CHAPTER 3 PROJECT JUSTIFICATION

3.1 Economic Evaluation

The economic evaluation is made for the components of Flood Control, Water Resources Development and Urban Drainage System Improvement by estimation of economic cost of the project and benefit which will be accrued as a result of project implementation.

3.1.1 Conditions of Evaluation

The economic evaluation is conducted in terms of the Economic Internal Rate of Return (EIRR), Benefit Cost Ratio (B/C) and Net Present Value (NPV) by using present values of economic cost and benefit of the Project under the following conditions and assumptions :

(1) Transfer payments such as value added tax (equivalent to 10 % of market prices) are not included in the economic cost and benefit ;

(2) Standard conversion rate of 93.2 % is applied to equipment and materials procured locally, based on export and import statistics in recent years in Indonesia ;

(3) Shadow wages of unskilled laborers are taken as 90 % of their market prices, taking their employment opportunity into consideration ;

(4) Opportunity cost of land to be acquired for the Project is assumed to be 100 % of the market price based on the existing land use in the objective areas ; and

(5) Economic cost and benefit are taken no account of inflation.

Economic life of the Project (hereinafter referred to as the "project life") is taken as 50 years after completion of the construction works, and the benefit and O&M cost of the Project are assumed to accrue every year during the project life.

3.1.2 Economic Cost

Economic cost is estimated based on the above conditions for Flood Control, Water Resources Development and Urban Drainage System Improvement components.

(1) Economic Cost of Flood Control Component

The Flood Control Component consists of West Floodway/Garang River Improvement and the construction of Jatibarang Multipurpose Dam. The economic

cost estimated based on the above conditions are summarized in the table below.

	West Floodway /Garang River	Jatibarang Dam allocated to F/C	Total
Economic Cost (Rp. million)	251,868	112,038	363,906

Note F/C : Flood Control Component

(2) Economic Cost of Water Resources Development

The component of Water Resources Development consists of the construction of Jatibarang Multipurpose Dam and the economic cost of the component is summarized below.

The economic cost of Jatibarang Multipurpose Dam allocated to Water Resources Development is Rp. 203,946 million.

(3) Economic Cost of Urban Drainage System Improvement

The economic Cost of the Urban Drainage System Improvement is estimated at Rp. 189,400 million.

3.1.3 Annual Operation, Maintenance and Replacement Cost

The economic operation, maintenance and replacement cost is estimated by work items as follow :

Flood Control Component
- West Floodway / Garang River Improvement : Rp. 1,051 million
- Jatibarang Dam Construction : Rp. 1,288 million

Water Resources Development
- Jatibarang Dam Construction : Rp. 738 million

Urban Drainage System Improvement : Rp. 1,746 million

3.1.4 Economic Benefit

The economic benefit is divided into three (3) categories ; (1) direct effect of reduction in the flood and inundation damages to assets, (2) reduction effect of flood damage to economic activities and public facilities, and (3) other socio-economic effects. Firstly, a flood and

inundation damage analysis is made to assets, which are composed of general assets (buildings and household effects). Next, the flood and inundation damages to public facilities and economic activities are estimated as a function of the flood and inundation damages to general assets.

As for the Flood Control Component, flood damages caused by 100-year probability are completely eliminated by the West Floodway/Garang River Improvement and the construction of Jatibarang Multipurpose Dam. Therefore, the flood damages of 100-year probability of Rp. 93,746 million can be converted into the benefit of the project.

The benefit of Water Resources Development is the cost of raw water which will be sold to the Regional Corporation of Potable Water (PDAM). According to an information from PDAM, the raw water price has become at Rp. 318/m^3 in 1997 from Rp. 218/m^3 in 1992 with an increasing rate of 7.81 % per annum. Raw water will be able to use from the year 2005/06 just after the completion of the said Jatibarang Multipurpose Dam Construction Works. Therefore, an envisaged amount of raw water price of Rp. 1,330/m^3 as of 2005/06 assuming to increase its price with the said past trend of 7.81 % per annum and the due consideration of the recent sharp inflation after 1998 is applied for estimation of the economic benefit on Water Resources Development.

According to the design criteria of Jatibarang Multipurpose Dam Construction Works, the water volume of 1.46 m^3/s will be newly developed for municipal water after reduction of the present intake and maintenance flow of the river. So PDAM might be saved the amount of Rp. 61,237 million per year (= Rp. 1,330/m^3 x 1.46 m^3/s x 60 second x 60 minutes x 24 hours x 365 days).

As for the Urban Drainage System Improvement, the annual average inundation damages are estimated at Rp. 46,290 million. The expected annual average of reduction by the designed facilities with the design scale of 5-year probability is estimated at Rp. 37,032 million on the condition that damage reduction factor is 0.8.

3.1.5 Economic Evaluation

The economic evaluation of the project in terms of the Economic Internal Rate of Return (EIRR), Benefit-Cost Ratio (B/C), and Net Present Value (NPV) is made and the results are shown below.

(1) Estimate of EIRR, B/C and NPV

The economic evaluation for the project is made by comparing present values of economic cost and benefit using the annual flows of the cost and benefit as presented in Table 3.1. The results are summarized as below.

Component	Design Scale (return period)	EIRR (%)	B/C	NPV (Rp. 10^6)
Flood Control	100-year	19.77	1.78	72,201
Water Resources Development		22.14	2.08	51,963
Jatibarang Dam Construction Works		18.53	1.66	58,938*
Hydropower Generation Works		11.66	0.97	-339
Drainage System Improvement	5-year	15.13	1.29	15,317
Overall Project		18.81	1.68	139,142

* Note : Since the amount of NPV of Jatibarang Dam Construction Works is sum of the dam portion of Flood Control, Water Resources Development and Hydropower Generation Works components, Rp. 58,938 x 106 is excluded from the amount of Overall Project.

(2) Sensitivity Analysis

A sensitivity analysis for the above EIRR is made for the increase of the economic cost by 10 , 20 and 30 %, and the decrease of the economic benefit by 10, 20 and 30 % respectively. The results of the analysis are tabulated in the table below.

	Change	EIRR for Flood Control (%)	EIRR for Water Resources Development (%)	EIRR for Urban Drainage (%)
Base	0 %	19.77	22.14	15.13
Cost	+ 10 %	15.68	20.53	13.90
	+ 20 %	14.57	19.14	12.85
	+ 30 %	13.60	17.93	10.91
Benefit	- 10 %	15.55	20.37	13.87
	- 20 %	14.07	18.52	12.38
	- 30 %	12.53	16.58	10.93

3.1.6 Justification of the Project

The EIRR presented above shows that the Project is economically justifiable, because the opportunity cost of capital is estimated to be 10 to 12 % in Indonesia.

3.2 Environmental and Social Impacts

Environmental and social impacts were also reviewed and updated as to obtain the approval from the Central Committee of Environment (KOMPUS) of Indonesian government for the Project.

3.2.1 Environmental Impact Study

The Environmental Impact Study (ANDAL) was carried out in 1993 as part of the feasibility study on Flood Control and Water Resources Development Plan by the former JICA Study Team. However, the study results have to be reviewed in accordance with the new Government Regulation No. 51, 1993 regarding environmental impact assessment, and official approval of KOMPUS is required prior to project implementation. The ANDAL should provide analytical information on what environmental impact could be brought by the Project to the project area, and serve for the preparation of the Environmental Management Plan (RKL) and the Environmental Monitoring Plan (RPL).

(1) Environmental Impacts

(a) West Floodway/Garang River Improvement

So far neither house evacuation nor large-scaled land acquisition is required due to West Floodway/Garang River improvement. The river improvement works include demolition of existing Simongan Weir to be replaced by new one. This old structure constructed in Dutch colonial days deserves to be preserved as an historical monument for future generation. It is recommended that a part of the more than 100-year aged structure be exhibited at a museum. The museum is believed to be constructed in or around the Goa Kreo park.

Since all construction works are to be done within the right-of-way of the existing river course, the environmental impacts due to the improvement works of the river are limited to be negligible and no endangered flora and fauna were found.

(b) Construction of Jatibarang Multipurpose Dam

The total required area for the construction of the dam and the reservoir is estimated at 150 ha of land which is presently used for paddy, upland, small plantation, woods and so on, and no people are living there. In consequence, no

house evacuation is required. According to the tax-related block map issued by Tax Office, there might be 340 land owners involved in the project. They live in four (4) different villages (Kelurahan) such as Kedungpane and Jatibarang on the left bank and Kandri and Jatirejo on the right bank.

It was clarified in the environmental impact assessment that the environmental impacts to the areas concerned due to the construction of the dam is limited to be negligible and there is no endangered species of flora and fauna in the dam site and reservoir areas.

(c) Urban Drainage System Improvement

Since the project area is fully developed as an urban area, there is no natural environment and no environmental impacts on flora and fauna are found. However, one particular thing was found through the environmental assessment that sediment in Semarang, Asin and Baru rivers which shall be dredged and dumped to a spoil bank contains some kind of heavy metals with significant amount. Therefore, dredged material shall be treated properly prior hauling the material to a spoil bank.

The treatment method to mix 7 % of cement with the dredged material is decided after a series of leaching test of the sediment which was conducted by the JICA Study Team.

(2) Environmental Management Plan

Based on the environmental impact study, the environmental management plan was formulated with a view of preventing and mitigating negative impacts as well as enhancing positive strategic impacts. The issues as enumerated below were discussed as basic approach to the establishment of a proper management plan. All fundamental issues on environmental management are summarized in Table 3.2.

(3) Environmental Monitoring Plan

The monitoring works has to be performed periodically for a certain period of time depending on the subject parameters. The impact sources vary according to the project stage. There are number of parameters to be monitored in each stage as tabulated below.

Project Stage	Parameter
(1) Pre-Construction	(a) Any issues arising from flood plain excavation
(2) Construction	(a) Noise level, dust content level, traffic congestion (b) River water quality (c) Sedimentation (d) Ground water level along West Floodway/Garang River (e) Aquatic biology (plant and biota)
(3) Post- Construction	(a) Illegal use of dike and flood plain (b) Illegal sand and gravel mining at river bed (c) River water quality (d) Sedimentation by erosion (e) Ground water level along West Floodway/Garang River (f) Solid waste and refuse in the riverbank (g) Project effect and evaluation

Basically, there are four methods to collect relevant data and information : (1) field observation, (2) interview survey, (3) field measurement and (4) sample analysis. The monitoring method is decided in accordance with the subject matter.

Fundamental issues and methods on the monitoring plan are compiled and summarized in Table 3.3.

3.2.2 Social Impact

(1) Project Area

The project area of the West Floodway/Garang River Improvement, Construction of Jatibarang Dam and Urban Drainage System Improvement administratively belongs to Semarang City.Among the project areas mentioned above, the areas at the dam site and the reservoir and small areas on the right bank of West Floodway/Garang River near the river mouth and a pumping station and retarding ponds shall be acquired.

(2) Social Impact of each Project Component

(a) West Floodway/Garang River Improvement

Since the project area is limited to the area within the right-of-way of West Floodway/Garang River, 2.6 ha of land acquisition and two (2) units of house evacuation is necessary. Since only limited area of land acquisition and number of house evacuation are required, any serious social problems are not predicted through the pre-construction, construction and post-construction stages.

(b) Construction of Jatibarang Dam

150 ha of land acquisition is necessary to be acquired for the dam construction

and the reservoir area. The area is covered with paddy, forest, small upland farm and plantation and owned by about 340 owners. However, there is no houses to be evacuated existed in the project area. All of these land owners are living outside the project area and 62 % of them showed positive attitude for the land acquisition with reasonable monetary compensation, while only several % of them expressed negative answer. The rest of the people remain undecided.

(c) Urban Drainage System Improvement

Land acquisition of 4.7 ha is necessary for construction of Asin and Baru retarding ponds. The land is located in West Bandarharjo Area, where is designated as "the conservation area for flood retarding" in the land use plan of Semarang City. Presently the area is reclaimed and utilized for crop cultivation temporarily. As the land owner of the area is the Semarang Harbor Authority, it is necessary to transfer the ownership from the Harbor Authority to the urban drainage administrator, namely Semarang City (refer to Fig. 2.18).

House evacuation of 3 units is necessary for construction of Asin Pumping Station. Land acquisition for Asin Pumping Station is limited to 2.8 ha only. The results of an interview survey of the residents of three houses shows that they prefer cash compensation rather than the preparation of resettlement area for them. (refer to Fig. 2.18)

The land acquisition and house evacuation which are necessary for the project implementation is summarized below ;

	Asin Pumping Station	Bandarharjo Pumping Station	Total
Land Acquisition	2.8 ha	1.9 ha	4.7 ha
House Evacuation	3 units	0 unit	3 units

By the positive impacts of the project, the project will bring about benefit such as saving of human lives and assets, improvement of public health and enhancement of economic activities, which will compensate all negative impacts. With regard to the perception of the inhabitants who are affected by the construction of Asin Pumping Station, all three families agree to the Project with reasonable cash compensation.

CHAPTER 4 PROJECT IMPLEMENTATION

4.1 Implementing Method and Time Schedule

4.1.1 Executing System

(1) Executing Agency

The Directorate General of Rural Development for West Floodway/Garang River Improvement and Jatibarang Multipurpose Dam Construction, and Directorate General of Urban Development for Urban Drainage System Improvement, Ministry of Settlement and Regional Development are the government agency responsible for the execution of the Project. Actual executing agencies are entrusted to JRATUNSELUNA Project Office of Central Java Province for West Floodway / Garang River Improvement, Construction of Jatibarang Dam and Semarang Municipal Office for Urban Drainage System Improvement.

(2) Executing Method

The implementation of the Project is expected to be undertaken with the financial assistance by foreign countries or international funding agencies. Therefore, the procedure or the execution of the construction should be referred to the guideline of the foreign government or agencies as well as the laws and regulations of the Government of Indonesia for the procurement of consultants and contractors. In line with the above, the implementation schedule and the acquirement of project fund, which are discussed in the following Section, are prepared.

4.1.2 Procurement Method and Packaging

(1) Procurement Method

The construction works will be undertaken by contractors selected through the formal international tendering, and the engineering services consisting assistance of the responsible government agency for the supervision of the construction works will be conducted by a consultant selected by the Government.

(2) Contract Packaging

(a) West Floodway/Garang River Improvement

The Project consists of West Floodway/Garang River Improvement (9.607 km) including the reconstruction of Simongan Weir. The construction works will be divided into three (3) contractual packages for the implementation as tabulated below and delineated in Fig. 4.1.

Package	Project Component	Section No.	Construction Base Cost ($Rp.x10^6$)	Ratio (%)
1	West Floodway/ Garang River Improvement	-0.628km~4.908km 5.086km~9.157km (9,607 m)	103,521	49.5
2	Reconstruction of Simongan Weir	4.908km~5.086km (178 m)	88,960	42.6
3	Reconstruction of Railway Bridge	3.700 km	16,514	7.9
Total		9,785m	208,995	100.0

Accordingly the contract is divided into the following three (3) packages :

Package 1 : West Floodway / Garang River Improvement Works (Section -0.628 km to +4.908 km and +5.086 km to +9.157 km)

The construction works include dredging riverbed of the low water channel, excavation of the flood plain, embankment of new dikes, revetments, raising and reinforcement of existing flood walls, construction of ground sills, groins, drainage sluices and some river front facilities.

Package 2 : Reconstruction of Simongan Weir (Section +4.908 km to +5.086 km)

The existing fixed type Simongan Weir is to be demolished and a new gated weir is reconstructed at the same place so that floods can be discharged smoothly to downstream stretches without dam up in the upper stretches. During the construction works of the new weir, the water level in the upper stream side shall be maintained at the existing level. The construction works include demolition of the existing weir and intake structures on both banks, construction of a new gated weir with a maintenance bridge and new intake structures on both banks, revetment and management office compound. A part of the existing weir structure

will be preserved at a new museum which is to be constructed near the Goa Kreo park as a monument.

Package 3 : Raising Railway Bridge (3.700 km)

Since the existing railway bridge does not have enough freeboard underneath the bridge girder, the existing girders will be raised by 70 cm and the raised girders are supported by new substructures.

(b) Construction of Jatibarang Multipurpose Dam

This project consists of the dam body and its related structures including buildings for dam management and a pedestrian bridge to the Goa Kreo park. The construction works will be divided into two (2) construction packages as tabulated below and delineated in Fig. 4.2.

Package	Project Component	Structures	Construction Base Cost (Rp. x10^6)	Ratio (%)
1	Dam Body and Its Related Structures	Dam, Spillway, Intake Facilities, Diversion Tunnel, Hydropower Station	328,588	98.8
2	Buildings and Pedestrian Bridge	Dam Management Office and other buildings, Pedestrian Bridge to Goa Kreo Park	3,945	1.2
Total			332,533	100.0

Accordingly the contract is divided into the following two (2) packages:

Package 1 : Dam Body and Related Structures

This package includes construction of a dam body of rockfill type with center core, a spillway, a hydropower station including a substation and transmission line, outlet facilities installed in an outlet tunnel and a diversion tunnel with temporary cofferdam on the up and down stream sides.

Package 2 : Dam Management Office Compound and Pedestrian Bridge

This package includes construction of dam management office compound which consists of a dam management office building, stuff houses, a mushola and a guest house and construction of a pedestrian bridge to the Goa Kreo park.

(c) Urban Drainage System Improvement

Packaging of the project has been determined taking into account the location and construction procedure of each work component as follows;

Package	Project Component	Construction Base Cost ($Rp \times 10^6$)	Ratio (%)
1	Semarang River Improvement	19,308	12.8
2	Asin Drainage System Improvement	81.610	54.2
3	Bandarharjo Drainage System Improvement	49,613	33.0
total		150,531	100

The construction works involved in each package are as follows (refer to Fig. 4.3):

Package-1 Semarang River Improvement (L= 7,300 m)

Dredging	V = 72,900 m^3
Dike Raising	L = 3,100 m
Inspection Road	A = 66,000 m^2

Package-2 Asin Drainage System Improvement (L = 1,300 m)

Dredging	V = 75,100 m^3
Semarang River Relocation	L = 300 m
Box Culvert (W = 4, H = 2 m)	L = 200m
Pumping Station (Q = 9.0 m3/s)	1 unit
Retarding Pond	A = 1.6 ha

Package-3 Bandarhajo Drainage System Improvement (L = 800m)

Dredging	V = 35,000 m3
Box culvert (W = 2 m, H = 2 m)	L = 600 m
Secondary Channels	L = 1,500 m
Pumping Station (Q=4.6 m3/s)	1 unit
Retarding Pond	A = 0.8 ha
Additional Dike Construction	L = 10,000 m

4.1.3 Implementation Schedule

(1) Construction Schedule

(a) West Floodway/Garang Rive Improvement

The construction works of Packages 1 to 3 are scheduled to be commenced in the year 2001 and 2002, namely the Improvement of West Floodway and the reconstruction of Simongan Weir will be commenced in the year 2001 and the Improvement of Garang River will be commenced in the year 2002. All works will be completed until the end of the year 2003. The detailed implementation schedule is prepared as shown in Fig. 4.4.

(b) Construction of Jatibarang Dam

The construction works of Packages 1 and 2 are scheduled to be commenced in the year 2001 and 2003, namely Package 1 will be commenced in the year 2001 and Package 2 will be commenced in the year 2002. All works will be completed at the end of 2004, The detailed implementation schedule is prepared as shown in Fig. 4.5.

(c) Urban Drainage System Improvement

The construction works of Packages 1 to 3 are scheduled to be commenced in the year 2001, namely the Semarang River Improvement will be commenced at the end of 2002 and be completed at the end of the year 2003, while the construction of Asin and Baru Pump Drainage Areas will be commenced from the beginning of 2001 and be completed until the end of 2004. The detailed implementation schedule is prepared as shown in Fig. 4.6.

(2) Overall Schedule

The implementation schedule is prepared aiming at a prompt implementation of the construction works of the Project in order to protect growing properties from flood damage and to improve the environmental conditions along West Floodway / Garang River and the central area of Semarang City. The implementation period of the major work items is estimated as shown in the table below.

Major Work Items	Period
Construction Works	
1. West Floodway / Garang River Improvement	
Package 1 : Improvement of West Floodway	Apr. 2001 to Nov. 2003
Package 2 : Reconstruction of Simongan Weir	Feb. 2001 to Oct. 2003
Package 3 : Improvement of Garang River	Apr. 2001 to Oct. 2002
2. Construction of Jatibarang Dam	
Package 1 : Dam Body and other Structures	Apr.2001 to Dec. 2004
Package 2 : Dam Management Office Compound and Pedestrian Bridge	Apr.2002 to Apr. 2004
3. Urban Drainage System Improvement	
Package 1 : Semarang Rive Improvement	Jan. 2002 to Oct. 2003
Package 2 : Asin Pump Drainage Area	Jan. 2001 to Apr. 2004
Package 3 : Baru Pump Drainage Area	Jan. 2001 to Apr. 2004

4.1.4 Financing

The total project cost is estimated as shown in the table below.

Component	FC (Rp. million)	LC (Rp. million)	Total	
			(Rp. million)	(Yen million)
West Floodway / Garang River	160,309	160,961	321,270	5,320
Construction of Jatibarang Dam	283,016	295,278	578,294	9,576
Urban Drainage System Improvement	110,326	129,316	239,642	3,968
Total	553,651	585,555	1,139,206	18,864

The eligible cost of financial agencies among the project cost is estimated by excluding the non-eligible cost items.

Where, the non-eligible costs are considered for the following categories, but they could be included in the total project cost :

- Land acquisition ;
- Compensation
- Taxes and duties as well as government administration cost ; and
- Interest during the construction period.

The breakdown of the total project cost and eligible costs are presented in the table below:

Cost Item	West Floodway / Garang River Improvement		Construction of Jatibarang Multipurpose Dam		Urban Drainage System Improvement	
	Project Cost (Rp. 10^6)	Eligible Cost (Rp.10^6)	Project Cost (Rp.10^6)	Eligible Cost (Rp.10^6)	Project Cost (Rp.10^6)	Eligible Cost (Rp.10^6)
1. Construction Base Cost	208,995	208,995	332,533	332,533	150,531	150,531
2. Engineering Service Cost	18,170	18,170	33,372	33,372	12,019	12,019
3. Compensation Cost	710	0	13,500	0	4,793	0
4. Administration Cost	14,679	0	24,222	0	10,873	0
5. Physical Contingency	13,673	13,630	37,940	36,590	10,041	9,753
5.1 for Construction Base Cost	12,540	12,540	33,253	33,253	9,032	9,032
5.2 for Engineering Service Cost	1,090	1,090	3,337	3,337	721	721
5.3 for Compensation Cost	43	0	1,350	0	288	0
6. Price Contingency	37,489	34,749	88,509	79,685	31,302	28,532
6.1 for Construction Base Cost	33,841	33,841	78,272	78,272	27,949	27,949
6.2 for Engineering Service Cost	907	907	1,413	1,413	583	583
6.3 for Compensation Cost	469	0	3,613	0	845	0
6.4 for Administration Cost	2,271	0	5,211	0	1,925	0
Sub Total	293,716	275,544	530,076	482,180	219,559	200,835
7. Value Added Tax	27,554	0	48,218	0	20,083	0
Total	321,270	275,544	578,294	482,180	239,642	200,835

The total eligible cost is Rp. 958,559 million (US$ 139,224 thousand or Yen 15,873 million) which consists of Rp. 275,544 million (US$ 40,021 thousand or Yen 4,563 million) for West Floodway Improvement, Rp. 482,180 million (US$ 70,033 thousand or Yen 7,984 million) for Construction of Jatibarang Multipurpose Dam and Rp. 200,835 million (US$ 29,170 thousand or Yen 3,326 million) for Urban Drainage System Improvement.

4.2 Engineering Service

4.2.1 Objective and Scope of Works

The objective of the consulting engineering services is to assist the Project Office and the Ministry of Settlement and Regional Development (KIMBANGWIL) in Pre-qualification, tendering and construction supervision for the successful implementation of the Project.

The specific scope of the engineering services covers the following activities :

(1) Pre-construction Stage

- Review the design drawings, cost estimate and prequalification and tender documents, and amend thereof, if any ;
- Appraise the prequalification documents received from the candidates for

tender ;

- Attend the pre-tender conference at the KIMBANGWIL, and the site explanation to tenderers ; and
- Attend the tender opening, and conduct the evaluation together with preparing the tender evaluation report.

(2) Construction Stage

(a) Construction Supervision

The Consultant shall supervise the construction works and assist the Project Office of KIMBANGWIL in conducting the following undertakings :

- Review and endorse all proposed plans, schedule and documents related to the project implementation and construction works submitted by the Contractor for approval ;
- Check to ensure the Contractor adherence to its plan and schedule approved ;
- Check and endorse the designs and design calculations prepared by the Contractor ;
- Check and inspect the work quality and quantity executed by the Contractor ;
- Supervise additional field investigations when required ;
- Advise on purchasing schedule and quantity of construction materials such as explosives, steel, cement, etc., to provide the license to the Contractor ;
- Advise on method of measurement and computation of the work volume and assisting verification of progress ;
- Carrying out factory inspection on manufacturing equipment and materials, when necessary ;
- Prepare the reports of inspection, tests and other activities ;
- Sign the request of progress payment from the Contractor ; and
- Supervise and approve as-built drawing to be prepared and submitted by the Contractor.

(b) Design Modification

The Consultant shall make revision and adjustment of design from time to time when they become necessary due to findings in the field or by comments from the KIMBANGWIL.

(c) Operation and Maintenance Manual

The Consultant shall prepare the system of operation and maintenance of the project facilities, compile the operation and maintenance manuals prepared by the Contractor and prepare the composite operation and maintenance manual of the project facilities.

(3) Transfer of Knowledge

Throughout the execution of the services, the Consultant should make a full effort to transfer his knowledge and skill to the Indonesian Government personnel through both on-the-job training and overseas training.

- On-the-job training includes the project management for the project implementation, the engineering practice for design and construction supervision including construction method, and operation and maintenance method/procedure for the Project.
- Overseas training includes lectures and practice on the engineering aspects of the similar projects covering the planning, designing and construction supervision method, and the observation visit to the similar project construction sites.

4.2.2 Procurement Method of Consultant

The Consultant to undertake the construction supervision for the Project is recommended to be procured through the direct appointment with the consulting firm which has undertook the detailed design of the Project in order to attain a smooth implementation of the Project.

TABLES

Table 2.1 CLIMATOLOGICAL DATA AT BMG-SEMARANG STATION

Element	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (/year)	Mean	Data Period
Monthly Rainfall	mm/mon	434	292	274	201	178	100	73	67	92	154	228	285	2378	198.2	1968-1996
Pan Evaporation	mm/day	3.3	3.7	3.8	4.0	4.3	4.5	4.8	5.1	5.7	5.5	4.4	3.8	1610	4.4	1978-1996
Average Temperature	deg. C	26.4	26.4	26.8	27.6	27.9	27.4	27.1	27.2	27.8	28.3	27.8	27.0		27.3	1968-1996
Highest Temperature	deg. C	29.9	30.0	30.4	31.7	32.5	32.4	32.6	33.2	33.7	33.7	32.3	30.8		31.9	- do. -
Lowest Temperature	deg. C	23.5	23.6	23.9	24.3	24.2	23.2	22.8	22.7	23.0	23.6	23.7	23.7		23.5	- do. -
Relative Humidity	%	84.4	84.1	83.8	79.8	77.2	74.6	72.2	70.7	70.1	71.7	77.3	81.5		77.3	- do. -
Rainy Days	days	22	18	18	15	11	7	6	5	8	11	16	19	156	13.0	- do. -
Sunshine Duration	%	38	46	52	59	65	65	75	81	74	70	56	46		60.6	- do. -
Wind Velocity	m/s	2.0	2.0	1.6	1.6	1.7	1.8	1.9	2.0	2.0	1.8	1.6	1.6		1.8	- do. -

Source : Badan Meteorologi dan Geofisika, Stasiun Klimatologi Semarang

Table 2.2 ANNUAL MAXIMUM DISCHARGE AT SIMONGAN WEIR

Year	Date	Data max. H (m)	Head h=H-5.6 (m)	Center Portion Q1 (m^3/s) =1.57*64.6m*h^1.5	Side Portion Q2 (m^3/s) =1.8*10.4m*h^1.5	Discharge Q=Q1+Q2 (m^3/s)
1961		7.9	2.3	353.8	65.3	419
1962		7.3	1.7	224.8	41.5	266
1963		9.4	3.8	751.3	138.7	890
1964		6.9	1.3	150.3	27.7	178
1965		7.4	1.8	244.9	45.2	290
1966		x	x	x	x	x
1967		x	x	x	x	x
1968		6.6	1.0	101.4	18.7	120
1969		7.1	1.5	186.3	34.4	221
1970		7.0	1.4	168.0	31.0	199
1971		7.0	1.4	168.0	31.0	199
1972		6.9	1.3	150.3	27.7	178
1973		6.9	1.3	150.3	27.7	178
1974		7.8	2.2	331.0	61.1	392
1975		6.9	1.3	150.3	27.7	178
1976		7.9	2.3	353.8	65.3	419
1977		7.5	1.9	265.6	49.0	315
1978		7.5	1.9	265.6	49.0	315
1979		7.2	1.6	205.3	37.9	243
1980		6.7	1.1	117.0	21.6	139
1981		8.1	2.5	400.9	74.0	475
1982		7.7	2.1	308.6	57.0	366
1983		7.4	1.8	244.9	45.2	290
1984		7.3	1.7	224.8	41.5	266
1985		8.2	2.6	425.2	78.5	504
1986		7.4	1.8	244.9	45.2	290
1987	Dec.21	7.70	2.1	308.6	57.0	366
1988	Mar.25	7.80	2.2	331.0	61.1	392
1989	Feb.05	7.60	2.0	286.9	52.9	340
1990	Jan.26	9.40	3.8	751.3	138.7	890
1991	Jan.09	8.25	2.7	437.5	80.8	518
1992	Jan.09	8.05	2.5	388.9	71.8	461
1993	Jan.30	9.10	3.5	664.1	122.6	787
1994	Mar.11	7.50	1.9	265.6	49.0	315
1995	Nov.29	7.65	2.1	297.7	54.9	353
1996	Dec.02	7.90	2.3	353.8	65.3	419

Note : Max. H means annual maximum water level by watching at site.
Water level data were given by RANTING DINAS (DOLOG PENGGARON)
Gates at side portions are closed even at flood time.

Table 2.3 AREA AND POPULATION IN INDONESIA

Province	Area (km^2)	Population			Households (HHs)			Family size (persons/HH)			Annual average growth rate of population (%)			Population density as of 1996
		1980 (persons in 1,000)	1990 (persons in 1,000)	1996 (persons in 1,000)	1980 (HHs in 1,000)	1990 (HHs in 1,000)	1996 (HHs in 1,000)	1980	1990	1996	'80-'90	'90-'96	'80-'96	(persons/km^2)
Sumatra island	482,393	28,016	36,502	41,841	5,375	7,474	9,201	5.21	4.88	4.55	2.68%	2.30%	2.54%	87
Dista Aceh	55,390	2,611	3,416	3,945	531	697	832	4.92	4.90	4.74	2.72%	2.43%	2.61%	71
Sumatera Utara	71,680	8,361	10,252	11,306	1,548	2,023	2,367	5.40	5.07	4.78	2.06%	1.64%	1.90%	158
Sematera Barat	42,898	3,407	4,000	4,390	704	868	1,004	4.84	4.61	4.37	1.62%	1.56%	1.60%	102
Riau	94,561	2,168	3,304	4,057	413	679	923	5.25	4.87	4.40	4.30%	3.48%	3.99%	43
Jambi	53,436	1,446	2,020	2,459	300	438	577	4.82	4.61	4.26	3.40%	3.33%	3.37%	46
Sematera Selatan	109,254	4,630	6,313	7,413	857	1,266	1,631	5.40	4.99	4.55	3.15%	2.71%	2.99%	68
Bengkulu	19,789	768	1,179	1,464	150	252	343	5.12	4.68	4.27	4.38%	3.68%	4.12%	74
Lampung	35,385	4,625	6,018	6,806	872	1,251	1,525	5.30	4.81	4.46	2.67%	2.07%	2.44%	192
Jawa island	127,499	91,270	107,581	116,379	19,623	24,908	28,268	4.65	4.32	4.12	1.66%	1.32%	1.53%	913
DKI Jakarta	664	6,503	8,259	9,341	1,164	1,740	2,117	5.59	4.75	4.41	2.42%	2.07%	2.29%	14,068
Jawa Barat	43,177	27,454	35,384	40,118	6,101	8,180	9,575	4.50	4.33	4.19	2.57%	2.11%	2.40%	929
Jawa Tengah	32,549	25,373	28,521	29,881	5,286	6,414	7,077	4.80	4.45	4.22	1.18%	0.78%	1.03%	918
DI Yogyakarta	3,186	2,751	2,913	2,915	593	729	769	4.64	4.00	3.79	0.57%	0.01%	0.36%	915
Jawa Timur	47,923	29,189	32,504	34,124	6,479	7,845	8,730	4.51	4.14	3.91	1.08%	0.81%	0.98%	712
Nusa Tengara islands	87,744	8,487	10,165	11,133	1,684	2,136	2,480	5.04	4.76	4.49	1.82%	1.53%	1.71%	127
Bali	5,633	2,470	2,778	2,924	485	601	704	5.09	4.62	4.15	1.18%	0.86%	1.06%	519
Nusa Tengara Barat	20,153	2,725	3,370	3,708	594	767	883	4.59	4.39	4.20	2.15%	1.60%	1.94%	184
Nusa Tengara Timur	47,349	2,737	3,269	3,641	496	619	715	5.52	5.28	5.10	1.79%	1.81%	1.80%	77
Timor Timur	14,609	555	748	860	109	149	178	5.09	5.02	4.83	3.03%	2.35%	2.77%	59
Kalimantan island	547,891	6,723	9,099	10,808	1,323	1,942	2,533	5.08	4.69	4.27	3.07%	2.91%	3.01%	20
Kalimantan Barat	146,807	2,486	3,229	3,732	458	640	795	5.43	5.05	4.69	2.65%	2.44%	2.57%	25
Kalimantan Tengah	153,564	954	1,396	1,686	186	306	408	5.13	4.56	4.13	3.88%	3.19%	3.62%	11
Kalimantan Selatan	36,535	2,065	2,597	2,960	444	597	748	4.65	4.35	3.96	2.32%	2.21%	2.28%	81
Kalimantan Timur	210,985	1,218	1,877	2,429	235	399	581	5.18	4.70	4.18	4.42%	4.39%	4.41%	12
Sulawesi island	191,800	10,409	12,521	14,020	1,923	2,558	3,018	5.41	4.89	4.64	1.86%	1.90%	1.88%	73
Sulawesi Utara	27,488	2,115	2,478	2,686	399	549	637	5.30	4.51	4.22	1.60%	1.35%	1.51%	98
Sulawesi Tengah	63,689	1,290	1,711	1,997	233	347	438	5.54	4.93	4.56	2.86%	2.61%	2.77%	31
Sulawesi Selatan	62,483	6,062	6,982	7,693	1,117	1,399	1,605	5.43	4.99	4.79	1.42%	1.63%	1.50%	123
Selawesi Tenggara	38,140	942	1,350	1,643	174	263	339	5.41	5.13	4.84	3.66%	3.33%	3.54%	43
Maluku and Irian Jaya	499,852	2,585	3,507	4,163	445	677	900	5.81	5.18	4.62	3.10%	2.90%	3.02%	8
Maluku	77,871	1,411	1,858	2,142	229	344	435	6.16	5.40	4.92	2.79%	2.40%	2.64%	28
Irian Jaya	421,981	1,174	1,649	2,021	216	333	465	5.44	4.95	4.35	3.46%	3.45%	3.45%	5
Total in Indonesia	1,937,179	147,490	179,375	198,343	30,373	39,695	46,401	4.86	4.52	4.27	1.98%	1.69%	1.87%	102

Source : Indonesia in Figures (Indonesia Dalam Angka) 1996, Central Statistic Bureau of Indonesia.

Table 2.4 AREA AND POPULATION IN CENTRAL JAVA

Kabupaten/Kotamadya (Regency/Municipality)	Area (km^2)	Population 1980 (persons in 1,000)	Population 1990 (persons in 1,000)	Population 1995* (persons in 1,000)	Households (HHs) 1990 (HHs in 1,000)	Households (HHs) 1995 (HHs in 1,000)	Family size (persons/HH) 1990	Family size (persons/HH) 1995	Annual average growth rate of population(%) '80-'90	'90-'95	'80-'95	Population density in 1995 (persons/km^2)
Kabupaten(Regency)												
Cilacap	2,143	1,344	1,459	1,535	326	348	4.48	4.41	0.82%	1.02%	0.89%	716
Banyumas	1,328	1,228	1,351	1,402	304	317	4.44	4.42	0.96%	0.74%	0.89%	1,055
Purbalingga	778	671	756	786	159	165	4.75	4.76	1.20%	0.78%	1.06%	1,010
Banjarnegara	1,070	678	773	808	178	176	4.34	4.59	1.32%	0.89%	1.17%	755
Kebumen	1,283	1,038	1,151	1,182	320	244	3.60	4.84	1.04%	0.53%	0.87%	922
Purworejo	1,035	694	724	733	158	165	4.58	4.43	0.42%	0.26%	0.36%	709
Wonosobo	985	601	671	705	140	146	4.79	4.82	1.12%	0.99%	1.07%	716
Magelang	1,086	935	1,017	1,038	235	238	4.32	4.36	0.84%	0.41%	0.70%	956
Boyolali	1,015	786	870	888	191	199	4.55	4.47	1.03%	0.40%	0.82%	875
Klaten	656	1,086	1,180	1,204	250	257	4.72	4.69	0.83%	0.41%	0.69%	1,836
Sukoharjo	467	605	696	727	140	159	4.96	4.56	1.41%	0.89%	1.24%	1,558
Wonogiri	1,822	953	1,026	1,050	203	213	5.06	4.93	0.74%	0.47%	0.65%	577
Kalanganyar	772	610	707	744	138	162	5.11	4.59	1.49%	1.01%	1.33%	963
Sragen	946	765	845	863	180	190	4.69	4.55	1.00%	0.43%	0.81%	912
Grobogan	1,976	1,020	1,176	1,242	262	300	4.49	4.14	1.44%	1.09%	1.32%	629
Blora	1,794	698	757	788	179	185	4.24	4.26	0.82%	0.79%	0.81%	439
Rembang	1,014	443	511	526	115	120	4.43	4.38	1.44%	0.56%	1.15%	518
Pati	1,491	971	1,070	1,110	259	275	4.13	4.03	0.97%	0.74%	0.89%	744
Kudus	425	537	610	635	127	141	4.80	4.51	1.27%	0.83%	1.13%	1,495
Jepara	1,004	701	776	827	190	203	4.08	4.08	1.03%	1.28%	1.11%	824
Demak	897	645	807	854	187	199	4.32	4.29	2.27%	1.15%	1.90%	953
Semarang	982	709	772	763	170	174	4.54	4.38	0.86%	-0.23%	0.50%	777
Temanggung	870	558	606	632	128	136	4.73	4.65	0.84%	0.82%	0.83%	726
Kendal	1,002	701	789	819	181	186	4.35	4.40	1.20%	0.74%	1.04%	817
Batang	789	531	593	616	130	135	4.57	4.58	1.10%	0.79%	1.00%	781
Pekalongan	836	653	701	734	142	146	4.93	5.02	0.72%	0.92%	0.78%	878
Pemalang	1,012	949	1,085	1,147	217	237	5.00	4.83	1.34%	1.13%	1.27%	1,134
Tegal	880	1,103	1,242	1,268	263	272	4.72	4.67	1.19%	0.43%	0.94%	1,441
Brebes	1,658	1,267	1,529	1,546	334	342	4.57	4.52	1.90%	0.23%	1.34%	933
Kotamdya (Municipality)												
Magelang	18	123	117	115	26	26	4.54	4.44	-0.47%	-0.36%	-0.43%	6,406
Surakarta	44	459	517	528	113	116	4.58	4.57	1.19%	0.44%	0.94%	12,010
Salatiga	18	80	86	143	18	30	4.92	4.76	0.80%	10.59%	3.97%	7,948
Semarang	374	996	1,147	1,221	251	274	4.58	4.46	1.42%	1.26%	1.37%	3,264
Pekalongan	45	133	235	242	48	51	4.87	4.78	5.89%	0.57%	4.08%	5,370
Tegal	34	132	230	230	48	49	4.82	4.67	5.69%	0.04%	3.77%	6,770
Total	32,549	25,402	28,582	29,653	6,311	6,576	4.53	4.51	1.19%	0.74%	1.04%	911

Source : Central Java in Figures (Jawa Tengah Dalam Angka) 1990, 1991, 1992, 1993, 1994, and 1996, Statistic Office of Central Java Province.

(Note) * Modified the data from the Central Java in Figures based on the Statistical Year Book of Indonesia.

Table 2.5 AREA AND POPULATION IN SEMARANG CITY

Kecamatan (district)	Area (km^2)	Population (persons)				Households (HHs)				Family size (persons/HH)				Annual average growth rate of population(%)	Population density in 1996 (persons/km^2)
		1985	1990	1993[1)]	1996	1985	1990	1993[1)]	1996	1985	1990	1993	1996	'93-'96	
Mijen	57.55	35,364	37,276	32,767	35,726	7,595	5,919	7,954	8,527	4.66	6.30	4.12	4.19	2.92%	621
Gunungpati	52.63	38,185	43,946	48,591	54,237	7,862	10,797	11,378	12,907	4.86	4.07	4.27	4.20	3.73%	1,031
Semarang Selatan	5.92	196,660	204,491	79,743	79,138	37,852	41,036	17,344	18,076	5.20	4.98	4.60	4.38	-0.25%	13,368
Banyumanik	27.73	0	0	81,561	93,681			19,025	20,713			4.29	4.52	4.73%	3,378
Gajahmungkur	10.78	0	0	52,711	54,625			10,941	11,506			4.82	4.75	1.20%	5,067
Genuk	27.39	85,417	137,504	48,631	55,872	18,092	31,622	10,777	12,034	4.72	4.35	4.51	4.64	4.74%	2,040
Pedurungan	20.72	0	0	98,134	117,770			22,852	27,594			4.29	4.27	6.27%	5,684
Gayamsari	5.26	0	0	54,355	61,182			12,327	13,509			4.41	4.53	4.02%	11,632
Semarang Timur	7.12	205,428	201,280	96,260	88,413	46,573	43,162	20,848	20,153	4.41	4.66	4.62	4.39	-2.79%	12,414
Candisari	6.80	0	0	76,006	76,640			15,780	16,521			4.82	4.64	0.28%	11,271
Tembalang	44.20	0	0	79,148	85,402			16,646	18,386			4.75	4.64	2.57%	1,932
Semarang Utara	10.97	169,330	152,457	122,705	129,299	34,366	35,182	27,090	27,816	4.93	4.33	4.53	4.65	1.76%	11,787
Semarang Tengah	5.14	72,473	62,756	84,652	81,283	14,669	13,048	20,030	19,247	4.94	4.81	4.23	4.22	-1.34%	15,814
Semarang Barat	19.96	248,254	251,707	132,754	139,189	49,876	53,656	28,083	29,519	4.98	4.69	4.73	4.72	1.59%	6,973
Ngaliyan	39.97	0	0	68,917	76,753			15,811	16,862			4.36	4.55	3.65%	1,920
Tugu	29.38	45,160	55,514	20,627	22,635	8,608	12,663	4,886	5,002	5.25	4.38	4.22	4.53	3.14%	770
Total	371.52	1,096,271	1,146,931	1,177,562	1,251,845	225,493	247,085	261,772	278,372	4.86	4.64	4.50	4.50	2.06%	3,370

(Note) 1) The administration units belonging to several districts had been revised at the end of 1992. So the new administration system is used since 1993.

- : Lack of data.

n.a.:Not available.

Source : Semarang City in Figures (Kotamadya Semarang Dalam Angka) 1985, 1990, 1993, and 1996, Statistic Office of Semarang City.

Data Monografi Kotamadya Dati II Semarang 1996, BAPPEDA Kotamadya Dati II Semarang.

Table 2.6 GROSS DOMESTIC PRODUCT IN INDONESIA

A. Gross Domestic Product (GDP) ($Rp.10^9$)

Industry of origin	GDP at current price			Annual average growth	GDP at 1993-constant price			Annual average growth
	1994[1]	1995[2]	1996[2]	ratio(%)	1994[1]	1995[2]	1996[2]	ratio(%)
Agriculture, livestock & fisheries	66,072	77,896	88,041	15.43%	59,291	61,885	63,743	3.69%
Mining & quarrying	33,507	40,195	45,916	17.06%	33,262	35,502	37,569	6.28%
Crude petroleum and natural gas	23,070	25,410	28,120	10.40%	23,720	23,720	24,063	0.72%
Others	10,437	14,785	17,796	30.58%	9,542	11,782	13,506	18.97%
Manufacturing	89,241	109,669	135,581	23.26%	82,649	91,537	102,260	11.23%
Oil and gas manufacturing	10,439	11,399	14,194	16.61%	10,269	9,782	10,864	2.86%
Petroleum refinery	5,855	6,599	8,340	19.35%	5,548	5,392	6,292	6.49%
Liquified natural gas	4,584	4,800	5,854	13.01%	4,721	4,390	4,572	-1.59%
Others	78,802	98,270	121,387	24.11%	72,380	81,755	91,396	12.37%
Electricity, gas & water	4,577	5,655	6,594	20.03%	3,703	4,292	4,841	14.34%
Construction	28,017	34,452	42,025	22.47%	25,858	29,198	32,924	12.84%
Wholesale & retail trade, restaurants & hotels	63,859	75,640	88,878	17.97%	59,504	64,231	69,372	7.97%
Transport & communication	27,353	30,795	34,926	13.00%	25,189	27,329	29,701	8.59%
Banking, insurance & real estate	34,506	39,510	44,371	13.40%	30,901	34,313	37,401	10.02%
Public services	22,755	26,555	29,753	14.35%	22,752	23,046	23,338	1.28%
Private services	12,335	14,127	16,545	15.81%	11,533	12,360	13,272	7.27%
GDP in total	382,222	454,494	532,630	18.05%	354,642	383,693	414,421	8.10%
GDP per capita ($Rp.10^3$)	1,988	2,327	2,685	16.21%	1,845	1,965	2,089	6.42%
Population(10^3)	192,217	195,283	198,343	1.58%	192,217	195,283	198,343	1.58%

B. Share Rate of Gross Domestic Product (% of GDP)

Industry of origin	GDP at current price			Annual average growth	GDP at 1993-constant price			Annual average growth
	1994	1995	1996	ratio(%)	1994	1995	1996	ratio(%)
Agriculture, livestock & fisheries	17.29%	17.14%	16.53%	-2.21%	16.72%	16.13%	15.38%	-4.08%
Mining & quarrying	8.77%	8.84%	8.62%	-0.83%	9.38%	9.25%	9.07%	-1.69%
Crude petroleum and natural gas	6.04%	5.59%	5.28%	-6.47%	6.69%	6.18%	5.81%	-6.83%
Others	2.73%	3.25%	3.34%	10.62%	2.69%	3.07%	3.26%	10.06%
Manufacturing	23.35%	24.13%	25.46%	4.41%	23.30%	23.86%	24.68%	2.90%
Oil and gas manufacturing	2.73%	2.51%	2.66%	-1.22%	2.90%	2.55%	2.62%	-4.85%
Petroleum refinery	1.53%	1.45%	1.57%	1.10%	1.56%	1.41%	1.52%	-1.49%
Liquified natural gas	1.20%	1.06%	1.10%	-4.27%	1.33%	1.14%	1.10%	-8.96%
Others	20.62%	21.62%	22.79%	5.14%	20.41%	21.31%	22.05%	3.95%
Electricity, gas & water	1.20%	1.24%	1.24%	1.68%	1.04%	1.12%	1.17%	5.77%
Construction	7.33%	7.58%	7.89%	3.75%	7.29%	7.61%	7.94%	4.38%
Wholesale & retail trade, restaurants & hotels	16.71%	16.64%	16.69%	-0.06%	16.78%	16.74%	16.74%	-0.12%
Transport & communication	7.16%	6.78%	6.56%	-4.28%	7.10%	7.12%	7.17%	0.45%
Banking, insurance & real estate	9.03%	8.69%	8.33%	-3.94%	8.71%	8.94%	9.02%	1.77%
Public services	5.95%	5.84%	5.59%	-3.13%	6.42%	6.01%	5.63%	-6.31%
Private services	3.23%	3.11%	3.11%	-1.89%	3.25%	3.22%	3.20%	-0.76%
Sub-total	100.00%	100.00%	100.00%		100.00%	100.00%	100.00%	

Source :

1) Statistical Year Book of Indonesia 1995, Biro Pusat Statistik Indonesia.

2) Statistical Year Book of Indonesia 1996, Biro Pusat Statistik Indonesia.

Table 2.7 GROSS REGIONAL DOMESTIC PRODUCT IN CENTRAL JAVA PROVINCE

A. Gross Regional Domestic Product (GRDP) (Rp.10^9)

Industry of origin	GRDP at current price			Annual* average growth	GRDP at 1993-constant price			Annual* average growth
	1994	1995	1996	ratio(%)	1994	1995	1996	ratio(%)
Agriculture, livestock & fisheries	8,779	10,635	-	21.14%	7,782	8,211	-	5.51%
Mining & quarrying	452	527	-	16.59%	433	472	-	9.01%
Manufacturing	12,454	14,863	-	19.34%	11,322	12,260	-	8.28%
Electricity, gas & water	272	331	-	21.69%	265	304	-	14.72%
Construction	1,768	1,983	-	12.16%	1,689	1,808	-	7.05%
Wholesale & retail trade, restaurants & hotels	8,002	9,673	-	20.88%	7,581	8,364	-	10.33%
Transport & communication	1,454	1,722	-	18.43%	1,379	1,511	-	9.57%
Banking, insurance & real estate	1,965	2,275	-	15.78%	1,869	1,974	-	5.62%
Public and private services	4,158	4,614	-	10.97%	4,026	4,128	-	2.53%
GRDP in total	39,304	46,623	n.a.	18.62%	36,346	39,032	n.a.	7.39%
GRDP per capita (Rp.10^3)	1,333	1,570	n.a.	17.81%	1,233	1,315	n.a.	6.66%
Population(10^3)**	29,485	29,688	29,881	0.67%	29,485	29,688	29,881	0.67%

B. Share Rate of Gross Regional Domestic Product (% of GRDP)

Industry of origin	GRDP at current price			Annual* average growth	GRDP at 1993-constant price			Annual* average growth
	1994	1995	1996	ratio(%)	1994	1995	1996	ratio(%)
Agriculture, livestock & fisheries	22.34%	22.81%	-	2.12%	21.41%	21.04%	-	-1.75%
Mining & quarrying	1.15%	1.13%	-	-1.71%	1.19%	1.21%	-	1.51%
Manufacturing	31.69%	31.88%	-	0.61%	31.15%	31.41%	-	0.83%
Electricity, gas & water	0.69%	0.71%	-	2.59%	0.73%	0.78%	-	6.82%
Construction	4.50%	4.25%	-	-5.45%	4.65%	4.63%	-	-0.32%
Wholesale & retail trade, restaurants & hotels	20.36%	20.75%	-	1.91%	20.86%	21.43%	-	2.74%
Transport & communication	3.70%	3.69%	-	-0.16%	3.79%	3.87%	-	2.03%
Banking, insurance & real estate	5.00%	4.88%	-	-2.40%	5.14%	5.06%	-	-1.65%
Public and private services	10.58%	9.90%	-	-6.45%	11.08%	10.58%	-	-4.52%
Sub-total	100.00%	100.00%	n.a.		100.00%	100.00%	n.a.	

Source : Central Java in Figures 1996 (Jawa Tengah Dalam Angka 1996), Kantor Statistik Provinsi Jawa Tengah.

(Note) :

* Annual average growth ratio between 1994 and 1995.

** Based on population projection reported in the Statistical Year Book of Indonesia 1996.

\- Lack of data.

n.a. : Not available.

Table 2.8 CONSTRUCTION BASE COST FOR WEST FLOODWAY/GARANG RIVER IMPROVEMENT

Bill No.	General Summary	Amount		
		Foreign Portion Rp	Local Portion Rp	Total Rp
PACKAGE 1: WEST FLOODWAY AND GARANG RIVER IMPROVEMENT WORKS				
A.	General	1,224,236,100	2,556,700,250	3,780,936,350
B.	Channel and Dike Works	26,440,030,831	17,771,888,767	44,211,919,598
C.	Raising the Existing Floodwall	3,164,457,437	4,781,453,016	7,945,910,453
D.	Protection Works for Riverbank and Riverbed	15,866,931,659	16,086,125,556	31,953,057,215
E.	Ground Sills	4,192,531,264	2,778,984,648	6,971,515,912
F.	Drainage Sluiceway at WF172R+15m	400,701,480	337,712,185	738,413,665
G.	Drainage Outlet Works	228,649,052	228,701,214	457,350,266
H.	River Amenity and Maintenance Facilities	2,171,852,616	2,843,976,179	5,015,828,795
I.	Waterlevel Gauging Station	140,117,812	122,838,306	262,956,118
J.	Supplying Maintenace Equipment	2,092,010,900	91,482,400	2,183,493,300
PACKAGE 2: RECONSTRUCTION OF SIMONGAN WEIR				
A.	General	511,635,500	1,136,890,950	1,648,526,450
B.	Preparatory and Temporary Works	3,445,187,330	2,953,498,074	6,398,685,404
C.	Earth Work	1,479,701,400	1,272,438,500	2,752,139,900
D.	Foundation Piles and Seepage Blocking Sheet Piles	5,351,089,110	981,878,770	6,332,967,880
E.	Concrete Work	5,595,405,321	6,715,589,709	12,310,995,030
F.	Stone and Masonry	1,077,386,961	1,202,767,610	2,280,154,571
G.	Metal Work and Mechanical Work	36,109,875,634	6,300,242,356	42,410,117,990
H.	Road Pavement	37,457,031	57,040,164	94,497,195
I.	Miscellaneous Work	318,468,929	118,806,353	437,275,282
J.	Electrical Work	1,594,590,480	380,644,740	1,975,235,220
K.	Simongan Weir Management Complex	713,871,390	1,424,744,937	2,138,616,327
L.	Preservation of Existing Simongan Weir	8,597,587,535	1,583,477,808	10,181,065,343
PACKAGE 3: RAISING OF RAILWAY BRIDGE OVER WEST WEST FLOODWAY				
1	Box Culvert BH 5 Km. 00+816	103,712,027	237,436,254	341,148,281
2	Box Culvert BH 6 Km. 01+177	143,448,770	177,039,868	320,488,638
3	Raising Railway Bridge BH 10 Km.01+577	4,253,776,445	3,260,876,160	7,514,652,606
4	Double Box Culvert BH 13 Km. 02+ 332	244,022,552	306,069,388	550,091,940
5	Track Raising Km. 00+677 - Km. 02+521	1,897,525,580	5,889,793,760	7,787,319,340
Grand Total		127,396,261,146	81,599,097,924	208,995,359,070

Table 2.9 DISBURSEMENT SCHEDULE
FOR WEST FLOODWAY/GARANG RIVER IMPROVEMENT

Work Name	Currency	2000	2001	2002	2003	Total
Package-1	Rupiah	0	40,275,563,871	71,002,903,000	29,153,430,717	140,431,897,588
	Converting into Yen	0	666,872,082	1,175,647,196	482,714,757	2,325,234,034
Package-2	Rupiah	0	52,582,094,693	19,290,157,339	45,720,924,153	117,593,176,186
	Converting into Yen	0	870,640,348	319,401,298	757,034,910	1,947,076,556
Package-3	Rupiah	0	1,203,338,179	21,685,777,774	0	22,889,115,953
	Converting into Yen	0	19,924,554	359,067,344	0	378,991,898
Administration Cost	Rupiah	0	5,701,675,877	6,753,295,899	4,495,029,881	16,950,001,656
	Converting into Yen	0	94,406,834	111,819,278	74,427,510	280,653,622
Engineering Service Cost	Rupiah	1,109,206,316	7,056,708,425	8,400,934,152	5,617,277,430	22,184,126,324
	Converting into Yen	18,365,943	116,843,102	139,100,435	93,009,387	367,318,867
Compensation Cost	Rupiah		782,704,000	438,916,320		1,221,620,320
	Converting into Yen	0	12,959,805	7,267,460	0	20,227,265
Total	Rupiah	1,109,206,316	107,602,085,045	127,571,984,484	84,986,662,181	321,269,938,027
	Converting into Yen	18,365,943	1,781,646,724	2,112,303,011	1,407,186,563	5,319,502,242

Note : All costs include price and physical contingencies and tax.

Table 2.10 CONSTRUCTION BASE COST FOR JATIBARANG MULTIPURPOSE DAM CONSTRUCTION

Bill No.	General Summary	Amount		
		Foreign Portion Rp	Local Portion Rp	Total Rp
Package-1: Jatibarang Multipurpose Dam including Appurtenant Structures				
A.	General	9,209,740,082	6,605,440,384	15,815,180,466
B.	Water Control	626,734,700	333,325,300	960,060,000
C.	Surface Excavation and Earth Works	22,011,194,000	14,332,972,000	36,344,166,000
D.	Protection Works for Riverbank and Riverbed	9,754,354,800	6,765,758,900	16,520,113,700
E.	Drilling and Grouting	11,321,362,740	4,417,509,800	15,738,872,540
F.	Embankment Construction	54,642,316,000	37,262,413,000	91,904,729,000
G.	Protection and Support of Excavation	1,685,999,000	2,255,106,000	3,941,105,000
H.	Drainage	254,820,100	676,796,100	931,616,200
I.	Concrete Production and Concrete Construction	30,250,975,890	27,751,224,180	58,002,200,070
J.	Road Construction	5,565,586,800	4,223,061,000	9,788,647,800
K.	Furnishing and Installing Metalwork	145,769,400	117,065,600	262,835,000
L.	Water Control Plant	17,212,975,600	7,942,623,000	25,155,598,600
M.	Instrumentation of Structures	1,126,099,950	182,010,780	1,308,110,730
N.	Generating Plant	27,338,234,600	8,689,025,100	36,027,259,700
O.	Relocation of Power Transmission Line	7,295,071,700	3,139,545,300	10,434,617,000
P.	Miscellaneous Works	2,961,217,712	543,758,440	3,504,976,152
Q.	Building Works	556,165,000	1,391,881,100	1,948,046,100
Package-2 : Operation and Maintenance Building and Goa Kreo Bridge				
A	General	243,179,479	295,142,683	538,322,163
B	Dam Mangement Complex	586,691,300	1,873,622,100	2,460,313,400
C	Construction of Approach Bridge to Goa Kreo	372,115,866	574,076,696	946,192,561
Grand Total		203,160,604,719	129,372,357,464	332,532,962,183

Table 2.11 DISBURSEMENT SCHEDULE FOR JATIBARANG MULTIPURPOSE DAM CONSTRUCTION

Work Name	Currency	2000	2001	2002	2003	2004	Total
Package-1	Rupiah	0	55,879,189,400	86,628,610,591	137,631,892,156	202,195,013,201	482,334,705,348
	Converting into Yen	0	925,232,766	1,434,373,509	2,278,872,288	3,347,891,286	7,986,369,849
Package-2	Rupiah	0	0	1,225,446,496	4,095,545,004	808,744,605	6,129,736,105
	Converting into Yen	0	0	20,290,617	67,812,946	13,390,978	101,494,541
Administration Cost	Rupiah	0	4,407,588,567	5,082,466,112	8,199,107,935	11,744,019,047	29,433,181,661
	Converting into Yen	0	72,979,680	84,154,123	135,758,650	194,454,346	487,346,799
Engineering Service Cost	Rupiah	838,679,050	4,701,203,147	7,391,298,516	11,923,749,804	17,079,022,000	41,933,952,517
	Converting into Yen	13,886,625	77,841,272	122,383,156	197,430,280	282,789,907	694,331,240
Compensation Cost	Rupiah		18,462,842,957				18,462,842,957
	Converting into Yen	0	305,702,846	0	0	0	305,702,846
Total	Rupiah	838,679,050	83,450,824,071	100,327,821,715	161,850,294,898	231,826,798,853	578,294,418,588
	Converting into Yen	13,886,625	1,381,756,564	1,661,201,405	2,679,874,164	3,838,526,517	9,575,245,275

Note : All costs include price and physical contingencies and tax.

Table 2.12 CONSTRUCTION BASE COST FOR URBAN DRAINAGE SYSTEM IMPROVEMENT

Bill No.	General Summary	Amount		
		Foreign Portion Rp	Local Portion Rp	Total Rp
PACKAGE 1: SEMARANG RIVER DRAINAGE SYSTEM IMPROVEMENT				
A	GENERAL	409,679,000	983,235,000	1,392,914,000
B	CHANNEL WORKS	5,617,377,200	5,471,053,000	11,088,430,200
C	DIKE RAISING	214,811,150	546,845,560	761,656,710
D	INSPECTION ROAD	1,342,465,300	3,927,349,520	5,269,814,820
E	MISCELLANEOUS WORKS	481,347,140	314,040,930	795,388,070
PACKAGE 2: ASIN DRAINAGE SYSTEM IMPROVEMENT				
A	GENERAL	950,550,600	1,954,715,100	2,905,265,700
B	SEMARANG RIVER IMPROVEMENT	9,603,568,355	6,821,048,706	16,424,617,062
C	ASIN RIVER IMPROVEMENT	13,318,345,112	14,490,110,075	27,808,455,187
D	ASIN PUMPING STATION	17,395,216,760	3,989,929,766	21,385,146,526
E	ASIN PUMPING STATION GATE	2,536,355,751	1,706,489,322	4,242,845,073
F	BUILDINGS	301,971,000	796,931,800	1,098,902,800
G	ASIN RETARDING POND	3,653,151,740	2,145,346,810	5,798,498,550
H	MISCELLANEOUS WORKS	52,837,750	211,828,150	264,665,900
I	SUPPLYING MAINTENANCE EQUIPMENT	1,609,525,300	72,262,300	1,681,787,600
PACKAGE 3: BANDARHARJO DRAINAGE SYSTEM IMPROVEMENT				
A	GENERAL	189,327,600	359,744,500	549,072,100
B	BARU RIVER IMPROVEMENT	7,480,013,395	7,045,033,596	14,525,046,991
C	BARU PUMPING STATION	11,453,843,592	2,366,343,226	13,820,186,818
D	BARU PUMPING STATION GATE	1,530,898,680	1,008,416,050	2,539,314,730
E	BUILDINGS	267,783,800	722,598,000	990,381,800
F	BARU RETARDING POND	1,302,214,351	1,732,466,108	3,034,680,459
G	BARU CONVEYANCE CHANNEL	4,393,667,144	4,030,785,525	8,424,452,669
H	BANDARHARJO WEST SECONDARY CHANNEL	1,116,302,872	1,930,880,196	3,047,183,068
I	BANDARHARJO EAST SECONDARY CHANNEL	624,613,807	658,108,978	1,282,722,785
J	MISCELLANEOUS WORKS	34,592,250	121,489,550	156,081,800
K	MAINTENANCE EQUIPMENT	1,191,670,300	52,111,000	1,243,781,300
Total of Bills		87,072,129,950	63,459,162,767	150,531,292,718

Table 2.13 DISBURSEMENT SCHEDULE FOR URBAN DRAINAGE SYSTEM IMPROVEMENT

Work Name	Currency	2000	2001	2002	2003	Total
Package-1	Rupiah	0	0	11,063,148,297	16,699,644,835	27,762,793,133
	Converting into Yen	0	0	183,180,669	276,508,280	459,688,949
Package-2	Rupiah	0	19,579,862,100	56,025,758,738	35,823,218,236	111,428,839,074
	Converting into Yen	0	324,198,152	927,659,622	593,151,326	1,845,009,100
Package-3	Rupiah	0	12,908,890,245	42,034,074,564	12,128,854,209	67,071,819,018
	Converting into Yen	0	213,741,974	695,989,034	200,826,344	1,110,557,352
Administration Cost	Rupiah	0	2,365,258,874	6,551,122,394	3,881,320,934	12,797,702,202
	Converting into Yen	0	39,163,328	108,471,743	64,265,880	211,900,952
Engineering Service Cost	Rupiah	439,648,074	2,239,063,487	7,520,549,914	4,455,674,320	14,654,935,794
	Converting into Yen	7,279,576	37,073,818	124,523,267	73,775,871	242,652,532
Compensation Cost	Rupiah		5,925,988,512			5,925,988,512
	Converting into Yen	0	98,120,943	0	0	98,120,943
Total	Rupiah	439,648,074	43,019,063,217	123,194,653,908	72,988,712,534	239,642,077,734
	Converting into Yen	7,279,576	712,298,214	2,039,824,335	1,208,527,702	3,967,929,827

Note : All costs include price and physical contingencies and tax.

Table 3.1 (1/6) CALCULATION OF ECONOMIC INTERNAL RATE OF RETURN (Flood Control Works)

(Rp.10^6)

Year in order	Year	Flood control works				Cost allocated from dam				Cost grand total	Benefit	Cash balan
		Construction cost		Cost for O/M & R	Total	Construction cost		Cost for O/M & R	Total			
		F/C	L/C			F/C	L/C					
1	1998/99	0	0	0	0	0	0	0	0	0	0	0
2	1999/00	0	0	0	0	0	0	0	0	0	0	0
3	2000/01	2,889	3,422	0	6,311	644	702	0	1,346	7,657	0	-7,657
4	2001/02	17,134	17,984	0	35,118	3,156	4,182	0	7,338	42,456	0	-42,456
5	2002/03	14,207	24,576	0	38,783	4,395	5,362	0	9,757	48,540	0	-48,540
6	2003/04	16,839	12,457	0	29,296	10,062	9,039	0	19,101	48,397	0	-48,397
7	2004/05			457	457	6,816	4,353	0	11,169	11,626	24,941	13,315
8	2005/06			457	457	0	0	176	176	633	40,759	40,126
9	2006/07			457	457	0	0	176	176	633	40,759	40,126
10	2007/08			457	457			176	176	633	40,759	40,126
11	2008/09			457	457			176	176	633	40,759	40,126
12	2009/10			457	457			176	176	633	40,759	40,126
13	2010/11			457	457			176	176	633	40,759	40,126
14	2011/12			457	457			176	176	633	40,759	40,126
15	2012/13			457	457			176	176	633	40,759	40,126
16	2013/14			457	457			176	176	633	40,759	40,126
17	2014/15			457	457			176	176	633	40,759	40,126
18	2015/16			457	457			176	176	633	40,759	40,126
19	2016/17			457	457			176	176	633	40,759	40,126
20	2017/18			457	457			176	176	633	40,759	40,126
21	2018/19			457	457			176	176	633	40,759	40,126
22	2019/20			457	457			176	176	633	40,759	40,126
23	2020/21			457	457			176	176	633	40,759	40,126
24	2021/22			457	457			176	176	633	40,759	40,126
25	2022/23			457	457			176	176	633	40,759	40,126
26	2023/24			457	457			176	176	633	40,759	40,126
27	2024/25			457	457			176	176	633	40,759	40,126
28	2025/26			457	457			176	176	633	40,759	40,126
29	2026/27			457	457			176	176	633	40,759	40,126
30	2027/28			457	457			176	176	633	40,759	40,126
31	2028/29			457	457			176	176	633	40,759	40,126
32	2029/30			457	457			176	176	633	40,759	40,126
33	2030/31			457	457			176	176	633	40,759	40,126
34	2031/32			457	457			176	176	633	40,759	40,126
35	2032/33			457	457			176	176	633	40,759	40,126
36	2033/34			457	457			176	176	633	40,759	40,126
37	2034/35			457	457			176	176	633	40,759	40,126
38	2035/36			457	457			176	176	633	40,759	40,126
39	2036/37			457	457			176	176	633	40,759	40,126
40	2037/38			457	457			176	176	633	40,759	40,126
41	2038/39			457	457			176	176	633	40,759	40,126
42	2039/40			457	457			176	176	633	40,759	40,126
43	2040/41			457	457			176	176	633	40,759	40,126
44	2041/42			457	457			176	176	633	40,759	40,126
45	2042/43			457	457			176	176	633	40,759	40,126
46	2043/44			457	457			176	176	633	40,759	40,126
47	2044/45			457	457			176	176	633	40,759	40,126
48	2045/46			457	457			176	176	633	40,759	40,126
49	2046/47			457	457			176	176	633	40,759	40,126
50	2047/48			457	457			176	176	633	40,759	40,126
51	2048/49			457	457			176	176	633	40,759	40,126
52	2049/50			457	457			176	176	633	40,759	40,126
53	2050/51			457	457			176	176	633	40,759	40,126
54	2051/52			457	457			176	176	633	40,759	40,126
55	2053/54			457	457			176	176	633	40,759	40,126
56	2054/55			457	457			176	176	633	40,759	40,126
Total		51,069	58,439	22,850	132,358	25,073	23,638	8,624	57,335	189,693	2,022,132	1,832,439
In the condition of discount rate at 12 %:												
Net Present value (NPV):										92,130	164,331	72,201
Internal rate of return (EIRR):												19.77%
B/C												1.78

Table 3.1 (2/6) CALCULATION OF ECONOMIC INTERNAL RATE OF RETURN (Water Resources Develioment)

(Rp.10^6)

Year in order	Year	Allocated cost from Jatibarang Dam			Total	Benefit	Cash balance
		Construction cost		Cost for O/M & R			
		F/C	L/C				
1	1998/99	0	0	0	0	0	0
2	1999/00	0	0	0	0	0	0
3	2000/01	1,173	1,278	0	2,451	0	-2,451
4	2001/02	5,746	7,613	0	13,359	0	-13,359
5	2002/03	8,011	9,761	0	17,772	0	-17,772
6	2003/04	18,316	16,454	0	34,770	0	-34,770
7	2004/05	12,407	7,924	0	20,331	0	-20,331
8	2005/06	0	0	321	321	26,700	26,379
9	2006/07	0	0	321	321	26,700	26,379
10	2007/08			321	321	26,700	26,379
11	2008/09			321	321	26,700	26,379
12	2009/10			321	321	26,700	26,379
13	2010/11			321	321	26,700	26,379
14	2011/12			321	321	26,700	26,379
15	2012/13			321	321	26,700	26,379
16	2013/14			321	321	26,700	26,379
17	2014/15			321	321	26,700	26,379
18	2015/16			321	321	26,700	26,379
19	2016/17			321	321	26,700	26,379
20	2017/18			321	321	26,700	26,379
21	2018/19			321	321	26,700	26,379
22	2019/20			321	321	26,700	26,379
23	2020/21			321	321	26,700	26,379
24	2021/22			321	321	26,700	26,379
25	2022/23			321	321	26,700	26,379
26	2023/24			321	321	26,700	26,379
27	2024/25			321	321	26,700	26,379
28	2025/26			321	321	26,700	26,379
29	2026/27			321	321	26,700	26,379
30	2027/28			321	321	26,700	26,379
31	2028/29			321	321	26,700	26,379
32	2029/30			321	321	26,700	26,379
33	2030/31			321	321	26,700	26,379
34	2031/32			321	321	26,700	26,379
35	2032/33			321	321	26,700	26,379
36	2033/34			321	321	26,700	26,379
37	2034/35			321	321	26,700	26,379
38	2035/36			321	321	26,700	26,379
39	2036/37			321	321	26,700	26,379
40	2037/38			321	321	26,700	26,379
41	2038/39			321	321	26,700	26,379
42	2039/40			321	321	26,700	26,379
43	2040/41			321	321	26,700	26,379
44	2041/42			321	321	26,700	26,379
45	2042/43			321	321	26,700	26,379
46	2043/44			321	321	26,700	26,379
47	2044/45			321	321	26,700	26,379
48	2045/46			321	321	26,700	26,379
49	2046/47			321	321	26,700	26,379
50	2047/48			321	321	26,700	26,379
51	2048/49			321	321	26,700	26,379
52	2049/50			321	321	26,700	26,379
53	2050/51			321	321	26,700	26,379
54	2051/52			321	321	26,700	26,379
55	2053/54			321	321	26,700	26,379
56	2054/55			321	321	26,700	26,379
57	2055/56			321	321	26,700	26,379
Total		45,653	43,030	16,050	104,733	1,335,000	1,230,267
In the condition of discount rate at 12 %:							
Net Present value (NPV):					48,337	100,299	51,963
Internal rate of return (EIRR):							22.14%
B/C							2.08

Table 3.1 (3/6) CALCULATION OF ECONOMIC INTERNAL RATE OF RETURN (DRAINAGE SYSTEM IMPROVEMENT)

(Rp.10^6)

Year in order	Year	Cost			Total	Benefit	Cash balance
		Construction cost		Cost for O/M & R			
		F/C	L/C				
1	1998/99	0	0	0	0	0	0
2	1999/00	0	0	0	0	0	0
3	2000/01	1,869	4,079	0	5,948	0	-5,948
4	2001/02	11,920	20,160	0	32,080	0	-32,080
5	2002/03	14,624	20,844	0	35,468	0	-35,468
6	2003/04	1,789	7,063	0	8,852	0	-8,852
7	2004/05			759	759	16,101	15,342
8	2005/06			759	759	16,101	15,342
9	2006/07			759	759	16,101	15,342
10	2007/08			759	759	16,101	15,342
11	2008/09			759	759	16,101	15,342
12	2009/10			759	759	16,101	15,342
13	2010/11			759	759	16,101	15,342
14	2011/12			759	759	16,101	15,342
15	2012/13			759	759	16,101	15,342
16	2013/14			759	759	16,101	15,342
17	2014/15			759	759	16,101	15,342
18	2015/16			759	759	16,101	15,342
19	2016/17			759	759	16,101	15,342
20	2017/18			759	759	16,101	15,342
21	2018/19			759	759	16,101	15,342
22	2019/20			759	759	16,101	15,342
23	2020/21			759	759	16,101	15,342
24	2021/22			759	759	16,101	15,342
25	2022/23			759	759	16,101	15,342
26	2023/24			759	759	16,101	15,342
27	2024/25			759	759	16,101	15,342
28	2025/26			759	759	16,101	15,342
29	2026/27			759	759	16,101	15,342
30	2027/28			759	759	16,101	15,342
31	2028/29			759	759	16,101	15,342
32	2029/30			759	759	16,101	15,342
33	2030/31			759	759	16,101	15,342
34	2031/32			759	759	16,101	15,342
35	2032/33			759	759	16,101	15,342
36	2033/34			759	759	16,101	15,342
37	2034/35			759	759	16,101	15,342
38	2035/36			759	759	16,101	15,342
39	2036/37			759	759	16,101	15,342
40	2037/38			759	759	16,101	15,342
41	2038/39			759	759	16,101	15,342
42	2039/40			759	759	16,101	15,342
43	2040/41			759	759	16,101	15,342
44	2041/42			759	759	16,101	15,342
45	2042/43			759	759	16,101	15,342
46	2043/44			759	759	16,101	15,342
47	2044/45			759	759	16,101	15,342
48	2045/46			759	759	16,101	15,342
49	2046/47			759	759	16,101	15,342
50	2047/48			759	759	16,101	15,342
51	2048/49			759	759	16,101	15,342
52	2049/50			759	759	16,101	15,342
53	2050/51			759	759	16,101	15,342
54	2051/52			759	759	16,101	15,342
55	2053/54			759	759	16,101	15,342
56	2054/55			759	759	16,101	15,342
Total		30,202	52,146	37,950	120,298	805,050	684,752
In the condition of discount rate at 12 %:							
Net Present value (NPV):					52,425	67,742	15,317
Internal rate of return (EIRR):							15.13%
B/C							1.29

Table 3.1 (4/6) CALCULATION OF ECONOMIC INTERNAL RATE OF RETURN
(Hydropower Generation Works)

(Note)

E.Rate= 2,971 Rp./US$ Annual increasing rate of fuel: 5.37% Unit benefit as of 1992(US$/kWh): 0.098 ($Rp.10^6$)

Year in order	Year	Cost for power generation works				Cost allocated from dam				Grand total of cost	Envisaged benefit in 2005/06			Cash balance
		Construction cost F/C	Construction cost L/C	OMR cost	Total	Construction cost F/C	Construction cost L/C	OMR cost	total		Unit value (Rp./kWh)	Annual E. output (mWh)	Benefit	
1	1998/99	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1999/00	0	0	0	0	0	0	0	0	0	0	0	0	0
3	2000/01	0	0	0	0	3	3	0	6	6	0	0	0	-6
4	2001/02	503	140	0	643	14	19	0	33	676	0	0	0	-676
5	2002/03	3,356	1,319	0	4,675	20	24	0	44	4,719	0	0	0	-4,719
6	2003/04	5,770	2,065	0	7,835	45	41	0	86	7,921	0	0	0	-7,921
7	2004/05	7,542	1,495	0	9,037	31	20	0	51	9,088	0	0	0	-9,088
8	2005/06	0	0	426	426	0	0	1	1	427	575	5,790	3,328	2,901
9	2006/07	0	0	426	426	0	0	1	1	427	575	5,790	3,328	2,901
10	2007/08			426	426			1	1	427	575	5,790	3,328	2,901
11	2008/09			426	426			1	1	427	575	5,790	3,328	2,901
12	2009/10			426	426			1	1	427	575	5,790	3,328	2,901
13	2010/11			426	426			1	1	427	575	5,790	3,328	2,901
14	2011/12			426	426			1	1	427	575	5,790	3,328	2,901
15	2012/13			426	426			1	1	427	575	5,790	3,328	2,901
16	2013/14			426	426			1	1	427	575	5,790	3,328	2,901
17	2014/15			426	426			1	1	427	575	5,790	3,328	2,901
18	2015/16			426	426			1	1	427	575	5,790	3,328	2,901
19	2016/17			426	426			1	1	427	575	5,790	3,328	2,901
20	2017/18			426	426			1	1	427	575	5,790	3,328	2,901
21	2018/19			426	426			1	1	427	575	5,790	3,328	2,901
22	2019/20			426	426			1	1	427	575	5,790	3,328	2,901
23	2020/21			426	426			1	1	427	575	5,790	3,328	2,901
24	2021/22			426	426			1	1	427	575	5,790	3,328	2,901
25	2022/23			426	426			1	1	427	575	5,790	3,328	2,901
26	2023/24			426	426			1	1	427	575	5,790	3,328	2,901
27	2024/25			426	426			1	1	427	575	5,790	3,328	2,901
28	2025/26			426	426			1	1	427	575	5,790	3,328	2,901
29	2026/27			426	426			1	1	427	575	5,790	3,328	2,901
30	2027/28			426	426			1	1	427	575	5,790	3,328	2,901
31	2028/29			426	426			1	1	427	575	5,790	3,328	2,901
32	2029/30			426	426			1	1	427	575	5,790	3,328	2,901
33	2030/31			426	426			1	1	427	575	5,790	3,328	2,901
34	2031/32			426	426			1	1	427	575	5,790	3,328	2,901
35	2032/33			426	426			1	1	427	575	5,790	3,328	2,901
36	2033/34			426	426			1	1	427	575	5,790	3,328	2,901
37	2034/35			426	426			1	1	427	575	5,790	3,328	2,901
38	2035/36			426	426			1	1	427	575	5,790	3,328	2,901
39	2036/37			426	426			1	1	427	575	5,790	3,328	2,901
40	2037/38			426	426			1	1	427	575	5,790	3,328	2,901
41	2038/39			426	426			1	1	427	575	5,790	3,328	2,901
42	2039/40			426	426			1	1	427	575	5,790	3,328	2,901
43	2040/41			426	426			1	1	427	575	5,790	3,328	2,901
44	2041/42			426	426			1	1	427	575	5,790	3,328	2,901
45	2042/43			426	426			1	1	427	575	5,790	3,328	2,901
46	2043/44			426	426			1	1	427	575	5,790	3,328	2,901
47	2044/45			426	426			1	1	427	575	5,790	3,328	2,901
48	2045/46			426	426			1	1	427	575	5,790	3,328	2,901
49	2046/47			426	426			1	1	427	575	5,790	3,328	2,901
50	2047/48			426	426			1	1	427	575	5,790	3,328	2,901
51	2048/49			426	426			1	1	427	575	5,790	3,328	2,901
52	2049/50			426	426			1	1	427	575	5,790	3,328	2,901
53	2050/51			426	426			1	1	427	575	5,790	3,328	2,901
54	2051/52			426	426			1	1	427	575	5,790	3,328	2,901
55	2053/54			426	426			1	1	427	575	5,790	3,328	2,901
56	2054/55			426	426			1	1	427	575	5,790	3,328	2,901
57	2055/56			426	426			1	1	427	575	5,790	3,328	2,901
Total		17,171	5,019	21,300	43,490	113	107	50	270	43,760			166,379	122,619
In the condition of discount rate at 12 %:														
Net Present value (NPV):										12,840			12,500	-339
Internal rate of return (EIRR):														11.66%
B/C														0.97

Table 3.1 (5/6) CALCULATION OF ECONOMIC INTERNAL RATE OF RETURN (OVERALL PROJECT)

(Rp.10^6)

Year in order	Year	Cost				Benefit	Cash balance
		Construction cost		Cost for O/M & R	Total		
		F/C	L/C				
1	1998/99	0	0	0	0	0	0
2	1999/00	0	0	0	0	0	0
3	2000/01	6,578	9,484	0	16,062	0	-16,062
4	2001/02	38,473	50,098	0	88,571	0	-88,571
5	2002/03	44,603	61,886	0	106,489	0	-106,489
6	2003/04	52,821	47,119	0	99,940	0	-99,940
7	2004/05	26,796	13,792	1,216	41,804	41,042	-762
8	2005/06			2,140	2,140	86,888	84,748
9	2006/07			2,140	2,140	86,888	84,748
10	2007/08			2,140	2,140	86,888	84,748
11	2008/09			2,140	2,140	86,888	84,748
12	2009/10			2,140	2,140	86,888	84,748
13	2010/11			2,140	2,140	86,888	84,748
14	2011/12			2,140	2,140	86,888	84,748
15	2012/13			2,140	2,140	86,888	84,748
16	2013/14			2,140	2,140	86,888	84,748
17	2014/15			2,140	2,140	86,888	84,748
18	2015/16			2,140	2,140	86,888	84,748
19	2016/17			2,140	2,140	86,888	84,748
20	2017/18			2,140	2,140	86,888	84,748
21	2018/19			2,140	2,140	86,888	84,748
22	2019/20			2,140	2,140	86,888	84,748
23	2020/21			2,140	2,140	86,888	84,748
24	2021/22			2,140	2,140	86,888	84,748
25	2022/23			2,140	2,140	86,888	84,748
26	2023/24			2,140	2,140	86,888	84,748
27	2024/25			2,140	2,140	86,888	84,748
28	2025/26			2,140	2,140	86,888	84,748
29	2026/27			2,140	2,140	86,888	84,748
30	2027/28			2,140	2,140	86,888	84,748
31	2028/29			2,140	2,140	86,888	84,748
32	2029/30			2,140	2,140	86,888	84,748
33	2030/31			2,140	2,140	86,888	84,748
34	2031/32			2,140	2,140	86,888	84,748
35	2032/33			2,140	2,140	86,888	84,748
36	2033/34			2,140	2,140	86,888	84,748
37	2034/35			2,140	2,140	86,888	84,748
38	2035/36			2,140	2,140	86,888	84,748
39	2036/37			2,140	2,140	86,888	84,748
40	2037/38			2,140	2,140	86,888	84,748
41	2038/39			2,140	2,140	86,888	84,748
42	2039/40			2,140	2,140	86,888	84,748
43	2040/41			2,140	2,140	86,888	84,748
44	2041/42			2,140	2,140	86,888	84,748
45	2042/43			2,140	2,140	86,888	84,748
46	2043/44			2,140	2,140	86,888	84,748
47	2044/45			2,140	2,140	86,888	84,748
48	2045/46			2,140	2,140	86,888	84,748
49	2046/47			2,140	2,140	86,888	84,748
50	2047/48			2,140	2,140	86,888	84,748
51	2048/49			2,140	2,140	86,888	84,748
52	2049/50			2,140	2,140	86,888	84,748
53	2050/51			2,140	2,140	86,888	84,748
54	2051/52			2,140	2,140	86,888	84,748
55	2053/54			2,140	2,140	86,888	84,748
56	2054/55			2,140	2,140	86,888	84,748
57	2055/56			2,140	2,140	86,888	84,748
Total		169,271	182,379	106,076	457,726	4,298,554	3,840,828
In the condition of discount rate at 12 %:							
Net Present value (NPV):					205,728	344,963	139,235
Internal rate of return (EIRR):							18.81%
B/C							1.68

Table 3.1 (6/6) CALCULATION OF ECONOMIC INTERNAL RATE OF RETURN (Jatibarang Dam Construction Works)

(Rp.10^6)

Year in order	Year	Jatibarang dam construction works				Envisaged benefit in 2005/06				Cash balance
		Construction cost		OMR	Total	Flood	Water	Power	Total	
		F/C	L/C	cost	cost	control	resources	Generation	benefit	
1	1998/99	0	0	0	0	0	0	0	0	0
2	1999/00	0	0	0	0	0	0	0	0	0
3	2000/01	2,148	2,464	0	4,612	0	0	0	0	-4,612
4	2001/02	10,611	14,160	0	24,771	0	0	0	0	-24,771
5	2002/03	15,194	18,690	0	33,884	0	0	0	0	-33,884
6	2003/04	31,666	30,971	0	62,637	0	0	0	0	-62,637
7	2004/05	21,551	15,537	0	37,088	0	0	0	0	-37,088
8	2005/06	0	0	497	497	12,550	26,700	33	39,283	38,786
9	2006/07	0	0	497	497	12,550	26,700	33	39,283	38,786
10	2007/08			497	497	12,550	26,700	33	39,283	38,786
11	2008/09			497	497	12,550	26,700	33	39,283	38,786
12	2009/10			497	497	12,550	26,700	33	39,283	38,786
13	2010/11			497	497	12,550	26,700	33	39,283	38,786
14	2011/12			497	497	12,550	26,700	33	39,283	38,786
15	2012/13			497	497	12,550	26,700	33	39,283	38,786
16	2013/14			497	497	12,550	26,700	33	39,283	38,786
17	2014/15			497	497	12,550	26,700	33	39,283	38,786
18	2015/16			497	497	12,550	26,700	33	39,283	38,786
19	2016/17			497	497	12,550	26,700	33	39,283	38,786
20	2017/18			497	497	12,550	26,700	33	39,283	38,786
21	2018/19			497	497	12,550	26,700	33	39,283	38,786
22	2019/20			497	497	12,550	26,700	33	39,283	38,786
23	2020/21			497	497	12,550	26,700	33	39,283	38,786
24	2021/22			497	497	12,550	26,700	33	39,283	38,786
25	2022/23			497	497	12,550	26,700	33	39,283	38,786
26	2023/24			497	497	12,550	26,700	33	39,283	38,786
27	2024/25			497	497	12,550	26,700	33	39,283	38,786
28	2025/26			497	497	12,550	26,700	33	39,283	38,786
29	2026/27			497	497	12,550	26,700	33	39,283	38,786
30	2027/28			497	497	12,550	26,700	33	39,283	38,786
31	2028/29			497	497	12,550	26,700	33	39,283	38,786
32	2029/30			497	497	12,550	26,700	33	39,283	38,786
33	2030/31			497	497	12,550	26,700	33	39,283	38,786
34	2031/32			497	497	12,550	26,700	33	39,283	38,786
35	2032/33			497	497	12,550	26,700	33	39,283	38,786
36	2033/34			497	497	12,550	26,700	33	39,283	38,786
37	2034/35			497	497	12,550	26,700	33	39,283	38,786
38	2035/36			497	497	12,550	26,700	33	39,283	38,786
39	2036/37			497	497	12,550	26,700	33	39,283	38,786
40	2037/38			497	497	12,550	26,700	33	39,283	38,786
41	2038/39			497	497	12,550	26,700	33	39,283	38,786
42	2039/40			497	497	12,550	26,700	33	39,283	38,786
43	2040/41			497	497	12,550	26,700	33	39,283	38,786
44	2041/42			497	497	12,550	26,700	33	39,283	38,786
45	2042/43			497	497	12,550	26,700	33	39,283	38,786
46	2043/44			497	497	12,550	26,700	33	39,283	38,786
47	2044/45			497	497	12,550	26,700	33	39,283	38,786
48	2045/46			497	497	12,550	26,700	33	39,283	38,786
49	2046/47			497	497	12,550	26,700	33	39,283	38,786
50	2047/48			497	497	12,550	26,700	33	39,283	38,786
51	2048/49			497	497	12,550	26,700	33	39,283	38,786
52	2049/50			497	497	12,550	26,700	33	39,283	38,786
53	2050/51			497	497	12,550	26,700	33	39,283	38,786
54	2051/52			497	497	12,550	26,700	33	39,283	38,786
55	2053/54			497	497	12,550	26,700	33	39,283	38,786
56	2054/55			497	497	12,550	26,700	33	39,283	38,786
57	2055/56			497	497	12,550	26,700	33	39,283	38,786
Total		81,170	81,822	24,850	187,842	627,500	1,335,000	1,650	1,964,150	1,776,308
In the condition of discount rate at 12 %:										
Net Present value (NPV):					88,629				147,568	58,938
Internal rate of return (EIRR):										18.53%
B/C										1.66

Table 3.2 (1/3) ENVIRONMENTAL MANAGEMENT PLAN (WEST FLOODWAY/GARANG RIVER IMPROVEMENT)

Managing Item	Source of Impact	Measuring Standard of Impact	Managing Approach	Management Location	Managing Agency Concerned
(Pre-Construction Stage)					
- Social unrest	- Land acquisition - Assets evaluation	- Compensation - Public protest and demonstration	- Negotiations - Presidential decree No.55/1993	- Right bank near river mouth (Tanah Mas area)	- Project office
- Roadside trees	- Dike embankment	- Number of affected trees	- Temporary transplantation - Proper care taking	- Downstream from Simongan weir	- Project office
(Construction Stage)					
- Noise	- Operation of heavy equipment	- Noise level : 60 dBA	- Control of speed of vehicles/equipment - Working hours/schedule	- Villages along the river and floodway	- Project office
- Air pollution	- Mobilization of equipment and materiales - Earth works	- Air quality standard KEP decree No. 02/ MENLH/I/1988	- Covering materials with sheet - Watering the road - Materials stock yard	- Villages along the river and floodway	- Project office
- Traffic congestion	- Mobilization of equipment and materiales	- Public complaint - Traffic congestion frequency/duration	- Schedule adjustment for equipment mobilization - Traffic control	- Villages along the river and floodway	- Project office
- Water quality of the river	- Dike embankment - Dredging work - Reconstruction of Simongan weir	- Water quality standard according to Gov. regulation No.20/1990	- Effort to minimize spilt soil into the river - Protection fence at downstream direction	- Garang river and floodway	- Project office - Environmental bureau of Provincial Gov.
- Sedimentation	- Dike embankment - Dredging work - Reconstruction of Simongan weir	- Soil suspended level 100 to 250 mg/l	- Protection fence at downstream direction - Temporary cofferdam - Dredging from downstream	- Garang river and floodway	- Project office
- Road damages	- Mobilization of equipment/materials	- Public complaint - Damage level	- Regular check system for road maintenance and repair	- City roads along the river/ floodway - Access road	- Project office
- Aquatic biota	- Dike embankment - Dredging work - Reconstruction of Simongan weir	- Diversity index of plankton and benthos	- Sediment control - Effort to preserve natural ecology	- Garang river and floodway	- Project office
- Existing water intake facilities	- Dredging work - Reconstruction of Simongan weir	- Water quality and quantity	- Temporary cofferdam to maintain water level - Protection fence around PDAM intake facility	- Intake facilities	- Project office - PDAM
- Sand quarry operation in the river	- Dredging work - River improvement	- Intensity of sand quarry activities	- Restrictions imposed on sand quarry in the river	- Downstream portion from Tugu Suharto	- Project office
- Railway bridge	- Raising river banks - River improvement	- Disturbance for train operation service	- Reconstruction of bridge over west floodway	- Existing railway bridge	- Project office - PJKA
- Ferry boat service	- Dike embankment - Dredging work	- Number of sevices suspended	- Schedule control for ferry services	- Ferry sevice location and route	- Project office
(Post-Construction Stage)					
- Replanting of roadside trees	- Temporary transplantation due to embankment	- Number of trees replanted	- Transportation of trees and transplanting techniques	- Road along floodway downstream from Simongan weir	- Project office
- Water quality	- Reconstruction of Simongan weir	- Water quality standard according to Gov. regulation No.20/1990 - Diversity index of plankton and benthos	- Occasional flush out by gate operation - Control of domestic waste discharge	- Garang river and floodway - Simongan weir	- Project office
- Flow of Garang river	- Reconstruction of Simongan weir - River improvement	- Minimum (2.69 m^3/s) for drought period - Maximum (790 m^3/s) for flood period	- Adjusting flow discharge by dam operation - Gate operation	- Garang river and floodway - Simongan weir	- Project office
- Water intake facilities	- Reconstruction of Simongan weir	- Water quality and quantity	- Adjusting water level to facilitate water intake - Gate operation	- PDAM water intake facility - Leftbank canal	- Project office - PDAM
- River morphology	- Dredging work - River improvement	- Flow discharge - Riverbed profile	- Restrictions imposed on sand quarry in the river	- Downstream portion from Tugu Suharto - River mouth	- Project office

Table 3.2 (2/3) ENVIRONMENTAL MANAGEMENT PLAN (JATIBARANG MULTIPURPOSE DAM CONSTRUCTION)

Managing Item	Source of Impact	Measuring Standard of Impact	Managing Approach	Management Location	Managing Agency Concerned
(Pre-Construction Stage)					
- Land ownership	- Land speculation	- Land values	- Restriction of land transaction	- Project-affected area	- Chief of village - Chief of subdistrict
- Social unrest	- Land acquisition - Assets evaluation	- Compensation - Public protest and demonstration	- Negotiations - Presidential decree No. 55/1993	- All project-affected villages	- Land acquisition committee - Project office - DGWRD
(Construction Stage)					
- Noise	- Operation of heavy equipment	- Noise level : 60 dBA	- Control of speed of vehicles/equipment - Working hours/schedule - Equipment operators	- Villages along access roads	- Project office
- Air pollution	- Mobilization of equipment - Earth works	- Air quality standard KEP decree No. 02/ MENLH/I/1988	- Covering materials with sheet - Watering the road - Selection of spoil site	- Villages along access roads - Dam site and borrow areas	- Project office
- Traffic disturbance	- Mobilization of equipment and materials	- Public complaint - Traffic congestion frequency/duration	- Schedule adjustment for equipment mobilization - Traffic control	- Villages along access roads	- Project office
- Water quality of the river	- All civil works relating to the project	- Water quality standard according to Gov. regulation No.20/1990	- Effort to minimize spilt soil into the river - Protection net at downstream direction	- Dam site and borrow area - Kreo river - Spill way	- Project office - Environmental bureau of Provincial Gov.
- Sedimentation	- Earth works - Material stock yard	- Soil suspended level 100 to 250 mg/l	- Installation of sand settling pond	- Dam site and borrow area - Kreo river	- Project office
- Road damage	- Mobilization of equipment/materials	- Public complaint - Damage level	- Regular check system for road maintenance and repair	- Village road - Access road	- Project office
- Aquatic biota	- All civil works relating to the project	- Diversity index of plankton and benthos	- Base camp sanitation againt water pollution - Sediment control - Effort to preserve natural ecology	- Dam site - Reservoir and its surrounding areas	- Project office
(Post-Construction Stage)					
- Illegal land use of reservoir surrounding areas	- Land acquisition - Recreational value due to impounded water	- Type of illegal land use - Number of squatters	- Control of illegal land use - Effort to gain public comprehension	- Dam and reservoir surrounding areas	- Project office - Chief of village - Chief of subdistrict
- Water quality	- Reservoir impounding	- Water quality standard according to Gov. regulation No.20/1990 - Diversity index of plankton and benthos	- Land clearing before impounding - Control of dometic waste discharge	- Reservoir and its surrounding areas - Uptream areas from the reservoir	- Project office - Chief of village - Chief of subdistrict
- Flow of Garang river	- Construction of dam	- Minimum (2.69 m^3/s) for drought period - Maximum (790 m^3/s) for flood period	- Adjusting flow discharge by dam operation	- PDAM water intake facility - Simongan weir	- Project office
- Land slide	- Fluctuation of water level in reservoir	- Soil test or geotechnical investigation	- Slope stabilization or protection	- Reservoir surrounding area	- Project office
- Goa Kreo park (tourism attraction)	- Change in recreational value due to the dam construction	- Number of tourists - Number of terrestrial fauna	- Providing facilities and infrastructures - Effort to upgrade environmental quality	- Goa Kreo park	- Project office - Tourism agency
- Land use pattern	- Increase in development potentiality due to the project	- Change of land use - Population increase	- Review of future land use plan - Institutional coordination - Environmental impact assessment	- Dam reservoir and its surrounding areas such as Jatibarang, Jatirejo, Kandri and Kedungpane	- Project office - BAPPEDA - City planning agency
- Fish farming	- Construction of dam reservoir	- Fishing activities - Presence of investor	- Restrictions imposed on fish farming	- Dam reservoir area	- Project office - Chief of village

Table 3.2 (3/3) ENVIRONMENTAL MANAGEMENT PLAN (URBAN DRAINAGE SYSTEM IMPROVEMENT)

Managing Item	Source of Impact	Measuring Standard of Impact	Managing Approach	Management Location	Managing Agency Concerned
(Pre-Construction Stage)					
- Illegal land use	- Open space remains unutilized	- Squatter's intrusion	- Fencing around acquired land - Strict control	- Proposed location of Asin retarding pond	- Project office - Municipality
- Social unrest	- Land acquisition - Assets evaluation	- Compensation - Public protest and demonstration	- Negotiations - Land resettlement - Presidential decree No.55/1993	- Proposed location of Asin pumping station	- Project office - Land acquisition committee
(Construction Stage)					
- Noise	- Operation of heavy equipment	- Noise level : 60 dBA	- Control of speed of vehicles/equipment - Working hours/schedule - Equipment operators	- Proposed urban drainage areas	- Project office
- Air pollution	- Mobilization of equipment and materiales - Earth works	- Air quality standard KEP decree No. 02/ MENLH/I/1988	- Covering materials with sheet - Watering the road - Materials stock yard	- Proposed urban drainage areas	- Project office
- Traffic congestion	- Mobilization of equipment and materiales - Street blockage	- Public complaint - Frequency/duration for blockage and traffic congestion	- Schedule adjustment for equipment mobilization - Traffic control	- Proposed urban drainage areas	- Project office
- Sedimentation	- Dredging work - Raising dikes - Soil excavation	- Soil suspended level 100 to 250 mg/l	- Dredging from downstream - Effort to minimize spilt soil into the river	- Asin, Semarang and Baru rivers	- Project office
- Road damages	- Mobilization of equipment/materials	- Public complaint - Damage level	- Regular check system for road maintenance, and repair if necessary	- City roads along the rivers - Access road	- Project office
- Dredged material	- Dredging work	- Concentration of heavy metals - Public complaint - Generation of stench	- Use of water-proof sheet for transportation - Treated with cement - Disposed in designated land raclamation site	- From working site to disposal area - Land reclamation site	- Project office
- Railway bridge	- Raising river banks - River improvement	- Disturbance for train operation service	- Reconstruction of railway bridge over Asin river	- Existing railway bridge and its surrounding areas	- Project office - PJKA
(Post-Construction Stage)					
- Pump operation	- Solid waste accumulation	- Suspension of operation due to solid waste	- Frequent cleaning of retarding pond and pumping station	- Pumping station - Retarding pond	- Project office
- Retarding pond	- Industrial waste discharge - Soil brought from upper basin	- Heavy metal contents - Volume of sediment accumulated in retarding pond	- Periodical dredging - Control of industrial waste discharge	- Asin retarding pond - Baru retarding pond	- Project office
- Land subsidence	- Groundwater abstraction mainly for industrial use	- Area and intensity of subsidence	- Monitoring on land elevation	- Proposed urban drainage area	- Project office
- River mouth morphology	- Change of sediment transport - Pump drainage system	- Volume of sediment at river mouth	- River mouth morphological survey - Pump operation	- River mouth - Harbor basin	- Port authority

Table 3.3 (1/3) ENVIRONMENTAL MONITORING PLAN (WEST FLOODWAY/GARANG RIVER IMPROVEMENT)

Monitoring Item	Monitoring Method	Location	Monitoring Frequency	Duration	Monitoring Agency Concerned
(Pre-Construction Stage)					
- Land issues and social unrest	- Interview and field confirmation	- Tanah Mas area on the right bank near river mouth	- Monthly	- As long as problems exist	- Land acquisition committee - Project office
- Roadside trees along the floodway	- Field Inspection	- Downstream from Simongan weir	- Weekly	- Until embankment work is over	- Project office
(Construction Stage)					
- Noise	- Measured by noise level meter	- villages along the river and floodway	- Bi-monthly	- Construction period	- Project office
- Air pollution	- High volume sampling method	- villages along the river and floodway	- Bi-monthly	- Construction period	- Project office
- Traffic congestion	- Traffic congestion frequency/duration	- villages along the river and floodway	- Weekly	- Construction period	- Project office
- Water quality of the river	- Test and analysis of sample water in laboratory	- Sampling locations selected in EIA	- Monthly	- Construction period	- Project office - Environment bureau of Provincial Gov.
- Sedimentation	- Field Inspecttion and measurement	- Downstream from Tugu Suharto	- Monthly	- Construction period	- Project office
- Road damage	- Field Inspection and measurement	- City roads along the river/ floodway	- Monthly	- Construction period	- Project office
- Aquatic biota	- Test and analysis of sample water in laboratory	- Sampling locations selected in EIA	- Monthly	- Construction period	- Project office
- Existing water intake facilities	- Water flow - Water level	- PDAM water intake - Intake to the left bank cannal	- Daily	- Construction period	- Project office - PDAM
- Sand quarry operation	- Field Inspection of sand quarry activity	- Downstream portion from Tugu Suharto	- Weekly	- Construction period	- Project office
- Railway bridge	- Field Inspection on risk management	- Railway bridge over west floodway	- Daily	- Construction period	- Project office - PJKA
- Ferry boat service	- Inspection on service frequency	- Ferry service location and route	- Daily	- Construction period	- Project office
(Post-Construction Stage)					
- Illegal land use	- Field Inspection	- Tanah Mas area (right bank near river mouth)	- Bi-monthly	- Min. 2 years	- Project office - Chief of subdistrict
- Water quality	- Test and analysis of sample water in laboratory	- Sampling locations selected in EIA	- Monthly	- No limit	- Project office - Environment bureau of Provincial Gov.
- Flood mitigation	- Inspection on flood frequency/duration	- Flood-prone area along Garang river/floodway	- Every rainy season	- No limit	- Project office
- Water intake facilities	- Field inspection	- PDAM water intake - Intake to leftbank canal	- Daily	- No limit	- Project office - PDAM
- River morphology	- Field inspection and measurement	- Downstream portion from Tugu Suharto - River mouth	- Every 6 months	- No limit	- Project office

Table 3.3 (2/3) ENVIRONMENTAL MONITORING PLAN (JATIBARANG MULTIPURPOSE DAM CONSTRUCTION)

Monitoring Item	Monitoring Method	Location	Monitoring Frequency	Duration	Monitoring Agency Concerned
(Pre-Construction Stage)					
- Land issues and social unrest	- Interview and field inspection	- All project-affected villages - Proposed dam site and reservoir area	- Monthly	- As long as problems exist	- Land acquisition committee - Project office - DGWRD
(Construction Stage)					
- Noise	- Measured by noise level meter	- Project-affected villages	- Monthly	- Construction period	- Project office
- Air pollution	- High volume sampling method	- Project-affected villages	- Monthly	- Construction period	- Project office
- Traffic disturbance	- Traffic congestion frequency/duration	- Project-affected villages	- Weekly	- Construction period	- Project office
- Water quality of the river	- Test and analysis of sample water in laboratory	- Kreo river	- Monthly	- Construction period	- Project office - Environment bureau of Provincial Gov.
- Sedimentation	- Field inspection and measurement	- Sand settling pond - Kreo river	- Monthly	- Construction period	- Project office
- Road damage	- Field inspection and measurement	- Village road - Access road	- Monthly	- Construction period	- Project office
- Aquatic biota	- Test and analysis of sample water in laboratory	- Kreo river	- Monthly	- Construction period	- Project office
(Post-Construction Stage)					
- Illegal land use	- Field inspection	- Dam and reservoir surrounding areas	- Bi-monthly	- Min. 2 years	- Project office - Chief of village - Chief of subdistrict
- Water quality	- Test and analysis of sample water in laboratory	- Reservoir - Kreo river	- Monthly	- No limit	- Project office - Municipality
- Flow of Garang river	- Inspection and measurement	- Kreo river - Garang river	- Weekly	- Min. 2 years	- Project office
- Land slide	- Field inspection	- Reservoir surrounding areas	- Monthly	- Min. 2 years	- Project office
- Goa Kreo park	- Number of tourists - Number of terrestrial fauna	- Goa Kreo park	- Monthly	- Min. 2 years	- Project office - Tourism agency
- Land use pattern	- Field inspection	- Jatibarang, Jatirejo, Kandri and Kedungpane	- Every 6 months	- No limit	- Project office - BAPPEDA - City planning agency
- Fish farming	- Field inspection	- Dam reservoir	- Monthly	- No limit	- Project office - Chief of village

Table 3.3 (3/3) ENVIRONMENTAL MONITORING PLAN (URBAN DRAINAGE SYSTEM IMPROVEMENT)

Monitoring Item	Monitoring Method	Location	Monitoring Frequency	Duration	Monitoring Agency Concerned
(Pre-Construction Stage)					
- Land issues and social unrest	- Interview and field inspection	- Proposed location of Asin retarding pond - Proposed Asin pumping station	- Monthly	- As long as problems exist	- Land acquisition committee - Project office - Municipality
(Construction Stage)					
- Noise	- Measured by noise level meter	- Proposed urban drainage areas	- Bi-monthly	- Construction period	- Project office
- Air pollution	- High volume sampling method	- Proposed urban drainage areas	- Bi-monthly	- Construction period	- Project office
- Traffic congestion	- Traffic congestion frequency/duration	- Proposed urban drainage areas	- Weekly	- Construction period	- Project office
- Sedimentation	- Field inspection and measurement	- Asin, Semarang and Baru rivers	- Monthly	- Construction period	- Project office
- Road damage	- Field inspection and measurement	- City roads along the rivers - Access roads	- Monthly	- Construction period	- Project office
- Dredged material	- Field inspection and supervision	- From dredging site to disposal area - Land reclamation site	- Weekly	- Until dredging work is over	- Project office
- Railway bridge	- Field inspection on risk management	- Railway bridge and its affected area	- Daily	- Construction period	- Project office - PJKA
(Post-Construction Stage)					
- Pump operation	- Field inspection	- Pumping station - Retarding pond	- Bi-monthly	- No limit	- Project office
- Flood mitigation	- Field inspection and interview on flood frequency/duration	- Proposed urban drainage area	- Every rainy season	- No limit	- Project office
- Sedimentation and its disposal site	- Field inspection	- Retarding pond - Disposal site	- Monthly	- No limit	- Project office
- Land subsidence	- Inspection and measurement	- Proposed urban drainage area	- Every 6 months	- No limit	- Project office - Mining agency
- River morphology	- Field inspection and measurement	- River mouth - Harbor basin	- Every 6 months	- No limit	- Port authority