

III.3 Water Quality

III.3.1 Water Quality Monitoring System

As of 1997, three agencies including PJT, PROKASIH and Kanwil PU monitor the water quality at 92 points in the whole Brantas river basin. In addition, PJT and PROKASIH monitor the waste water of 41 and 58 industries respectively. In case of monitoring by PJT, sample taking and analysis are made by laboratory staff. Annual monitoring costs are Rp 75 millions for sampling and test, and Rp 78 millions for personnel expenses, data examination and reporting. The present water quality monitoring systems in the Brantas river basin are summarized in Table III.3.

III.3.2 Present Conditions of Water Quality

III.3.2.1 Profiles of Water Quality

During the dry season, the lower flow discharge combined with pollution loads causes deterioration of water quality so much that BOD ranges from 5 to 12 mg/l. While during the rainy season especially at the beginning, the river water contains much silt. These profiles of the river water quality are shown in Figure III.12.

The Surabaya river is one of the most contaminated rivers in the Brantas river basin by organic pollutant. The BOD values are always as high as 10 to 20 mg/l. In particular, the section of the Surabaya river running parallel to the Mastrip road is heavily contaminated largely due to the pollution loads from the intensely industrialized strip extending about 10 kilometers. The second worst stream is the upper reaches near Malang city. The BOD is monitored at 8 to 15 mg/l.

III.3.2.2 Evaluation of Present Water Quality

Most of the parameters such as BOD, COD, NH₄, NO₂ and so on which indicates organic matters and nutrients exceeds standards in the most part of the Brantas river and its tributaries all through the year. In particular near the intakes of PDAM WSTPs, Karangpilang and Ngagel, the water quality is at a critical level for the raw water for drinking.

Heavy metals and other harmful substances are not so serious according to the data monitored by Kanwil PU. Microbiological parameters such as most probable number of coliform group and fecal coliform group, however, are observed very much. This subject will be taken up in the pollution control of domestic sewage.

III.3.3 Existing Pollution Sources

As of 1994, total pollution load of BOD produced by inhabitants within the Brantas river basin was estimated at about 380 t/d and that from the industries being monitored by PJT and PROKASIH (62 factories) was estimated at about 2,000 t/d.

In addition to the above, pollutants from the irrigated areas, livestock, organic garbage or solid wastes and natural sources affect the river water quality.

III.3.4 Domestic and Industrial Waste Water Control and Treatment System

III.3.4.1 Present System

There is no centralized treatment facility for domestic waste water in the Brantas river basin. Leaching pits and/or septic tanks are common for "black water". However, no treatment facility exists for "gray water".

The East Java province has published the regional industrial effluent standards indicating the volume, concentration and pollution load for categorized industries. The waste water audit to the industries discharging high pollution loads is implemented by the Work Team for Controlling and Overcoming Industrial Waste Pollution (PPPLI).

All the priority industry selected by PPPLI has their own waste water treatment plants. Most of the other industries, however, do not have efficient waste water treatment plant. The off-site waste water treatment facilities are installed in an industrial district in Surabaya. Those for small scale factories are installed in Sidoarjo and Malang.

III.3.4.2 Plan

For domestic sewage, a centralized waste water treatment system has been proposed around the Mas and the Wonokromo rivers. While, for industrial waste water, a centralized treatment plant has been proposed along the Mastrip road.

The pollution charge system has been proposed by PJT and related agencies.

III.3.5 Water Quality in 2020 During the Dry Season

During the dry season, rivers are overloaded with soluble and insoluble organic pollutants due to the lower discharge and dilution effect. In addition, the pollution control for industries and domestic sewages is required. Thus the river maintenance flow would be necessary in order to improve the water quality in the rivers. Therefore, the dry season accounting for 6 months from June to November is given priority for the Study.

III.3.5.1 Control Points

Ten(10) control points for water quality are selected from densely populated areas and intakes of PDAM treatment plants. The selected control points are shown below.

No.	Location	River or Canal	Remarks
1	Bumiayu Bridge	Brantas river	Downstream of Kotamadya Malang
2	Demangan Bridge	Brantas river	Downstream of Kotamadya Blitar
3	Jogbiru Bridge	Brantas river	Downstream of Kotamadya Kediri
4	Padangan Bridge	Brantas river	Near Mojokarto WSTP (under construction)
5	Canggu Tambangan	Surabaya river	Downstream of Kotamadya Mojokerto (Near New Lengkong Dam)
6	Karangpilang	Surabaya river	Near Karangpilang WSTP (Near proposed WSTP for Gresik)
7	Ngagel	Surabaya river	Near Ngagel WSTP
8	Kayoon	Mas river	Near Kayoon WSTP
9	Pelayaran	Pelayaran canal	Near Tawang Sari WSTP
10	Porong	Porong canal	Near Porong WSTP

Note: WSTP: Water Supply Treatment Plant

III.3.5.2 Method of Water Quality Calculation

BOD is used as a typical parameter of organic pollution in the rivers in this study. BOD 75% value, i.e. the second highest value during the dry season is focused on the evaluation of water quality in this study. Pollution loads from domestic, industries and others are calculated by means of pollution load units in the existing monitoring data. Increase rates are adopted in accordance with socio-economic indexes. In the process of calibrating the model, flow-out ratio and flow-down ratio are assumed.

In the study of Brantas III project, the Brantas river basin has been divided into sub-basins (hydrological zone) in order to estimate pollution load. Since the divided sub-basins shows characteristics of each water regime, they are adopted in the present study.

III.3.5.3 Water Quality Without-Project

Water quality (BOD) at each control point in 2020 assuming 10-year-drought (allowing for $8.02\text{m}^3/\text{s}$ from the Wonorejo Dam project) is estimated under without-project conditions. The result of the estimate is shown below :

No.	Location	River or Canal	Present Water Quality (mg/l)	Water Quality in 2020 (mg/l)
1	Bumiayu Bridge	Brantas river	8.4	21 (10 m ³ /s)
2	Demangan Bridge	Brantas river	4.3	4 (62 m ³ /s)
3	Jogbiru Bridge	Brantas river	7.7	7 (58 m ³ /s)
4	Padangan Bridge	Brantas river	7.6	5 (36 m ³ /s)
5	Canggu Tambangan	Surabaya river	6.1	9 (13 m ³ /s)
6	Karangpilang	Surabaya river	14.0	28 (13 m ³ /s)
7	Ngagel	Surabaya river	8.0	20 (13 m ³ /s)
8	Kayoon	Mas river	6.2	11 (8 m ³ /s)
9	Pelayaran	Pelayaran canal	12.9	29 (3 m ³ /s)
10	Porong	Porong canal	9.3	18 (0.06 m ³ /s)

Note : 1) Present water quality are BOD 75% value during the dry season in 1994

(Kayoon, Pelayaran, Porong are on August 15th and 16th, 1997).

2) Parenthesized numbers show 10 year drought water flow.

III.3.5.4 Water Quality With-Projects

(1) Calculation cases

In order to set treatment levels of domestic and industrial waste water in 2020, three cases are assumed: 1) the currently scheduled program by Government 2) the Case I with a treatment project and 3) the new methodology proposed by the Study Team as shown below.

Calculation Cases	Domestic waste water	Industrial waste water
Case - I	- Treatment level is based on REPELITA VI	- Major producers would attain the Effluent Standards - Pollution load from remaining industries decrease 20%
Case - II	- Case I and centralized waste water treatment along the Surabaya river	- ditto-
Case - III	- New methodology proposed by the Study Team	- Enforcement of CP and stringent standard along the Surabaya river are considered added to Case - II

(2) Results of calculation

The river water quality at each control point in 2020 assuming 10-year-drought (allowing for 8.02m³/l from the Wonorejo Dam project) is projected in terms of BOD value as summarized below.

No.	Control points	Water Quality (BOD mg/l)		
		Case-I	Case-II	Case-III
1	Bumiayu Bridge	14	14	13
2	Demangan Bridge	2	2	2
3	Jogbiru Bridge	3	3	3
4	Padangan Bridge	5	5	5
5	Canggu Tambangan	5	5	5
6	Karangpilang	17	8	6
7	Ngagel	14	14	11
8	Kayoon	6	6	6
9	Pelayaran	7	7	6
10	Porong	14	14	13

III.3.6 Water Quality During the Rainy Season

Changes of run-off pollution loads throughout the year and correlation between BOD/SS pollution loads and water flow were examined. This was done for the purpose of investigating the importance of SS in river water quality during the rainy season.

The correlation between SS and other parameters (BOD, T-P) during the rainy season are computed at 0.5-0.6 of correlation coefficients. That is to say, SS would contain organic components. Another possibility is an existence of insoluble organic pollutants such as solid waste and/or sludge disposed or dumped in and around the rivers. In particular, the correlation between SS and T-P indicates that SS would contain agricultural chemicals and/or livestock excreta. Therefore, non-point sources including agricultural activities are considered to play an important role on the water quality during the rainy season.

III.4 Water Demand and Supply

III.4.1 Irrigation Water Demand and Supply System

(1) Present Irrigation Area

Irrigation area in the Brantas river basin was recorded at 309,100 ha in 1996 by Dinas PU Pengairan Daerah Propinsi Daerah Tingkat I Jawa Timur. The present Study, however, concentrates only on irrigation areas which take irrigation water from main Brantas river.

(2) Present Agriculture in the Brantas River Basin

The main crops in the irrigation area are rainy season paddy, dry season paddy, sugarcane, polowijo, vegetables, fruits, etc. Annual cropping intensity in each irrigation area ranges from 1.5 to 2.6 in the last two years. The total production of wetland paddy has increased from 2,160,000 ton to 2,230,000 ton (3.2% increase) in the Brantas basin and 7,440,000 ton to 8,580,000 (15.3%) in East Java respectively from 1985 to 1995. The total annual harvested area of major food crops has decreased from 874,700 ha to 803,700 ha in the basin during the same period. On the other hand, the harvested area has increased from 3,530,000 ha to 3,754,000 ha in East Java. The role of the Brantas river basin in agriculture is decreasing. The reason of the decrease might be caused from reduction of agriculture land in the basin, promotion of irrigation development in East Java, etc.

(3) Present Operation and Maintenance Works And Irrigation Water Management

The irrigation areas irrigated by the main Brantas river are commanded by 16 intakes operated by 13 Cabang Dinas Pengairan, PJT and PKB respectively. Some intakes do not function well because of degradation of river bed, sediment in front of the intake, deterioration of structure, etc.

Uneven distribution of water is claimed in many irrigation system. The reasons are overtaking to the field located at upstream, unexpected loss in the canal, etc.; the overtaking is frequently beyond control of Juru Air. Education and training are essential for efficient operation and maintenance.

The taking of water from the Brantas river seems to be strictly controlled or some time squeezed in the upstream. On the other hand, in the downstream the control seems to be looser. The downstream user some time can benefit the excess water, if any. Further, the surplus water frequently goes to sea without being utilized.

The mainstay of irrigation development in Java has been shifted from large scale development to rehabilitation, development and turnover of small scale irrigation to community, and Efficient Operation and Maintenance (EOM).

III.4.2 Brackish Water Fishery

(1) Existing Fishery Area

The brackish water fishponds (tambak) for fish and shrimp cultivation in East Java are centuries old. They were first developed along the north coast of East Java where majority of them are still located.

The existing total area of brackish water fishery in East Java in 1997 was approximately 60,000 ha., out of which 54,000 ha. is under extensive culture, and only 6,000 ha. under intensive culture (which were introduced here in 1985). The total present brackish water fishery area in the Brantas delta is approximately 15,730 ha., it mostly is based on the extensive method of cultivation.

There are about 318,812 people employed by inland fishery in East Java. There are about 4,000 brackish water fishpond owners in the Brantas delta. The owners employ more than 3,000 tenant farmers. The total inland fishery production for East Java, in 1995, was 122,573 tons. For the year 1996 brackish water fishery yield was 23,744 tons in the Brantas delta.

(2) Irrigation System

In the Brantas delta, two irrigation canals, Mangetan and Porong provide water to a paddy irrigation area of 27,362 ha. The paddy irrigation area in Sidoarjo has been reduced due to the other land use pressures, between 1980 to 1997 it has been reduced from 32,600 ha. to 27,362 ha. In the future, further reduction in the acreage of paddy agriculture is anticipated.

The return flow from this operation is available for the irrigation channels of brackish water fishery. It is extremely difficult to measure this water amount accurately. Most of the estimates available are based on subjective judgments. If the water for paddy agriculture decreases the return flow as a result, also decreases. Moreover, there is no return flow in the dry season.

(3) Cropping Pattern

The extensive fishponds (more than 90% of the total in E. Java) have one cropping cycle which is 8 months long. It relies on tidal water and irrigation water return flow exchange and its production is approximately around 500 kg./ha./year.

In the intensive fishponds (less than 10% of total in E. Java) the cropping cycle is only 5 month long, with 2 annual periods of harvest in March - April and November - December. In this method of cultivation, it is possible to have a production of 14 - 16 tons/ha./year. However, since 1992, this method has been abandoned by fishpond owners in the Brantas delta. The reason has reportedly been a virus infection and water pollution in the return flow.

Since 1992 - 93, the cropping pattern in the Brantas delta has been changing, the milkfish production has been increasing and the production of all types of shrimps has been decreasing.

As a consequent, presently, about 60% of all shrimp production in East Java province are produced using extensive method.

(4) Water Demand Under Present Condition

The water demand is calculated to be 1.29 m³/sec. In agriculture, the overall efficiency of irrigation canals is 50 %, and there is an additional water loss. The losses accrue at many levels, due to operations, conveyance and field applications. The amount of water reaching the drainage canal is only 30 % during the best periods of return flow. There is also a 80% dependability for drought year in the Brantas delta. The return flow from irrigation has an unmet net demand of water in February, and between June to October.

III.4.3 Domestic Water Demand

(1) Present Domestic Water Supply System

(a) Public Water Supply System by PDAM

Public water supply systems are operated by water supply organizations called Perusahaan Daerah Air Minum (Regional Water Supply Company, or " PDAM " hereafter). There are altogether 14 PDAMs in the Brantas River Basin area, one PDAM in each regency and municipality. PDAMs' service is provided mostly in urban areas by pipe water supply system as a major service as well as through water supply by deep and shallow wells and water tank trucks for rural area and fringe areas. Piped water supply systems include both house connections and public hydrants. The major customers of PDAM are households, business and commercial institutions, various government and social organizations and industries.

(b) Domestic Water Supply by Other Source

Population in rural areas and urban fringe areas get water for domestic use from such sources as river, shallow wells, irrigation and drainage canals, PDAM's water tank trucks and rain water. The consumption of 50 to 60 liter per day per capita is the generally recognized amount of water used in areas where no pipe water supply system is available, both in urban and rural areas.

(2) Present Supply Condition in the Service Area

The present condition of the service area as of 1996 which would be a basis of the demand forecast is summarized in the succeeding section, V.4.1.(4).

III.4.4 Industrial Water Demand

(1) Present Industrial Water Source

The present amount of water used for industrial production is estimated by source of water as summarized as follows.

	(million m ³ /year)	(%)
Direct abstraction from the Brantas River	: 131	60.9
Abstraction of ground water	: 67	31.2
Supply by PDAMs	: 5	2.3
Other source	: 12	5.6
Total	: 215	100.0

The Brantas river above includes the main stream, tributaries and canals. The data are obtained from PJT for the year 1996. There were altogether 95 industries directly taking water from the Brantas River. The sugar industry and paper industry are the largest water users, accounting for 58% (76 million m³ per year) and 22% (29 million m³ per year), respectively, of the total amount.

The data on ground water use are obtained from East Java Mining Service. These data are the amount of ground water licensed to be abstracted. The data from DIPENDA were sought to obtain data on the actual amount of water abstracted. It was found, however, that the DIPENDA data do not classify the purpose of water use (industrial, commercial, domestic etc.) For the present study, therefore, the data on licensed amount were used.

Other source refers to irrigation and drainage canals in Sidoarjo Regency. There were 21 industries taking water from irrigation and drainage canals. Out of these, 17 factories are included in the PJT's customers list. The other 4 factories are not listed in the PJT list, therefore should be counted as water users from other source. The amount of water these 4 factories took was 9.2 million m³ between January and September in 1997. This volume can be converted to an annual amount by multiplying 1.33 (12 months / 9 months), thus deriving 12.2 million m³ per year.

The following table presents the existing amount of industrial water use by type of industry and source of water:

	(million m ³ /year)				
Source	Sugar	Paper	Other	Total	
Brantas	76	29	26	13	61%
Ground Water	34	17	16	67	31%
PDAM	0	0	5	5	2%
Other	7	3	2	12	6%
Total	117	49	49	215	100%

(2) Water Demand for the Main Stream of Brantas River

Out of 95 industries taking water from the Brantas River, 84 factories are those taking water from the main stream of the Brantas River as of 1996, as follows:

Sugar	:	50	(million m ³ per year)
Paper	:	28	
Others	:	26	
Total	;	104	

(3) Water Demand for Business and Social Uses

Concerning water demand for business and social uses from the main stream of the Brantas River, the following amounts in 1996 are regarded to fall under this category.

Surabaya PDAM	:	33.8	(million m ³ per year)
Sidoarjo PDAM	:	1.0	
Direct abstraction from Brantas main stream	:	2.8	
Total	:	37.6	

III.5 Water Resources Development

The existing water resources development projects in the Brantas river basin are categorized into (i) Existing development plans in the Brantas river basin, (ii) Existing dam and reservoirs in the Brantas river basin, and (iii) Existing development plans outside the Brantas river basin.

III.5.1 Existing Development Plans in the Brantas River Basin

(1) General Feature of the Projects

Most of the projects classified in this category were identified and preliminarily studied in the previous master plan studies conducted in 1973 by OTCA and in 1984 by JICA. Only a few projects have proceeded to the feasibility study and detailed design stages. The present status of these projects is outlined below according to available information:

No.	Project Name	Status	River(Basin)	Objectives	Effective Storage Vol. (mil.m ³)
(1)	Beng Dam (pump up)	MP	Beng. (Brantas)	WS, IR, HP	147
(2-1)	Kedungwarak Dam (pump up)	MP	Kedungwarak(Widas)	WS, IR	54
(2-2)	Ketandan Dam (interbasin)	MP	Ketandan(Widas)	IR	12
(3)	Semantok Dam	MP	Semantok(Widas)	IR, FC	40
(4)	Kuncir Dam	MP	Kuncir(Widas)	IR, FC, HP	23
(5)	Babadan Dam (interbasin)	MP	Bendokrosok	WS, FC, HP	84
(6)	Tugu Dam	FS	Keser(Ngrowo)	WS, IR, FC	21
(7-1)	Karangates4-5	FS	Brantas	HP	-
(7-2)	Kesamben Dam	FS	Brantas	HP	6
(8)	Lesti III Dam	DD	Lesti	IR, HP, SC	4
(9)	Genteng I Dam	MP	Genteng(Lesti)	WS, HP, SC	70
(10)	Kepanjen Dam	MP	Brantas	HP, SC	0.5
(11)	Lumbang Sari Dam	MP	Brantas	HP, SC	0.9
(12)	Konto II Dam	MP	Konto	IR, FC, HP, SC	63

Note WS:Urban water supply, IR:Irrigation, FC:Flood control, HP:Hydropower, SC:Sediment control, MP:Master plan study, FS:Feasibility study, DD:Detailed design

Source: Widas Flood Control and Drainage Project, Part I Study(1985)
 Widas Flood Control and Drainage Project, Part II Study(1986)
 Review Feasibility Study and Environmental Impact Analysis Tugu Dam(1995)
 Survai, Investigasi Desain Detail Pada Proyek Bendungan Lesti III, 1983
 Review Detail Design, Survey and Investigation Work for Lesti III Project, 1994

Locations of those projects are shown in Figure III.13 and the project features of the existing plans are summarized in Table A6-1 of Annex 6.

(2) Present Conditions of the Prospective Project Sites

(a) Beng dam project

The dam site is located in a narrow and shallow valley of about 2 km long. Near the dam site, no cultivated land is found but forest area only where no house is located.

In the reservoir area which is the upstream of the narrow valley, low and flat lands are extending where crop fields are rather well developed including fields for maize, tobacco, peanuts, banana and scarce upland paddy field. A village is located with estimated number of houses of 1,200 in 1984 at the dam crest elevation of 59.0 m.

(b) Kedungwarak dam project

The dam site is located in a narrow valley with an opening of 115 m wide at an elevation of 173 m. Near the dam site, only forest area is found. About a 3.5 m wide of provincial road is passing by the valley. The road will not be submerged under the reservoir but some portions might need to be relocated.

In the reservoir area which is a part of Mgluyu district, low and flat lands are extending where crop fields are well developed including fields for tobacco, peanuts, banana and upland paddy field. A village is located in the left bank of the Kedungwarak river, and will need resettlement.

(c) Genteng I dam project

The dam site is in a narrow gorge between Mt. Nawang of 496 m high on the right bank and a mountain of 463 m high on left bank. About a 5 m wide provincial road crosses the river in the dam construction site and shall be relocated.

The reservoir area is extended in the hilly and mountainous area. Scarce and small scale upland paddy field were observed along the rivers. In the reservoir area, no house was found in the site reconnaissance conducted by the Study Team.

III.5.2 Existing Dam and Reservoirs in the Brantas River Basin

(1) Feature of the Dam and Reservoirs

The existing dam and reservoirs, which have storage capacity of runoff regulation, are the Sungguruh dam, the Sutami and Lahor dams, the Wiingi dam and the Lodoyo dam in the Brantas river as well as the Selorejo dam in the Konto river and the Bening dam in the Bening river. Among the above dam/reservoirs, only the Sutami and Lahor dams have an inter-seasonal regulating capacity to supply stored water in the dry season. Feature of the existing dams/reservoirs is summarized in terms of water storage function as follows:

Dam /Reservoir	River	Catchment Area(km ²)	Purposes	Effective Storage (mil. m ³)	Water Supply
Sengguruh	Brantas	1,593	HP	2.5(1.2)	
Sutami	Brantas	2,050	WS, IR, HP,	253.0(149.7)	Domestic and Industrial water Irrigation(35,000 ha)
Lahor	Brantas	160	FC	29.4(26.5)	
Wlingi	Brantas	2,884	HP, IR	5.2(1.4)	Irrigation(13,600 ha)
Lodoyo	Brantas	3,014	HP	(2.3)	
Selorejo	Konto	90	IR, HP, FC	50.1(44.5)	Irrigation(5,700 ha)
Bening	Bening	238	IR, HP	28.4(28.0)	Irrigation(9,120 ha)

Note: Effective storage shows those soon after completion and the latest survey result by PJT in parenthesis respectively

(2) Present Sedimentation and Storage Capacity

According to the hydrological study of the Study, the latest surveyed sediment volumes in the Sutami reservoir has reached to about 78 million m³ as of 1997. The effective storage volumes of the Sutami and Lahor reservoir have been worked out in the Study as of 1997 at 146.6 million m³ and 26.2 million m³, respectively.

The present effective storage capacity of the Sutami dam between the high water level(El.272.5 m) and the operating low water level(El.260.0 m) is about 94.5 million m³. Additional 52 million m³ is presently reserved which has been seldom used.

III.5.3 Existing Development Plans Outside Brantas River Basin

The water resources in East Java other than the Brantas river basin, which will be exploitable for the water use in East Java urban area are presently identified as the Umbulan Spring located around 65 km south-east from Surabaya city, and water resources of the Lower Solo river.

Project /Plan	Location/River	Status of Project	Water Supply
Umbulan Spring	Pasuruan R.	Construction (committed)	0.7 m ³ /s(present) and 4.05 m ³ /s (to be additionally exploited)
Sembayat Barrage	Solo	D/D Finished	7.0 m ³ /s to Surabaya, Gresik and Bangkalan(Madura)
Jabung Retarding Basin	Solo	D/D On-going	5.0 m ³ /s to Gresik
Private Water Supply	Solo	Existing	1,000 l/s to P.T.Petrokimia
Lamong I	Lamong	Existing	100 l/s to Gresik
Lamong II	Lamong	D/D On-going	100 l/s to Gresik
Lamong Reservoir	Lamong	Preliminary study	Gresik

III.6 River Facilities

This section presents main results of the study on present condition of river facilities. Detailed discussions and data not incorporated in this section are presented in the ANNEX-7 "RIVER FACILITIES" of the Supporting Report.

III.6.1 Present Condition of River Facilities

Many kinds and large numbers of river facilities exist in the river courses of the Brantas river basin. They are classified into dam/reservoir, weir, dike, revetment, drainage culvert, retarding basin, ground sill, bridge, water intake, siphon, sabo dam, sand pocket, sea dike and sea dike gate. Among them, major facilities, directly related to the water management of the Brantas and Surabaya rivers, are taken up in this study. Locations of the major river facilities are shown in Figure III.14.

These facilities have been relatively well operated and maintained through the efforts by the authorities concerned to keep the essential function. However, problems to be solved still remain as presented in Table III.4.

Among those problems, the sedimentation in the Sengguruh, Sutami, Wlingi and Lodoyo dams is recognized to be the most serious problem in the Brantas river basin.

III.6.2 Organization for Operation, Maintenance and Rehabilitation (OMR)

(1) Responsible Agency

Executing agencies responsible for OMR of the major river facilities are divided into eight authorities. Among them, PJT is basically responsible for the rivers and most of the river structures. PLN is responsible for power generating equipment including the penstocks, DPU Pengairan for the intake facilities of irrigation and drinking water, PKB for large-scale rehabilitation works, PGKS for the sabo facilities around Mt. Kelud.

(2) Organization for OMR in PJT

As mentioned above, most of the river facilities are operated and maintained by PJT. Within the organization of PJT (as of August 1997, refer to the later section III.9), two bureaus perform planning including development, programming and monitoring of the OMR works. That is, the Research and Development Bureau for planning including development, and Programming and Controlling Bureau for programming and monitoring. Two water services divisions mainly perform the actual OMR works for the river facilities in accordance with the planning and programming established by above two bureaus. Responsibilities and objective facilities for two divisions are described as follows.

Division of Upstream Water Service

- OMR works of the river facilities in the upstream area from the confluence of the Ngrowo River and the Brantas River, including the Selorejo dam.
- Monitoring and control of water supply, water quality, sand mining and land utilization

- Major facility:
Sengguruh dam, Sutami dam , Lahor dam, Wlingi dam, Lodayo dam, Selorejo dam, Tulungagung gate, Tulungagung outlet gate and tunnels.

Division of Downstream Water Service

- OMR works of the river facilities in the downstream area from the confluence of the Ngrowo River and the Brantas River, including the Surabaya and Mas rivers.
- Monitoring and control of water supply, water quality, sand mining and land utilization.
- Major facility:
Bening dam, Mrican Barrage, Menturus rubber gate. New Lengkong dam, Mlirip gate. Gunungsari dam, Gubeng dam.

III.6.3 Problem and Recommendation for Present OMR Works

Based on the studies on the present condition of the river facilities and the organization related to their OMR works, the following problems are identified and recommendations are presented.

Problem

- At present, five authorities (PJT, PKB, PLN, DPU Pengairan and PGKS) are mainly responsible for the OMR works of the river facilities in the Brantas river basin. However, there is no authority to grasp the present condition of the OMR works for all of the river facilities in the basin. Because there is no overall inventory of the river facilities in the basin.
- Although the dams/reservoirs are the trunk facilities for the water use in the Brantas river basin, there are serious problems to be solved and there are no established measures. It seems that there is no responsible authority to plan and control the OMR works for all of the river facilities in the basin.
- Repairs of the flood control facilities are delayed in comparison with the well-maintained water-use facilities. The cost of these activities would have to be borne by the Government. On the other hand, PJT did not get the national budget (APBN) for maintenance of the flood control facilities. A cause of delay is considered that the allocation of the OMR budget between the flood control and the water use is not definite.

Recommendation

- Overall inventory of the river facilities should be made, to perform the OMR works of the facilities more efficiently and steadily.
- One responsible authority of the water resources management should perform the OMR works of major river facilities in the basin. In this aspect, PJT shall become a candidate of this authority.
- The allocation rule of OMR budget should be established. And PJT shall request the national budget for the flood control to the Government.

III.7 Monitoring and Information System

This section presents main results of the study on present condition of the monitoring and information systems in the Brantas river basin. Detailed discussions and data not incorporated in this section are presented in the ANNEX-9 "MONITORING AND INFORMATION SYSTEM" of the Supporting Report.

III.7.1 Present Condition of Monitoring System

III.7.1.1 Flood Forecasting and Warning System (FFWS)

The flood forecasting and warning system (FFWS) works for flood forecast and flood prevention in the Brantas river basin. Existing FFWS was installed at the end of 1990 and started operation from the beginning of 1991. Two rainfall gauging stations and a water level and outflow gauging station were installed in 1994 additionally.

FFWS consists of sub-systems for telemetering, analysis and communication. Most part of operation and maintenance of FFWS are carried out by Unit of Computer and FFWS of Bureau of Program and Control of PJT.

(1) Telemetering System

Telemetering system is a centralized data management system. Rainfall (26 data), water level (river 10, reservoir 11 data) and outflow from dam and weir (10 data) are collected in real time by the system. These data are used for flood forecasting and other analysis for water resources management in the Brantas river basin.

The system is supervised and controlled at Master Station(M/S) in PJT head office and at Sub-master Stations(Sub-M/S) in PJT offices at Kediri and Tulungagung. The part of data are monitored at Monitoring Stations in Sengguruh dam and Wlingi dam offices. The all data are stored and managed finally at M/S in PJT head office.

Location of the gauging stations and the telemetering radio network are shown in Figure III.15. List of stations of FFWS is shown in Table III.5.

(2) Analysis System

Analysis system located at M/S is computer system for flood forecasting and other hydrological analysis. The forecasted items are river water levels(9 points) and reservoir water levels, inflow and outflow data(10 sites).

(3) Communication System

Communication system consists of M/S, Sub-M/S and major dam/weir offices. The system has been established for communication about instruction of flood control operation, check of telemetering data between M/S and sites, and measures in emergency about telemetering system.

(4) Operation of FFWS

Main flow of flood control operation is shown in Figure III.17. Procedures for analysis, evaluation and forecast of flood and issue of warning are shown in Figure III.18. FFWS is operated according to these flows. The flood warning is transmitted by the communication system of FFWS and telephone line.

(5) Operation Records

Operation records of FFWS were not kept from the beginning of its operation until November 1996. Operation of FFWS in emergency as the issue of warning, flood control measures taken, troubles of data transmission, etc. has been recorded since November 1996.

(6) Management of FFWS

(a) Operation and Maintenance

Unit of Computer and FFWS of Bureau of Program and Control of PJT is in charge of operation and management of FFWS at M/S in PJT head office.

Sub-divisions of two Water Services Divisions of PJT operate and manage FFWS equipment and appurtenant facilities at sites. Besides, each unmanned gauging station is kept by the nearby resident with payment.

Equipment of FFWS are maintained in the inspection by Unit of Computer and FFWS. Simple repair and adjustment such as replacement of spare parts and calibration of equipment are carried out by themselves, but difficult repair of the equipment is ordered to the makers concerned.

Organization in charge of the OM activities of FFWS is summarized below.

Station		Master Station	Sub-Master Stations and Dam/Weir office (including Monitoring Stations)	Rainfall, Water Level and Relay Stations
Operation		Unit	ASA I/II	Automatic
Maintenance	Inspection	Unit		
	Simple Repair and Adjustment	Unit		
	Difficult Repair	Commission to the makers		
	For Appurtenant Facilities	ASA I/II		

Where, Unit: Unit of computer and FFWS
 ASA I/II: Sub-divisions of two Water Services Divisions

(b) Operation and Maintenance Cost

The operation and maintenance (OM) cost of FFWS includes personnel expenses, equipment cost, traveling expenses for maintenance, electric charge, and expenses for repair and changing spare parts. Annual OM costs were about 240 million rupiah in 1996.

(5) Expansion Plan of FFWS

The Wonorejo Multipurpose Dam Project proposed the expansion plan of FFWS. The expansion plan aims to establish the telecommunication system for low flow management in the Brantas river basin using the existing FFWS, as well as to expand the function of FFWS incorporating the new facilities to be constructed for the Wonorejo project.

According to the Wonorejo project, principal objectives of the establishment of Low Water Management System (LWMS) are effective utilization of available water resources, accurate control of river water, and conservation of river environment.

Under these objectives, hydrological condition of the Brantas river and water supply at major intakes from the Brantas river will be monitored by the LWMS (Table III.6).

(6) Problems

The existing FFWS has various problems about hydrological observation, telemetering data processing and data management as follows:

(a) Hydrological Observation

Some water level gauges in the river do not function well in dry season under influence of sedimentation and river bed erosion.

In the existing FFWS, hourly outflow data of dam and weir are sent from each dam and weir office to M/S in PJT, Malang by telemetering system, through operator's manual operation at each office. Some telemetering outflow data are not accurate. Causes of the problem are delay of manual typing into terminal of FFWS (called Setting Panel) against automatic data polling by telemetering system, and typing not every hour at some site.

(b) Updating of H-V Curves in FFWS

Reservoir water level – storage curve (H-V curve) changes due to sedimentation year by year. However, H-V curves installed in FFWS have not been revised from the start of operation in 1991. Therefore, the accurate values of inflow and storage of reservoir can not be known by FFWS.

To solve this problem, PJT is taking an action to replace the ROM to new one which built in the latest H-V curves. However, replacing of the ROM takes much time and required the cost. Therefore, it is difficult for FFWS to change the H-V curves in the reservoirs timely.

(c) Telemetering Data Use and Verification of Flood Forecasting Program

In the existing FFWS, there are two kinds of storage types for hydrological data, one is in the Data Storage Equipment(DSE) of the FFWS, and other is in the floppy disks.

For verification of flood forecasting program, the past flood data are needed. However, DES which connected to the personal computer for flood forecasting, can store 3 days' data required and, the personal computer can not use the data from the floppy disk through the floppy disk drive of FFWS.

Furthermore, the data in floppy disks are recorded by special format for FFWS. For that reason, it is difficult to use the data for verification of flood forecasting program in other PC. This means that the data in floppy disks can not be used for other analysis for water resources management.

Still more, staffs of M/S can not verify and update the flood forecasting program due to lack of the knowledge of hydrology and programming.

(d) No Experience of the Flood Forecasting

The staffs for flood control operation do not have enough experience of the action based on the flood forecasting by FFWS, because of no big flood since commencement of FFWS operation.

III.7.1.2 Low Water Management System

At present, low flow discharges in the Brantas river basin are observed and collected by the PJT by use of telephone line and FFWS. In addition, as described before, the Wonorejo project proposes to establish Low Water Management System using the existing FFWS, to monitor the amount of the major intake discharge.

Present low water management is executed based on "POLA OPERASI WADUK-WADUK" (POLA, operation pattern of reservoir) decided by Provincial Water Management Committee (PWMC) consisting of water suppliers and water users. PWMC has been established to have an integrated action of related agencies, in order to provide water management which could serve an optimum benefit for the society in all life sectors, in relation to water resources management in river basins of East Java.

In case that shortage of water is observed at a monitoring point corresponded to POLA, adjustment of water allocation will be performed effectively in accordance with POLA. In case of extreme shortage of water, the PWMC will be called and reconsider the water allocation based on the present condition like monitored discharge data.

The Brantas river basin has experienced the severe droughts in 1982, 1987 1994 and 1997. During those droughts, PWMC took respective measures against each drought under discussions based on each drought conditions, because there are no standards for adjustment of water allocation against drought.

III.7.1.3 Water Quality Monitoring System

At present, water quality monitoring is carried out by manual sampling and testing at several agencies including PJT.

There is duplication among the monitoring activities by several agencies including PJT.

On the other side, automatic water quality monitoring stations are proposed to be installed by the Wonorejo project as parts of establishment of Low Water Management System. The locations are as follows:

- Karangpilang (Surabaya River)
- Pelayaran (Surabaya River)

III.7.2 Present Information Management

Hydrological data, which are very important information for water resources management, are presently monitored and collected by PJT through FFWS. However, other kind of information, which are also important for water resources management, are not collected presently.

Many agencies carry out various management activities related to the water resources management, and the agencies keep the information about their own management. The following issues are found in relation to utilization of information on water resource management.

- It is not clear what kind of and where the information related to water resources exists among the agencies concerned.
- Information is not put in order for easy use, and accordingly special attention is needed for using the information to avoid the mis-use of the information.
- The water management activities by the related agencies are not clear for the other agencies. Accordingly the information of the other agencies is not clear among the agencies.
- There are some differences of data arrangement among the related agencies, and accordingly it causes the ineffective use of data and information among the agencies.
- Similar study or investigation under different agencies have been conducted.

III.8 River Environment

III.8.1 Present Condition

The Brantas river waters are used for drinking water, agriculture, fisheries waste disposal and others. Rapid development and increased human activity is causing alarming increase in pollution and is severely limiting availability of clean water. The PROKASIH 2005 Vision have classified the river environment into four functional areas (the Upper Course, Rural Areas, Urban Areas, and the Lower Course), and with modifications they apply to the Brantas river. The supply of Brantas river water for most of the above area was generally decreasing, both in the discharge of flow especially during the dry season and in the quality of water. It was ascertained that the deterioration of water quality cannot be easily restored and had caused varying degrees of destruction to the ecological system in the Brantas basin.

The river environment needs pollution control and river conservation to be on a convergent path for a workable river management plan. PROKASIH 2005 Vision had also reiterated it as 'the problem of water supply in broad outline includes the problem of quality and quantity'. For the management to succeed, 'one river, one plan and one coordination management' will have to be adapted urgently by the PJT.

III.8.2 Preservation of Biodiversity

Biological diversity which is often shortened to biodiversity in the Brantas river is important which flows through nine regencies and is rich in plant and animal life. The perceptions about the preservation of fauna and flora have changed all over the world, just 10 years ago it was considered that biotic preservation was only for the future uses of genetic material contained in the animal and plant life. Now rightly the present trend and research sees the value of biodiversity as a source of resilience of ecosystems. This is exactly how the biota of the Brantas river should be treated. In concrete terms, the individual organisms present in the Brantas basin which collectively make up the biota have specific properties that make them of a given value in satisfying the consumption or production needs in East Java.

The present land use in the Brantas river basin is 57% farmland, 26% forests, 14% homesteads, and 3% for other area. In the future, as per 'Land Use Plan in East Java Province 2008' the overall farmland area is estimated to decrease. However, the forest and homestead are estimated to increase by 10.2% and 21.8% at an annual rate of 0.54% and 1.1% from 1990 to 2008. Meanwhile, the Forestry Department, Surabaya, has a planned project of plantation of 50 million sapplings in the upper Brantas river area. This will be implemented by related agencies. This activity would help in land rehabilitation and the preservation of the existing plant life in the future.

The biota of Brantas river is in all the most important cases a public and an economic good. The keystone species (chanos chanos, gorami etc.) have an insurance value and this insurance value depends on their contribution to economic resilience. A survey of

biodiversity for the dry and rainy season was designed and carried out, the survey results

presented in the supporting report, the following table provides information about the existing 16 indigenous fish.

Indigenous Fish Identified In The Biodiversity Survey(Rainy & Dry Seasons)

Species	Local Name	Importance & Value
<i>Chanos chanos</i>	Bandeng	Economic
<i>Clarias batrachus</i>	Lele	Economic & Ecological
<i>Cyclocheilichthys enoplos</i>	Wader	Ecological
<i>Kalimantania lawak</i>	Lawak	-
<i>Monopterus albus</i>	Belut	Economic
<i>Hampala macrolepidota</i>	Palung	Economic
<i>Macronagthus aculeatus</i>	Sili	Ecological
<i>Mystus nigriceps</i>	Keting	Economic
<i>Mystus gulico</i>	Baug	Economic
<i>Nemacheilus fasciatus</i>	Uceng	Economic
<i>Osteochilus haseltii</i>	Bader muntu	Economic
<i>Pangasius micronemus</i>	Wakal	Economic & Ecological
<i>Puntius binotatus</i>	Cakul	Ecological
<i>Barbodes bellaroides</i>	Baderbang	Economic & Ecological
<i>Barbodes gonionatus</i>	Tawes	Economic & Ecological
<i>Rasbora argyrotanina</i>	Wader pari	Ecological & Social

The fish above have values ranging from economic, social and ecological, they are aquarium fish, fish for food, and the fish that help keep the river environment clean.

III.8.3 Recreation

III.8.3.1 Reservoir

Recreational uses at Brantas river reservoirs ideally prefer the water levels to be kept as close as possible to the normal maximum so the surface area for sailing and the shoreline for fishing are at a maximum. In addition, unsightly mudflats and other structures are not revealed for the tourist. In many reservoirs in other countries historically the authorities were reluctant to allow the public to use reservoirs for recreation for many years because of pollution risks. Nowadays the situation has changed and many more reservoirs are used intensively for recreation. However, in most cases recreation is still treated as a low priority use.

PJT has tourism sites on annual reservoirs within its working area in Selorejo, Sutami and Bening reservoirs. The tourist sites provide facilities such as inn, cottages, golf course, tennis court, swimming pool and playground.

Another attractive recreational opportunity that need to be looked into is a waterfall site, five kilometers east from Selorejo Tourist Park and mid point to Pujon. This site is considered to be scenic and all year round. Reportedly Coban Talun and Coban Rondo are alternative waterfalls which could be integrated into the future recreation plan.

Furthermore, there is also rafting potential in the upper Brantas river between Mergosono and Blobo.

To better manage these facilities, in 1996 PJT had proposed the formation of Selorejo Tourist Park as Mandiri Unit which was expected to immediately form a business association in the development of the unused potential of Selorejo tourist park.

Selorejo Tourist Park Unit since 1996, is a new unit of the General Service Division with the aim to delegate a bigger authority to the Head of Unit.

According to the PJT Annual Report 1996, 'in the effort of tourist business development in Selorejo tourist park, the main problem encountered was the funds and human resources limitation of the Company, for which an investor was sought as business associate.'

In 1996, income from tourism within working area was Rp. 479,335,786, while the business costs for tourism were Rp. 225, 195,185. The balance sheet speaks for itself, much more needs to be done to generate revenues. PJT must organize its recreation activities as professionally as possible, with adequate funds and human resources allocated to it.

III.8.3.2 River Area

(1) Sumber Brantas and Junggo Eco-tourism

In the Phase I of this study, as presented in the Interim Report, an eco-tourism potential for upper Brantas was proposed, in this section the same ideas are further developed. Nowadays, around the world, eco-tourism has a substantial and well-publicized potential to boost local and national economies. In the Sumber Brantas- Junggo area it could provide 'long-term employment to the locals and generate new funds for the conservation without damaging biodiversity' (Global Biodiversity Assessment, UNEP, 1995). In many famous sites around the world, it has been observed that excessive visitation has caused serious damage to biologically diverse and fragile areas. And, in many sites eco-tourism's financial and economic potential has remained largely unrealized, except by commercial travel operators. In exploring the eco-tourism option for the upper Brantas, there is a need for careful analysis of eco-tourism to identify appropriate policies than can:

- (1) Capture a greater proportion of eco-tourism's economic benefits for the upper Brantas river.
- (2) Regulate visitors adverse environmental and cultural impacts; and
- (3) Provide additional funds for Sumber Brantas / Junggo areas biodiversity conservation.

There are many countries where eco-tourism has been successful, in Nepal, for example, analysis shows that the total economic benefits attributable to parks related eco-tourism are significantly greater than the direct costs incurred by the government in maintaining the protected area network. In addition, Costa Rica, Ecuador, and Kenya also have very successful ecotourism programs, these programs and their developments should be reviewed by PJT. To plan further, PJT should conduct simple, low-cost, survey based research studies to estimate demand curves for upper Brantas eco-tourism and thereby justify a pilot project.

The unrealized potential of eco-tourism can contribute to biodiversity conservation as well as economic development in the upper reaches of the Brantas river and may be linked to the following two policy issues:

- (1) The value of eco-tourism has been substantially underestimated by many countries and less than optimal investment was made in its management.
- (2) In many countries very little of the economic value of eco-tourism was being appropriated by the local region, either in terms of public sector revenues or in local. In addition to the above, eco-tourism in Brantas river can act as an effective economic incentive for conservation of fauna and flora.

(2) Brantas River Middle and Lower Stream Potential

For the middle Brantas river tourism potential the following should be taken into consideration for the proposed activities in the Interim Report. In river areas the existence of the land-water interface and its degree of naturalness, and nature conservation aspect are also important. It has been shown in the USA and other countries that the public attitudes towards preservation of multi-use river corridor amenities including wildlife habitats, riparian vegetation and open spaces are very desirable. In many river areas urban and upland river stress the aesthetic and recreational potential of such areas, as well as, their role in water quality and erosion control.

The recreation potential of a two kilometer length portion of river at Kademangen should be developed. The area is very scenic and has a large number of fish. The clean and clear waters from Kali Putih, perhaps are responsible for the attraction of this river segment. This area also has the largest number of fish in all of Brantas river.

III.9 Organization and Management

III.9.1 Current Organizations related to W.R.M. in the Brantas River Basin

III.9.1.1 Category and function of related agencies

There are a number of organizations that are involved in the water resources management in the Brantas river basin. Of them, major thirty four (34) organizations are selected and listed in Table III.7. Main tasks and responsibilities of each organization are described in the same table.

In Table III.8, work duties of each agency are depicted in the form of a matrix. The organizations are categorized in this table as shown below and are denoted by alphabet "a" to "f" in the upper column ahead of the name of agencies. Regency (Tingkat II) level Government agencies are considered to be included in the same agency of Provincial (Tingkat I) level.

- | | |
|---------------------------------------|------------------------------|
| a) Ministry level Government agencies | ex.: MPW, BAPEDAL |
| b) Representative office of Ministry | ex.: Kanwil PU |
| c) Government managed Project | ex.: PKB, PIAT |
| d) Provincial level Govt. agencies | ex.: Dinas Pengairan, DPRIND |
| e) Public corporation | ex.: PJT |
| f) Limited corporation | ex.: PT PLN |
| g) Committee / Unit of Government | ex.: PWMC |
| h) Other organizations | ex.: PDAM |

III.9.1.2 Current activities of agencies in each W.R.M. sector

Current works and duties of water resources management related agencies are presented in a matrix of Table III.8. This matrix is considered to show the current sharing of roles and responsibilities of the water resources management in the Brantas among related agencies.

The Directorate General for Water Resources Development (DGWRD) of Ministry of Public Works (MPW) is mainly responsible for the following:

- to set up policy concept on water resources including planning, management, maintenance and conservation,
- to guide the implementation of water resources policy,
- to guide and set up water balance and water permit recommendation,
- to assist the operation and maintenance of completed water resources infrastructures,
- to assist and implement the management of state-owned property and
- to guide and set up the master plan on water resources.

It assists Ministry of Mining and Energy for ground water development. The organization chart of MPW is depicted in Figure III.18.

(1) Watershed management

In the watershed management sector, Directorate General of Reforestation and Land Rehabilitation(DGRLR) of Ministry of Forestry is responsible for policy making and in the whole sector. The Kanwil Kehutanan is responsible for planning and technical guidance for land rehabilitation and soil conservation including long-term (25 years) plan of reforestation. The BRLKT(Sub-division Brantas) is responsible for soil and watershed conservation planning for all lands including the middle-term plan (5 years). In 1994, BRLKT(Sub-division Brantas) was reformed into DPKT whose office was built in each Kabupaten. The BRLKT(Sub-division Brantas) is still existing with a reduced number of staffs. The DPKT succeeding the functions of BRLKT prepares annual plan and implements it. The BRLKT Area VI office has three sub-divisions in East Java Province including Brantas, Sampean and Madura sub-divisions. The activities of DPKT cover the land except for that of Perum Perhutani.

The Perum Perhutani is a state corporation specified in commercial forestry. Within its demarcated area, it covers all the aspects of watershed management including land use management, land slide erosion prevention and sediment control. The PGKS is implementing the debris control in its responsible area including the whole mountain area of Kelud and southeastern side of Mt. Semeru which is located in the catchment area of the Brantas.

(2) Flood management

The DGWRD of MPW is supervising all the aspects of flood control works. The MHA is supervising flood damage management for implementing rescue service and reporting flood damage. The PJT is solely responsible for FFWS and reservoir operation rule.

The PKB and PJT are doing tasks cooperating together in this sector. Their scope of works and duties extend to flood control works and flood damage management. The Dinas Pengairan is taking care of flood control works in the tributaries in upper stream.

For flood damage management covering rescue service and damage reporting, SATKORLAK PB is coordinating many related agencies and supporting the Governor who gives order and implements the actual countermeasures.

(3) Water supply management

The DGWRD makes supervision of all the aspects of this sector including water supply, water resources, water balance and low water management system. The MHA is supervising domestic water supply.

The PJT is responsible for implementing all the aspects of water supply. The Dinas Pengairan, DPERIKAN and DPRIND are also responsible for water supply in their

respective areas. The PT PLN and PDAM are users and purchasers of raw water of the Brantas.

The PWMC is coordinating water allocation among water users. Water allocation plans are submitted by PJT for discussion at the meeting, which is passed to the Governor for approval. The Dinas Pengairan currently takes a role of the secretary of PWMC.

As for the water resources development planning, four agencies including PJT, Dinas Pengairan, DISTAMB and PDAM are being involved. Of them, DISTAMB is responsible solely for ground water supply.

Water balance is planned by PJT, discussed at PWMC and submitted to the Governor for approval. The low water management system (LWMS) is being maintained by PJT and PWMC as well. The PKB is responsible for expansion plan of LWMS.

(4) Water quality management

There are two ministry level organizations in this sector: MOE and BAPEDAL. Broadly speaking, the MOE is policy making agency while BAPEDAL is an implementing agency by nature. The head of the two agencies is the same person. A number of other agencies are involved in this sector and the demarcation of their roles and responsibility are not necessarily clear.

The MOH is supervising the domestic waste water quality management.

As for river water, Kanwil PU and PJT are doing water quality monitoring. The BAPEDAL is supervising the river water quality management.

As for domestic waste water, Kanwil PU and Dinas Kebersihan are doing water quality management.

As for industrial waste water, DPRIND is doing quality control and monitoring. The MIT is supervising the industrial waste water quality management.

In the water quality management sector, BBLH has been responsible for legislation matters and is coordinating with other related agencies in many aspects. In November 1997, BBLH was reformed into BAPEDALDA based on the newly enacted Environmental Law. Unlike the former BBLH which was a staff-agency, the new BAPEDALDA is a line agency which is assumed to implement quality conservation activities of water, air and soil. In this Study, BBLH is referred to when it relates to the present conditions while BAPEDALDA is referred to when it relates to the future.

(5) River environment

The DGWRD is supervising recreation in river space while the BAPEDAL is responsible for supervising biota in the river area.

The PJT is doing operation and maintenance and control planning of land use in river area and surroundings. The Kanwil PU is supervising PJT activities. As for biota in the river area, BBLH is doing conservation activity, controlling and planning. The BAPEDAL is supervising BBLH activities. As for recreation activity in the river space, PJT is doing operation and maintenance, control and planning.

(6) Water resources management master plan

The master plan for water resources management in the Brantas river basin has been required for a long time but not prepared yet. All the related agencies is required to cooperate with PJT who is assumed to be primarily responsible.

(7) Governor's authority

The Provincial Governor is currently bestowed with wide range of rights of decision in water resources management. Some relevant authority comprises the following:

- (i) to give license of water resources utilization
- (ii) to approve reservoir operation plan (as the chairman of PWMC)
- (iii) to approve flood control manual as the chairman of PWMC
- (iv) to issue the license or rejects the request for waste disposal, can cancel the license for waste disposal.
- (v) to designate the sand mining location, issues and rejects for mining license.
- (vi) to designate the land use in river bank areas, issues and rejects the request for land use in river bank areas, river use areas and river authority areas and cancels the license for land use.
- (vii) to approve the proposal on the tariff (MPW designates the tariff for O&M contribution)

III.9.1.3 Some problems in sharing roles and responsibilities

In Table III.8, some problems are observed with respect to sharing roles and responsibilities among the related agencies, which are commented as follows.

- (a) Duplication and obscurity of works and duties
 - As for land development plan, Kanwil Kehutanan (Forestry) and BRLKT are doing the same task.
 - As for land slide and erosion prevention management, the duplication of task between Kanwil Kehutanan and BRLKT is observed for the works including regular inspection survey, land slide inventory and land slide prevention plan.

- As for sediment control, there are work-duty duplications among PKB, PJT, Kanwil Kehutanan, BRIKT and DISTAMB.
- As for flood control works, there are duplications among PKB, PJT and Dinas Pengairan.
- As for water resources development plan, both PJT and Dinas Pengairan are responsible and primary responsibility is obscure.
- River water quality monitoring is being implemented by Kanwil PU and PJT.
- Domestic waste water quality monitoring is being done by Kanwil PU and Dinas Kebersihan.
- Industrial waste water quality monitoring is being done by PJT and DPRIND.

(b) Water conservation

In watershed management sector, there is no agency who is responsible for water conservation. The DPKT covers land and soil conservation mainly from the point of view of forestry conservation while PJT, PKB and PGKS cover land use management mainly from the point of view of sediment control. This is the interface of water use management and land use management. The effect of reforestation toward enhancement of river water, for example, cannot be clarified under the current water resources management system in the Brantas.

III.9.2 Current Operation and Organization of PJT

III.9.2.1 Current operations

(1) Main tasks of PJT

The current operations of PJT is being carried out according to the provision of Minister of Public Works Regulation No. 56 / PRT / 1991 in which the main tasks of PJT are stipulated as follows :

- (a) Operation and maintenance of water resources infrastructure,
- (b) Dealings in water and water resources,
- (c) River basin management i.e. conservation, development and utilization of water and water resources, and
- (d) Rehabilitation of water resources infrastructure.

Although stipulated in the Regulation as shown above, construction activities are not being done in routine practices of PJT. Neither conservation works are being done. Thus only (a) and (b) are actually implemented in daily practices of PJT.

(2) Major operations of PJT in W.R.M. in the Brantas river basin

Major operations of PJT in water resources management of the Brantas river basin can be derived by reading vertically the column of PJT in the work duty matrix of Table III.16 and is described as follows.

(a) Watershed Management

In watershed management sector, PJT's operation concentrates in the sediment control in the existing reservoirs. The sedimentation is the big problem common to almost all the reservoirs in the Brantas though it is critical in the Sengguruh, Karangates and Wlingi reservoirs. For the details, a chapter of "Watershed Conservation, Sabo and Flood Control" is to be referred.

(b) Flood Management

The PJT is doing a primary role in flood management sector together with PKB under the supervision of DGWRD. For the management of flood control works, PJT together with PKB is functioning as a responsible agent for all the areas except rehabilitation and flood control plans for which PKB is solely responsible. For flood damage management, especially for FFWS and reservoir operation rules of existing reservoirs, PJT is solely responsible.

(c) Water Supply Management

The PJT is functioning primarily in the river water supply management sector with the cooperation of PKB. The PJT with the cooperation of PKB is assumed to be responsible for water supply for domestic use, irrigation use, brackish fishery use, industrial use, river maintenance water and hydropower purpose. For water resources management, PJT is responsible for surface water and DISTAMB is responsible for ground water. For water balance management, PJT is responsible for all the water balance planning including middle term, long term and the current water balance as well.

For low water management system (LWMS), PJT is functioning as a primary agent in every aspects under the supervision of DGWRD and Kanwil PU. The PJT is solely responsible for regular inspections, operations of LWMS, coordination of water allocation and regulation in this sector. The rehabilitation plan and expansion plan are prepared with the cooperation of PKB. The PJT delivers technical recommendations to the PWMC to which PJT submits water allocation plan at the beginning of dry season and wet season.

(d) Water Quality Management

The PJT is one of the member of PROKASIH (Clean River Program) and its largest sponsor. The program contributes to improve the water quality of rivers including the Surabaya river through many community participation programs. The PJT

together with Kanwil PU and DPRIND is monitoring water quality of rivers and waste water of industries as well. The result of the laboratory analysis is reported to BBLH from which recommendations are submitted to the Governor as necessary.

(e) River Environment

The PJT is solely responsible for management of land use in rivers and their surroundings including operation and maintenance and control plans. It is also responsible for recreation in river space for their O & M and control plans in the recreation zones of Selorejo, Karangates, Wlingi and Bening reservoirs.

III.9.2.2 Current organization of PJT

The current organization structure of PJT is as stipulated in Figure III.19.⁽¹⁾ Under the President Director, three(3) directors are assumed to be responsible for Technical Affairs, Operation and Administration and Finance. The Internal Supervision Unit is directly responsible for the President Director.

(a) Directorate for technical affairs

In the Directorate for Technical Affairs, all the technical matters are handled. They include surveys and investigations including research and feasibility studies, technical guidance for each Division, environmental planning including waste water treatment and water quality. A laboratory in which water quality testing is carried out is installed in Research and Development Bureau. The legal aspects are being dealt in the same Bureau. The FFWS is installed in Programming and Controlling Bureau. Feasibility studies are conducted by the Research and Development Bureau and later handed to the Corporate Development Bureau for its further detailed study aiming at implementation. New businesses are being hatched by the Corporate Development Bureau.

(b) Directorate for operations

In the Directorate for Operations, all the routine operations are handled. They include O&M activities, water resources management, consulting and construction services and equipment utilization. The daily O&M of river and river structures, monitoring and control of water supply, sand mining and land utilization and water quality are being done by Division of U/S (upper stream) and D/S (down stream) Water Services.

In each Water Service Division, there are three(3) sub-divisions as shown below.

- | | |
|-------------------------|--|
| (i) Water Division U/S: | Sub-division 1: Sengguruh, Karangates |
| | Sub-division 2: Wlingi, Selorejo, Lodoyo |
| | Sub-division 3: Tulungagung |

⁽¹⁾ This figure shows the organizational structure of PJT as of December 1997. As a matter of actual, it was changed thereafter and the current one as of March 1998 is shown in Figure III.17 in this report for reference's sake.

- (ii) Water Division D/S: Sub-division 1: Kediri, Widas
 Sub-division 2: Lengkong--estuary
 Sub-division 3: Surabaya river, Mas river

Construction and consultant services and equipment service are being done by Division of Non Water Service. Tourism services are being handled also by the same division.

(c) Directorate for administration and finance

In the Directorate for Administration and Finance, managerial matters related to administration and finance is being handled. The financial reporting, budgeting and accounting are being done by Bureau of Finance. The human resources development and public relations are being dealt by Bureau of Human Resources Development and General Affairs.

III.9.2.3 Some problems in PJT organization

Some organizational problems are observed and pointed out as follows.

(a) Bureau of Research and Development

Various jobs of different nature are mixed in this bureau. The whole jobs can be broadly broken down into the following seven job groups:

- i) Management planning
- ii) Technical planning
- iii) Research
- iv) Water resources conservation
- v) Water quality conservation
- vi) Public relations
- v) Legal matters

The jobs of vi) and vii) are to be transferred to Directorate for Administration and Finance. Strengthening is needed for the group of legal matters. The job of i) is already transferred to Bureau of Corporate Development. Due to the heavy load and manpower shortage, no research works nor master plan preparation are being done.

(b) Bureau of Planning and Controlling

The managerial jobs such as "work plan and company budget", "quarterly work program for each unit" and "evaluation on company operation" are not the job of this Bureau but the job of Corporate Development.

(c) **Division of Water Service(Up Stream and Down Stream)**

Besides the primary job of O&M of river infrastructures, “marketing and observation of water service sales to customers” is allotted to this Division. These are not the jobs fitted to engineers.

(d) **Division of Non Water Service**

This Division cannot be responsible for tourism development without any expert of tourism. Since the tourism has different nature from the conventional PJT’s tasks, it is better be handled in the unit in charge of new businesses.

(e) **Bureau of Finance**

i) Annual budget is to be prepared in this Bureau in stead of Bureau of Planning and Controlling.

ii) MIS is to be transferred from Bureau of Research and Development .

iii) Budget control is not included in job descriptions of any Bureau. This should be done in this Bureau.

iv) The management accounting is not being done but financial accounting only is being done. The cost allocation system should be firstly established.

(f) **Bureau of Human Resources and General Affairs**

i) Jobs of Public Relations, career planning and task analysis (control of number of staff by each task) should be included in this Bureau.

ii) Staff training and education are not included.

(g) **Internal Supervising Unit**

Financial auditing seems to be the main interest. Operational (performance) auditing is desired to be added aiming at improvement of operational systems and procedures.

III.9.2.4 Some problems in managerial aspects of PJT

Some problems in managerial aspects of PJT are pointed out hereunder. The counter measures toward these problems will be presented in each corresponding sector study in Chapter VI.

(1) Water charge formula

The main revenue source of PJT is water charge to be collected from such beneficiaries as PT PLN, PDAM and industries which intakes industrial water from the main stream. Unit water rates are negotiated between PJT and the beneficiaries individually every year. But the

formula to compute the unit water rate is not established yet. This situation so far does not bring any harm to the management of PJT because annual revenue exceeds annual expenditure for these years. Annual expenditures including O&M cost and personnel cost have been increasing every year while there is no assurance of the increase of water revenue in the future. From the point of view that the water revenue should be reliable and stable for the long term sustainability of PJT management, the formula of water charge should be established as soon as possible.

(2) Management of fixed assets

The PJT is running business by utilizing state assets free of charge. The O&M costs that PJT spent for maintaining the state owned assets is recovered from beneficiaries by collecting water charge. However, the state owned assets are not posted on the balance sheet of PJT. Neither the bookkeeping nor the depreciation of these state owned assets are being done. As a matter of fact, the current book value of them are not known by PJT. The proper bookkeeping is absolutely necessary for the full recovery of the cost rendered for delivering the services of PJT. The proper bookkeeping constitutes the base of the formula of water rate computation.

(3) Strengthening of manpower

According to the PJT data, only 15% of the total PJT staff is the graduates of university and/or higher academic level. In terms of the professional field, three engineering fields comprising civil, mechanical and electrical engineering occupies 39% of the total. The age composition of staff shows that the staff of more than 40 years old occupies more than half of the total. Based on these characteristics of the staff of PJT, the following is to be pointed out.

- (a) Some deviation is observed in the composition of the staff specialty. There are only two environmental engineers, two informatic experts and two legal experts.
- (b) As seen in the above table, the age composition is not well balanced. Anticipating the situation when aged people retired, new employment should be increased periodically every year following the above mentioned reinforcement of some specialties.
- (c) A task analysis should be conducted to determine the proper number of staff in each Bureau and Division. The existing study carried out by the personnel section of PJT will be the base of this analysis.

(4) Reform of organization

- (a) A section for Public Relations is recommended to be built. The needs of community are required to be grasped and incorporated in the water resources management. This is necessary to promote the participation activities of community.

- (b) A legal section is to be built being separated in Research and Development Bureau after enhancing the number of legal experts. This is required because the legal matters is anticipated to increase in the near future.
- (c) A marketing unit is to be built. The contact with beneficiaries will become more and more important in the future. Through an intimate communication with beneficiaries, mutual understanding will be increased. An exploitation of new business market will be another task of this marketing unit.

III.10 Financial Condition and Budget Resources of PJT

III.10.1 Operation Record of PJT

PJT is a self-supporting corporation independent of the state budget. It was initiated as a profit earning corporation in accordance with Letter of Decision of Minister of Public Works No. 9/KEP/RUPS/1995, dated Jan. 18, 1995.

An analysis of the financial statements including balance sheet and profit and loss statement was carried out based on the latest three years figures which are compiled in Tables III.9 to III.13. Main features are summarized below.

III.10.1.1 Balance Sheet

- (1) Due from PLN amounted to Rp. 3,266 million at the end of 1995, which was 33.8% of the year revenue from PLN, and 11.7% of total asset. This reveals some trouble lies in price negotiation between the two parties. Based on the agreement signed between PLN and PJT, the price was settled at Rp.11.20/kWh in 1996 and Rp.11.76kWh in 1997. For years thereafter, an annual increase of 5% was agreed up to the year 2000.
- (2) A problem is seen in the account receivable of the several private corporations who rented construction equipment from PJT. The outstanding as of 1996 is Rp.846 million, out of which Rp.398 million is the delay in payment. The account receivable of Rp.196 million was assigned to the State Account Receivable and Auction Agency for the settlement.
- (3) As shown in Table III.12 Company Performance Trend, the collection period which reflects the management of account receivable was improved from 3.7 months in 1995 to 2.5 months in 1996. While the payable period which is a control ratio for a liability was 1.1 months in 1995 and 2.1 months in 1996. Consequently, the difference which affects the company's cash position improved from -2.6 months to -0.4 months between 1995 and 1996.
- (4) The capital ratio (ratio of equity to total assets) increased from 80.1% in 1995 to 85.3% in 1996.

III.10.1.2 Profit and Loss Statement

- (1) The O&M expense increased in 1995 due to the dredging of Sengguruh reservoir, that cost PJT for Rp.1.6 billion in 1995 and Rp.1.2 billion each in 1996 and 1997.
- (2) According to Article No.55 of the Inauguration Law, profit of the year should be appropriated in the following manner: 55% to national development fund to be paid to the government, 25% to reserve fund of PJT, and 20% for social funds, education, production services, and pension fund contribution.

During the period from 1991 to 1996, PJT paid Rp.5.8 billion to national development fund as a kind of cash dividends.

III.10.1.3 Investment

The Selorejo tourist resort was constructed in 1995 with the investment of Rp.2.85 billion.

III.10.1.4 Company Performance

In accordance with Decision of Minister of Finance No. 826/KMK 013/1992, the company performance is being evaluated every year. The PJT's company performance was evaluated as "Very Healthy" in both 1995 and 1996.

III.10.2 Details of Annual Revenue by Source

The annual revenue of PJT for the latest three years is shown in Table III.14 by each source.

In 1996, the revenue amounted to Rp. 21,050 million which increased by 12.2% compared to 1995. Of the total revenue, that of PLN occupied the largest share of 47.0%, followed by the industries of 19.6% and by the PDAM of 17.5%. This order among the three water users has not changed these three years.

III.10.3 Details of Annual Expenses

The annual operating expenses for the three years from 1994 to 1996 are shown in Table III.15. The total annual operating expenses amounted to Rp. 18,061 million in 1996 which increased by 10.2% compared to 1995. The share of direct cost was 68.7% of the total operating expenses and that of indirect cost was 31.3% in 1996. The O&M cost was Rp.8,881 million of which share was the largest in the total operating expenses with 49.2% followed by the personnel cost (in total of direct and indirect) of 22.1%. Indirect cost excluded personnel cost was Rp. 2,454 million in 1996, which was 13.6% of the total operating expenses.

III.10.4 Details of Property

III.10.4.1 Owned assets

Owned assets listed on PJT's balance sheet (On-B/S assets) are as shown below in Rp. million.

	<1994>	<1995>	<1996>
Land	799	934	1,275
Construction/Building	5,412	7,833	7,995
Machine/Equipment	8,480	8,966	9,749
Other equipment	612	783	1,221
Depreciation	(6,916)	(8,185)	(9,726)
Net Fixed assets	8,387	10,331	10,514

III.10.4.2 Managed asset

The state owned assets have being transferred to PJT for O&M as managed asset.

In 1996 irrigation property with the value of Rp. 171.1 billion was transference to PJT.

Managed assets are not listed on PJT's balance sheet, but are dealt with off balance sheet.

The investment cost of the managed assets was evaluated by the Study Team amounting to Rp. 2,870 billion at current price in 1997. Details are shown in Table VI-10.

III.10.4.3 Land

The land listed on B/S is Rp1,275 million in 1996, and in addition the land of 3,394 ha for Rp 13,690 million as managed assets has been transferred in May, 1996. Most of these land area are not generating any revenue to PJT at present.

III.10.5 Present Status of Accounting System

III.10.5.1 Current Accounting System

The PJT's accounting policy presented below is the one prepared by following the Decree No. KP254/KPTS/DU of Ministry of Public Works, dated 30 December 1994.

- (1) The bookkeeping method is standardized in accordance with Indonesian accounting principles as a public utility industry. For example, the revenue is recognized at cash basis and the bookkeeping is done by double-entry system.
- (2) The accounting operation is computerized by "Accounting System General Ledger" (ASGL). The version up was made in July, 1997.
- (3) Interim Financial Reports are made quarterly. Annual Report and Audited Financial Statement are prepared every year.

III.10.5.2 Some Problems of Present Accounting System

- (1) Management information system (MIS) is not well prepared. The computer system can not out put necessary data like yearly maintenance cost by category or by project.
- (2) Neither current book value of properties nor accumulated amount of depreciation are available. Although bookkeeping of managed assets transferred from PKB started.
- (3) Cost allocation is not introduced yet.

III.10.5.3 Contract System with Financial Sources

(1) PLN

The water rate is determined by the Decree of Minister of Public Works of "Adjustment of Basic Rate in the contribution for the exploitation and maintenance of water reservoirs infrastructure of public company (Perum) Jasa Tirta". It is determined at Rp. 11. 76 per kWh for the period from January 1, 1997 to December 31, 1997. (Decree No. 511/KPTS/1996)

With the tariff increase, PJT is obliged to carry out the sediment dredging work of Sengguruh reservoir to increase the production of electric power generation of PLTA (Subsidiary of PLN) Sengguruh. Dredging has started from 1995. However the agreement has not been reached yet between PLN and PJT on the methodology of tariff calculation.

(2) PDAM and Industry

The basic rate was determined in the Article 1 of Minister of Public Works' Decree No. 232/KPTE/1994 which stipulates as follows:

- For semi-commercial group (PDAM) rated at Rp. 18 per m³ originally was adjusted to Rp. 30 per m³;
- For commercial group (industry and non-PDAM) rated at Rp. 30 per m³ originally was adjusted to Rp. 51 per m³.

The basic rate of this Article is the average rate for each group of users and is valid from July 1, 1996 to December 31, 1997. Governor of the Province of East Java will decide more detailed rate according to volume of consumption of industries.

III.10.5.4 Auditing System

- (1) Internal Supervision Unit (SPI) was established to execute internal auditory activities in 1990 in accordance with Government Regulation No. 3, dated August 26, 1983.

Internal auditor's report is summarized in the annual report of 1996 which is enclosed in Data book.

- (2) Outside auditor of PJT is the Representative Office of Finance and Development Control Agency (BPKP) East Java Province and has audited PJT since 1991.

In 1996, the representative of BPKP worked at PJT office for about 4 months for auditing.

- (3) Except for small amendments, PJT's financial statements present its financial position fairly and "normal without conditions" which is targeted in the PJT's long term plan for 1994 - 1998.

III. 11 Human Resources Development

III.11.1 Present Condition of Manpower

The present number of staff of PJT is 436 in total. The number of staff who is in charge of technical matters is 228 (53%), and the number of staff who is in charge of administrative matter is 208 (47%). Out of the present PJT staff, 393 staffs are from Brantas River Basin Development Project (PKB). There are two types of employment in PJT, an organic staff and non organic staff. Organic staff is considered as a permanent who can be divided into government official and non government official. Non organic staff is considered as non permanent staff who be divided into the staff with concrete contract period and staff without concrete contract period. 170 staffs are organic, including 145 government officials and 266 staffs are non organic.

The present number of staffs for PKB is 894 in total. Out of the present staff of PKB, 365(40%) of staffs are engaging in technical matters and 529(60%) of staffs are engaging in administrative matters. Approximately 70% of staff is government official and 30% of staff is local staff.

The present number of staffs for PGKS is 242 in total. Of them, 98 staffs (40%) belong to administration, 17 (7%) belong to Mount Kelud Project, and 127 staffs (53%) belong to Mount Semeru Project. For PGKS staff, 102 staffs (43%) are engaging in technical matters and 140 staffs (57%) are engaging in administrative matters. Approximately 55% of staff is government official and 45% of staff is local staff.

Note : Since the characteristics of government officials and local staffs for PKB and PGKS are similar to those of organic staffs and non organic staffs for PJT, respectively, the term "organic staff" is used for describing government officials or permanent staffs and "non organic staff" for locally hired staffs for PKB and PGKS.

III.11.2 Evaluation of Manpower

Since consolidation of PJT, PKB and PGKS is planned in this Study, evaluation of staff was done for PJT, PKB and PGKS.

III.11.2.1 Evaluation by PJT, PKB and PGKS managers

A matrix sheet, which shows breakdown of staff for each group in sections and character of staff (specialty, education level and job experience) was prepared for evaluation of manpower. Section chiefs or managers for administration evaluated the staff for the number, education level, and job experience by 3 ranking of A to C, in which A shows appropriate (satisfied), B shows not appropriate (not satisfied) but manageable and C shows causing trouble. The result of evaluation is summarized below.

(1) Evaluation for PJT

The evaluation was done by all the chiefs of bureaus and divisions. The result shows shortage of staff is a problem for engineering sectors. Overall quality of staff is acceptable in terms of education level and skill level, but skill development is necessary for executing tasks properly. Training is necessary for improving skills for sections that require new activities and activities that staff is not familiar.

(2) Evaluation for PKB

According to the chief of administration of PKB, overall performance of manpower for PKB is acceptable. One thing that should be pointed out for the manpower is that ratio of staffs who are responsible for administration, compared with the staff for technical sector, is large.

(3) Evaluation for PGKS

According to the Project Manager of PGKS, overall of performance of manpower is acceptable, and major manpower problems which affects the operation of PGKS cannot be seen. There is a shortage in the number of staff for some projects for PGKS, but that can be easily solved by transferring staffs from administration section to the projects. Technical assistant in G. Semeru has more staffs than actually needed.

III.11.2.2 Manpower Composition of PJT, PKB and PGKS

(1) Aging

The aging problem is a concern for the manpower of PJT, PKB and PGKS. More than a half of staffs are older than 40 years of age. Since older staffs are experienced, their retirement may lead to lowering the quality of staff in the future.

(2) Education and Specialty for New PJT

About 80% of the total staff has the education level of high school or lower. Fourteen percent of total staff has the bachelor or higher degrees, and the rest has the diploma from universities. More than forty percent of staffs is not specialized in specific fields. There are enough staffs for civil engineering, mechanical engineering and electrical engineering, which shows some deviation in the composition of the staff specialty. The specialists and tasks necessary for New PJT are shown below.

- | | |
|----------------------------|--------------------------------------|
| (i) Environmental engineer | : water quality management, ISO14000 |
| (ii) Biologist | : river conservation |
| (iii) Accountant | : MIS, asset management |
| (iv) Legal expert | : institutional aspects |
| (v) Tourism expert | : tourism development |

Generally speaking, with the education level that the staffs have, the skill improvement of staffs for most sectors can be achieved by proper training, but an internal training may not be

sufficient for such sectors as environment, biology, accounting, law and tourism. The recruitment should be considered for these sector specialists.

(3) Job Assignment

Some imbalance of the allocation staff among departments can be seen in PJT. Because of changing responsibility of departments or new business development, the number of staff is not assigned properly, and some staffs are assigned to the tasks that they are not familiar.

Since staffs for PKB and PGKS are assigned by projects, staff arrangement is organized relatively well. The problem for staff assignment for PKB and PGKS is that there are too many staff for administration compared to the staff for the technical sector.

III.11.2.3 Quality of Skills

Low quality of skills can be seen in some sectors in PJT, which is caused by several reasons as stated below. Overall skill of staffs for PKB and PGKS is acceptable.

(1) Inexperience for assigned tasks

The inexperience can be seen among site staffs who do not have enough working experiences in the sector, while there are older staffs who are assigned to the sections with which they are not familiar.

(2) Lack of basic knowledge

Some staffs do not have basic knowledge of their assignments. Without the basic knowledge, up-grading or improvement of quality of works can hardly be achieved.

(3) Attitude problem of staffs

There are some staffs who do not know the meaning of the tasks, so reliability of the job tends to be low. There is a tendency that once staffs gain some skills, they do not share the skills with other staffs, and there is no transfer of skills.

III.11.3 Manpower Policy

The manpower policy of PJT, PKB, and PGKS is set by the government regulation. The treatment of organic staff and non organic staff is different. Organic staffs are treated as permanent staff and non organic staffs are treated as contract staffs, so that the salary, retirement age, health insurance and pension vary between organic staff and non organic staff.

After New PJT changes to Persero Jasa Tirta in 2005, the status of government official is no longer available. A new manpower policy for Persero Jasa Tirta should be established.

III.12 Brantas River Basin Management Institutions

III.12.1 Objective and Approach

The objective of this report is to present the results of institutional. The studies are aimed at analyzing legal and institutional aspects of water resources management in the Brantas River Basin and providing recommendations.

The content of this Report deals with legislation and institutions related with water resources management including;

- Major points of basic legislation related with water resources development and management in Indonesia,
- Legal foundations of Perum Jasa Tirta and related organizations;
- Water right and water allocation;
- Water demand management including non structural water saving measures
- Water resources institutions including examples of private sector participation in several countries.

The approach used in the study is to identify and discuss major issues concerning water resources management in the basin. The study therefore did not intend to examine in detail the whole of legal issues and the activities of the related agencies and offices.

III.12.2 Present Condition of Water Resources Development and Management Institutions

This section reviews major points of the water resources management institutions in the Brantas River basin and provides brief evaluation.

III.12.2.1 Legal and Regulatory Issues on Water Resources Development and Management

(1) Summary of Jurisdiction for Water Resources Development and Management in the Brantas River

The State has overall responsibility for water resources development and management. The government is empowered to manage, develop and utilize water resources. Such powers of the government may be delegated to central or regional level government agencies and to specific corporate bodies. River including lake and reservoir is under the jurisdiction of the Minister of Public Works. Ministry of Mining and Energy is responsible for groundwater. Some aspects of water resources management including water use licensing are delegated to provincial governor and to State-owned corporations. Jurisdictions for water resources management and actual practices in the Brantas River basin are summarized below.

Activities	Jurisdictions	Practices in the Brantas River Basin
Overall responsibility for water resources and river	State has responsibility for WRDM. The Government authorizes its power to central and government agencies (Law No.11/74) Authority on river including lake and reservoir lies upon Minister of Public Works (GRNo.35/91)	
River Planning including Master planing	MPW (Law 11/74 & GR35/91). It can be delegated to Provincial Government or State-owned corporation (GRNo.35/91 & GRNo.22/82). 73 river basins by Governor, 15 by MPW and 2 by State-owned Corporation (MPWReg. No.48/90).	Though PJT is responsible for master planning for the Brantas River basin, it has never prepared.
Development (construction)	MPW or State-owned corporation (GRNo.35/91) or it can be Governor in case it has not been delegated to State-owned Corporation	MPWReg.56/91 provides that development as one of PJT's major tasks. PKB is currently doing construction work.
Operation & Maintenance	MPW or State-owned corporation (GRNo.35/91)	PJT does O&M of major river structures.
Water Use License	Governor except hydropower which is issued by MPW (GRNo.22/82). MPWReg.No49/90 stipulates that MPW shall issue license in the basins of MPW jurisdiction, and Governor in his jurisdiction.	PJT provides technical recommendation with Governor on licensing. MPWReg.No49/90 does not stipulate licensing authority in Citarum and Brantas River basins.
Water Allocation (priority)	Governor (MPWReg.67/93 on Water Management Committee).	PJT presents reservoir operation plan (POLA) to Water Mgmt. Committee
Water Quality	MPW approves water quality standard. Governor issues the license for waste disposal (MPWReg.45/90).	PJT and several other agencies monitor water quality.
Sand Mining	Governor decides location of sand mining. (GRNo.37/86) Sand mining is prohibited if it affects river flow.(MPW Decree No.458/86).	Many illegal sand mining activities are observed.
Irrigation (water & channel)	Management and regulation of irrigation networks together with their accessory structures are delegated to Governor (GRNo.23/82).	Operation and maintenance of main and secondary irrigation channels are done by DPU pengairan.
Resettlement	Coordination shall be made by MPW (GRNo.35/91).	No particular practice to report
Flood Control	MPW sets standards, methods for flood prevention. Governor coordinates the prevention effort by involving government agencies. Emergency action shall be taken by Governor (GRNo.35/91).	Flood control manual is prepared by MPW. PGKS and PJT do Sabo works.
Watershed Management	Ministry of Forestry (Law No.5/67).	BRLKT has primal responsibility for watershed conservation.

Activities	Jurisdictions	Practices in the Brantas River Basin
Water service fee decision in PJT working area	MPW designates the tariff for PDAM, PLN and industry (GRNo.6/81). Governor approves the tariff for PDAM and industry.	Water service fees are first negotiated among PJT, PDAM and PLN. Then the Governor approves the fee for PDAM then MPW issues the Decree. PLN tariff shall be approved by MPW.
Pollution charge	Can be formulated by each province.	PJT and BAPEDALDA are planning to introduce pollution charge.

MPW Minister of Public Works
GR Government Regulation
MPW Reg. Minister of Public Works Regulation
MPW Decree Minister of Public Works Decree

(2) Major Issues in Water Resources Management Regulations

Several problems in regard to current regulations are pointed out below.

(a) Compliance with Water Regulations

Current water regulations are mostly well designed. Enforcement of regulation needs more effort. Compliance with the existing is the problem. Lack of compliance may exist in many areas. Some examples are described.

(i) Sand Mining

Sand mining activities without approval is prohibited. Many illegal sand mining activities are however observed in the Brantas River, Porong River and Surabaya River. On the other hand, Perum Jasa Tirta is doing dredging work at the down stream.

(ii) Water Use License

The license of water use could be cancelled in case water use is no longer in conformity with what that stipulated in the license (GRNo.22/82). Many cases of unconformity in water use are observed.

(iii) Penal Provisions

Penalty for violations of legal provisions is stipulated in Law No.11 of 1974. Similar penal provision is found in Government Regulation No. 22 of 1982. Such provisions refer to prohibition of water use without license and negligence in participation for soil conservation, and protection of water resources and waterworks. Penalty is stipulated as negligence and infringement of the legal provisions shall be imprisonment of up to 3 (three) months and/or to a fine up to 50,000 rupiahs. Amount of fine shall be examined. It is important to make more policing efforts.

Other example of non-compliance includes throwing solid and liquid waste in a form of sewage into river. Though the Government Regulation No.35 of 91 prohibits it,

this is seen in many areas along the Brantas River.

(b) **Contradiction among Regulations and Conformity with Regulations**

There seems to be some contradictions among regulations.

(i) **Balai in the Brantas River Basin**

The Ministry of Public Works Regulation (No.56/1991) says that PJT carries out planning, developing, rehabilitation, operation and maintenance activities in Brantas River and 39 rivers and its tributaries. It means that PJT has overall responsibility over the Brantas river basin. Similarly, Ministry of Public Works Regulation No. 48 of 1990 on the "Management of Water and or Water Resources within River Basin" lists names of 90 river basins in Indonesia. It provides that PJT has general responsibility over the Brantas River basin. There seems to be a contradiction regarding the roles of river basin management in the case of Brantas river basin, i.e. discrepancy between the roles of PJT set by the Government Regulation and Balai set by the Ministry of Home Affairs.

(ii) **Licensing Authority**

Lack of coverage or ambiguity of stipulation exists in terms of water use licensing. Minister of Public Works Regulation No. 48 set forth 90 river basins in Indonesia. 15 of them, which are inter-provincial rivers, are kept under the management of Ministry of Public Works. 73 river basins are under the jurisdiction of the provincial governments, two river basins are to be managed by the special river management agencies. The Regulation No. 49 stipulates licensing authority. According to this Regulation, the Minister of Public Works gives license for the water use in the river basins, which are under his jurisdiction. Governor can provides license in the basins under his jurisdiction. This Regulation does not clearly stipulate licensing authority of Citarum and Brantas River basins. According to the Regulations, Perum Otoritas Jatiluhur and Perum Jasa Tirta should issue water use license. The Regulation No. 49 refers only to the river basins that the Minister is in charge and those of the provincial governor. No reference is made to Citarum and Brantas River basins. In the East Java Province, prior to the Regulation No. 49, the East Java Provincial Regulation on "Permission to use water" was issued in 1987. By this Regulation, the provincial government issues permission to use water. However, the Revised Version of this Provincial Regulation (No. 11 of 1995) provides that permission to use water is given after Perum Jasa Tirta's technical recommendation.

(iii) **Water Service Fee Determination**

Current water service fee in the Brantas River basin is determined by negotiations between PLN, PDAM and PJT. It is not clear what elements are considered in fee determination.

Service to pay concept as set in Government Regulation No. 6 of 1981 is yet to be fully realized.

(c) Lack of Coverage

Demolition of Old River Structures

No clear stipulation is however found regarding demolition of old river structures.

III.12.2.2 Regulations related with Perum Jasa Tirta

It is proposed that PJT, PKB and PGKS be integrated by the end of 2001. The new organization will start its operation on 1 January 2002. Several aspects related with the scope of work of the new organization must be clearly defined before commencing its operation. Jurisdictions of three organizations are summarized below.

(1) Contradiction and Unconformity with Regulations on PJT Task and Responsibility

Contradiction and unconformity found in current PJT operation is summarized in the following table.

Issues	Current situation	Provisions
Major task	Little activity is made in the areas of development and rehabilitation	Development and rehabilitation are included as major tasks. (MPWReg.56/91)
Master plan	Master plan for the Brantas River basin has not been prepared yet since PJT establishment though the Master plan prepared in 1985 is still valid.	The river basin master plan preparation is included as PJT tasks. (MPWReg.56/91)
40 rivers and tributaries	Government Regulation No.5 of 1990 lists the names of 40 rivers without referring to tributaries, while the Regulation No. 56 of 1991 sets those 40 rivers and their tributaries are PJT working area.	
PJT funding	PJT never received government budget (APBN).	APBN is included as PJT's budget source (MPWReg.56/91)
IPEDA(PBB)	While POJ receives a part of PBB, PJT has not received any to date.	Article 4 of "Government Regulation No. 6 of 1981 on Contribution for operation and maintenance cost for water resources infrastructure" sets that " Corporation (in this case, refers to Perum Otoritas Jatilufur and PJT) has the right to receive a part of IPEDA ...from local government concerned". IPEDA now has been changed to PBB.

(2) Current Expansion Proposal of PJT Tasks and Responsibility

In order to clarify and support the above mentioned issues, Ministry of Public Works Decree on the designation of authorities and responsibilities of Perum Jasa Tirta was drafted and is now under discussion.

Activities of PJT will expand to a great degree if this Draft Decree is enacted. This Draft Decree attempts to provide PJT with authorities and responsibilities in many areas of works. It seems necessary to carefully analyze organizational setting of PJT including human and financial resources in order to cope with its expanded authorities and responsibilities foreseen in this Draft Decree.

III.12.2.3 Water Resources Institutions in Selected Countries

Water resources institutions in the following countries are briefly described below for reference.

Major characteristics for the above countries' water resources institutions can be summarized as follows:

	Indonesia		Japan	Netherlands	U.K.	France	U.S.A.	Australia
Demarcation of river	90 river basin management demarcation		Grade A and B river	N/A.	29 river systems	6 major river systems	N/A.	N/A.
Working area	Brantas Basin		7 major river systems		29 river system	6 river basins	single state	single state
Type and Functions of W. M. Entity	State Corporation / O&M, provision of raw water		State Corporation/ construction and O&M	Water Board (civil organization) / O&M of limited facilities	Government Agency / planning, construction, and O&M	Inter-regional agency / planning & Coordination	State commission / planning & coordination	State Commission / planning & coordination
Name of Organization	Perum Jasa Tirta		Water Resources Development Public Corporation	Water Boards	National River Authority	Basin Financial Agency	State Commission	State Commission
	(A)	(B)						
Data collection	○	○	○	○	○	○	○	○
Planning	×	○	×	×	○	○	○	○
Design	×	○	○	×	○	×	×	×
Construction	×	○	○	×	○	×	×	×
O&M	○	○	○	○	○	×	○	○
Regulatory	×	×	×	×	○	×	×	×
Privatization	under study		N/A.	N/A.	Domestic water supply	Domestic water supply	Domestic water supply	N/A.

- N/A. indicates either no data available or not applicable.
- ○ - implemented, × - not in the scope of work
- (A) - Present
- (B) - Proposed

III.12.2.4 Private Sector Participation in Water Supply

Practices of Private Sector Participation

The transformation of Perum Jasa Tirta's corporate status to Persero is proposed in this study. Corporate management becomes more important when it operates as Persero. Perum Jasa

Tirta already plans to diversify its business lines. There are various institutional arrangements in water supply.

There are more than 75 privatized piped water supply projects in the world.

Asian privatization projects in water supply have only a few years' experiments¹. It is too early to draw any conclusions. Gains from private sector participation do not seem to depend on the model of participation such as foreign companies' participation or BOT or management contract. Gains from privatization seem to be more dependent on such other factors as stable macro economy and effective financing mechanism.

PJT is a water resources development and management organization. The preceding cases are of outsourcing and concession of water supply by municipal water supply organizations. New PJT shall make appropriate institutional arrangement when they actually start providing drinking water. The government support is necessary. The Government shall issue Government Regulation to show its commitment and support for private sector participation in water supply. Without the governmental support, it will be difficult to attract private sector investment.

III.12.2.5 Water Demand Management

In addition to supply-driven approach, which has been dominant in the past, demand-side approach involving institutional and policy, intervention to influence water users' behavior is described. Current cost recovery situation is studied in order to support the full cost recovery principle as proposed in this study. This cost recovery analysis is also aimed at achieving efficient and equitable use of water.

Summary of Payment for Surface Water by Water Users is summarized in the following table.

Name of user	Farmers	PDAM & Industry		PLN	
Name of payment	IPAIR (ISF)	Water Service Fee	Paid to PJT	Water Service Fee	Paid to PJT
	-	Retribution	Paid to Local Government	-	
Purpose of payment	A part of O&M cost for irrigation canal	Water Service Fee is for O&M cost of reservoir.		O&M cost for reservoir	
		Retribution is a tax levied by the local government.			

As seen in the above table, farmers' contribution is limited to irrigation canals.

¹ In case of Manila (Metropolitan Waterworks and Sewerage System), the competitive bidding for water supply concession was held in January 1997. The new operation started in August 1997.

III.13 Community and Beneficiaries' Participation

III.13.1 Present Conditions of Participation Activities In Indonesia

In Indonesia, the government has followed the 'top-down' administrative approach in development programs and in its natural resources management systems. However, in recent days, the government of Indonesia is emphasizing the equity through wider participation in government's development programs for reducing poverty. The NGOs are encouraged to participate in community groups' activities of PROKASIH (Clean Rivers Program). There are many organizations in the Brantas river basin which work for community participation to improve the socioeconomic condition of the vulnerable groups. These organizations are working in various areas such as environment, education, health, agriculture, women in development, poverty alleviation and awareness building of the vulnerable groups through formal and non-formal education. The view of community and beneficiaries' participation, however, is still narrow within development activities.

III.13.1.1 Present Participation Activities of PJT

Since the beginning of 1990s, PJT has been involved in public campaign activities in cooperation with provincial/local governments, non-government organizations and academic institutions. Most of the activities are periodical and related to awareness building of the people on water resources and river environmental issues as shown in Table III.16. The PJT carries out a coordination with provincial level government-related institutions and performs campaign/training to improve the people's knowledge and awareness. The PJT's activities related to the public awareness covered a wide range of individuals, institutions and organizations such as community leaders, entrepreneurs, college/university students, high school teachers/students, Islamic education center, farmers, and so on. PJT's activities related to the participation is divided into two major groups i.e. public campaigns & community improvement.

(I) PJT's Public Campaign Activities

- (a) In the early 1990s, PJT had started its public campaigns in cooperation with the BBLH (Bureau of Environmental Guidance, East Java) and Cipta Karya (Human Settlements, Ministry of Public Works) for public awareness building focused on cleaning up the river and conserving the good quality of water.
- (b) In the middle of 1990s, PJT had expanded its public campaigns to teachers' and students' awareness in water resources management of the Brantas river basin. These programs were conducted in cooperation with the IKIP University (Malang) and other similar academic institutions to prepare teachers' guidelines and work books for the students.
- (c) The PJT also had its independent public awareness building program which provided training and environmental education especially for the Muslim Boarding School (MBS) teachers and students. This program had focused on training for the trainer of MBS teachers in water resources management.

- (d) In 1996, PJT had conducted a training program of water quality monitoring by biological analysis method in cooperation with the Malang local government. The aim of this training program was to make people realize about water resources conservation and its significance for ecology.
- (e) Currently, the PJT has expanded its views and social commitment to increase people's awareness in water resources and environment issues. In 1997, the PJT has signed up with the DPKT to build 10 check dams in Gedangan and Sumbermanjing sub-districts for watershed management. As of 1997 since early 1990s, the PJT spent about Rp. 1.4 billion for public campaigns and water quality related activities as shown in Table III.16.

(2) PJT's Loans for Community Improvement Activities

In addition to the above mentioned people's awareness building activities through public campaigns, PJT also started a community improvement program since 1993. The intention of this program was poverty alleviation of the poor community and vulnerable groups through lending capital to cooperatives and households for small scale enterprise development. As of 1995, the PJT has provided loans of Rp. 221.12 million to the 15 cooperatives and 229 households as shown in Table III.17.

III.13.1.2 Inventory of Participation Activities

An inventory survey was conducted to study the possibility of "community and beneficiaries' participation" in the comprehensive management plan for the water resources of the Brantas river basin. The survey focused on community and beneficiaries participation issues covering the area of category of organization, purpose of program/project, activities in details, source of funds, number of people participating in the program/project, problems encountered and Evaluation.

The inventory survey has been conducted by the JICA Study team with cooperation of PJT in early September 1997 based on direct interviews with the respective organizations. These organizations are mainly divided into three groups such as government, non-government and academic institutions.

(1) Governmental Organizations

No	Name of Organization	Inventory Survey of Community and Beneficiaries' Participation						
		Category	Purpose of program	Location	Source of Funds	Activities	No. of Participant	Problems encountered
1	KPPLH	Environment	Pollution Control	Malang City	Local govt. Enterprise Contribution	River Clean Program	20,000	Lack of public awareness
2	DPKT	Plantation	Grow more trees	Malang Kabupaten	C. Govt. & L. govt	Plantation	2,280	Wide area of land
3	WRSO	Irrigation Service	Improve farmers' welfare	East Java Province	C. Govt. World Bank Loan	Detailed design of irrigation	188,896	Lack of farmers knowledge
4	WRSO	Irrigation Service	To support O&M of I. canals	East Java Province	Central Government	Training for operation & maintenance	1,060,000	Lack of HRD
5	BBLH	Pollution Control	Control pollution and HRD prog.	East Java Province	Australia & Central Government	Pollution control training	10,000	Miscordination of the program
6	DP3 Program	Community Participation	To improve women status	Rural area of Malang	Ministry of Education & Culture	Adult education	90	Women less education

- KPPLH: Committee for Environment and Pollution Control
 DPKT: Frustration and Soil Conservation Office
 WRSO: Water resources Services
 BBLH: Bureau of Environment Guidance
 DP3: A program under the Department of Education and Culture

(2) Academic Institutions

No	Name of Organization	Inventory Survey of Community and Beneficiaries' Participation						
		Category	Purpose of program	Location	Source of funds	Activities	No. of Participant	Problems encountered
1	IKIP Malang (University)	Awareness building	To build students' awareness	IKIP Malang	PJT IKIP, Malang	Training for school teachers	Teacher + students 48+500	Lack of fund
2	Brawijaya University	Water Quality	To converse water quality	Malang City	European Community	Training for water quality	Teacher + students 6+20	Financial problem
3	RHEIP Merdeka University	Watershed Management	Community awareness	Malang City	Australia & Indonesian governments	Education & demonstration	500	Less awareness of the people

(3) Non-Governmental Organizations

No	Name of Organization	Inventory Survey of Community and Beneficiaries' Participation						
		Category	Purpose of program	Location	Source of funds	Activities	No. of Participant	Problems encountered
1	LPKP (NGO)	Integrated Fanning	Improvement of community income	Southern of Malang Regency	Belgium (FADO) ILO (Indo.)	Group Training for farmers	500	Lack of equipment & fund
2	LBMI(NGO)	Community Development	To improve community organizations	Malang City	Fund from language program	Education program	196	Lack of fund
3	WALHI (NGO)	Environment	To prevent pollution	Surabaya City	Contribution from members	Training on Environment policy	500	Fund is not adequate
4	PPLH(NGO)	Environment	To converse environment	Mojokerto	Donation from outside & own funds	Seminars, workshops on environment	30,000	People less awareness on environment
5	FOSSNU	Community Participation	Provide an umbrella for the scholar	East Java Province	University PJT and Private	Publish Magazine	400	Lack of operational funds

LPKP: Institute of Society and Development Studies
 LBMI: Service and Consultation for Small Scale Business
 WALHI: Indonesian Forum for Environment
 PPLH: Environmental Education Center
 FOSSNU: Friendship Forum of Nahdlatul Ulama's Scholar

Most of the organizations have certainly increased their outreach in recent years. Majority of the organization stated that they have encountered problems such as lack of operational funds, low level of education and lack of awareness among the beneficiaries. Some of them found that, when the beneficiaries realized they were getting benefits from the program, then they become more self motivated in undertaking activities. Except for a very few, most of the organizations recommend that their experiences of community and beneficiaries participation will be applicable in the Brantas river basin. However, they also recommended that it should be conducted stage by stage to raise public awareness and to involve the community and beneficiaries in the water resources management activities.

III.13.1.3 Present Beneficiaries in the Brantas

At present, there are five main beneficiaries in the Brantas river basin, namely (1) PLN (Electric Power Company), (2) PDAMs (Regional Water Supply Enterprise), (3) industries, (4) irrigation farmers and (5) fish farmers. Among these beneficiaries, the PLN, PDAMs (Surabaya & Sidoarjo) and industries currently pay water service fee to PJT. The irrigation farmers and fish farmers do not pay any water service fees to PJT. However, the irrigation farmers pay for IPAIR (contribution for irrigation service) to Bupati (Head of Regency) through the HIPPA (Water Users' Associations). Besides above mentioned beneficiaries, there are also other unspecified beneficiaries such as many residents using water from the river and those benefited from the PJT's flood control and river maintenance activities.

III.13.2 Questionnaire Survey on Community and Beneficiaries' Participation

(1) Aim of the Questionnaire Survey

A questionnaire survey on the community and beneficiaries' participation of the water service beneficiaries in the Brantas river basin was conducted by the JICA Study Team with the cooperation of PJT and a local consultant. The main aim of the survey is to study the possibility of the community and beneficiaries participation for the Comprehensive Management Plan of the Brantas river basin. For this purpose, this questionnaire survey includes questions such as those on present condition of water supply and management, consciousness to water scarcity, efficient water use and understandings on beneficiaries-pay concept.

(2) Methodology of the Survey

The questionnaire survey has been conducted by a local consultant through direct interviews with the water service beneficiaries of the Brantas river basin. The Survey was followed by face-to-face interviews with water service beneficiaries groups of the basin in some selected areas.

(3) Target Groups and Sample Size

1) Irrigation water users i.e. farmers:	500 respondents
2) Fishery water users i.e. fishpond farmers:	10 respondents
3) Industrial water users i.e. industries:	30 respondents

(4) Surveyed Issues

- 1) Respondent socioeconomic background
- 2) Production activity
- 3) Present condition and issues of water supply for the beneficiaries production activities
- 4) Beneficiaries involvement in water resources management activities and expectation in participating in water resource management
- 5) Beneficiaries pay-concept
- 6) Consciousness of efficient use of water

(5) Survey Area and Sample Size

The survey covers the following water service beneficiaries groups in the Brantas river basin such as irrigation farmers, fish farmers and industries. Their numbers and geographical locations are as follows:

1) Irrigation water users	Total Samples : 500
(a) Brantas Delta Irrigation Area	100 respondents
(b) Turi-Tunggorono Irrigation Area	100 respondents

(c)	Widas Irrigation Area	100 respondents
(d)	Warujayeng Irrigation Area	100 respondents
(e)	Lodoyo Tulungagung Irrigation Area	100 respondents

A random sampling technique is applied in such a way that respondents are those farmers having land along the tertiary irrigation canal. Tertiary irrigation blocks located in two districts (Kecamatan) in the corresponding irrigation areas are determined as the area of survey. A total of 500 respondents in 10 groups are selected from different tertiary irrigation blocks. Through questionnaire interview also collects information on farmers production activities, income and socioeconomic conditions. Thus, it will reflect any variability in Water Users Association and water use in the corresponding irrigation area.

- 2) Fishery water users Samples 10

A total of 10 respondents are determined and they are randomly distributed in 5 pre-determined villages situated in the Brantas delta irrigation area. A similar technique as for the farmers is employed to collect the answers from the fish farmers.

- 3) Industrial water users Samples 30

Industries that are considered as extensive water users and potentially substantial pollutants to the Brantas river are chosen as respondents. A total of 30 individual industries are surveyed. The first visit intends to distribute the questionnaire and to explain the details to fill it. In the second visit, upon the collection of the filled questionnaire, discussion was carried out to verify the data filled in the questionnaire.

III.13.3 Summary of Findings of the Questionnaire Survey

(1) Irrigation Water Users

The area of the land operated is relatively small: mostly in the order of 0.26-0.50 hectare per family. The cropping pattern practiced varies somewhat depending on the degree of water availability. The river and irrigation canals are the main sources of water for irrigation. The ground water is found as an additional source. The farmers' source of income includes agricultural sector and non-agricultural sector which is composed of earnings from, for example, part time working outside farm fields. It was observed that the farmers in the surveyed areas are inefficient in the use of irrigation water. It is found that there are Water Users Associations almost in every village in the Brantas river basin. However, the members are not active in joining their regular meetings. In some areas participation is demonstrated by farmers in the Brantas river basin in the form of involvement in rehabilitation works of the tertiary and quaternary canals.

The problems of water unavailability and water shortage are observed in most areas in the basin. Water is not available when it is needed and the water is not sufficient. These are main complaints by most farmers. Majority of the farmers shares the same problem in the dry season.

Farmers' family income in the Brantas river basin may be classified into two categories, namely agricultural sector and non-agricultural sector. The agricultural sector contributes from 59% to 86% of the total family income of farmers in the surveyed area. The income derived from the agricultural sector is found still to be an important and higher than that of non-agricultural sector.

The average farmers' family income from both sectors were Rp.22,062,500/family/year. From the agriculture sector, farmers' average income was Rp.15,575,000/family/year, while from non-agriculture sector only Rp.6,487,500/family/year. This indicates the high dependency of the farmer's family life to the agriculture sector.

It was identified that the farmers' participation for rehabilitation works of irrigation canals in the past was relatively high. This was indicated in Blobo, Lodoyo, Widas and Brantas Delta irrigation areas where more than 80% of the farmers took part in such works.

There are three kinds of payment by the farmers in the basin; i.e. land tax, irrigation service fees (IPAIR) and IURAN (contribution in the form of paddy). It varies by areas of irrigation. It is found that HIPPA membership fee is also applied in some of the irrigation areas of the Brantas river basin.

Most farmers in the Brantas river basin area seem to accept the beneficiary- pay concept, since 60% or more farmers in the surveyed areas recognized that such concept is reasonable. Still there is a small percentage of farmers who do not understand the concept in Blobo, Lodoyo and Turi Tunggorono areas as shown in table below. The failure to understand the beneficiary- pay concept may be caused by the fact that most farmers still keep the old perception that the irrigation water service fee is included in the tax they pay and that it is the duty of the government to supply the water. Since the concept to some degree is already practiced, an introduction of beneficiary-pay concept based on the water actually used may not be so difficult as long as the water supply service is also improved.

Perception to Beneficiary-Pay Concept			
Irrigation area	Reasonable	Not Reasonable	Can not Reply
Blobo	60%	8%	32%
Warujayeng	100%	-	-
Turi Tunggorono	60%	3%	37%
Lodoyo	64%	14%	22%
Widas	94%	-	6%
Delta Brantas	78%	2%	20%

(2) Fishery Water Users

Brackish water fishpond aqua culture is presently consuming a considerable amount of water which is mainly derived from the Brantas river. The most serious problems encountered are associated with water shortage in the dry season. The water problems and issues are dealt individually or discussed in a small group of fishpond farmers. It was observed that there is no organization like HIPPA for fishery water. It is identified that there is need for better water

management system for the fishery water. Improvement of water efficiency, both in quantity and quality, will be the entry point to introduce a beneficiary-pay concept.

All of the surveyed fish farmers expressed that to obtain adequate water for the fish farming is within their own responsibilities. Most of the fish farmers (80%) stated that they want to participate in the rehabilitation works of the fishery water canal. However, all fish farmers stated that they had never paid for the operation and maintenance of the canals. For decades, there is a perception among the fish farmers that since they already pay for the land and income taxes, it is the obligation of the government to supply water for fish farming. In order to overcome these problems, it is necessary to introduce the beneficiary-pay concept in relation to water service to the fish farmers. It is likely that the above mentioned problems, especially water shortage and the decline of water quality, may be an entry point to make a closer contact with the fish farmers.

(3) Industrial Water Users

Those industries that are considered as extensive water users and that discharge the waste water into the Brantas river are selected to be respondents. A total of 30 individual industries selected for the survey, mostly located in the Brantas river basin area.

One third of industries depend solely on the river as the main source of water required for the operation of their industries, while about one fifth rely only on the ground water. Another one fifth use a combined source of water, namely the river and the ground water. The remaining industries employ a single or mixed source of water like PDAM, rain fall and ground water.

The majority (56%) of the industries state that they are already participants in the water resources management activities through respective industry association meetings. The problems frequently discussed in those association meetings include the water quality, water tariff, water shortage and wastewater. According to the JICA survey, 24% of the industries claim that the quality of water is not as good as expected. Among those who complain about the water quality, 50% of them state that it is due to pollutant, and the remaining 26% express it results from sedimentation.

When the industrial water users are questioned whether they want to "participate more actively in the water resource management of the Brantas river basin", 76% of industries state they are willing to do so. Among those industries ready to participate more actively, according to the survey results, most of them hope to make closer contacts with government agencies concerned through umbrella organizations. It can be concluded that in general the industrial water users actually are ready to participate in those activities in order to establish the appropriate water resources management systems.

All surveyed industries pay for water. However, most of them seem to be reluctant to pay higher water tariff. Among those industries experienced discussing water related issues with government agencies, a quarter of them are not satisfied with water supply services. The reasons cited include no solution to problems discussed and the high water tariff.

The details of the findings of the questionnaire survey is accommodated in the Data Book .