

7.4.4 Trunk Drainage Channels Rehabilitation

Maintenance of trunk drainage channels, primary and secondary channels, is under the responsibility of Dinas Kimpraswil of Kota Palembang. There are a total of 19 drainage systems in Palembang Municipality. Though the trunk channels have been improved in major drainage basins in the City center, deterioration of the facilities and deposition of mud are identified in almost all channels. Due to the lack of budget, proper maintenance for the existing drainage channels have not been conducted. Strengthening of the capability of the regular maintenance of the structures shall be a prerequisite to the new construction of the facilities. **Trunk Drainage Channels Rehabilitation Program (Program 4-3)** has thus been proposed.

The objective is to establish the system for the drainage system rehabilitation. Drainage system improvement proposed in the **Program 4-4** can be implemented when such rehabilitation system is established and start functioning. Dinas Kimpraswil of Kota Palembang is the leading agency for this program. Rehabilitation program consists of excavation of garbage and mud and rehabilitation of trunk drainage channel (primary and secondary drainage channel). This program improves capacity of drainage channels and sanitary condition, and scenery in the city.

7.4.5 Drainage System Improvement Program

One of the water environment problems in urban area is storm water inundation. The detailed study has been conducted to minimize storm water inundation in Palembang. The Study Team examined the present capacity, degree of inundation damage, and urgency of improvement of existing 19 drainage systems in Palembang Municipality. **Drainage System Improvement Program (Program 4-4)** include two drainage systems for early implementation.

Improvement Plan for Drainage System 6

Present channel alignment has not been changed in the proposed plan. Design discharge distribution of Bendung channel for the design scale of 15-year return period is shown in **Figure 7.4.2**.

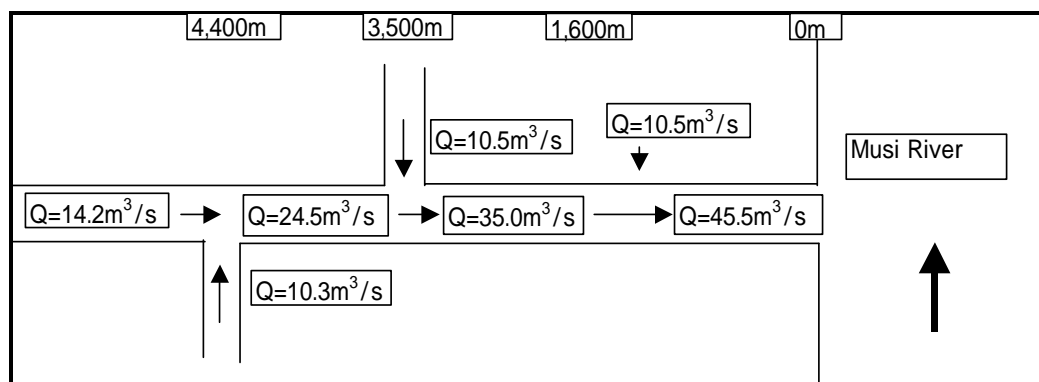


Figure 7.4.2 Design Discharge Distribution of Bendung Channel

Alternatives for channel improvement have been studied and Alternative-2 that proposes excavation of channel bed by 1 m in average and smoothing of the longitudinal profile has been selected. Stone masonry protection works are employed to protect the existing revetment. Proposed profile is in **Figure 7.4.3**.

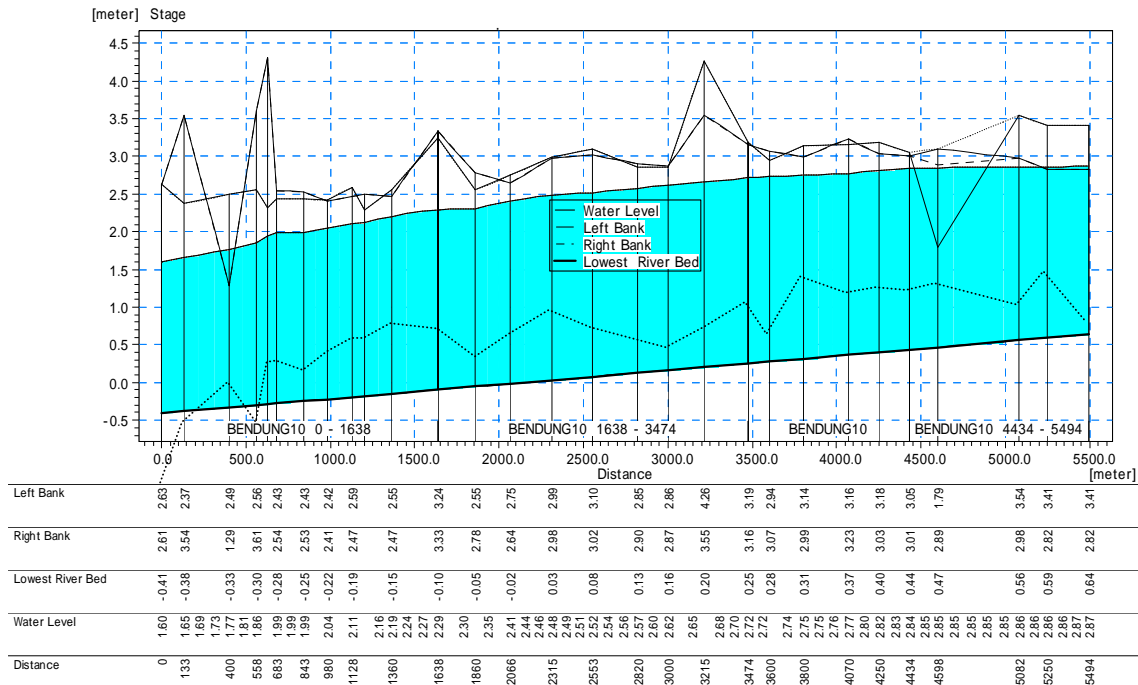


Figure 7.4.3 Proposed Profile for Bendung Channel Improvement

An average depth of 1.0 m and the total length of 8,990 m including branch channel give the total dredging volume at 110,000m³. Stone masonry works is about 32,400 m³. Alternative-2 has finally been selected for the proposed plan.

Improvement Plan for Drainage System 8

Present channel alignment has not been changed in the proposed plan. Design discharge distribution of Buah Channel for the design scale of 15-year return period is shown in **Figure 7.4.4**.

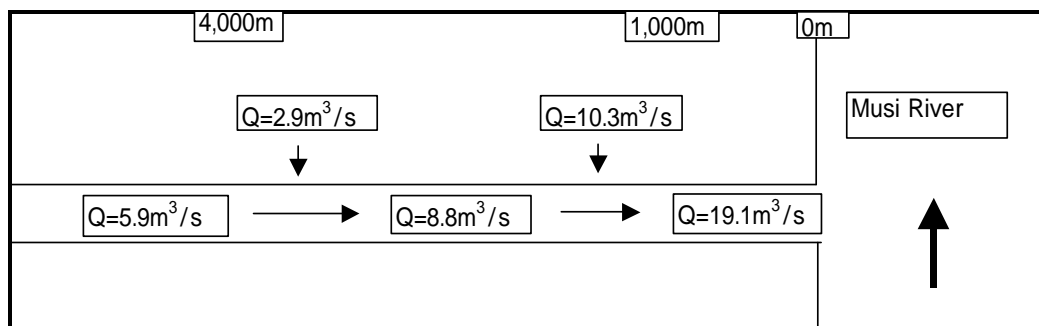


Figure 7.4.4 Design Discharge Distribution of Buah Channel

Alternative improvement plans have been studied and Alternative-3 has been selected. In this alternative, channel bed excavation at the mouth of the channel, excavation of

channel bed by 0.5 m in average for smoothing of the longitudinal profile, and channel wall heightening at critical location were proposed. Work volume is as follows: For 0.5 m depth of dredging and total length reaches of 6,400m from river mouth toward upstream, the dredging volume is turned out to be 25,000m³; Stone masonry protection works are employed to protect the existing revetment. The works volume is about 6,800m³; 0.5m heightening: 1,400m length, 420m³ concrete volume. Proposed profile is shown in **Figure 7.4.5**.

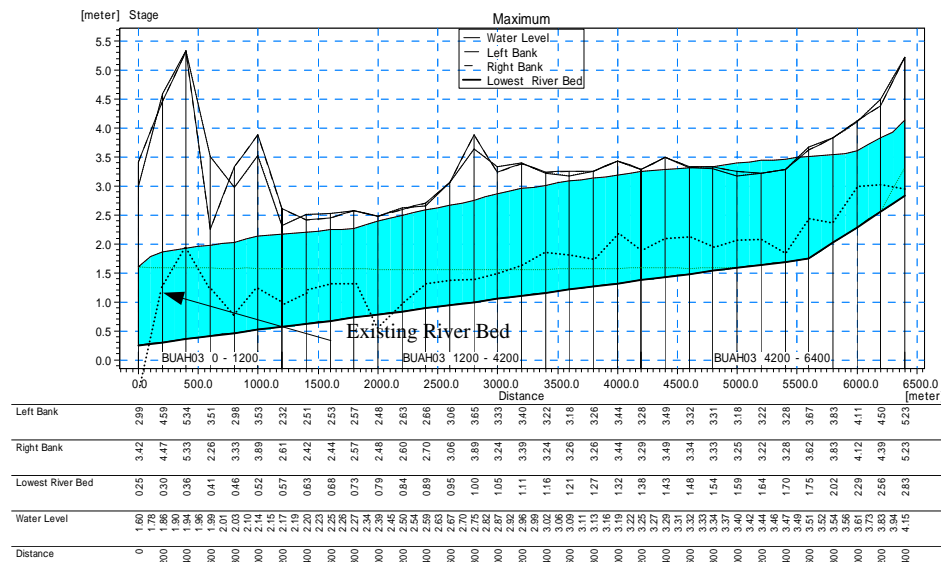


Figure 7.4.5 Proposed Profile for Buah Channel Improvement

7.4.6 Selection of Priority Programs

Priority programs have been selected through the same procedure with Component 1 as shown in **Table 7.4.1**. As a result Program 4-1: Community drainage management and Program 4-3: Trunk drainage channels rehabilitation have been selected as priority programs for Component 4.

Table 7.4.1 Priority Program Selection for Component 4

Program	Pre-requisite	Seriousness	Early Start	Cost Sscale	Total Score	Rank
4-1 Community drainage management	3	5	5	5	18	1
4-2 Riverine areas conservation	1	3	3	5	12	3
4-3 Trunk drainage channels rehabilitation	3	5	5	3	16	2
4-4 Drainage system improvement	3	3	3	3	12	3

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.

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

Hydrological monitoring in the Musi River Basin can be broadly divided into two for the purpose of the data use, namely; local phenomena (short-term spot data) for flash 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

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. 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.

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

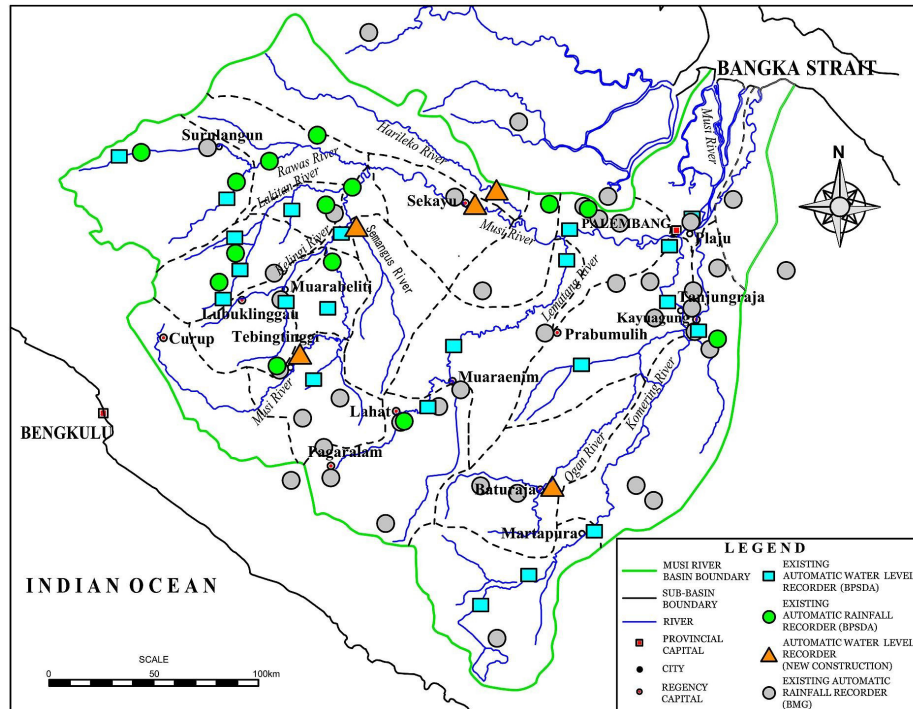


Figure 7.5.1 New Instillation of Water Level Gaging Stations

Although one of the major issues of the Musi River Basin is erosion and sedimentation, there is not enough accumulation of sediment discharge data. Available observed sediment load is only for Upper Komering River in 1986-87. Periodical and continuous sediment discharge monitoring for the whole basin is needed.

Data Storage

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.

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.

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 has 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.

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. Rehabilitation of monitoring facilities shall include; improvement of climatology station; improvement of rainfall recorder; and improvement of river water level recorder with staff gages (for detail, see Sector G of Supporting Report).

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** as discussed below. 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; and, River sediment discharge measurement.

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

The past water quality monitoring does not sufficiently cover the whole Musi River Basin. 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 7.5.1**). The monitoring points are widely scattered in the whole Musi River Basin, and the actual river water conditions can be estimated.

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.

Table 7.5.1 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	5.4	Desa Pular	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		Palembang	6.1	Jembatan Ampera
	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
	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				

Sampling Number and Necessary Parameters

The water quality analysis should cover the 45 parameters specified in the water quality standards. **Table 7.5.2** shows the recommended parameters and sampling interval.

Table 7.5.2 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 Didrin, 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.

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.

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 7.5.1** and 10 locations in tidal swamp areas
- Monitoring Interval: Sampling and laboratory test interval by parameters as shown in **Table 7.5.2**.
- 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. Necessary equipment for laboratory and monitoring work is shown in Sector E of Supporting Report.

Monitoring (Program 5-2-4)

Water quality monitoring work shall be conducted following the proposed monitoring program. 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:

- 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)
- Use of water for daily basic needs can be carried out by anyone without permit. (Article 79)
- 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)
- 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:

- 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
- 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

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 7.5.3 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

7.5.6 Prioritization of the Programs

Priority programs have been selected through the same procedure with Component 1 as shown in **Table 7.5.4**. As a result Program 5-1: Hydrological monitoring system establishment, Program 5-2: Water quality monitoring system establishment, and Program 5-4: Hydrological database establishment program have been selected as priority programs for Component 4.

Table 7.5.4 Priority Program Selection for Component 5

Program	Pre-requisite	Seriousness	Early Start	Cost Scale	Total Score	Rank
5-1 Hydrological monitoring system establishment	5	5	5	3	18	2
5-2 Water quality monitoring system establishment	5	5	5	1	16	3
5-3 Water use monitoring	3	3	3	3	12	4
5-4 Hydrological database establishment	5	5	5	5	20	1

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.

7.6.2 New Governmental Regulation on Water Resources Management (Draft)

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. Detailed have been examined in detail before the formulation of the program.

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. 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.

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.

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.

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.

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

New Government Regulation (Draft) requires public consultation at various phases. 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. 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.

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. 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 structure is shown in **Figure 7.6.1**. The percentage of members from non-governmental organizations 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:

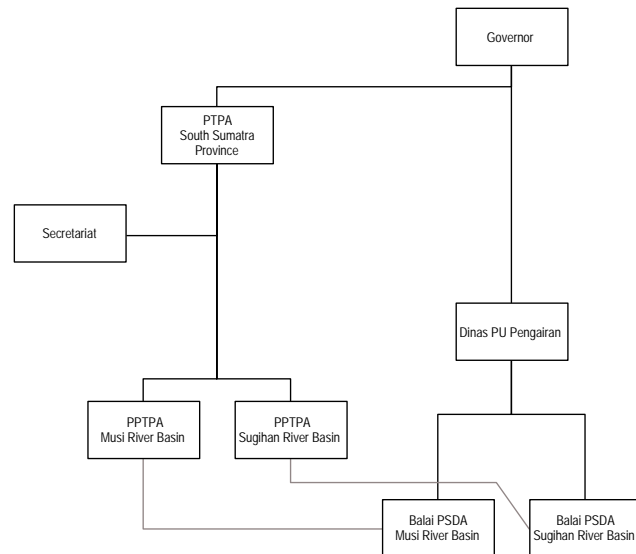


Figure 7.6.1 Structure of Water Resources Management Authorities

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 through the Director General of Water Resource. These reports also should be disclosed with using the Official Web Site (See Program 6-2-3).

Water Users Association (WUA)

According to Government Regulation No.3/2001 (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 shall include all the related personnel for the basin management.

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 capabilities, e.g. 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) should be developed for the related employees.

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

The capabilities, e.g. effective planning and implementation of water resources management, personnel management, project management, public relations and public consultation, and administration of web server system should be developed for the related employees:

Training Programs for Non-Government People

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

The capabilities, e.g. business administration, business accounting, cropping pattern, and gate operation should be developed for the management committee of WUA:

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

The training, e.g. presentation and discussion skill, basics on water resources management, and planning and implementation procedures of water resources management are planned and implemented in collaboration with related NGOs in order to develop capability of participation:

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. Proposed programs should be structured to support and enhance their incentives on water resources management. Structure of proposed programs is illustrated in **Figure 7.6.2**. The new Law and Government Regulation on Water Resources Management (Draft) will be the foundation of water resources management.

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.

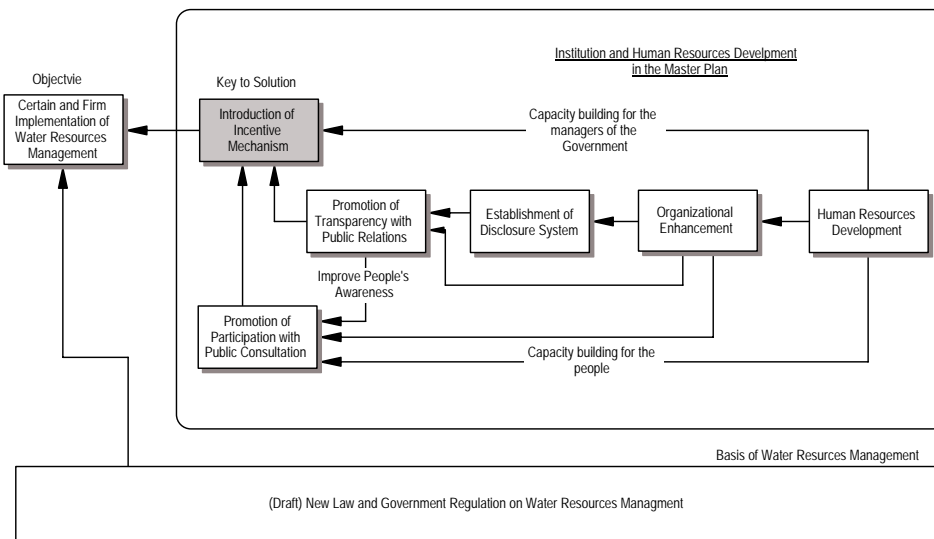


Figure 7.6.2 Structure of Proposed Programs

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.

7.6.7 Priority Programs

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.

Evaluation has been made as shown in **Table 7.6.1**. 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.

Table 7.6.1 Priority Program Selection for Component 6

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>	<i>1</i>	<i>5</i>	<i>5</i>	<i>11</i>
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>	<i>3</i>	<i>5</i>	<i>3</i>	<i>11</i>
6-5-2	Enhancement of the Function of Finance Section in Balai PSDA	3	3	3	9
6-5-3	<i>Activation of PTPA/PPTPA</i>	<i>5</i>	<i>5</i>	<i>5</i>	<i>15</i>
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>	<i>3</i>	<i>5</i>	<i>5</i>	<i>13</i>
6-6-2	<i>Training for Management and Planning for Related Government Employees</i>	<i>3</i>	<i>5</i>	<i>5</i>	<i>13</i>
6-6-3	<i>Training for Operation & Maintenance of Irrigation System</i>	<i>1</i>	<i>5</i>	<i>5</i>	<i>11</i>
6-6-4	<i>Joint Training with NGOs to Informal Leaders and Selected People</i>	<i>1</i>	<i>5</i>	<i>5</i>	<i>11</i>

(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

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.

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. The most appropriate institution for the management of the Musi River Basin is thought to be Musi Balai PSDA.