

7.5 Component 5: Monitoring Network Establishment

7.5.1 Identification of Programs and Objectives

Monitoring is a basic work for the collection and accumulation of necessary data and information for the basin water management. Without such data and information, no study can be conducted, and no evaluation for implemented projects can be carried out. Data observation should be steady, continuous, and for a long period. Data storage should be systematic, accurate, and easy to maintain. A system for the effective use of data should be maintained properly and should be open to users.

Government Regulation on Water Resources Management (draft) has been prepared and waiting for the enforcement of the New Water Resources Law. Articles 45 to 48 of the same Regulation declare about Water Resources Information System. It is declared that Water Resources Data and Information Unit should be created in provinces and for river basins. In the case of the Musi River Basin, it is recommended to establish the Unit in Musi Balai PSDA by enhancing the Operation and Data Management Section as discussed under **Program 6-5-1**.

The monitoring network for the water management of the Musi River Basin should basically cover (i) Hydrology, (ii) Water Quality, and (iii) Water Use. The target of Component 5: Establishment of Monitoring Network is set as: Capable in supplying necessary data and information of hydrology, water quality, and water use timely for the effective use in water management in the Musi River Basin.

7.5.2 Hydrological Monitoring

As discussed in **Section 3.7**, the hydrological data (rainfall, river water level and river flow) in the Musi River Basin are observed mainly by two agencies, namely, Musi Balai PSDA under the Dinas PUP, and BMG (Meteorological and Geophysical Agency) under Ministry of Transportation and Communication. Management is performed in each organization and coordination between the two agencies is insufficient.

Hydrological monitoring in the Musi River Basin can broadly be divided into two for the purpose of the data use, namely; local phenomena (short-term spot data) for flush floods and local inundation; and basin wide phenomena (daily data at widely distributed locations) for basin wide water balance analysis and study on basin wide water quality analysis, etc. In this monitoring plan, priority is given to the basin wide phenomena for the purpose of basin wide water management. Local phenomena can be considered for each purpose individually.

Distribution of the Station and Observation

Rainfall Gaging Station

According to the location map, the distribution of rainfall gaging stations managed by Musi Balai PSDA is biased toward the eastern part of the Musi River Basin. The

distribution of stations becomes uniform, however, when the rainfall gaging station managed by BMG is taken into account. The density of the station is so far adequate for the management of the whole Musi River Basin.

Gages of Musi Balai PSDA is of automatic recording type and those of BMG are manual type except the one in Plaju Station at Palembang Airport. Automatic recording type is of course preferable because it supplies accurate and short-term (every minute) to daily data, but for the purpose of basin wide management, daily data is enough. Important is that all the data observed at stations of Musi Balai PSDA and BMG should be stored and processed under a single system for the use of water management in the Musi River Basin. Thus, coordination between Musi Balai PSDA and BMG is deemed important.

Inventory of the rainfall stations should be developed. Coordinates (latitude and longitude) are important for the use in GIS. Inventory should cover the following item.

- Station name
- Management organization (Musi Balai PSDA or BMG)
- Location (address)
- Coordinates and altitude
- Date of operation start
- Other information (status of equipment, etc.)

Water Level Gaging Station

Musi Balai PSDA is the principal agency responsible for the water level observation in the rivers of South Sumatra Province. There are a total of 22 automatic water level gages with staff gages in the Musi River Basin.

Distribution of the stations has been evaluated for the use of the data in the basin water management. The water level observation system seems not satisfying for this purpose, and the following five water level gaging stations have been proposed for new installation to strengthen the present monitoring system (**Figure 7.5.1**).

- Musi River at Tebingtinggi (upstream of the Musi River)
- Musi River at Sekayu (midstream of the Musi River)
- Harileko River upstream point from confluence with the Musi River
- Semangus River upstream point from confluence with the Musi River
- Organ River at Baturaja

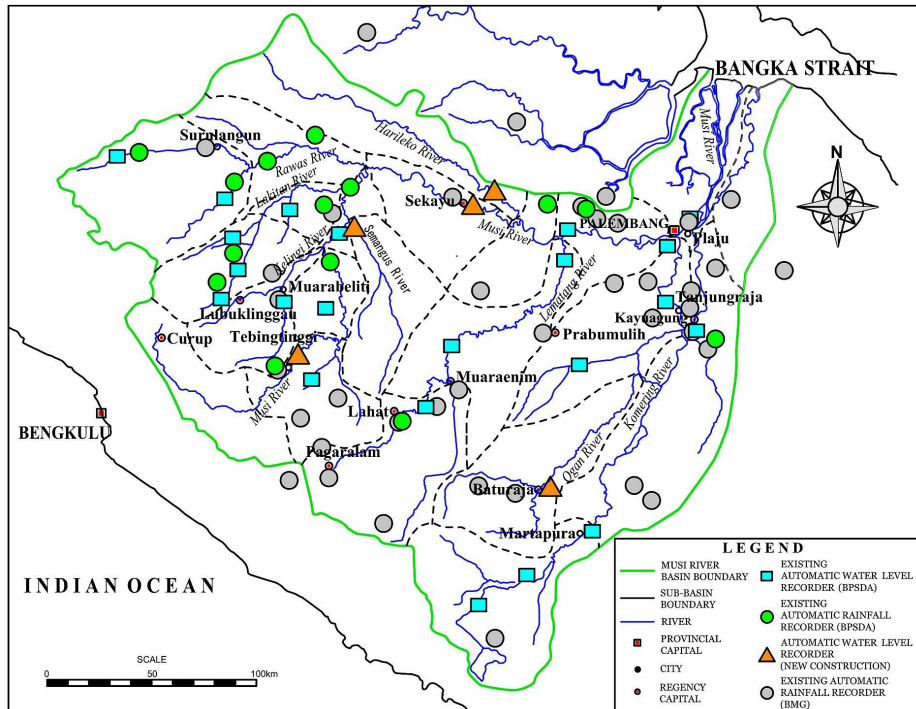


Figure 7.5.1 New Instillation of Water Level Gaging Stations

The list of automatic water level gaging station with those proposed above is shown in Table 7.5.1.

Table 7.5.1 Existing and Proposed Water Level Gaging Stations

No.	Station Name	H-Q curve	No.	Station Name	H-Q curve
1	Karang Anyar	No	15	Tanjung Raja	O.K.
2	Martapura	O.K.	16	Tanjung Beringin	O.K.
3	Kota Agung	O.K.	17	Pinang Belarik	O.K.
4	Tanjung Raja	O.K.	18	Lebak Budi	O.K.
5	Terawas	O.K.	19	Mambang	O.K.
6	Megang Sakti	O.K.	20	Ulak Bandung	O.K.
7	Tebing Abang	No	21	Cipodadi	O.K.
8	BandarJaya (K.Agung)	No	22	Menanga	No
9	Rantau Bingin	O.K.	23	Tebingtinggi *1	No
10	Sungai Rotan	O.K.	24	Sekayu *1	No
11	Tanjung Rambang	No	25	Harileko *1	No
12	Ulak Surung	O.K.	26	Semangus *1	No
13	Mariana	No	27	Baturaja, Ogan *1	No
14	Pulau Kidak	O.K.			

Note: *1: proposed under the present program
O.K.: H-Q curve is available, but data are not updated in most cases

Water level is the elevation above some arbitrary zero datum of the water surface at a station. Only a few stations in the Musi River Basin have the datum from mean sea level. Inventory of the stations should be developed and all the stations' datum should be expressed as mean sea level value. Coordinates (latitude and longitude) are important for the use in GIS. Inventory should cover the following item.

- Station name

- River name
- Catchment area of the river
- Location (address) of the station
- Coordinates and altitude of datum
- Date of operation start
- Other information (status of equipment, etc.)

Discharge Measurement

Development of the relation between water level and discharge (Discharge Rating Curve) should also be conducted periodically. **Table 7.5.1** shows availability of H-Q curve at each station. The status “O.K.” means there is a H-Q curve, but the data are not updated in most cases. Thus, discharge measurement at all the water level gaging stations once in two-month is necessary.

Sediment Discharge Measurement

Although one of the major issues of the Musi River Basin is erosion and sedimentation, there is no enough accumulation of sediment discharge data. Available observed sediment load is only for Upper Komerling River in 1986-87. Periodical and continuous sediment discharge monitoring for the whole basin is needed.

Data Storage

The hydrological data observed by Dinas PUP had been recorded manually on recording sheets without saving it in digital format on media such as Floppy Disk, Hard Disk, or CD-ROM. Survey by the JICA Study Team revealed that a lot of the recording sheets were missing for the reason that Musi Balai PSDA is in the process of renovation or reorganization for the hydrological observation station.

Musi Balai PSDA intends to establish a hydrological database with the software “MS-ACCESS”. For that purpose, a local consultant was employed to carry out the inventory survey for the hydrological network starting from October 15, 2002. The progress as of February 2003 is that the inventory has been completed and the establishment of the hydrological database is about 30% progress.

Above proposed inventory of the rainfall stations and water level gaging stations should also be maintained in this system. Conditions should be defined at certain intervals (e.g., stock of materials, observer’s name, maintenance record, normal/irregular condition, etc.). The inventory of the station is to be registered in the GIS system.

Data Processing System

Data processing includes the tabulation of data, the calculation of average value, the extraction of extreme data, the visualization of data and so on. Capacity building of

involving personnel in charge of hydrological observation/ processing is needed to ensure accuracy and the continuous processing. Visualization of hydrological data with the use of computers is also effective for minimizing errors. The collected data shall be stored in the database and published as the annual hydrological report.

Coordination with Other Organizations

As discussed above, coordination between Musi Balai PSDA and BMG is very important. Discussion should be made how to supply the rainfall data from BMG to Musi Balai PSDA for the purpose of basin water management, especially whether it shall be compensated by the budget of Musi Balai PSDA or not.

Programs in the Past

The strengthening of hydrological activities as the primary responsibility of the Musi Balai PSDA in fiscal year 2002 was recommended under the Project IWIRIP. The proposal included the following items, but nothing of them has been approved by IWIRIP.

- (1) To undertake a detailed inventory of the hydrometric stations and equipment (current meter, etc.) in the field and in storage, their conditions and approximate costs of repair/upgrade by 31 May 2002;
- (2) Through the decree of Dinas PSDA for role-sharing (with the inventory as attachment), to transfer management of all hydrometric assets from Project PSAPB to Musi Balai PSDA;
- (3) To transfer or co-opt some of the staff of Project PSAPB (training/working in hydrology) to the BPSDA;
- (4) For Musi Balai PSDA to set up an asset register and implement annual inspection/monitoring of the hydrometric network;
- (5) For Musi Balai PSDA to manage the operation (observation/data collection/database) and maintenance of the hydrometric network;
- (6) For Musi Balai PSDA to prepare a three-year hydrometric rolling plan to repair/rehabilitate hydrometric stations (priority for discharge measuring and rain gage stations) and to prepare list of equipment with cost for procurement; and
- (7) For Musi Balai PSDA to prepare the annual hydrology report from FY 2003.

Hydrological Monitoring System Establishment Program (Program 5-1)

Hydrological monitoring covers meteorological data, rainfall, river water stage, river flow, and sediment discharge. The program includes the following activities. Responsible agency is Musi Balai PSDA

Inventory Survey (Program 5-1-1)

Musi Balai PSDA shall undertake a detailed inventory of the hydrometric stations and equipment (current meter, etc.) in the field and in the storage, their conditions and approximate costs of repair and upgrade. Prepare a plan to repair and rehabilitate hydrometric stations (priority for rainfall gaging stations and discharge measurement) and to prepare list of equipment with cost for procurement. Most part of the inventory survey have already been completed by sub-contracted work from Musi Balai PSDA.

Establishment of Organization (Program 5-1-2)

Establish Water Resources Data and Information Unit in Musi Balai PSDA (**Program 6-5-1**). Musi Balai PSDA should coordinate with BMG and establish a rule for rainfall data transfer from BMG to Musi Balai PSDA.

Capacity Building (Program 5-1-3)

Musi Balai PSDA shall grasp present capability of hydrometric monitoring group and prepare a capacity building plan. Conduct capacity building to technical personnel for hydrological monitoring work. Cost shall be 5-person with 1-month period of training per year at Rp. 5 million per year.

New Construction and Improvement of Facilities (Program 5-1-4)

New construction of the hydrometric station shall be made for the proposed five water level gaging stations. Based on the inventory, necessary improvement of the facilities shall be conducted. A typical water level gaging station is illustrated in **Figure 7.5.2**.

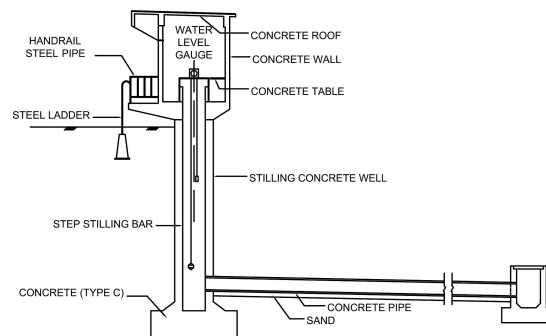


Figure 7.5.2 Typical Structure of Water Level Gage

Cost for the new construction of the water level gaging station is estimated at Rp. 240 million per station with a total of Rp. 1,200 million for five gaging stations.

Rehabilitation of monitoring facilities shall be conducted based on the inventory survey to be conducted under the Program 5-1. Estimated cost for the improvement under the present information is as follows:

- Improvement of climatology station: Rp. 183.5 million

- Improvement of rainfall recorder: Rp. 100.3 million
- Improvement of river water level recorder with staff gage: Rp. 264 million

Monitoring (Program 5-1-5)

Hydrological monitoring work shall consist of field monitoring work, e.g., maintenance of stations, retrieval of recorded data, field measurement work, and office work for data storage and processing. Of these, office work for data storage and processing work shall be conducted under the **Program 5-4**. Field monitoring work consists of the following work to be conducted every two months:

- Maintenance of the station and equipment
- Retrieval of recorded data
- River water discharge measurement
- River sediment discharge measurement

Required costs of monitoring work have been estimated at Rp. 800 million as an initial investment and Rp. 93 million for annual operation cost.

7.5.3 Water Quality Monitoring

Water quality monitoring is the basic work for the water quality management in the Musi River Basin. The results of monitoring should be widely utilized in relevant institutions and should be open to the general public. Important point is that BAPEDALDA has been the agency responsible for the water quality until now, and in the future, it is proposed that Musi Balai PSDA cover a certain part of this work.

Past Water Quality Monitoring

As mentioned in **Section 3.5**, the past water quality monitoring does not sufficiently cover the whole Musi River Basin since the full-scale river water quality monitoring was conducted only in 2001. Necessary data on river water quality has not been stored and utilized for water quality management and control.

BAPEDALDA has a plan for water quality monitoring; however, the plan has not been conducted well due to the shortage of budget and monitoring equipment. Also, parameters in the past monitoring do not cover all the required parameters of 45 specified in the water quality standards. There is another problem that the institutional issues have been hindering the sufficient usage of monitoring data. Therefore, these obstacles to monitoring should be solved.

Necessary Sampling Locations of River Water

The water quality of the Musi River Basin should be monitored at least at the 45 monitoring points observed in 2001 by BAPEDALDA (see **Table 7.5.2**). The

monitoring points are widely scattered in the whole Musi River Basin, and the actual river water conditions can be estimated.

Table 7.5.2 Proposed Water Quality Monitoring Stations

Regency	No.	Location Name	River Name	Regency	No.	Location Name	River Name
Muara Enim	1.1	Tebat Agung	Niru		4.5	Kayu Agung	Komering
	1.2	Muara Niru	Lematang		4.6	Desa Pedamaran	Babatan
	1.3	Teluk Lubuk	Lematang		4.7	Desa Gunung Batu	Komering
	1.4	Banu Ayu	Lematang		4.8	Muara Burnel	Burnel
	1.5	Indramayu	Enim	OKU	5.1	Rantau Nipis	Selabung
	1.6	Jembatan Enim II	Enim		5.2	Desa Selabung	Ogan
	1.7	Tanjung Priok	Lematang		5.3	Desa Mendala	Ogan
Lahat	2.1	Kembatan Kebur	Lematang	Palembang	5.4	Desa Puser	Ogan
	2.2	Tanjung Mulak	Lematang		5.5	Martapura	Komering
	2.3	Bunga Mas	Kikim		5.6	Muara Dua	Komering
MUBA	3.1	Sukamerindu	Lematang		5.7	Kota Batu	Warkuk
	3.2	Sungai Dua	Komering		5.8	Danau Ranau	Danau Ranau
	3.3	Desa Upang	Musi		5.9	Tj. Lengkayap	Lengkayap
	3.4	Pulau Burung	Musi	MURA	6.1	Jembatan Ampera	Musi
	3.5	Hulub Ogan	Ogan		6.2	Hulu Komering	Komering
	3.6	Talang Kelapa	Musi		6.3	Desa Rambutan	Keramasan
3.7	Kota Sekayu	Musi	6.4		Pulau Kerto	Musi	
OKI	3.8	Durian Gadis	Padang	MURA	7.1	Terawas	Hulu Lakitan
	3.9	Desa Teluk	Batangharileko		7.2	Lawang Kidul	Rawas
OKI	4.1	Desa Indralaya	Kelekar		7.3	Muara Rupi	Rupit
	4.2	Desa Pemulutan	Ogan		7.4	Muara Beliti	Beliti
	4.3	Tanjung Raja	Ogan		7.5	Lubuk Linggau	Kelingi
	4.4	Desa SP Padang	Komering				

On the other hand, the monitoring of saline intrusion and low pH in the Lowland Area has not been well executed and hence a continuous monitoring plan for saline intrusion is required. A total of 10 points in Lowland Area should be included.

Sampling Number and Necessary Parameters

The water quality analysis should cover the 45 parameters specified in the water quality standards. **Table 7.5.3** shows the recommended parameters and sampling interval.

Table 7.5.3 Sampling Number and Necessary Parameters on Annual Basis

Parameters	Measurement interval
A. Field Measurement Items Water Temperature, EC, Salinity, Flow Rate, Transparency, Color and Smell	Every month
B. General Items TDS, TSS, NH ₃ , NO ₃ , pH, BOD, COD, DO, Cl ₂ , PO ₄ , SO ₄ , Faecal coliform, Total coliform	Every month
C. Heavy Metals and Other Toxic Substances Hg, As, Ba, Fe, Cd, Cl ⁻ , B, Co, Cr ⁶⁺ , Mn, Se, Zn, CN, H ₂ S, , Cu, Pb, Aldrin and Dieldrin, 2,4-D, DDT, BHC, Detergent, Phenol, Heptachlor, Lindane, Methylchlor, Oil and Grease, Toxaphan	Once in 6-month

Institutional Reinforcement

Water quality monitoring is a part of basic monitoring for the water management in the Musi River Basin. According to Decree of Musi Balai PSDA (821/003/BPSDA.

M/2002, July 18, 2002), the task of water pollution control is given to Musi Balai PSDA with the concrete activities proposed as follow.

- (1) To plan the locations of water quality observation point in river, river mouth, delta, reservoir, lake, and *situ/embung* (small reservoir).
- (2) To plan quality planning of river, river-mouth, delta, reservoir, lake, and *situ/embung* (small reservoir).
- (3) To plan the periodical and particular observation point water quality monitoring (usually at the point of discharge measurement station)
- (4) To arrange the actions that are needed to be taken
- (5) To act or do some actions directly in the field
- (6) To provide/give technical recommendation for industrial wastewater disposal to river, river-mouth, delta, lake and *situ/embung* (small reservoir).

On the other hand, Provincial BAPEDALDA is responsible for the following matters: Environmental impact assessment against the specific project, the stipulation of water quality criteria, drawing-up of plans for countermeasures on industrial pollution and so on. In addition, ten municipal BAPEDALDAs have environmental monitoring activities in the Musi River Basin. Another organization related to water quality is PDAM of each municipality. PDAM is responsible for the supply of piped water and has to monitor the water quality according to the criteria, thus the monitoring data of the Musi River have been accumulated.

Demarcation of the tasks relating to water quality monitoring between Musi Balai PSDA, Provincial BAPEDALDA, Municipal BAPEDALDA, and PDAM, and coordination between these organizations is deemed urgent and important for the smooth implementation of water quality monitoring and effective utilization of the monitoring results in the Musi River Basin.

Improvement of Laboratory Facilities

To monitor water quality based on the above recommendations, relevant monitoring equipment must be improved. The required equipment is given in **Annex 7.5.1**.

Water Quality Monitoring System Establishment Program (Program 5-2)

Water quality monitoring is the basic work for the environmental management in the Musi River Basin. The results of the monitoring should be widely utilized in relevant institutions and should be open to the general public.

Coordination between Relevant Agencies (Program 5-2-1)

Dinas PU Pengairan (Musi Balai PSDA), Provincial BAPEDALDA, Municipal BAPEDALDAs, and PDAMs shall coordinate and formulate clear demarcation of the water quality monitoring work. It is preferable that Musi Balai PSDA will be the

leading agency. In any case, data and information should be stored and maintained in the Water Resource Data and Information Unit to be established under Musi Balai PSDA, and sharing of the data and information between relevant agencies and dissemination to the general public are deemed important.

Preparation of Monitoring Plan (Program 5-2-2)

Musi Balai PSDA shall finalize water quality monitoring plan based on the proposal above. Presently assumed monitoring plan is as follows:

- Location: 45 locations shown in **Table 7.5.2** and 10 locations in tidal swamp areas
- Monitoring Interval: Sampling and laboratory test interval by parameters as shown in **Table 7.5.3**.
- Monitoring and Laboratory Test Group: To conduct the above monitoring work, three monitoring teams with the following man-power shall be needed, namely, one manager, one secretary, three monitoring group chiefs, three sampling staffs for each group, a total of ten laboratory staffs, two workers and three drivers.

Establishment of Water Quality Laboratory in Musi Balai PSDA (Program 5-2-3)

Musi Balai PSDA shall establish Water Quality Laboratory. The cost of equipment for the water quality laboratory is estimated at; common analytical equipment of Rp. 1,965.8 million; general laboratory equipment of Rp. 2,481.4 million; and, water quality monitoring equipment of Rp. 1,636.5; with a total of 6,083.7 million.

Monitoring (Program 5-2-4)

Water quality monitoring work shall be conducted following the proposed monitoring program. Necessary cost for man-power of monitoring work is estimated at Rp. 291 million/year. Data storage and processing work shall be conducted under the **Program 5-4** as discussed below.

7.5.4 Water Use Monitoring

Background

New Government Regulation on Water Resources Management (Draft), waiting for the enforcement of New Water Resources Law, stipulates:

- (1) Water resources management service fee can be imposed on the users of water resources who have acquired benefits from the result of water resources management. (Article 36)
- (2) Use of water for daily basic needs can be carried out by anyone without permit. (Article 79)
- (3) Use of water resources with permit covers, among others, all usages for agriculture, power, industry and services, mining, communication/water traffic,

floating, sport, recreation and tourism, aesthetics, as well as other needs set according to the prevailing laws and regulations. (Article 80)

- (4) In the article of Procedures for Application and Issuing Permit, it is mentioned that technical requirements in the application for permit include “volume of water taken per time unit”, “method/technique of taking water”.

After the enforcement of New Government Regulation, water exploitation volumes by extractors shall be grasped in order to manage the water resources of the Basin using system models (refer to **Program 1-6: Modeling of Water Use Management**). The proposed program is, as follows:

Water Use Monitoring Program (Program 5-3)

After the enforcement of New Government Regulation, water exploitation volumes shall be collected through the coordination of the following procedures and this program:

- Application and Issuance of Water Usage Permit (Article No. 82 and 83)
- Water Resources Management Service Fee (Article No. 36 to 39)

Musi Balai PSDA shall be the executing agency of this program. Water Resources Data and Information Unit, under Musi Balai PSDA, shall store and process the collected data. The activities of this program are, as follows:

Establishing Procedure Rules of Water Use Monitoring (Program 5-3-1)

The following procedure rules are to be established (refer to **Figure 7.5.3**):

- Data/information of approved water usage will go to Musi Balai PSDA from Office of Governor
- Appointed institution for the fee collection will inform extracted volumes to Musi Balai PSDA

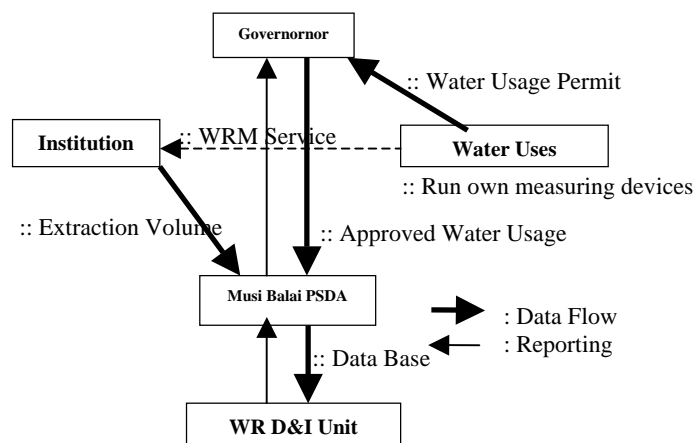


Figure 7.5.3 Data Flow of Water Use Monitoring

- Musi Balai PSDA will submit water use report to Governor

Data Storage and Processing (Program 5-3-2)

Water Resources Data and Information Unit shall store and process the collected water use data under the **Program 5-4: Hydrological Database Establishment Program**. The data processing shall include:

- Statistical analysis: basic statistics, e.g., annual and monthly totals in each sub-basin and regency/municipality by water use purposes; statistical distributions of water uses, etc.
- Making GIS database: intake locations; consumption places, etc.
- Estimation of water use volumes
- Arranging data for the Modeling

7.5.5 Establishment of Database

Hydrological Database Establishment Program (Program 5-4) is proposed as follows: Hydrological database shall consist of two systems, namely, numerical data storage database and GIS database.

Establishment of Numerical Database

Musi Balai PSDA is presently establishing the numerical database using Microsoft ACCESS. This system shall storage rainfall and water level data. Necessary data processing should be included in the system. Water quality database should also be established. Use of Microsoft ACCESS is recommended to unite the numerical database.

Establishment of GIS Database

As discussed in **Section 3.12**, the JICA study team has already established a GIS database for Musi River Basin. The database has been used in the study for land use analysis, environment analysis and forest disappearance analysis. It was proofed that the water management work can be more efficient by using the GIS Database.

As it was mentioned above, the Musi River Basin GIS Database has already established, and the GIS technology has been transferred. However, to use the GIS technology efficiently in daily management work, the following shall be needed.

The GIS environment has three factors, GIS Engineer, GIS Database and GIS Application. The GIS database and GIS application must be stored in computer hardware. To maintain the computers, system administrators must be included in the environment. In Musi Balai PSDA, the following GIS environment (GIS group) is proposed by this study.

Table 7.5.4 Quantities of GIS Engineers, GIS Software and Hardware

Engineers	Persons	Software	Unit	Hardware	Unit
GIS Engineer	2	ArcView 8.2	2	Computer	3+
Database Manager	1	ArcInfo8.2	1	Plotter	1
Computer System Administrator	1	Office Soft	3	Printer	1
				Scanner	1

Costs for Program 5-4 have been estimated as follows:

- System development (Water quality numerical database): Rp. 50 million
- Maintenance man-power: Rp. 57 million
- Hardware and software: Rp. 353 million as initial investment and Rp. 68 million for annual maintenance from the 2nd year

7.5.6 Prioritization of the Programs

Establishment of monitoring network and accumulation of the data and information should be started as soon as possible, since these information shall be the basis for the other programs. Of these, **Program 5-1: Hydrological Monitoring System Establishment Program**, **Program 5-2: Water Quality Monitoring System Establishment** and **Program 5-4: Hydrological Database Establishment Program** should be started at an earliest stage. **Program 5-3: Water Use Monitoring Program** shall be implemented when the Government Regulation about Water Resources Management is in effective, and the system of water use permit is established.

7.5.7 Implementation Plan

Program		1st Year				2nd Year				3rd Year				4th Year				5th Year			
No.	Title	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
5-1	Hydrological Monitoring System Establishment Program																				
5-1-1	Inventory Survey			Preparation	Full Operation																
5-1-2	Establishment of Organization	▲																			
5-1-3	Capacity Building	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5-1-4	New Construction and Improvement of Facilities					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5-1-5	Monitoring	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5-2	Water Quality Monitoring System Establishment Program																				
5-2-1	Coordination between Relevant Agencies	■	■	■	■																
5-2-2	Preparation of Monitoring Plan		■	■	■																
5-2-3	Establishment of Water Quality Laboratory in Musi Balai PSDA					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5-2-4	Monitoring																				
5-3	Water Use Monitoring Program					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
5-4	Hydrologica Database Establishment Program	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Figure 7.5.4 Implementation Plan for Monitoring Network Establishment

7.6 Component 6: Institutional Strengthening

7.6.1 Objective of the Programs

Objectives of "Component 6: Institutional Strengthening" of the Master Plan are to establish and/or enhance necessary organization and institutional mechanism as well as human resources that are important keys to certain and firm implementation of the whole Master Plan. In addition, the institutional reformation programs of the water sector are on the way at this time with assistances from the World Bank namely WATSAL, IWIRIP, WISMP, etc. Therefore, those reformation programs should be incorporated into the Master Plan.

Among such reformation programs in water sector, New Water Resources Law (Draft) shows the new policy of water resources management while New Government Regulation on Water Resources Management (Draft) stipulates more detailed provisions on systems and procedures for water resources management in the reformed stage as well as ethical codes. It should be examined in detail before the draft of "Institution and Human Resources" plan is formulated, which also incorporates issues identified in the field survey by the JICA Study Team.

7.6.2 New Governmental Regulation on Water Resources Management (Draft)

Discussion in this section is based on the English draft of the regulation dated on October 2002. New Governmental Regulation (Draft) stipulates objectives, ethical codes as well as provisions of systems and procedures, which are aimed to realize such objectives and ethics. Items and activities are summarized as in **Table 7.6.1**.

Table 7.6.1 Summary of New Governmental Regulation on Water Resources Management

Procedure & System	Article No.	Execution Body	Activity	Note
Provincial WR Policy	10	Provincial Government	<ul style="list-style-type: none"> can decree the policy 	
Policy guidance of WRM	15	Service	<ul style="list-style-type: none"> propose draft of policy guidance 	PTPA/PPTPA
	15	WR Council	<ul style="list-style-type: none"> recommend to the Governor 	
Inventory of WR	15	Governor	<ul style="list-style-type: none"> decide and decree 	
	19	Service	<ul style="list-style-type: none"> prepare list of inventory through coordination with other related services report changes of changes to other related services submit to the Governor to endorse 	
Master Plan of WRM	19	Governor	<ul style="list-style-type: none"> endorse list of inventory every 5years 	
	23	(Not specified)	<ul style="list-style-type: none"> review and evaluate every 5 years 	
	24	Governor	<ul style="list-style-type: none"> establish team to carry out MP decide MP and decree 	MP Team members consist of related Services.
	24	MP Team	<ul style="list-style-type: none"> prepare draft MP carry out PC submit draft MP to WR Council submit draft MP 	
		WR Council	<ul style="list-style-type: none"> discuss draft MP 	PTPA/PPTPA

Procedure & System	Article No.	Execution Body	Activity	Note
Program & Plan of Activities	25	Service	<ul style="list-style-type: none"> • prepare and decree • carry our PC 	
	25	Community	<ul style="list-style-type: none"> • can propose program & plan 	
Establishment of MP	26	(Not specified)	<ul style="list-style-type: none"> • carryout PC • announcement • keep objection period • carry out socialization to Community 	cf. Article 24
	27	Provincial Government/ Private Sector/ Community	<ul style="list-style-type: none"> • can carry out WRM 	
Implementation of WRM	27	Provincial Government	<ul style="list-style-type: none"> • appoint WR Council to coordinate WRM 	
	27	WR Council	<ul style="list-style-type: none"> • carry out coordination 	PTPA/PPTPA
	29	Provincial Government	<ul style="list-style-type: none"> • consult WR Council on cooperation plan 	
Cooperation in Implementation of WRM	29	WR Council	<ul style="list-style-type: none"> • give consultation 	PTPA/PPTPA
	29	Provincial Government/ Related District/ Municipality	<ul style="list-style-type: none"> • make Cooperation Agreement 	
	30	Service	<ul style="list-style-type: none"> • carry out monitoring and evaluation 	
Monitoring & Evaluation	30	Provincial Government	<ul style="list-style-type: none"> • coordinate implementation of monitoring and evaluation 	
	31	Governor	<ul style="list-style-type: none"> • submit accountability report to regional parliament 	
Accountability Supervision	32	(Not specified)	<ul style="list-style-type: none"> • appoint supervisor 	
	32	Supervisor	<ul style="list-style-type: none"> • carry out observation, request information, and check implementation • make report 	Selected from Service
	32	WRM agency	<ul style="list-style-type: none"> • fulfil request by supervisor 	PUP
	32	Authorized party	<ul style="list-style-type: none"> • follow up report 	"Authorized party" is not specified.
	35	Service	<ul style="list-style-type: none"> • propose financing plan 	
Financing WRM Service Fee	36	Authorized party	<ul style="list-style-type: none"> • decide types of fee 	"Authorized party" is not specified.
	37	Related Regent/Mayor	<ul style="list-style-type: none"> • input information for deciding fee tariff 	
	37	Provincial WR Council	<ul style="list-style-type: none"> • give input for deciding fee tariff 	PTPA
	37	Governor	<ul style="list-style-type: none"> • regulate procedures of deciding fee 	
	38	Institution appointed	<ul style="list-style-type: none"> • carry our collection, depositing and book keeping of fee • submit accountability report to users through WR Council (PTPA) 	" Institution appointed" is not specified.
	38	Governor	<ul style="list-style-type: none"> • appoint Institution for fee 	
	38	WRM Service	<ul style="list-style-type: none"> • receive collected fee for WRM 	PUP
	39	Community	<ul style="list-style-type: none"> • can decide and collect fee for own needs if they carry out WRM 	
	40	WR Council	<ul style="list-style-type: none"> • receive information on grant, loan and bonds 	PTPA/PPTPA

Procedure & System	Article No.	Execution Body	Activity	Note
Role of Community	42	Community	<ul style="list-style-type: none"> • can participate in all stages of WRM • give input on plan of WRM • participate in PC • declare objection to MP and Plan of Activities • carry out part of construction • carry out maintenance of infrastructure • give suggestion, complaint, report and supervision to the authorized party 	
	42	Provincial Government	<ul style="list-style-type: none"> • give opportunity of participation to Community 	
	42	Authorized party	<ul style="list-style-type: none"> • supply and distribute information to Community • facilitate and process input form Community, and submit result to Community • prepare and carry out PC • manage complaints from Community 	"Authorized party" is not specified.
	42	(Not specified)	<ul style="list-style-type: none"> • review draft MP if it is rejected in PC 	cf. Article 24
WR Information System	45	Provincial WR Data and Info Unit	<ul style="list-style-type: none"> • collect and process data and info • supply data and info to National Unit • select and keep data • present and distribute info 	Establish in accordance with need and development of WRM activities. Operation & Data Management Section of Balai PSDA
	45	WR Data and Info. Unit at WR area	<ul style="list-style-type: none"> • collect and process data and info • supply data and info to all levels • select and keep data • present and distribute info 	
	45	Provincial Government	<ul style="list-style-type: none"> • establish Provincial WR Data and Info Unit • establish WR Data and Info. Unit at WR area 	
	46	Service	<ul style="list-style-type: none"> • manage WR data and info 	Provincial level
	47	Provincial government agencies	<ul style="list-style-type: none"> • decide regulation and policy • prepare and decide plan • give information reference 	
	47	WR Council	<ul style="list-style-type: none"> • propose policy to provincial agencies 	PTPA
	47	WRM agency at WR area	<ul style="list-style-type: none"> • decide operational regulation and policy • prepare and decide plan • collect and analyze data and info 	Balai PSDA
	48	Provincial WR Data and Info Unit/ WR Data and Info. Unit at WR area/ Data managing institution	<ul style="list-style-type: none"> • provide WR data and info for Community by request 	Disclosure system
48	Provincial Government	<ul style="list-style-type: none"> • decide procedures for request and supply of info 		
Civil Servant Investigator (PPNS)	49	Provincial Government	<ul style="list-style-type: none"> • appoint PPNS 	Task of PPNS is not specified.
Maintaining Sustainability of the Function of Water Seepage and Catchment Area	50	Provincial Government	<ul style="list-style-type: none"> • decide and manage protected zone • encourage and carry out empowerment of Community • conduct program of conservation • decide and supervise implementation of regulation 	
	51	Provincial Government	<ul style="list-style-type: none"> • maintain existence of water collection areas and 	

Procedure & System	Article No.	Execution Body	Activity	Note
Arrangement of WS Border Area	57	Provincial Government	<ul style="list-style-type: none"> determine border land 	
	57	WR Council	<ul style="list-style-type: none"> recommend for decision of border land 	PTPA/PPTPA
	58	Provincial Government	<ul style="list-style-type: none"> maintain function of border land 	
Conservation of Protected Forest	59	Provincial Government	<ul style="list-style-type: none"> carry out conservation empower Community to participate in maintain conservation 	
Rehabilitation of Forest and Land	61	Provincial Government	<ul style="list-style-type: none"> carry out rehabilitation of forest and critical land 	
Storing Water during Rainy Season	62	Provincial Government	<ul style="list-style-type: none"> provide rain water storing facilities for Community 	
Water Saving	63	Provincial Government	<ul style="list-style-type: none"> decide mechanism for water saving implement water saving 	
Prevention of Water Pollution at WR and WR Infrastructure	65	Everybody	<ul style="list-style-type: none"> is forbidden to throw away solid wastes is forbidden to discharge liquid waste exceeding quality standard limit 	Ethical codes
	65	Authorized official	<ul style="list-style-type: none"> permit discharge waste water 	"Authorized official" is not specified.
	65	Related agency	<ul style="list-style-type: none"> give technical recommendation to Authorized official 	"Related agency" is not specified.
	65	Provincial Government	<ul style="list-style-type: none"> arrange implementation of water pollution prevention 	
	66	Provincial Government	<ul style="list-style-type: none"> can collect water pollution cost supervise implementation of water pollution prevention 	
	66	Responsible person	<ul style="list-style-type: none"> pay recovery cost and compensation and or correctional actions 	Polluter-Pays Principle
Improvement of Water Quality at WR and WR Infrastructure	67	(Not specified)	<ul style="list-style-type: none"> carry out improvement of water quality 	Technical code
	67	Managing agency	<ul style="list-style-type: none"> give compensation for disturbance of water allocation due to cleaning 	"Managing agency" is not specified.
Decision of Water Source Utilization Zone	70	(Not specified)	<ul style="list-style-type: none"> make draft water source utilization zone carryout PC decide water source utilization zone 	
	70	Governor	<ul style="list-style-type: none"> appoint technical agency 	
	70	Technical agency	<ul style="list-style-type: none"> study and measure water sources hydrological parameters develop inventory of utilization analyze environmental impact and conflict of utilization and legal compliance formulate draft water resources utilization 	PUP
Decision of Water Allocation	72	(Not specified)	<ul style="list-style-type: none"> prepare allocation proposal carry out PC legalize evaluate water allocation periodically 	
	72	Governor	<ul style="list-style-type: none"> appoint technical agency 	
	72	Technical agency	<ul style="list-style-type: none"> collect data for decision of water allocation analyze data prepare allocation proposal submit proposal to WR Council 	PUP
	72	WR Council	<ul style="list-style-type: none"> make recommendation 	PTPA

Procedure & System	Article No.	Execution Body	Activity	Note
Decision of WR Supply Priority	73	Technical agency	<ul style="list-style-type: none"> prepare proposal of priority submit proposal to Provincial WR Council 	PUP
	73	Provincial WR Council	<ul style="list-style-type: none"> make recommendation 	PTPA
	73	(Not specified)	<ul style="list-style-type: none"> carry out PC decide priority for inputs for WR Supply Plan review priority every 5years 	
WR Supply Planning	74	Technical agency	<ul style="list-style-type: none"> prepare concept of WR supply plan submit concept to related WR Council 	PUP
	74	WR Council	<ul style="list-style-type: none"> make recommendation 	PTPA
	74	Provincial Government	<ul style="list-style-type: none"> carry out PC decide WR supply plan 	
Implementation of WR Supply	75	WR managing agency of WR area	<ul style="list-style-type: none"> implement WR supply 	Balai PSDA
	75	Authorized party	<ul style="list-style-type: none"> can adjust supply of WR if WR cannot carried out by considering input from Provincial WR Council 	PUP
	75	Provincial WR Council	<ul style="list-style-type: none"> give input for WR supply adjustment 	PTPA
	76	(Not specified)	<ul style="list-style-type: none"> carry out monitoring and evaluation 	
Use of WR with Permit	80	Water User	<ul style="list-style-type: none"> need permit for water usage other than daily basic needs 	
Application & Issuance of Water Usage Permit	82	Governor	<ul style="list-style-type: none"> receive application for permit give approve or refusal to application within 90 days from receipt give reasons in case that application is refused submit application to WR Council if its permission can disturb balance of WR supply regulate further procedures and requirements for permission 	cf. Article 80 (2)
		WR Council	<ul style="list-style-type: none"> decide whether to give agreement or not with permission which can disturb balance of WR supply 	PTPA
	83	WR managing agency at WR area	<ul style="list-style-type: none"> supply water resources according to what is mentioned in the permit maintain water resources and its infrastructure to maintain its function carry out empowerment of users of water resources 	Balai PSDA
Implementation of WR Development	89	(Not specified)	<ul style="list-style-type: none"> carry out PC if implementation of WR development has important impact on general public review the plan for WR development if it is refused in PC 	
	90	Provincial Government	<ul style="list-style-type: none"> implement WR development 	
Water Exploitation	104	Provincial Government	<ul style="list-style-type: none"> prepare exploitation plan 	
	104	BUMN/BUMD	<ul style="list-style-type: none"> implement exploitation plan 	
	104	Business entity	<ul style="list-style-type: none"> can implement through tender process 	
	106	Provincial Government	<ul style="list-style-type: none"> issue permission for exploitation 	
	109	Governor	<ul style="list-style-type: none"> determine allocation of fee from water exploitation 	
	109	WR Council	<ul style="list-style-type: none"> consider allocation of fee from water exploitation 	PTPA
	110	Provincial Government	<ul style="list-style-type: none"> carryout supervision, monitoring and evaluation of performance 	
110	WR Council	<ul style="list-style-type: none"> give consideration on evaluation of performance 	PTPA	

Procedure & System	Article No.	Execution Body	Activity	Note
Control of Water Disaster	112	Provincial Government	• decree control plan	
	113	Provincial Government	• determine hazardous area and early warning system	
	114	Provincial Government	• control utilization of hazardous area by involving Community	
	115	Coordinating agency for overcoming disaster	• coordinate actions to overcome disaster/damages	"Coordinating agency" is not specified.
	115	Provincial Government	• socialize procedures for overcoming disaster/damages	

(Abbreviation) WR: Water Resources WRM: Water Resources Management MP: Master Plan
PC: Public Consultation

(Note) Community is an individual regardless of gender, group, or a community's self-supporting institution located at a certain region.

7.6.3 Institutional Development Program

Introduction of Incentive Mechanism (Program 6-1)

One of the most significant issues on institution is law enforcement. It may not be so difficult to find regulations to cope with problems raised concerning water resources management, including illegal logging, waste dumping and so on. These regulations, however, just exist in the statute book. Since regulations cannot apply themselves to problems, a person in charge has to apply them. The basic issue is that a person in charge does not have an incentive to apply regulations.

As a component of the Master Plan, the following program is proposed to introduce incentives to personnel management of government employees.

Personnel Management with Incentive Mechanism (Program 6-1-1)

In order to introduce incentive mechanism into the jobs of employees, the following personnel system should be established:

- Job of each employee is clearly defined.
- Each employee sets his/her job target by the consultation with the supervisor and also agrees the criteria with which the achievement is evaluated.
- Each employee reports the achievement of his/her job target periodically.
- Achievement of each employee is evaluated periodically with the criteria by the supervisor.
- If the evaluation result is not acceptable to the employee, he/she can claim the review of the evaluation to the superior of the evaluator.
- Promotion and demotion of the employee are made based on the job evaluation.

Institutional development should be designed to establish systems and procedures to support the incentive mechanisms, considering transparency, participation, and disclosure. From the viewpoint of such principles, new Government Regulation on Water Resources Management has been elaborately drafted very much. For example, the provision of Water Resources Information System can work as a disclosure system, frequent employment of Public Consultation promotes participation, and accountability reports by the Governor enhance transparency.

As a component of the Master Plan, the following programs are also proposed for the institutional development.

Promotion of Transparency with Public Relations (Program 6-2)

Annual Report on Water Resources Management (Program 6-2-1)

Annual report gives the total illustration of activities on water resources management in the Province to the people. Dinas PU Pengairan prepares the draft and sends to PTPA for discussion. The Governor publishes with a reasonable cost to the people. The annual report contains:

- Five-year review and evaluation of master plan. See Article 23 of the new Government Regulation (Draft).
- Results of monitoring and evaluation (Article 30)
- Accountability report by the Governor (Article 31)
- Follow up of the requests by Supervisor (Article 32)
- Financing report on grant, loan and bond issuing (Article 40)
- Results of public consultation (Article 42)
- Results of disclosure on water resources management (Article 48)
- Activities of Civil Servant Investigator (PPNS) (Article 49)
- Realized budget on water resources management
- Issued decree on water resources management

Publishing Picture Booklet on Water Resources Management (Program 6-2-2)

Information on water resources management is explained in plain words with graphics so that those who are young or with low education can understand and published with free of charge. These picture booklets should be revised periodically. Such picture booklets include:

- Master plan of water resources management
- Environmental conservation

- Water supply and saving
- Water disaster and protection

Official Web Site of Water Resources Management (Program 6-2-3)

Official website contains information on water resources management. Dinas PU Pengairan maintains the website periodically. Data and information are provided by Water Resources Data and Information Unit of Balai PSDA and other related offices with the consultation of PTPA. Dinas PU Pengairan decides the data and information to be released in the official website with the consultation of PTPA. Such data and information include:

- Data and information stored by Water Resources Data and Information Unit
- Explanation on water resources management
- Summary of accountability report by the Governor
- Summary of annual report on water resources management

Promotion of Participation with Public Consultation (Program 6-3)

New Government Regulation (Draft) requires public consultation at:

- Drafting master plan on water resources management (Article 24 and 26)
- Preparing program and plan of activities (Article 25)
- Deciding water source utilization zone (Article 70)
- Deciding water allocation (Article 72)
- Deciding water resources supply priority (Article 73)
- Deciding water resources supply plan (Article 74)
- Implementing water resources development (Article 89)

Since the new Government Regulation does not specify, it is proposed that public consultation be required also at *determining area susceptible to disaster*, considering the cooperation of the community is important for overcoming water disaster.

Making Guideline of Public Consultation for Water Resources Management (Program 6-3-1)

In order that public consultation (PC) is carried out effectively, Dinas PU Pengairan should make a guideline including the following contents:

- Execution body who has responsibility for carrying out PCs
- Subjects on which PCs are carried out

- Procedures on the selection of the participants
- Procedures on the notification to the participants
- Procedures on the acceptance of opinions from the participants
- Procedures on the publication of the results from PCs

It is proposed that the guideline of PCs be published to people and released in the official web site.

Establishment of Disclosure System (Program 6-4)

Establishment of Disclosure System for Water Resources Management (Program 6-4-1)

The new Government Regulation (Draft) stipulates the establishment of Water Resources Data and Information Unit at river basin level (Article 45). This Unit not only collects and processes data and information but also have to provide them to anybody upon request in the form that he/she can retrieve and copy them (Article 48). It is suitable for the disclosure system of water resources management. In order to establish an effective disclosure system, the followings should be carried out:

- The Unit is established in Balai PSDA with enhancing Operation & Data Management Section.
- Collected data and information are stored in a database for the sake of data process and retrieval.
- Screened data and information are provided in the official web site on water resources management for the people's convenience.
- Decision on data/information provision is made within a certain period. In case that data/information is refused to provide, specified reason for the refusal is informed of in writing. The results of data/information provision are reported in the accountability report by the Governor.

7.6.4 Organizational Enhancement

Organizational Enhancement (Program 6-5) has been proposed in the Institutional Strengthening component.

Balai PSDA

According to New Government Regulation (Draft), functions of Balai PSDA, as a water resources management and technical implementation body at the river basin, would include:

- Collecting, processing, storing and distributing data and information as the functions of Water Resources Data and Information Unit at river basin (Article 45)

- Deciding operational regulation, policy, and plan on the management of water information system (Article 47)
- Supervising and involving directly action on water pollution (Article 66)
- Implementing water resources supply (Article 75)
- Maintaining water resources and its infrastructure (Article 83)
- Carrying out capacity building of water resources users (Article 83)

With the consideration of such Articles, the followings are proposed.

Establishment of Water Resources Data and Information Unit in Balai PSDA (Program 6-5-1)

It is strongly recommended that the Water Resources Data and Information Unit be set up by enhancing the Operation & Data Management Section in order to establish disclosure system on water resources management. See Program 6 for the detail of disclosure system. The Unit's functions are:

- Supplier of data and information for Water Resources Data and Information Unit at District/Town, provincial, and national levels and simultaneously as selector and keeper of data,
- Presenter and distributor of information

According to new Government Regulation, request for water resources information for non-commercial interest can be charged with limited cost, and that for commercial interest can be charged with cost for information collecting, multiplication and process of information for the party's purpose. The Provincial Government should decide procedures for request and supply of water resources information.

Enhancement of the Function of Finance Section in Balai PSDA (Program 6-5-2)

As several types of money are expected to be paid to the Balai PSDA, manpower and accounting skill of Finance Section should be expanded. In addition, appropriate computer system for accounting should be prepared. Expected money includes: water resources management fee; data and information supply fee; water pollution cost; water exploitation fee.

PTPA/PPTPA

Water resources councils, or coordinating agency are to be established at the Provincial level and river basin level. New Government Regulation (Draft) gives the following roles to PTPA/PPTPA:

- Recommend draft of policy guidance on water resources management to the Governor (Article 15)

- Discuss draft of master plan of river basin water resources management (Article 24)
- Carry out coordination in the implementation of master plan (Article 27)
- Give consultation for the cooperation in the implementation of master plan (Article 29)
- Give input for deciding fee tariff (PTPA only) (Article 37)
- Receiving information on grant, loan and bond issuing (Article 40)
- Propose policy on water resources information system to provincial agencies (PTPA only) (Article 47)
- Make recommendation for the decision of border land (Article 57)
- Make recommendation for the decision of water allocation (PTPA only) (Article 72)
- Make recommendation for the decision of water resources supply priority (PTPA only) (Article 73)
- Make recommendation for the decision of water resources supply plan (PTPA only) (Article 74)
- Give input for water resources supply adjustment (PTPA only) (Article 75)
- Decide whether to give agreement or not with permission which can disturb balance of water resources supply (PTPA only) (Article 82)
- Consider allocation of fee from water exploitation (PTPA only) (Article 109)
- Give consideration on evaluation of performance (PTPA only) (Article 110)

The letter of the Governor of South Sumatra Province was issued to establish PTPA/PPTPA in April 2003 (No. 226/KPTS/PU-AIR/2003). The percentage of members from non-governmental organizations in PTPA is presently about 10%, which will be increased to 50% or so when they will be restructured to Provincial Water Resources Council in the future. The Program concerning PTPA/PPTPA should be as follows:

Activation of PTPA/PPTPA (Program 6-5-3)

According to the Governor's Letter, PTPA/PPTPA should report regularly (every three month) or incidentally upon request to the Governor and the Minister of KIMPRASWIL

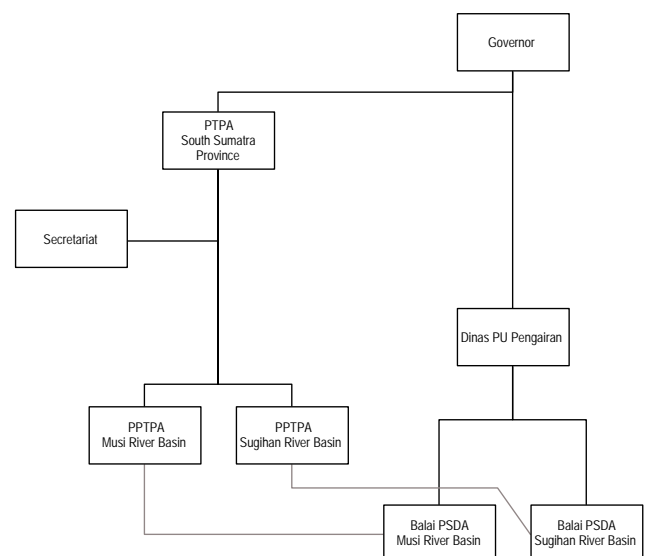


Figure 7.6.1 Structure of Water Resources Management Authorities

through the Director General of Water Resource. These reports also should be disclosed with using the Official Web Site (See Program 6-2-3). The structure of water resources management organizations at river basin is illustrated in **Figure 7.6.1**.

Water Users Association (WUA)

According to Government Regulation No.77/2001 (Irrigation), which is issued after the Irrigation Management Policy Reform (PKPI) in 1999, a Water Users Association (WUA) is a decision-making unit and main actor in irrigation management in its definite area. WUA bears obligation and responsibility in operation and maintenance (O&M) of irrigation system, coordinating with other water users when necessary. Budget for irrigation management is provided by member's fee as well as provision of funds from Central and Regional Governments.

As a result of the Irrigation Management Policy Reform, about 700 WUAs are established in 2000. Only 10 or so among them are evaluated as working well in 2002. All of good WUAs are those in pilot project areas that are supported by IWIRIP. On the other hand, it is reported that some WUA was working well at the beginning of establishment but stopped later. Due to low budget for facility construction from the government, the quality of the channel gates was not so preferable. WUA stopped working since it could not repair because the gates got damaged so frequently that WUA could not afford repairing cost with the result that it could not collect service fee from the members. Therefore, it is proposed as a component of Master Plan that:

Increase in Revenue of WUA by Increase in Income of Members by Enhancing Extension Activities (Program 6-5-4)

Extension activities include:

- Introduction of new variety with higher production
- Training of farmers on cropping pattern and techniques
- Training of officials of the management committee in WUA
- Introduction of micro credit system by which farmers can borrow money with limited interest

Coordination among Related Organizations

Establishment of Coordinating Network for Daily Works (Program 6-5-5)

Since PTPA/PPTPA are higher level organization for coordination on water resources management, it is required more practical level organization for coordinating daily and routine work in water management such as information collection/distribution, preparation and implementation of daily action plans among related organizations. This network is established in the official website as a *virtual* organization and also has an off-line quarterly meeting. Balai PSDA manages and maintains the virtual organization

and off-line meetings. Only the members of the network can access the website with password. Members are:

- Balai PSDA (Dinas PU Pengairan)
- Sub-service of Swamp, River and Water Resource Use (Dinas PU Pengairan)
- Sub-service of Spatial Plan and Programming (Dinas PU Pengairan)
- Sub-service of Irrigation Development & Utilization (Dinas PU Pengairan)
- Strategic Planning Division of BAPPEDA
- Sub-service of Crop Plantation and Horticulture (Service of Agriculture)
- Sub-service of Agricultural Facility & Infrastructure (Service of Agriculture)
- Sub-service of Program (Service of Ocean and Fishery)
- Sub-service of Geology and Mineral Resources (Service of Mining & Energy)
- Program Guiding section of BAPEDALDA
- Sub-service of Forest Protection (Service of Forestry)
- PDAM
- Meteorological and Geographical Agency (BMG)
- BAPPEDA of related District/Municipality
- PU Pengairan of related District/Municipality
- Cipta Karya of related District/Municipality
- Mining Service of related District/Municipality
- Forestry Service of related District/Municipality
- BAPEDALDA of related District/Municipality
- Industry & Trade Service of related District/Municipality
- Transportation & Communication Service of related District/Municipality
- Tourism Service of related District/Municipality

7.6.5 Human Resources Development Programs

Human Resources Development (Program 6-6) has been proposed as follows: Human resources development programs are tools for the realization of and/or assistance to the institutional development and organizational enhancement mentioned above. Training programs should be developed with the consideration of:

- Needs of the trainee's present and future job

- Trainee's present skills and enthusiasm (Enthusiasm is evaluated by the achievement of his/her past job.)
- Schedule and progress of institutional development and organizational enhancement

Programs are basically divided into two categories, those for government employees and those for non-government people including farmers and informal leaders.

Training Programs for Government Employees

Training for Operating Techniques for Government Employees of Balai PSDA (Program 6-6-1)

The following capabilities should be developed for the related employees:

- Business accounting
- GIS data management and operation
- Data sampling and chemical analysis
- Hydrological data analysis
- Operation and maintenance of water resources facilities
- Training skill for irrigation management and irrigation operation (Government officials are obliged to train WUA personnel)

Training for Management and Planning for Related Government Employees (Program 6-6-2)

The following capabilities should be developed for the related employees:

- Effective planning and implementation of water resources management
- Personnel management
- Project management
- Public relations and public consultation
- Administration of web server system

Training Programs for Non-Government People

Training for Operation & Maintenance of Irrigation System (Program 6-6-3)

The following capabilities should be developed for the management committee of WUA:

- Business administration
- Business accounting

- Cropping pattern
- Gate operation

Joint Training with NGOs to Informal Leaders and Selected People (Program 6-6-4)

The following trainings are planned and implemented in collaboration with related NGOs in order to develop capability of participation:

- Presentation and discussion skill
- Basics on water resources management
- Planning and implementation procedures of water resources management

7.6.6 Action Plan for the Proposed Programs

Objectives and Relations of Proposed Programs

The key to the certain and firm implementation of water resources management is the incentive of government employees in charge of water resources management. Nothing can be changed with any elaborated plans if they do not have incentives on their jobs. Thus, proposed programs should be structured to support and enhance their incentives on water resources management.

Structure of proposed programs is illustrated below. The new Law and Government Regulation on Water Resources Management (Draft) will be the foundation of water resources management.

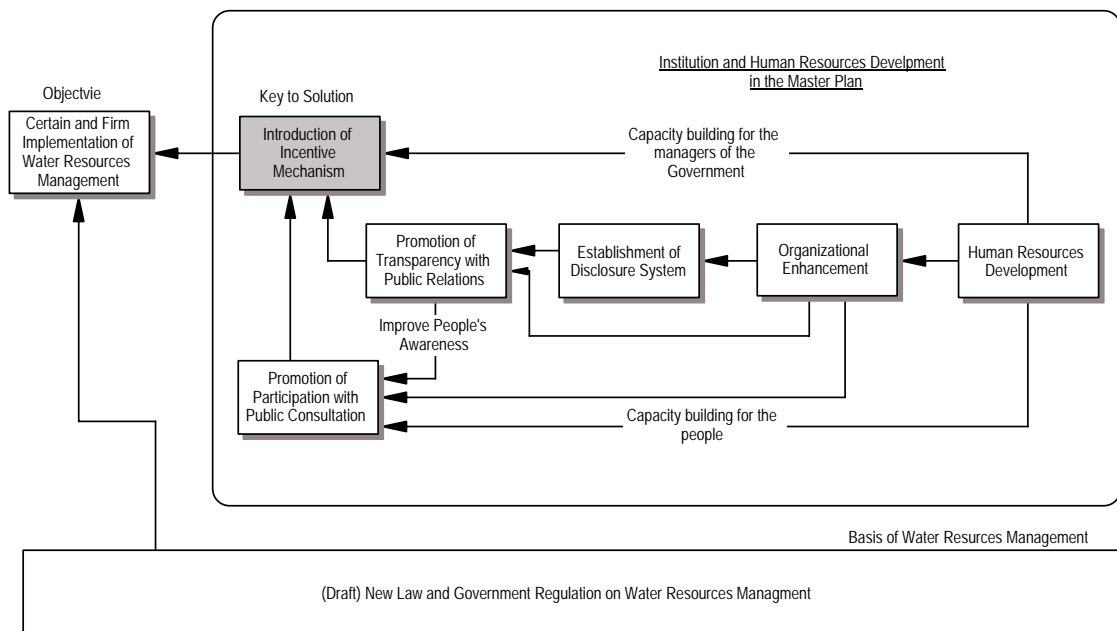


Figure 7.6.2 Structure of Proposed Programs

Implementation Authorities and Schedule

Implementation timing of a program is decided by its length of preparation time and relations with other programs. Generally, programs containing capacity building should start earlier since it takes comparably long time to finish human training. In addition, programs usually have preparatory period, test period and full operation period. Implementation timing is divided into *urgent*, which is prerequisite of other program, *next step*, which is implemented after the urgent program is implemented, and *third step*, which should be decided considering the operating conditions of the next step program.

An implementing authority of a program is decided by regulations or decrees. Usually, it is Dinas PU Pengairan or Musi Balai PSDA if it is not decreed otherwise. In addition, even if a regulation stipulates other higher authority for the responsibility, namely Governor or so, Dinas PU Pengairan has to present an initiative of the series of activities.

Figure 7.6.3 shows the implementation schedule.

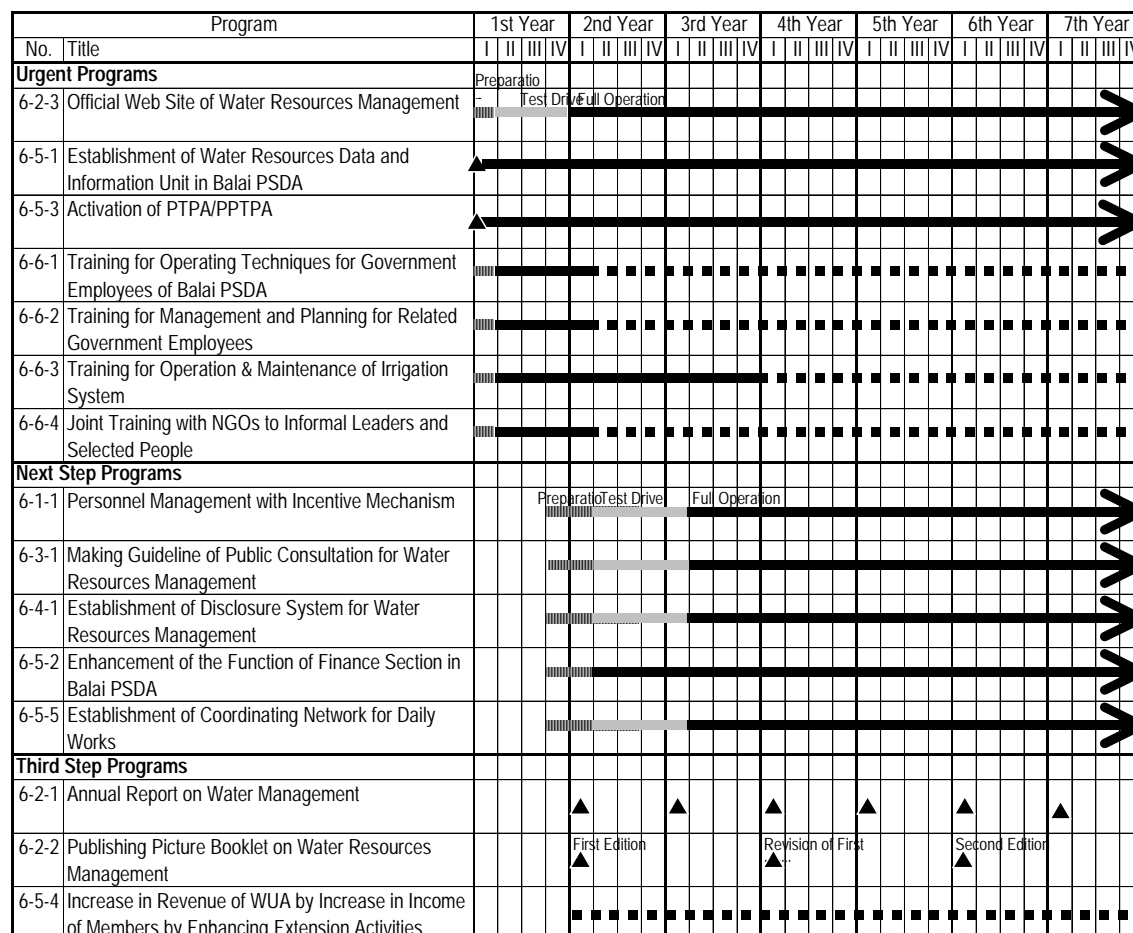


Figure 7.6.3 Program Implementation Schedule

7.6.7 Priority Programs

Selection Method

These criteria are decided, taking into consideration that institutional strengthening is a basis of program implementation in other Master Plan components. Priority programs are selected with the following three criteria for institutional strengthening:

- Their implementation is required by regulations;
- Their implementation is a prerequisite of other programs; or
- They are ready to be implemented.

Evaluations are made by attributing 5 points to high priority programs, 3 points to middle priority programs and 1 point to low priority programs concerning each criterion, and these scores were summed up for each program. If the total score exceeds 10 points, the program is selected as a priority program. This means that a program is selected if it has high priority with at least two criteria and that it is not selected if it has only middle priority with all the three criteria.

Results of Priority Evaluation

Proposed programs have been evaluated as shown in **Table 7.6.2**.

Table 7.6.2 Selection of Priority Program

No.	Program Title	Required by Regulation	Prerequisite of Others	Ready to Be Implemented	Total
6-1	Introduction of Incentive Mechanism				
6-1-1	Personnel Management with Incentive Mechanism	1	5	1	7
6-2	Promotion of Transparency with Public Relations				
6-2-1	Annual Report on Water Resources Management	3	1	3	7
6-2-2	Publishing Picture Booklet on Water Resources Management	1	1	3	7
6-2-3	<i>Official Web Site of Water Resources Management</i>	1	5	5	11
6-3	Promotion of Participation with Public Consultation				
6-3-1	Making Guideline of Public Consultation for Water Resources Management	1	1	3	5
6-4	Establishment of Disclosure System				
6-4-1	Establishment of Disclosure System for Water Resources Management in Balai PSDA	3	3	3	9
6-5	Organizational Enhancement				
6-5-1	<i>Establishment of Water Resources Data and Information Unit in Balai PSDA</i>	3	5	3	11
6-5-2	Enhancement of the Function of Finance Section in Balai PSDA	3	3	3	9
6-5-3	<i>Establishment of PTPA/PPTPA as Soon as Possible</i>	5	5	5	15

No.	Program Title	Required by Regulation	Prerequisite of Others	Ready to Be Implemented	Total
6-5-4	Increase in Revenue of WUA by Increase in Income of Members by Enhancing Extension Activities	1	3	3	7
6-5-5	Establishment of Coordinating Network for Daily Works	1	5	3	9
6-6	Human Resources Development				
6-6-1	<i>Training for Operating Techniques for Government Employees of Balai PSDA</i>	3	5	5	13
6-6-2	<i>Training for Management and Planning for Related Government Employees</i>	3	5	5	13
6-6-3	<i>Training for Operation & Maintenance of Irrigation System</i>	1	5	5	11
6-6-4	<i>Joint Training with NGOs to Informal Leaders and Selected People</i>	1	5	5	11

(Note) Score 5: High Priority; Score 3: Middle Priority; Score 1: Low Priority
Italic: Priority Program with Total Score >10.

7.6.8 Preliminary Study on Institutional Arrangements for the River Basin Water Management

Objectives of the Preliminary Study

Institutional issues have been discussed in this section so far with the assumption that the main management organization of the Musi River Basin is Musi Balai PSDA, which is a "pure" governmental organization, being strictly controlled by Dinas PU Pengairan or Provincial Government. Recently, more and more developing countries as well as developed ones are trying to introduce private participation into the provision of public services for the purpose of improving efficiency and accountability of the provision. In this chapter, institutional arrangements for the water management of Musi River Basin are examined with very basic viewpoints in order to present some issues of private participation for the further discussions.

Review on PJT I (Jasa Tirta Public Corporation) of the Brantas River Basin

PJT I (Jasa Tirta Public Corporation) of the Brantas River Basin has been reviewed since it is a typical public corporation for the river basin management in Indonesia.

Master Plan

The Brantas River is the second largest river in Java Island with its catchment area of about 11,800 km². It functions as the most important source of water supply in the East Java Province. As almost all the water of the Brantas River had been utilized in dry season, measures for enhancing water supply in good quality had been required in the middle of 1990s. A master plan for the comprehensive water resources management in the Brantas River basin had been formulated in 1998, which recommends the following institutional setup: (JICA, "The Study on Comprehensive Management Plan for the Water Resources of the Brantas River Basin, Final Report," 1998.)

- The Ministry of Public Works (the then) shall be primary responsible for supervising the water resources management in the Brantas River basin while PJT I (Perum Jasa Tirta = Jasa Tirta Public Corporation) shall be responsible for its implementation;
- The Basin Water Resources Management Committee shall be newly established;
- The New PJT I shall be established in 2002 through consolidating Brantas River Basin Development Project, Volcanic Disaster Prevention Project, and PJT; and
- The New PJT I shall be transformed to get more privatized status (Persero) in 2005 subject to introduction of self-supporting financial system.

Conditions of PJT I of the Brantas River Basin

Mr. Rusfandi Usmam, President Director of PJT I, reveals conditions of PJT I of the Brantas River basin in his article *"Integrated Water Resource Management: Lessons from Brantas River Basin in Indonesia, 2001"* as follows (Parenthetic descriptions are comments made by JICA Study Team):

- To manage the basin, many institutions are concerned, and each has their sectoral responsibility. But co-ordination among sectors may be difficult in some situations, because each sector has previously had its own plan, strategies and objectives. (It seems that the river basin management had not been fully integrated into one body i.e. PJT I as of 2001.)
- The investment in new infrastructures, and the operation and maintenance cost are too huge to be covered by the government budget. It is necessary to increase participation of beneficiaries and the private sector in water resources investment and in the cost of operating and maintaining the infrastructures. (Funding of the Brantas River management depended highly on the Government budget. Contributions were not expected from beneficiaries as of 2001 as follows)
- Contributions from water users are not collected because projects are not authorized to collect these contributions. It is necessary to transfer the operation and maintenance of finished structures to a body that is duly authorized to collect contributions (PJT I). (Though the reason why the operation and maintenance had not been transferred to an authorized body or PJT I is not clear, it can be thought that there were no agreements on the way how the operation and maintenance would be transferred with projects which would be restructured after the transfer.)
- The cost for operation and maintenance activities will be collected by PJT I from the beneficiaries. For the time being, the main source of funds will be from electricity, drinking water and industries. (It means that the Government has to bear the costs if there are no power plants and/or industries that are large enough to bear the costs in the river basin like the Musi River Basin.)
- There is no obligation for farmers to pay water charges, although more than 80% of water use in the Brantas River is for irrigation purposes. The government now is introducing a pilot project of Irrigation Service Fee in several provinces around

Indonesia. The purpose is to show the farmers the importance of adequate budget to support the O&M of irrigation facilities. (There are two points to be mentioned. Firstly, we may have to wait for a long time until farmers will begin to pay irrigation fees. Secondly, it would be very difficult to reach an agreement on the contributions between the Government and beneficiaries other than farmers because the largest part of beneficiaries i.e. farmers do not pay contributions.)

Issues on Institutional Arrangements with Private Participation in the case of the Musi River Basin

Providing that the improvement of efficiency and accountability with introducing private participation, however low its degree is, market incentives are required to a certain extent. Since the water management is a public service, market incentives can be realized when the following conditions are fulfilled: namely, creating competition, developing effective participation, reducing risks, effective regulation, appropriate pricing, investment planning. Considering the above discussion, the most appropriate institution for the management of the Musi River Basin is thought to be Musi Balai PSDA.