver community needs. Meaningful liaison with these stakeholders will be essential for project success. In addition, a mechanism for ensuring that approved recommendations of the Project Steering Committee are implemented within the component projects is required.

An effective management group needs to be formed to undertake these broad program management tasks. This is to consist of a small consulting team of international and national consultants, together with relevant technical staff seconded from the implementing agencies. A contract will initially be let for the program management for Tranche 1 only.

OBJECTIVE

The key objective of program management is the effective implementation of Tranche 1 of the MFF.

COMPONENTS

- Monitoring and reporting of project performance, including financial management
- Liaison with executing agencies and other relevant stakeholders
- Coordination among component projects
- Identification of the need for and coordination of implementation of minor studies (up to $400,000 total) to improve knowledge of water issues in CRB
- Capacity building for NGOs involved in the component projects of Tranche 1
- Coordination of preparation for Tranche 2

Integrated Citarum Water Resource Management Project

Component Name	**West Tarum Canal Rehabilitation Project**
Project Area	West Java - Kabupaten Karawang and Bekasi
Duration	54 months **Part of MFF** **Yes** **Tranche** **1**
Key Areas Addressed	Irrigation & DMI demand, O&M, water quality, institutional, environmental, resettlement
Estimated Cost	USD 40.372 million
Implementing Agency	Balai Besar (under Ministry of Public Works)

RATIONALE

Deforestation, urbanisation and industrial development in (i) the catchment area of the Cikao (Purwakarta), a tributary that enters the Citarum just upstream of West Tarum Canal (WTC) intake at Curug weir; and (ii) the catchments of rivers intercepted by the WTC, being the Cibeet, Cikarang and Kali Bekasi have caused an increase of the erosion rate, occurrence of flash floods, and uncontrolled discharge of untreated waste water and garbage, resulting in deterioration of the water quality in the WTC and its feeding rivers.

Urbanisation and industrial development in the region along the WTC, particularly between Cikarang and Jakarta, dumping of waste, construction of make-shift toilets in the canal and the drains discharging in the tail end of the WTC are sources of a further decrease of the water quality

Lack of operational and maintenance staff, adequate maintenance equipment and materials and the limited financial resources of PJT-II, have caused excessive sedimentation in certain canal reaches; malfunctioning of control and measuring gates in cross regulators and irrigation offtakes; and damaged trash racks and other hydro-mechanical equipment. This has resulted in a reduced conveyance capacity in some canal sections and difficulties in a proper operation of the water regulating and measuring structures.

In order to overcome, or at least reduce, the above shortcomings to a manageable level, it is necessary to implement the recommendations for improvement of institutional settings, rehabilitation works of canal and related structures, installation of hydro-mechanical and procurement of maintenance equipment, resulting from the West Tarum Canal Rehabilitation Project.

OBJECTIVES

The general objective is:

Design and implementation of all civil works, hydro-mechanical equipment, pollution prevention measures, institutional and financial settings to improve the water quality of the WTC and to establish a reliable and sustainable conveyance and supply system that can meet the water quality standards and the water demand for irrigation and domestic, municipal and industrial purposes (DMI) up to 2025.

COMPONENTS

A. Project Management

B. Consulting Services DED comprising a.o. :
- Feasibility study Cikarang and Cibeet bypass.
- Detailed design canal and related structures.
- Topo surveys and geotechnical investigations.
- Hydrometric and sediment sampling program.
- Hydrological study Cibeet, Cikarang & Bekasi.
- Satellite image interpretation for irrigation areas.
- Preparation of peak water demand model.
- Preparation of hydraulic canal model.
- Detailed design of siphons & separation walls.
- Improve canal operation and maintenance.
- Refurbishment of hydro-mechanical equipment.
- Prepare cost estimate and tender documents.
- Pollution control and public awareness.
- Study Institutional and legal framework of PJT-II.
- Analyse financial and revenue base of PJT-II.

C. Construction of Civil Works of WTC and CFC
- Canal excavation and dredging.
- Fill and slope stabilisation.
- Construction of siphons and partition walls.
- Bridges, maintenance road, drains, etc.
- Rehabilitation of canal structures.

D. Installation of hydro-mechanical equipment
- Refurbishment of eight (8) hydraulic pumps.
- Installation of control and measuring gates.
- Procurement and installation of trash racks.
- Replacement of spillway gates of Cibeet weir.

E. Workshops and Training of canal O&M

F. Resettlement of affected persons

Integrated Citarum Water Resource Management Project

Project Name	**Roll-Out of System Rice Intensification in Three Districts**
Project Area	West Java - Kabupaten Karawang and Bekasi
Duration	54 months **Part of MFF** **Yes** **Tranche** **1**
Key Areas Addressed	Reduce demand for water for rice irrigation, Increase availability of water for DMI
Estimated Cost	USD 4.17 million
Executing Agencies	Ministry of Agriculture

RATIONALE

Currently, the annual irrigation water supplied to 57,000 ha of rice fields in WTC is about 1.57 billion m^3 or 27,600 m^3/ha. The water used for irrigation is estimated at 6,000 m^3/ha for the main season and 12,000 m^3/ha for the off-season giving a total of 18,000 m^3/ha/year. The irrigation efficiency is only 65%.

The adoption of the SMI will result in reducing the water requirement from 18,000 m^3/ha/year at present to 11,700 m^3/ha/year; a savings of 45%.

The overall savings in water requirement from this sub-project is 63 million m^3/year valued at Rp7.69 billion or $826,450.

The SMI program will benefit from the infrastructure improvements planned under this Project. These improvements will increase the reliability and sustainability of the irrigation water conveyance. However, there need to be more careful attention to gate operation to maintain the desirable wet conditions in the plot.

The main features of the SMI are: (i) selecting only strong seeds and planting them in plastic trays; (ii) transplanting seedlings to field after 8 to 15 days; (iii) planting seedlings at 30cm spatial intervals; (iv) providing a ditch at the perimeter of plot to drain excess water; (v) reducing the amount of water use to only wet the soil to a depth of 2 cm; (vi) increasing the use of organic fertilizer (in conjunction with reduced levels of chemical fertilizer) to improve the soil structure; (vii) reducing the use of chemicals; (viii) weeding by compacting the soil 4 times per crop; and (ix) providing intermittent water supply.

This system leads to a 50 to 100% increase in rice yield due to: (i) increased activity of aerobic and anaerobic bacteria aiding vigorous plant growth; (ii) increased tillering; (iii) reducing damage caused by storm, pest and diseases; and (iv) reducing the competition among seedlings for plant nutrients.

OBJECTIVES

The objective is to accelerate the adoption of System of Rice Intensification (SMI) in the Project Area. Some 10,000 ha of paddy land will be targeted under this project.

The main impact of this sub-project are:

(i) Increase rice yield by 63%.

(ii) Reduce the need for irrigation water by 45%.

(iii) Increase income of rice farmers by 95%.

(iv) Increase labour use by 30%.

Sub-project will be implemented in 5,0000 ha in Bekasi district and 5,000 ha in Karawang district. A total of 20,000 farmers will benefit from this sub-project.

COMPONENTS

A. Project Management comprising 5 field visits per year.

B. Participatory Rural Appraisal for 3 districts and 16 sub-districts.

C. Training of Trainers for 800 farm leaders.

D. Training of Farmers for 20,000 farmers.

E. Demonstration Plots – 80 plots.

F. Farmer Empowerment – 660 sessions.

G. Production of Organic Fertilizer – distribution of 400 units

H. Decomposer – distribution of 10,000 kits

I. Seed Supply – distribution of 50,000 kg of selected seeds.

J. Monitoring and Evaluation – preparing 27 reports.

Integrated Citarum Water Resource Management Project

Project Name	**Community Rural Water Supply and Sanitation**
Project Area	Riparian rural communities in the upper Citarum catchment and along the West Tarum Canal (WTC)
Duration	36 months **Part of MFF?** Yes **Tranche 1?** Yes
Key Areas Addressed	Community empowerment
Estimated Cost	US$1.64 million
Implementing Agencies	DG Human Settlements, MPW; Ministry of Health (EAs) Provincial/Local Public Works Agencies; Provincial/Local Health Agencies; NGOs, CBOs (IAs)

RATIONALE

From the brief discussions carried out during field visits, rural communities in the upper catchment and along the West Tarum Canal (WTC) seem to have adequate drinking water supplies (from springs and shallow wells respectively), and sanitation facilities, but a comprehensive survey is needed to properly assess the situation. Conditions are poor along the Citarum river south of Bandung city where there is considerable domestic and industrial pollution and most people dispose of waste in traditional ways, including rivers.

Very often in this kind of environment there is a high incidence of waterbone and water-related disease as poor people, and particularly children and women suffer most from using water unfit for human consumption and from poor hygiene practices and behavior.

Any ICWRMP interventions should be community-driven, based on the processes developed under the ongoing WSLIC-II and CWSH projects and SANIMAS (Sanitasi Masyarakyat - community-based sanitation), and using the resources of NGOs and CBOs active in the field.

OBJECTIVE

To improve public health and reduce waterborne diseases in rural riparian communities in the upper catchment and along the WTC, by improvements to water supply and sanitation.

COMPONENTS

1. Identification of potential NGOs who can facilitate participatory village/community development planning focusing on issues of environment, health and livelihoods, community participation in all project cycles.
2. Socialization and awareness-raising about community health, hygiene, sanitation and water supply, access, and quality. and assessment of needs.
3. Selection of communities based on socioeconomic and health criteria and other indicators.
4. Formation of community implementation teams with members drawn from community stakeholders in a transparent, inclusive, and accountable manner.
5. Community problem identification and analysis meetings to determine priority problems and possible solutions, through presentations of water supply and sanitation options (informed choice menu*), investment costs, O&M costs.
6. Provision of skills training based on communities' priorities, assets and needs to generate income and employment opportunities.
7. Provision of access to capital and markets to directly implement skills acquired.
8. Formulation of community action plans and proposals.
9. Disbursement of funds and construction of approved water supply and sanitation schemes, together with supporting socialization and training activities.
10. Operation and maintenance of completed schemes, and socialization and training support on hygiene behavioural change.

Annex 10 TOR for Tranche 1 Priority Components

West Tarum Canal Rehabilitation Project – TOR for Consultants

1. Objective of the Services

Design and implementation of all civil and hydro-mechanical works required to improve the water quality of the WTC and to establish a reliable and sustainable conveyance and supply system that can meet the water quality standards as well as the present and future water demand for irrigation and domestic, municipal and industrial purposes (DMI).

Preparation of detailed design, engineers estimate, prequalification and tender documents for the (i) proposed rehabilitation works for WTC and CFC to convey the future water demands; (ii) stabilisation of the WTC banks in the head reach; (iii) Bekasi siphon to improve the quality of raw water for DMI supply; (iv) closure and diversion of drainage inlets in WTC's tail end reach; (v) WTC protection measures; and based on the results of the feasibility study (vi) Cibeet Feeder Canal siphon and separation wall; (vii) Cikarang siphon and separation wall.

2. Feasibility Components

The feasibility component comprises the following components:

(a) siphon, link canal and separation wall for the WTC-Cikarang crossing; and

(b) separation of CFC and WTC by separation wall and a siphon to BTb23.

3. Design Components

The main design components are:

(a) improvement of the conveyance capacity of the WTC and CFC by excavation and dredging works and stabilization of the banks;

(b) propose and design appropriate measures for improvement of the operation and maintenance of WTC, CFC and sediment traps;

(c) design of the Bekasi siphon and related hydro-mechanical equipment;

(d) design of Cikarang siphon, separation wall and related hydro-mechanical equipment, if feasible;

(e) design of CFC siphon, separation wall and related hydro-mechanical equipment, if feasible;

(f) investigate and propose rehabilitation works for existing canal crossings and design new bridges;

(g) determine condition of the hydraulic pumps in Curug and propose refurbishing works;

(h) inspect hydro-mechanical canal equipment, as gates, trash racks and spillway gates of Cibeet weir and propose the necessary repair or replacement works; and

(i) prepare tender documents, specification and engineer's cost estimate.

4. Scope of Works

4.1 General

The following scope of works has been formulated based on the results of the Integrated Citarum Water Resources Management Project (ICWRMP) and other available information. Details of the feasibility and design work as well as the corresponding activity and work schedule will be finalised in the inception period.

4.2 Inception Phase

The Consultant will study and review the existing reports, data, field investigations, maps, surveys and the institutional and regulatory conditions, which are relevant for the proper implementation of the project. At an early stage in the inception period, details of field investigation such as additional data collection, field surveys, mapping, geotechnical investigation and water quality assessment shall be determined and subcontracts for the anticipated survey and investigation programmes should be prepared

4.3 Feasibility Phase

To avoid that Cibeet and Cikarang water with high sediment loads is intercepted by the WTC, it is

proposed to construct bypasses through means of siphons and partition walls. However, in the present situation the volume of water intercepted from the Cibeet and Cikarang for DMI purposes is considerably less than the volume intercepted from the Bekasi river. Because, the estimated construction cost of the Cibeet Feeder Canal bypass, and especially the Cikarang bypass, are relatively high compared to the cost of the Bekasi siphon, it is required to carry out a feasibility study for each crossing in which the option with siphon should be compared with the present situation and proper maintenance of the sediment trap. Another parameter, which should be investigated are the savings in water treatment cost by the use of "bypass" water or water released through the sediment traps with proper maintenance with the present situation.

Based on the outcome of the feasibility study, prepare the detailed design of the proposed measures for improvement of the water quality as further detailed in the Design Phase.

The scope of works for the feasibility study will comprise:

(a) Water quality WTC and intercepted rivers.

Collect and analyse all available water quality data of the WTC and intercepted rivers (Cibeet, Cikarang and Bekasi), evaluate the existing water quality monitoring program of PJT-II.

(b) Treatment process and treatment cost WTPs along the WTC.

Evaluate the present water treatment process of Buaran treatment plant and other WTPs located next to the WTC and analyse the cost of water treatment and the use of chemicals.

(c) Treatment process and treatment cost WTPs along the WTC.

Evaluate the effect of taking raw water from the WTC after construction of the "bypasses" or introduction of improved operation of the sediment traps, on the water quality, use of chemicals and costs of the treatment process.

(d) Water quality WTC and intercepted rivers.

Advise on application of various chemicals for the pre-treatment and treatment process of the WTP, taking into account the present and improved water quality in the WTC.

(e) Feasibility study.

Carry out an economic and financial feasibility study for each separate bypass and for the option that both bypasses are implemented, taking into account the present and improved water quality of the WTC.

4.4 Design Phase

The scope of works for detailed design of the main rehabilitation and improvement works for the West Tarum Canal and Cibeet Feeder Canal comprise the following components:

(A) Technical Issues

(a) improvement of canal capacity; (b) cleaning and operation of sediment traps; (c) Bekasi siphon; (d) Cikarang siphon and separation wall, if feasible; (e) Cibeet Feeder Canal separation wall and siphon, if feasible; (f) diversion of drainage inlets WTC reach Bekasi-Cawang; (g) stabilisation of canal banks WTC reach Curug-Cibeet and construction of side drains; (h) rehabilitation and construction of canal crossings and bridges; (i) water quality protection measures and public awareness; (j) refurbishment and/or replacement of hydro-mechanical equipment. The following works should be carried out each component:

(1) Undertake design level topographical surveys, geotechnical and soil investigations, hydrometric surveys and sediment sampling.

(2) Carry out detail design based on relevant Indonesian and/or other international standards and prepare the tender drawings;

(3) Prepare the bill of quantities, engineer's cost estimate and a project implementation schedule; and

(4) Prepare prequalification documents and tender documents by packages as approved.

(B) Institutional Issues

The design phase will further include analyses and review of institutional and financial issues of Perum Jasa Tirta II (PJT-II), before 1999 Perum Otorita Jatiluhur (POJ).

The scope of works for the design phase is detailed in the following paragraphs.

Technical Issues

(a) Determine water availability in Bekasi, Cikarang and Cibeet rivers.

Collect, update and analyse hydrologic data of the catchment areas of the Cibeet, Cikarang and Bekasi rivers in order to determine (i) the reliable flows available for irrigation and DMI purposes; and (ii) the supplemental flows from the WTC to the irrigation areas after construction of one or more siphons to bypass flow interception from the 3 (three) rivers.

(b) Determine irrigation areas under command of WTC and CFC.

Determine the present irrigation areas under command of the West Tarum Canal (WTC) and Cibeet Feeder Canal (CFC) by interpretation of aerial photographs and/or satellite images, verified by field investigations. Investigate how much irrigated land served by the WTC system has been taken out of production during the past years and estimate how much more irrigated area is projected or expected to be converted to other forms of land use.

(c) Future DMI demand.

Analyse the present commitments of PJT-II for delivering raw water to (ex) PT Thames PAM Jaya (TPJ), PDAM's along the WTC and secondary canals and the various industrials estates and discuss with the relevant authorities, private companies and private users the location of future offtakes and projected raw water demand.

(d) Review water demand from WTC and CFC.

Review the water demand for present and future irrigation command areas of the WTC & CFC and the raw water demand for domestic, municipal and industrial (DMI) purposes, which is now supplied from the WTC as well as the future demand for the years 2010, 2015, 2020 and 2025. Included in this review should be the existing and proposed agreements for raw water supply between PJT-II and the PDAM's and between PJT-II and other users in the private and industrial sector.

(e) Flushing demand.

Investigate if regularly flushing of the rivers crossing the Bekasi-Cawang reach is still required. If this is the case, consider the possibility to meet this demand by surcharging.

(f) Preparation of a water demand/canal capacity model.

Prepare and run a water demand model in order to determine the required design capacity of the various canal reaches for the present and future water demands in the WTC and CFC. The model shall at least include the following parameters: irrigated area, cropping pattern, golongan system, efficiency, irrigation and DMI demand, location major offtakes, and inflow from crossing rivers, situation with and without interception of water from these rivers.

(g) Hydraulic verification and estimation of seepage losses.

Undertake a hydraulic verification of the WTC and CFC conveyance capacity at critical reaches and measure the canal seepage losses through field investigations and hydrometric surveys.

(h) Preparation of a hydraulic canal model.

Prepare and run a one-dimensional steady state hydraulic model of the WTC and CFC in order to determine hydraulic gradients, effect of variations in water demands on water levels, required capacity of security devices as emergency gates and spillways, offtake and cross regulator levels, energy losses over cross structures, etc.

(i) Canal conveyance capacity.

Analyse if the conveyance capacity of the WTC and CFC is sufficient to meet the present and future water demand and propose measures to improve, restore or increase the capacity by means of surcharging, widening, deepening, lining, sheet piling, etc., if required.

(j) Investigate and improve canal operation and maintenance.

Survey and investigate all cross regulators, irrigation offtakes and other regulating structures and determine the type and operation conditions of these structures. Undertake a study of the canal gate system, propose and design improvements based on ease of operation, discharge measurement and sediment distribution. Measures could include changes to the existing Romeijn gate system or replacement with other types of gates. Examine alternative solutions for system operation simplification and recommend the most suitable one for implementation. The study should also cover PJT-II's operational and maintenance staff, funds and equipment and present recommendations for improvement measures of staff, equipment and required maintenance budget.

(k) Flow measurement.

Investigate how and when canal flows are measured including type and location of measurement structure(s), status of structure, last time calibrated, reliability of Q-h curve and propose measures for improvement, if required, as new calibration, additional measuring structures, measurement by acoustic devices, etc.

(l) Sediment transport.

Carry out a sediment sampling programme in the WTC, CFC, crossing rivers and sediment traps and determine the sediment balance of the WTC system in the cases with and without interception of Cibeet, Cikarang and Bekasi flows.

(m) Operation and maintenance of sediment traps.

Investigate present operation and maintenance of the sediment traps in the WTC and CFC and, if found to be inadequate, propose and design adequate measures for improvement based on the results and conclusions of the sediment sampling programme.

(n) Design of Bekasi siphon.

Investigate the situation of the WTC level crossing with the Bekasi river and prepare the detailed design of siphon and link canal to the WTC with appropriate trash racks, gates, flow measuring devices, outlet gates to the Bekasi for additional supply to the North Bekasi Canal (NBC) and the emergency spillway.

(o) Design of Cibeet and Cikarang crossings.

To avoid that Cibeet and Cikarang water with high sediment loads is intercepted by the WTC, it is proposed to construct bypasses through means of siphons and partition walls. Based on the results of the feasibility study, prepare the required detailed designs for the proposed measures to improve the water quality in the WTC, being siphons, separation walls or improvement of sediment trap maintenance.

(p) Stabilisation of canal banks and side drains.

Investigate the sliding problems of the canal bank in the reach between Curug and Cibeet, propose and design measures to stabilise the canal banks. In some canal reaches, especially the reaches in deep cut, erosion material will flow into the canal during the wet season. Propose and design measures to prevent that runoff and erosion material from roads and slopes in deep cut can enter the canal.

(q) Maintenance road.

Investigate the condition of the maintenance road along the right bank and propose and design road improvement works, if required.

(r) Seepage losses at structures.

Investigate the occurrence and size of canal seepage losses at the major culverts, irrigation offtakes, emergency spillways and other major structures. Propose and design improvement measures, if required.

(s) Drainage inlets into the WTC.

Locate and survey all drainage inlets into the WTC and investigate measures to isolate and divert the drainage flows into natural drains or proposed parallel drains. Especially, measures are required in the section Bekasi-Jakarta and in other sections of the WTC passing through urban areas and which are vulnerable to pollution.

(t) Toll road along Bekasi-Cawang.

Due technical consideration shall be given to the alignment of the proposed Bekasi-Cawang toll road, with respect to implications in design of the rehabilitation works for the section Bekasi-Cawang.

(u) Canal crossings.

Survey and locate all canal crossings as bridges, cross regulators, makeshift bridges and small ferries. Analyse the status of the crossing structures and the degree of obstruction to canal flows. Propose measures and carry out detail design for improvement, rehabilitation, widening, removal or new crossings, as appropriate.

(v) Spoil dump areas and dredging method.

Investigate locations for possible spoil dumps required to receive material from canal excavation and dredging and cleaning of the sediment traps. Investigate and advise on the most suitable dredging methods and equipment, allowing for use of the same or similar equipment during later

maintenance and allowing for constraints in available work space and spoil dump areas. Prepare cost estimate and specifications on dredging works and especially on the method of measurement and payment.

(w) Cikao pollution control.

Review and update the hydrologic data of the Cikao; analyse the river flows and water quality; and identify existing and potential future sources of water pollution and composition of their effluent. Propose measures to either improve the Cikao river water quality by treatment of effluent entering the Cikao both in the short and in the long term or to isolate the Cikao flow from the Citarum through measures as separation of the flow of the Cikao and Citarum during the dry season. Investigate the possibility of introducing a public awareness program concerning river pollution and garbage collection.

(x) Pollution control and public awareness.

Investigate the canal reaches passing through urban and industrial areas that are vulnerable to pollution and propose pollution control measures. These measures could include construction of drains parallel to the WTC, canal fencing and improvement of existing fencing, construction of concrete vehicle barriers on the canal side of all roads with public access, covering of the canal, construction of garbage containers, construction of MCKs, regulatory measures, etc. Investigate the possibility of introducing a public awareness program concerning pollution and use of WTC water, use of MCKs and garbage collection.

(y) Encroachment in the Right of Way (RoW) of WTC.

Survey and record nature and type of encroachment in the RoW of the WTC and the issues related to relocation of squatters and infrastructure in the RoW. Propose measures to relocate people and infrastructure from the WTC RoW area.

(z) Resettlement and compensation, if required.

If resettlement of the squatters living in the RoW is required, address the institutional issues of how preparation and implementation of resettlement will be undertaken, how it will be funded, what skills are required and where that capacity is to be found and develop a Resettlement Action Plan (RAP).

(aa) Capacity of Hydraulic Pumping Station at Curug (CHPS).

Determine the overall capacity of the pumps in the Curug hydraulic pumping station, especially the nine (9) pumps that have recently been refurbished, and check whether the capacity is sufficient to cope with the present and future water demands and the possible additional hydraulic head losses in the WTC. Determine the effect of possible surcharging of the WTC on the pump operation and the effect of the water level downstream of Curug weir on the pump efficiency.

(ab) Hydro-mechanical equipment in WTC.

Investigate the condition of present hydro-mechanical equipment in the WTC system, comprising trash racks, water level control and measuring gates, flushing gates, and propose refurbishment, repair or replacement of the equipment as appropriate. Prepare the design of all hydro-mechanical equipment required for the proposed new siphons.

(ac) Spillway gates Cibeet weir.

Inspect the 3 (three) gates of the Cibeet weir and evaluate the operation conditions of the gates, which were installed more than 50 years ago. Prepare specifications and a cost estimate for repair, rehabilitation or replacement for the gates and appurtenant electro-mechanical equipment, as appropriate.

(ad) Detailed design and cost estimate.

Prepare detailed design, tender drawings, cost estimates and implementation schedules for the proposed WTC rehabilitation and improvement works.

Institutional Issues

(ae) Legal Framework PJT-II.

Study and review the legal framework of PJT-II and suggest changes, if deemed necessary, based on the future role of PJT-II in basin water resources management.

(af) Revenue base of PJT-II.

Review PJT-II's revenue base and suggest, based on cost recovery concept, strengthening PJT-II revenue, also propose an institutional study component for development of PJT-II based on its revised role and responsibility.

(ag) Financial situation of PJT-II.

Study PJT-II's financial situation, especially the revenue side of its finance should be focused on, which shall include (i) rates for bulk raw water supply to (ex) PT Thames PAM Jaya (TPJ) and other private and public customers; (ii) the kWh price of power supplied to PLN and generated at the Jatiluhur dam; and (iii) other revenue sources.

5. Study Requirement

The West Tarum Canal Rehabilitation study is divided into the following three phases: (i) inception phase; (ii) feasibility phase of possible Cibeet and Cikarang bypasses; and (iii) detailed design phase. Detailed design of the selected option for the Cibeet and Cikarang crossing will start after the feasibility phase, while detailed design of the other canal rehabilitation and improvement works will start after the inception phase.

To undertake the WTC Rehabilitation project the Ministry of Public Works will engage the services of a consulting firm or firms through requirement procedures as stipulated in the Government regulation and acceptable to the Bank. It is anticipated that a total of 122 person-months of professional staff will be required comprising 47 person-months of International professional staff and 75 person-months of National professional staff. Further, about 50 person-months of sub-professional staff and technical staff and 60 person-months of supporting staff will be required.

The topographic surveys, geotechnical investigations, hydrometric surveys and sediment sampling programme for the feasibility and design phase will be undertaken through LCB subcontracts, which will be supervised by the Consultants.

5. Surveys and Investigations

In order to obtain reliable field data required for a proper feasibility study and detailed design, it is anticipated that the following surveys and investigations have to be carried out under subcontracts with third parties:

(1) topographic survey programme on detailed design level comprising (i) a strip survey of canals and adjacent terrain, levelling and measurement of cross sections of the WTC, CFC and the sediment traps; (ii) detailed surveys of the site and rivers proposed for implementation of siphons and major structures, and (iii) survey of the land selected for spoil dumps. The results of the programme will at least include cross sections at intervals of 100 m of the WTC and CFC, longitudinal profiles of the canal bottom and each embankment, strip plans of the canals and detailed site maps at scale 1:1,000 of the sites proposed for construction of major structures;

(2) programme for design level geotechnical, foundation and material investigations and laboratory soil testing for the major structures to be implemented under the project. The Consultant shall supervise the field and laboratory works and evaluate the results of the filed investigations and laboratory testing;

(3) hydrometric survey programme to collect hydrometric information about canal roughness coefficients, head losses at cross regulators, trash racks, siphons and intake structures, efficiency of the hydraulic pumping station at Curug and the seepage losses in the WTC. The programme shall further include the required flow measurements for the sediment sampling programme as proposed below; and

(4) programme for integrated sampling of suspended solids in the WTC, CFC, crossing rivers and sediment traps and bed load sampling of the canals, sediment traps and river bed near the intake structures. The suspended load concentration should be determined and the bed load samples should be analysed on grain size distribution and sand-silt percentage.

The Consultant shall prepare the relevant subcontracts for the above topographic surveys, geotechnical investigations and sediment sampling programmes, supervise the relevant field and laboratory work and analyse and comment on the results and findings of the programmes.

6. Resettlement

Resettlement of informal settlers in certain areas along the canal and in the soil dump areas will be required. This will involve compensation for loss of livelihood and amenity, as well as rehabilitation.

(1) Conduct a socio- economic survey and alternative livelihood appraisal of 540 settlers (small shops, temporary trader shelters and those living on sediment spoil dump areas) on inner embankments. Identify willingness of settlers on sloping outer embankments to be relocated. Evaluate socio-economic options for settlers on the WTC embankments,

(2) Identify alternative replacement land. Identify re-training possibilities. Negotiate compensation and

rehabilitation activities for informal settlers and legitimate resident affected by construction. Develop a rehabilitation plan and negotiate compensation and rehabilitation for affected households near Cibeet Syphon, Cikarang & Bekasi Weir. Facilitate compensation payments and undertake rehabilitation program.

(3) Assist broker appropriate tenure leases contracted with informal settlers. Fence and sign post outer boundaries along the course of WTC with limited entry points for current informal settlers. Form a mobile group to monitor and report to authorities further encroachment and disturbances on the WTC embankments.

7. Expertise Requirements

The feasibility and design study will be undertaken by a team of experts comprising International and National professional staff. In general, preference will be given to International professional staff that has work experience in Indonesia or in other Southeast Asian countries. It is expected that the following professional staff and qualifications will be required:

6.1 International Professional Staff

(1) Team Leader/Water Resources Engineer

Should be university graduated civil engineer with about 20 years experience in the field of water resources development and management. He should also have experience in operation and design of irrigation systems, river systems and maintenance of infra-structure projects. He should have preferably worked in Indonesia and/or other Southeast Asian countries in the field of water resources planning, operation and design of major irrigation systems and raw water supply projects. Further, he should have experience in management of a multi-disciplinary team for a minimum period of 10 years and be capable of concise reporting and have a working knowledge of Bahasa Indonesia. His duties will include all duties normally assigned to a team leader such as liaison with the Ministry of Public Works and other Indonesian institutions, liaison with and reporting to his home office, coordination of the feasibility, design and investigation work, overall responsibility for administrative, financial, and technical reporting, progress planning and overall guidance to the professional and supporting staff.

(2) Senior Hydrologist

Should be a university graduate with at least 15 years experience in operational hydrology, collection, storage and interpretation of hydrological and meteorological data using appropriate processing methods and modelling techniques. He should be familiar with the use of computer for data processing, computer basin models as well as advanced computer analysis techniques. Further, he should have experience in water resources assessment, water balance studies and modelling of rainfall-runoff relations. He should have experience in Southeast Asia and preferably in Indonesia in the field of water resources. Hid duties will also include supervision of the proposed hydrometric survey programme.

(3) Senior Geotechnical Engineer

Should be a university graduate with at least 15 years experience in planning of geotechnical investigations, collection and analysis of geotechnical data for design of high embankments, foundations for weirs, siphons and other water related structures. His duties will include preparation of a subcontract for geotechnical field investigations and soil laboratory testing, supervision of such investigations and testing and interpreting borelogs and soil parameters.

(4) Water Resources Planner/Irrigation Engineer

Should be a university graduate with about 15 years experience in water resources planning. He should have experience in planning of water availability and water demand for irrigation and DMI and preparation of water balance studies by using appropriate computer models. Preferably, he should have worked in Indonesia or in other Southeast Asian countries in the field of water resources planning.

(5) Remote Sensing Specialist

Should be a university graduate with about 15 years experience in the field of interpretation of aerial photographs and satellite images related to water resources, land use and agriculture. His main duty will be determination of the irrigation areas at present under command of the WTC and the CFC.

(6) Senior Hydraulic Engineer

Should be a university graduate with at least 15 years experience in planning and hydraulic design of large conveyance systems such as irrigation canals and pipelines including appurtenant

hydraulic structures as weirs, siphons, water level control and measuring structures, culverts, etc. Further, he should have experience in preparation and running of hydraulic canal models.

(7) O & M Expert

Should be a university graduate with about 15 years of experience in the O&M of irrigation and drainage systems. He should have experience in the planning of O&M, improvement of irrigation and drainage system operation and its management.

(8) Senior Structural Design Engineer

Should be a university graduate with at least 10 years relevant experience in planning and detailed design of structures in large conveyance systems such as weirs, siphons, intake and outlet works, gated regulators, retaining walls, sheet piling, tunnels, bridges, etc. He should have profound knowledge of detail design of water retaining structures and construction planning, including preparation of design and tender drawings. His duties will be to plan and prepare detail designs of the major structures, execute design calculations, prepare the relevant specifications and guide the National structural and civil engineers in their design work, preparation of the bill of quantities, cost estimate and design and tender drawings.

(9) Hydro-Mechanical Specialist

Should be a university graduate with at least 15 years experience in planning, design, installation and operation of hydro mechanical equipment used in water resources infrastructure, such as pumping plants, trash racks, hydraulic gates, measuring gates, spillway and flushing gates, etc. Further, he should also have experience in preparation of specifications for procurement of mechanical equipment and testing of hydro-mechanical equipment.

(10) Senior Sedimentologist

Should be a university graduate in civil engineering with at least 10 years of experience in hydraulic modelling, sediment sampling and sediment analyses. His duties will be preparation of a subcontract for a sediment sampling programme, supervision of the sampling programme, analysis of the results, estimation of the sediment transport in the river and canal system and advice on operation of the sediment traps.

(11) Dredging Expert

Should be a university graduate in civil engineering with at least 8 years of experience in planning, set-up and execution of small scale dredging and earth moving operations. It will be his task to advise on the most suitable dredging methods for canal and sediment traps, allowing for the use of the same or similar equipment during later maintenance and allowing for constraints in available work space and spoil dump areas. He will also advise on the types of equipment to be used, estimate the construction fleet requirements, unit cost and production rates, prepare specifications for dredging works, advise on equipment requirements for maintenance, maintenance scheduling and programming.

(12) Water Quality Specialist

Should be a university graduate with about 15 years of experience of which at least 5 years in river basin water quality management. He should have experience in the field of setting up water quality assessment programmes, measurement of water quality in rivers and canals, water quality analysis, methods to improve water quality in rivers, water treatment processes and water quality models. He should preferably have experience in Southeast Asia or in Indonesia.

(13) Drinking Water Specialist

Should be a university graduate with at least 10 years experience in the field of drinking water treatment and waste water treatment. He should have knowledge about chemical engineering and the capability to collect and analyse water quality data, chemicals to be used in the treatment process, control of the drinking water treatment process and propose measures for adjustment and improvement.

(14) Senior Economist

Should be a university graduate with at least 15 years experience in economic analyses of water resources projects involving irrigation and drainage, drinking water supply, water quality, hydro power and canal maintenance. He should be capable of evaluating project costs and benefits, requirements for operation and maintenance of canals and sediment traps and financial analyses of the project components. Preferably, he should have at least 5 years of experience in Indonesia or in Southeast Asia.

(15) Institutional Specialist

Should be a university graduate in public administration with about 15 years of experience in the

field of organization of public, private and semi-government services of which at least 5 years in Indonesia and/or other Southeast Asian countries. He should have knowledge of the legal setting for water resources institutions and be able to analyse institutional functioning and propose institutional development strategies.

6.2 National Professional Staff

(1) Deputy-Team Leader/Water Resources Engineer

Should be a university graduate in civil engineering with about 15 years experience in the field of water resources planning, feasibility studies, design of irrigation and drainage systems and related structures and raw water supply. Further, he should have ample experience in managing project teams for design studies. His duties will include liaison with the Team Leader as well as his own home office, preparation of coordination with various local authorities and survey and investigations contractors, overall guidance to the National staff members, reporting on special subjects to the Client and participation in feasibility and design work.

(2) Topographical Engineer

Should be a university graduate with about 10 years experience in collection and review of topographical data, measurement of cross sections and levelling, preparation of contracts for topographical surveys and supervision of field work. He will be responsible for planning of the survey work, its supervision and preparation of survey data and maps for detailed design. His duties will further include quantity estimation of canal excavation and dredging works and determination of the location and dimensions of cross regulators, irrigation offtakes and other important canal structures.

(3) Geotechnical Engineer

Should be a university graduate with about 10 years experience in the geotechnical aspects of foundation design of large hydraulic structures and siphons as well as in the design of canal banks in unstable soil and embankments in high fill. Further, he should have ample experience in analyses of materials used for fill and foundation of hydraulic structures and supervision of geotechnical field investigations and laboratory testing.

(4) Water Quality Engineer

Should be a university degree with at least 10 years experience in collection, evaluation and analyses of water quality data and implementation of water quality monitoring programmes. He should have the capability to collect, evaluate and analyse data about waste water sources and to propose water pollution control programmes.

(5) Hydrologist

Should be a university graduate with a strong background in hydrology and about 10 years experience in collection and analysis of climatologic and hydrological data and setting up of an appropriate database. He should be able to assess water availability in river basins, analyse floods and prepare water balance of river basins. He should also have experience in execution and supervision of hydrometric measurement programmes for canal and river flows and calibration of flow measuring structures.

(6) Irrigation Design Engineer

Should be a university graduate with about 10 years experience in planning and design of irrigation and drainage systems including determination of irrigation demands and water availability analysis. He should also have knowledge of operation and maintenance of irrigation canals and related control and measuring structures as Romeijn and Crump de Gruyter gates.

(7) Hydraulic Design Engineer

Should be a university graduate with about 10 years experience in hydraulic design of irrigation and drainage canals and appurtenant structures such as weirs, siphons, cross regulators, irrigation off takes, etc. He should also have experience in calculation and verification of the conveyance capacities of existing canals.

(8) Irrigation O&M Engineer

Should be a university graduate with at least 10 years of experience in planning of O&M requirements (equipment, manpower, maintenance intervals) for large irrigation and drainage conveyance systems, including maintenance excavation, cleaning of canal banks, etc. Further, he should have experience in investigation and implementation of operation improvement measures for large conveyance systems, including water level control, flow measurement and maintenance of sediment traps.

(9) Structural Engineer

Should be a university graduate with about 7 years of experience in structural design of hydraulic structures such as weirs, siphons, spillways, culverts, cross regulators and irrigation off takes as well as in the design of roads and bridges. His duties will be preparation of detailed design of canal structures and improvement works, relevant specifications and structural design and tender drawings.

(10) Civil Engineer

Should be a university graduate with at least 7 years of experience in preparation of bills of quantities, cost estimating and preparation of design and tender drawings. His duties will be preparation of the bill of quantities, engineer's cost estimate and design and tender drawings.

(11) Contracts Engineer

Should be a university graduate with at least 10 years of experience in preparation of prequalification documents, tender documents and schedules for construction works. He should also have experience in preparation of tenders and contracts for International Competitive Bidding (ICB) and Local Competitive Bidding (LCB).

(12) Environmental Specialist

Should be a university graduate with environmental background and about 8 years of experience in environmental impact assessment (EIA) of water resource development and related projects. This shall include experience in environmental impact and in the assessment of resettlement and compensation. He must have experience in the preparation of Environmental Impact Assessment reports according to the national guidelines (AMDAL). The consultant shall be assisted by the Sociologist/Public Participation Specialist.

(13) Sociologist/Public Participation Specialist

Should be a university graduate in social geography or spatial planning with about 8 years of experience in the field of regional development planning, assessment of social impacts of water resources development and related projects and in public participation activities. Further, he should have experience in identification of socio-economic problems related to resettlement, preparation of resettlement plans and compensation arrangements.

(14) Economist

Should be a university graduate with at least 10 years of experience in the economic and financial analyses of water resources projects. He should have experience in projects for water conveyance systems, drinking water supply and water quality and must be able to compare alternatives.

(15) Institutional Specialist

Should be a university graduate with about 10 years of experience in the field of organisation of public services. He should have ample knowledge of the legal setting for water resources institutions and be able to analyse institutional functioning and propose institutional development strategies.

(16) Legal Expert

Should be a university graduate with about 20 years experience in the field of the legal aspects of organizations of public services. He should have knowledge of the legal settings for water resources institutions and water pollution control. He should have the capability to analyse legal functions, water resources policies and strategies and to propose adjustments to improve management of water resources development.

7. Reporting

The Consultant shall prepare and submit the following reports to the Client and the Bank during the period of services. All reports and drawings shall be in the English language and with standard dimensions, unless otherwise specified. The SI system shall be used in all reports, computations and drawings. During the course of the consulting services, the following reports are to be submitted:

(1) Inception Report

The Consultant will submit an Inception Report 45 days after commencement of the services. This report will present the Consultant's preliminary evaluation of the scope of works, field conditions, availability and status of data and reports, detailed work plan, subcontracts for topographical surveys, geotechnical investigations, hydrometric surveys and sediment sampling programme (15 copies).

(2) Feasibility Report of Cibeet and Cikarang bypass

A Feasibility Report at the end of the 6th (sixth) month, presenting the alternatives selected, being separation of the WTC flow from the Cibeet and/or the Cikarang or improvement and adequate maintenance of the sediment traps considering the improvement of water quality in the WTC. This report should present clear recommendations and justification of the chosen alternative(s) for improvement of the water quality and sediment situation in the WTC (15 copies).

(3) Report about Legal and Institutional Issues of PJT-II

A Report at the end of the 6th (sixth) month, presenting the findings of the study about the legal framework, institutional setting, revenue base and financial situation of PJT-II (15 copies).

(4) Draft Design Report

At the end of the 10th (tenth) month from the start of services, the Consultant will submit a Draft Design Report which will describe the general approach of the study, detailed design of canal, required structures and equipment to improve canal operation, the Bekasi siphon, option to improve the water quality and sediment condition in the WTC at the crossing with Cibeet and Cikarang. It should also include the results of topographical surveys, geotechnical investigations, laboratory testing and hydrometric and sediment sampling programmes carried out during the study (15 copies).

(5) Final Design Report

At the end of the services, the Consultant will submit a Final Design Report which will describe the general approach, standards used, detailed design of canal, works and equipment required for improved canal operation, Bekasi siphon and chosen options for interception/bypassing of the Cibeet and Cikarang flows, including design calculations for the major components. It should also include the results of topographical surveys, geotechnical investigations, laboratory testing and hydrometric and sediment sampling programmes carried out during the study (15 copies).

(6) Prequalification Document

At the end of the 6th (sixth) month from the start of services, the Consultant will submit Prequalification Documents for the proposed improvement works (15 copies).

(7) Draft Tender Document

At the end of the 10th (tenth) month from the start of services, the Consultant will submit Draft Tender Documents for the agreed packages comprising (i) Invitation for Tenders; (ii) Instructions to Tenderers; (iii) General Conditions (FIDIC); (iv) Particular Conditions; (v) Specification; (vi) Letter of Tender and Appendix; and (vii) Forms, Securities and Schedules (10 copies).

(8) Final Tender Documents

After approval of the Draft Tender Documents by the GoI and ADB, the Consultant will prepare the Final Tender Documents for the agreed packages comprising (i) Invitation for Tenders; (ii) Instructions to Tenderers; (iii) General Conditions (FIDIC); (iv) Particular Conditions; (v) Specification; (vi) Letter of Tender and Appendix; (vii) Bill of Quantities; (viii) Forms, Securities, Schedules, etc.; and (ix) Tender Drawings (15 copies).

(9) Quarterly Progress Report

The Consultant will submit at the end of each study quarter a progress report giving a summary of the progress, team activities during the reporting period, technical and management problems, if any, contract administration, financial and person-months utilisation and work anticipated to be carried out in the next progress reporting period (10 copies).

(10) Completion Report

At the end of the services, the Consultant will submit a short Completion Report with details about the way the feasibility study and detailed designs were carried out, reports submitted, person-months used and costs incurred (10 copies).

8. Project Organization and Management

The executing agency for the West Tarum Canal Rehabilitation Project will be the Balai Besar under the Ministry of Public Works. The CRBDP will appoint a Project Officer under whom the Consultant will carry out the project and it will also provide counterpart staff to the Consultant, if deemed necessary during the course of the feasibility and design study.

The Consultant's office will be located in Jakarta. Office space, housing arrangement for the Consultant's staff, supporting and administrative staff and running of the office will be the responsibility of the

Consultant.

Topographical surveys, geotechnical investigations, a sediment sampling programme and the hydrometric surveys will be undertaken through local sub-contracts.

A technical steering committee will be constituted to guide the study and to provide recommendations to the GoI for implementation of the project. The Steering Committee will meet at regular intervals during the study.

ICWRMP Program Management – TOR for Consultants

1. Objectives of the Services

The key objective of program management services to be provided is the effective implementation of Tranche 1 of the MFF. This will involve:

- Effective liaison between the program stakeholders and the teams undertaking the individual component projects so that outcomes align with stakeholder needs. The component projects are:
    - Rehabilitation of West Tarum Canal
    - Water Supply Options and Improved Groundwater Management for Bandung
    - Roll-Out of System Rice Intensification in Three Districts
    - Support for Community- and NGO-Driven Initiatives for Improved Water Supply and Sanitation
    - Development and Implementation of a Basin River Quality Improvement Strategy and Action Plans
    - Productive Reforestation of Degraded Catchments [Phase 1]
    - Protected Area Management for Biodiversity [Phase 1]
- Effective coordination among the component projects to promote cooperation and information exchange, improve performance overall, and minimise wasted effort caused by overlaps.
- Accurate and timely monitoring and reporting of component project performance, including financial management.

2. Scope of Work

The following main activities will be undertaken

General

- Implement sound project management practices within the Program Management Unit
- Design and implement quality management procedures applicable to the program, and promote these among the component projects.

Monitoring and reporting

- Prepare and maintain a performance monitoring and evaluation mechanism for the component projects.
- Establish and maintain an accounting system that summarises information provided by the component projects and provides consolidated reports.
- Seek and receive regular and frequent (at least 6-monthly) financial and progress reports from each of the component projects. Prepare written consolidated reports and submit to the Project Steering Committee.
- Attend Project Steering Committee meetings and report as required.
- Provide *ad hoc* information to the Project Steering Committee, Executing Agency and Implementing Agencies as required.

Stakeholder Liaison

- Establish a network of contacts among stakeholder groups associated with each of the component projects, as well as relevant national, provincial and district agencies and ADB.
- Act as a point of contact for all stakeholder representatives.
- Provide advice on request to stakeholder representatives.
- Facilitate six-monthly stakeholder workshops to discuss relevant issues related to progress and coordination.
- Develop and maintain a website to provide a means of information access by stakeholders and the

public, and well as providing a mechanism for feedback (stakeholder forum).

Project Coordination

- Establish formal links with the team leaders of each of the component projects and act as a point of contact.
- Facilitate six-monthly workshops for component project staff to discuss relevant issues related to progress and coordination, as well as common technical issues.
- Identify potential overlaps and inefficiencies among projects and report these to the Project Steering Committee.
- Deal with procedural issues related to project management and in particular to interpretation and application of relevant GOI and ADB procedures and guidelines.

Minor Studies

- Identify the need for minor studies (up to $400,000 total) to improve knowledge of water issues in CRB.
- Make recommendations to the Project Steering Committee and seek approval for these studies.
- As approved, recruit local consultants, universities, institutes or other appropriate organizations to undertake the studies.
- Manage the implementation of the studies.
- Promulgate the results of the studies widely among component projects, stakeholders and elsewhere.

Capacity Building for NGOs

- Identify NGOs involved in the various component projects of Tranche 1.
- Undertake a training needs analysis for each of the NGOs – in relation to the roles they will be required to play in the particular component projects.
- Develop a comprehensive training program for each of the NGOs, and implement them.
- Monitor performance of each NGO during the period of the component project implementation.
- Provide mentoring for NGOs and be a resource in times of difficulty.
- Facilitate exchange of information among the NGOs.

Preparation of Tranche 2

- Assist the Executing Agency to confirm (or otherwise) the component projects to be included in Tranche 2 of the MFF, including the facilitation of stakeholder consultations.
- Assist in the preparation of the necessary documents for recruitment of consultants to undertake preparation of the Tranche 2 component projects.
- Assist in the submission of the documents to GOI and ADB (as may be necessary).
- Assist the Executing Agency in the preparation of the Periodic Financing Request for submission to ADB.

3. Expertise Requirements

The program management will be undertaken by a team of experts comprising International and National professional staff. In general, preference will be given to International professional staff that have work experience in Indonesia or in other Southeast Asian countries. It is expected that the following professional staff and qualifications will be required:

3.1 <u>International Professional Staff</u>

(1) Team Leader/Water Resources Specialist

Should be a university graduated civil engineer with about 20 years experience in the field of water resources development and management. He/she should also have experience as a team leader in charge of multi-disciplinary aid projects. He/she should have preferably worked in Indonesia and/or other Southeast Asian countries in the field of water resources and river basin planning and management. Further, he should have experience in management of a multi-disciplinary team for a minimum period of 10 years and have good communication and report writing skills.

(2) Monitoring and Evaluation Specialist

Should be a university graduate with at least 15 years experience in designing and implementing monitoring and evaluation systems for large programs and/or projects. In addition, he/she should have experience in the field of water resource management, preferably in Indonesia and/or other Southeast Asian countries.

(3) Unallocated Pool of Specialists

It is impossible to clearly define all requirements for skills and experience necessary for the execution of the required program management functions. Therefore, a pool of specialists will be created (up to 12 months total) to cater for specific needs as may arise from time to time. Such specialists may include (but not be limited to): economist, hydrologist, civil engineer, environmental scientist, legal specialist.

3.2 National Professional Staff

(1) Deputy-Team Leader/Water Resources Engineer

Should be a university graduate in civil engineering with about 15 years experience in the field of water resources planning and management. Further, he/she should have ample experience in managing project teams for multi-disciplinary projects. Formal qualifications in project management would be an advantage.

(2) Financial Management Specialist

Should be a university graduate with about 10 years experience in economics, accounting or business. He/she should have experience in water-related projects, and establishing and implementing financial management systems for large programs/projects. A knowledge of GOI financial management requirements is essential and a knowledge of ADB procedures would be an advantage.

(3) Water Engineer

Should be a university graduate with about 10 years experience in the engineering aspects of water resource management, including planning, construction, operation and maintenance of water control infrastructure. Experience in working on internationally funded water resource projects in Indonesia would be an advantage, as would experience in preparation of prequalification documents, tender documents and schedules for construction works.

(4) Sociologist/Public Participation Specialist

Should be a university graduate in social geography or spatial planning with at least 10 years of experience in the field of regional development planning, assessment of social impacts of water resources development and related projects and in public participation activities. Further, he/she should have experience in working with Indonesian NGOs, Experience in identification of socio-economic problems related to resettlement, preparation of resettlement plans and compensation arrangements would be an advantage.

3. Reporting

The Consultant shall prepare and submit the following reports to the Client, the Bank and the Project Steering Committee during the period of services. All reports and drawings shall be in the English language and with standard dimensions, unless otherwise specified. During the course of the consulting services, the following reports are to be submitted as a minimum:

- Inception Report [within two months of commencement]
- Program Management Manual (detailing the performance monitoring and evaluation mechanism for the component projects) [within three months of commencement]
- Financial Management Manual [within two months of commencement]
- Quarterly Progress and Financial Reports
- Annual Progress and Financial Reports
- Other regular reports required by GOI and ADB
- Program Completion Report