3.9 Water Use

3.9.1 Estimation of Present Consumptive Water Use

In this Study, the water uses in the Basin are classified into: domestic, industrial, mining, irrigation, swamp, aquaculture, tourism, livestock, hydropower, inland transport and environmental. These water uses are also classified into consumptive water uses and in-stream water uses (non-consumptive one). In this sub-section, present conditions of consumptive water uses are discussed.

Domestic Use

In 1998, the water supply in South Sumatra Province became under the responsibility of regencies and municipalities. Before this, the water supply infrastructure was constructed under the "Clean Water Supply and Management Project of South Sumatra Province (P3AB)". The financial source of this Project was Provincial Government Resources and Expenditure Budget (APBD). The constructed infrastructures were PDAM systems, IKK systems and village systems. These systems were operated and maintained by PDAM and Regional Water Management Board (BPAM) using collected water charges.

In accordance with the decentralization, P3AB changed its name to the "Project for Development of Infrastructure and Facilities in Living Area (P2SP)" in 1997. P2SP is under CIPTA KARYA using APBD as priority fund. Under P2SP, PDAM systems have been constructed. The IKK systems and village systems were handed over to regencies and municipalities after the decentralization. PDAM systems as well as IKK and village systems are operated and maintained by regional PDAM using collected water charges. However, many village systems do not produce clean water at present.

In addition to above P2SP, the water supply systems were also constructed under INPRES. Therefore, the existing water supply systems are PDAM, IKK and INPRES substantially. Population of rural and remote areas, where those systems do not cover, obtain their water from wells, rivers and rainfall at present.

Based on the collected data and information, the characteristics of the present water use in each regency/municipality are analysed. In the Basin, the service ratios are low with the highest ratio of 31% at Palembang. On the other hand, per capita daily use of household connections (PCDU) ranges from 91 l/p/d (Lahat) to 210 l/p/d (Palembang). The results of analysis are as in **Table 3.9.1**. The total domestic water use in the Musi River Basin in the year 2000 was estimated at 93.6 million m^3/year.

Table 3.9.1 Present Domestic Water Use in the Province, 2000

Item	OKU	OKI	Muara Enim	Lahat	MURA		PLB	Rejang Lebong
Service Ratio (%)	5	3	9	7	8	1	31	17
PCDU (l/p/d)	110	110	126	91	112	163	210	100*

Note: PCDU (Per Capita Daily Use) *: Assumption (average of Lahat and MURA)

Industrial Use

The manufacturing industries, the major water consuming industry, in South Sumatra Province are classified into two categories, (i) Large and Medium Scale industries, (ii) Small Scale industries and handicraft. Major categories with number of workers more than 1,000 are; (i) Woods and the products of woods (excluding the furniture), (ii) Foods and beverages, (iii) Chemistry, (iv) Latex, and (iv) Furniture and other processing. In 2000, the numbers of establishments and persons engaged of Large/Medium scale manufacturing industries in the Province were 179 and 45,499 (254.2 person per establishment), respectively. The numbers of establishments and persons engaged in Small Scale industries were 37,230 and 121,295 (3.3 person per establishment), respectively.

There are no statistics of the industrial water use in the Basin. Industrial water use volume was estimated based on the retributions on industrial water use that was investigated from UPTD. Total industrial water demand in the year 2001 was estimated at 365 million m^3/year.

Mining Use

The mining and quarrying sector gives high contribution to the provincial economy, e.g., natural gas for urea industry, coal for the electricity production, and crude oil for petroleum industry production. There are no statistics of the mining water use. The mining water use demand was estimated based on the questionnaire survey at 115 million m^3/year for the year 2001.

Irrigation Use

According to the Irrigation Design Criteria of Indonesia, 1986, the irrigation systems can be classified into three categories, as in **Table 3.9.2**. These systems fall in PU systems. Non-PU systems are communal irrigation systems.

Table 3.9.2 Classification of Irrigation Systems in Indonesia

Item	System Classification		
	Technical	Semi Technical	Simple
Main Canal	Permanent	Permanent or semi-permanent	Temporal
Measuring Device	Good	Ordinal	Bad
Canal System	Separate	Incomplete separate	Irrigation-cum-drainage
Tertiary Canal	Exist	No or partial exist	No exist
Irrigation Efficiency	50 – 60 %	40 – 50 %	Less than 40 %
Scale	No limit	Up to 2,000 ha	Less than 500 ha

Source: Irrigation Design Criteria of Indonesia, 1986

In 2000, the total harvested irrigation area was 77,804 ha in the Musi River Basin in South Sumatra Province, which consisted of 60,079 ha with 2 cropping paddy and 17,725 ha with 1 cropping paddy. Those in Rejang Lebong, Bengkulu Province in the Basin are 1,563 ha (double cropping of 1,537ha and single cropping of 26ha). The total in the Musi River Basin is thus calculated at 79,367ha consisting of double cropping of

61,616ha and single cropping of 17,751ha. As shown in the following table, the situations were almost stable from 1996 to 2000 except in 1998. The total harvested area in 1998 was considerably small in comparison with the others due to the severe drought that hit overall Indonesia.

Table 3.9.3 Harvested Irrigation Area in South Sumatra Province

Category	Irrigation Area (ha)				
	1996#)	1997#)	1998##)	1999##)	2000##)
2 Cropping	57,048	55,319	31,211	57,659	60,079
1 Cropping	19,042	21,828	7,077	24,020	17,725
Total	**76,090**	**77,147**	**38,288**	**81,679**	**77,804**

Source: #) Sumatera Selatan Dalam Angka Tahun 1998, Dinas Pertanian Tanaman Pangan
##) Statistic Tanaman Pangan 2000

The irrigation water requirements are estimated based on consumptive use of crop (ET crop). ETcrop is computed, as follows:

$$ETcrop = Kc \times ETo$$

Where, ETo is the evapotranspiration of the reference crop and Kc is crop coefficient.

Other factors were determined as follows: The cropping periods and patterns are determined based on the questionnaire survey and existing reports. The average ETo in the Basin throughout the year at 4 mm/day was applied to this Study. Crop Coefficient (Kc) of 1.10 was adopted throughout the year. Land preparation is for soil saturation and initial water layer establishment, and normal value of 200 mm was applied. A daily percolation rate of 4 mm is assumed for percolation and seepage losses. Referring to the design criteria, 50 % of the mean monthly rainfall with a return period of five years, namely, 90 mm/month in rainy season and 45 mm/month in dry season, was considered as effective rainfall. Diversion requirements (DR) refer to the quantity of water needed at the diversion point from river et al, considering irrigation efficiency of Ei as: DR = IR / Ei.

The irrigation water requirement of each irrigation type is estimated, as shown in **Table 3.9.4**. Total irrigation water demand in the year 2000 was thus estimated at 2,758 million m^3/year.

Table 3.9.4 Irrigation Water Requirement by Irrigation Type

Irrigation Type	Irrigation Efficiency	Season	Cropping Period (Month)	Field Water Req. (mm/year)	Diversion Req. (mm/year)
Technical	0.6	Rainy	4	848	1,413
		Dry	4	1,028	1,713
Semi Technical	0.5	Rainy	4	848	1,692
		Dry	4	1,028	2,056
Simple & Communal	0.4	Rainy	4	848	2,120
		Dry	4	1,028	2,570

Swamp Area Use

Major consumptive water uses of the swamp areas accrue from paddy cultivation. On the other hand, water supply to transmigration farmers in the tidal swamp areas is recognized as one of the most serious problems.

Swamp area of the Basin comprises non-tidal swamp and tidal swamp. Non-tidal swamp is seasonally flooded swamp of the river flood plain. Water management is practised by construction of bunds parallel to the rivers in order to maintain cultivated area flooded when the water level recedes. Tidal swamp locates in the coastal area, and the areas are irrigated and drained by tide through canal networks.

The harvested areas in swamps in South Sumatra Province from 1996 to 2000 are as follows:

Table 3.9.5 Harvested Area in Swamp in South Sumatra Province

Category	Irrigation Area (ha)				
	1996#)	1997#)	1998##)	1999##)	2000##)
2 Cropping	8,709	14,372	31,807	10,403	9,039
1 Cropping	257,638	260,049	150,389	274,329	258,458
Total	**266,347**	**274,421**	**182,196**	**284,732**	**267,497**

Source: #) Sumatera Selatan Dalam Angka Tahun 1998, Dinas Pertanian Tanaman Pangan
##) Statistic Tanaman Pangan 2000

Following the same method as the irrigation water requirement, and applying percolation rate at 1 mm/day and the irrigation efficiency at 0.8 considering the condition in the swamp, diversion water requirement was calculated as follows:

Table 3.9.6 Water Requirement in Swamp Paddy

Irrigation Type	Irrigation Efficiency	Season	Cropping Period (Month)	Field Water Req. (mm/year)	(mm/year)
Non-tidal and tidal swamp	0.8	Rainy	5	560	700
		Dry	5	785	981

The present paddy water use in swamp areas in the Musi River Basin was calculated at 920 million m^3/year, and that in the whole South Sumatra Province was at 1,961 million m^3/year.

The total population of transmigration farmers in tidal swamp area of South Sumatra Province is around 432,800 persons with 105,300 families, showing average family size of 4.1 persons (as of 2002). Domestic water sources for those farmers are rainwater, surface water (rivers, canals and from forests), shallow groundwater, and buying/transport water. Rainwater is collected on homestead roofs (average 30 m^2) to obtain drinking water. Collected water is stored in steel drums (200 liters each, frequently oil drums lined with plastic sheet). A family with 4-5 persons possesses 2-4 drums to store rainwater. In the wet season, there is no shortage of clean water from the roof catchments. The collection capacity of this system is inadequate to ensure a supply

of drinking water throughout the dry season. Tanks are dry for months during the dry season, and this recourses farmer to shallow well or canal water. In saline intrusion areas, those supplementary sources are not usable.

Aquaculture Use

Based on the questionnaire survey, the major kinds of the fishes are; *patin, gold fish, nila, gurame, mas, lele dumbo and toman*. The water sources are rivers, springs, wells, rain and irrigation systems. The methods of the aquaculture are of ponds, paddy fields, cages and fences. Aquaculture water demand in the year 2001 was estimated at 504 million m^3/year.

Tourism Use

The total numbers of domestic and foreign visitors arrived to the Province in 2001 was 260,479 and 18,584 persons, respectively. Those to Rejang Lebong, Bengkulu Province in 2000 were 13,089 and 27 persons, respectively. Based on these figures and assuming the average staying duration at two days, total water use by tourists in the year 2001 was estimated at 149,000 m^3/year.

Livestock Use

The major kinds of livestock are *milk cow, cow, buffalo, horse, goat, sheep, pig, poultry and duck*. Livestock water demand in the year 2001 was estimated at 14.9 mcm.

Hydropower Use

Water use for hydropower is in-stream use unless it is inter-basin diversion. There exist not many hydropower stations in the Musi River Basin. There are several micro-hydropower stations in the basin. Musi Hydropower Station is a large-scale hydropower station and presently under construction.

Electrification in rural areas where are not covered by PLN trunk network is important to promote economic activities and social welfare in these areas. Rural electrification in South Sumatra Province is conducted both by PLN and Energy Development and Mine Services, South Sumatra Province. Rural electrification by PLN is called as Village Electricity. Energy Development and Mine Services, South Sumatra Province is promoting rural electrification by micro hydropower stations. Existing and operating micro hydropower stations are three in number with installed capacity between 10-30 kW. A total of 16 micro hydropower station sites were identified as potential sites in the Province with installed capacities of mainly from 40 to 1,000 kW.

Musi Hydroelectric Power Project (Musi Hepp) is a run-of-river type scheme, and is under construction. The installed capacity of the project will be 210 MW (= 70 MW × 3 units), and annual energy is expected at 1,120 GWh harnessing a gross water head of 406 m. The power generation of Musi Hepp is planned with the 95% dependable firm discharge of 15.5 m^3/s, and its plant discharge for three units is designed at 62.0 m^3/s under the conditions of six hours of peak generation period per day. The water for the

hydropower will be diverted from the Musi River with drainage area 587 km^2, in Rejang Lebong Regency, Bengkulu Province, and released to the Simpangaur River, finally discharging into Indian Ocean. The commercial operation will start at January 2006. Annual average of 897 million m^3 water will be diverted outside of the Musi River Basin.

Total Consumptive Water Use

Present consumptive water uses of the Basin are summarized as follows:

Table 3.9.7 Present Consumptive Water Uses of the Basin

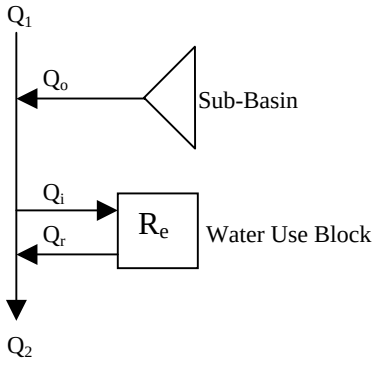
Water Use	Volume (million m^3/year)	Ratio to Total (%)
Domestic	93.6	2.0
Industrial	364.7	7.7
Mining	115.4	2.4
Irrigation	2,757.6	57.8
Swamp Area	920.3	19.3
Aquaculture	504.0	10.6
Tourism	0.15	0.0
Livestock	14.9	0.2
Hydropower	0.0	0.0
Total	**4,772.7**	**100.0**

3.9.2 Water Balance Model

Water balance model of the Basin comprising 22 sub-basins and 22 water use blocks has been established in the Study. These sub-basins correspond to the basin division of hydrological analysis of this Study, and outflow from each sub-basin is generated by the hydrological analysis. Each sub-basin corresponds to its water use block. Water balance is calculated at each sub-basin using those outflow and water uses. Principle formula of the water balance is, as follows:

$$Q_2 = Q_1 + Q_o - Q_i + Q_r$$
$$D_e = (R_e - Q_1 - Q_o) > 0.0$$

Where,
- : Q_2 = discharge after water consumption
- : Q_1 = inflow to sub-basin
- : Q_o = generated natural outflow from sub-basin
- : Q_i = intake flow for water consumption
- : Q_r = return flow (assumed as 20% of paddy water)
- : R_e = required water uses
- : D_e = deficit



Typical Sub-Basin Model

3.9.3 Present Water Balance

Water balance under the present water uses and management (as of 2001) has been simulated for 15 years. Although not considerable level, water deficits occur 5 times in

15 years at Upper Komering, where commanding Komering Irrigation Project. These deficits can be solved by water supply from Lake Ranau (effective capacity: 254 million m^3). Based on the water balance, the ratio of present water use to potential surface water of the Basin is estimated, as follows:

Table 3.9.8 Present Water Balance

Item	Value
(1) Present Water Requirement (MCM/yr)	4,772.7
(2) Present Water Deficit	5.9
(3) Present Water Use: (1)-(2)	4,766.8
(4) Potential Surface Water:	73,700
(5) Present Water Use Ratio: (3)/(4)	6.5%

3.9.4 Projection of Consumptive Water Uses to the Target Year

Consumptive water uses, other than irrigation and swamp area, are projected in this section. Tourism and livestock water uses were excluded because of their small quantities. The results are as follows:

Table 3.9.9 Consumptive Water Demand in the Basin (million m^3/year)

Sector	Present	2005	2010	
Domestic	93.6	141.0	190.0	296.0
Industrial	365.0	405.0	462.0	602.0
Mining	115.0	133.0	159.0	226.0
Aquaculture	504.0	652.0	743.0	798.0
Hydropower	0.0	0.0	898.0	898.0
Tourism & Livestock	15.1	-	-	-
Total	**1,092.7**	**1,331.0**	**2,452.0**	**2,820.0**

3.9.5 Potential Land Resources

Potential land resources have been identified in order to estimate development potential in South Sumatra Province and the Musi River Basin, by system (technical irrigation area, semi technical irrigation area, simple irrigation area, communal irrigation area, and rainfed) and by status of development as shown in **Table 3.9.10**.

Table 3.9.10 Classification of Potential Irrigation Area ('000ha)

System	Classification	Province	Basin *
	Functioned	34.3	
	Non optimal	0.0	
	With primary network & non paddy	0.2	
	No primary network & paddy	16.0	
	No primary network & non paddy	34.5	
Technical	Sub-total (1)	85.0	70.4
	Functioned	22.4	
	Non optimal	8.8	
	With primary network & non paddy	11.1	
	No primary network & paddy	3.2	
	No primary network & non paddy	8.7	
Semi Technical	Sub-total (2)	54.2	61.5
	Functioned	6.0	
	Non optimal	1.3	
	With primary network & non paddy	1.2	
	No primary network & paddy	2.4	
	No primary network & non paddy	12.8	
Simple	Sub-total (3)	23.7	25.0
	With network	70.8	
	No network	97.2	
Communal	Sub-total (4)	168.0	189.2
	Can improve	42.8	
	Cannot improve	53.5	
Rainfed	Sub-total (5)	96.3	78.8
Total	Sub-total (1)+(2)+(3)+(4)+(5)	427.3	424.9

*) Including land potential area (assumed) in Rejang Lebong, Bengkulu Province

From the viewpoint of swamp cultivation potential, agricultural land can be classified into tidal swamp area and non-tidal swamp area. These potential areas in South Sumatra Province and the Musi River Basin (as of 2001) are, as shown in **Table 3.9.11**.

Table 3.9.11 Classification of Potential Swamp Area ('000ha)

Swamp	Classification	Province Area	Basin
	Developed & used for food crops	149.7	
	Developed & not used paddy field	12.2	
	Undeveloped & agricultural	587.5	
Tidal	Sub-total (1)	749.4	264.0
	Developed & used for food crops	28.7	
	Developed & but not used	43.2	
	Undeveloped & agricultural	423.6	
Non Tidal	Sub-total (2)	495.5	321.7
Total	Sub-total (1)+(2)	1,244.9	585.7

3.9.6 Existing Plans and Strategies

Existing plans and strategies were identified for the formulation of water use management plan as follows:

PROPENAS 2000-2004

Policy directions and programs in Chapter IV Economic Development has strong relation to water use management as follows: Development of a system of food self-reliance is given as one of the policy directions. Objectives of the program for developing and managing water resources are: (i) realized restructuring of various institutions and regulations and management of water resources that uphold fair water use rights; and (ii) increased utilization and productivity of water resources through increased efficiency and effectiveness and self reliance in the operation and maintenance and preservation of water intake infrastructure and natural water sources.

Strategic Planning of Water Resources Development, Water Resources Service of South Sumatra Province 2001-2004, revised April 2002

There are changes of the goals of agriculture development from the production increase for rice self-reliance in the previous plan to: the preservation of food self-reliance, increase of farm income, increase of job opportunities in rural areas, improvement of family nutrient conditions. These goals are to be attained by the coordination of the directions, working steps and approaches of the water use management mainly for irrigation problems.

The value of water shifts from a communal resource, which is abundant and can be consumed with almost no cost, to an economic resource bearing social function. In addition, water supply scarcity, water demand conflict between irrigation and other usages, irrigated land conversion to other usages need an effective irrigation management policy to sustain the irrigation system as well as to secure water right for all stakeholders.

Study for Formulation of Irrigation Development Program, 1993, JICA

Study for Formulation of Irrigation Development Program, Nov. 1993, JICA was carried out to formulate an irrigation development program, which provided the current and future REPELITA with rationale guideline, in line with overall food production increase program, thus, contributing to the sustenance of self-sufficiency in rice. By this study, South Sumatra Province is expected as potential food resources area for the rice self-reliance at the national level. Although the study is not very new, Indonesian Government still maintains the policy of stable self-sufficiency in rice.

South Sumatra Province is a part of Zone 2 (South Sumatra, Jambi, Bengkulu and Lampung). In this study, Zone 2 was selected as one of the strategic zones for further development as having large potential for development with moderate level of human resources and infrastructure. Strategy for irrigation development of Zone 2 is: For its location advantage for exporting rice to surrounding deficit region including Java (not at present but in future) and Kalimantan regions, large irrigation development should be sought in the region. Also small to medium scale irrigation development should be promoted to increase agricultural productivity. The target production and irrigation development area is: In order to attain self-sufficiency rate of 100% at the national level,

about 1.3 million ha of new irrigation area is required adding to the area of all program and on-going irrigation schemes to product 66.5 million tons of paddy in 2020. Target self-sufficiency rate of Zone 2 is 120%. After allocation of the total newly development area of 1.3 million ha to each province, annual target development of South Sumatra Province is proposed at 310,300ha for the period from 1991-2020. Irrigation development target of South Sumatra Province is given in REPELITA at 305,100ha from 1994-2018, consisting of 267,000ha of new construction, 1,100ha of rehabilitation, and 37,000ha of small scale.

Domestic Water Supply Development

Corporate Plan is middle term (5-year) management plan of each PDAM, consisting of various technical and non-technical aspects. Based on the plan, management and financial programs of PDAM are formulated and implemented.

Irrigation Projects of Water Resources Service, South Sumatra Province

Water Resources Service implements development projects comprising irrigation, swamp, flood handling, and coastal protection. These projects can be classified into APBN and APBD projects. APBN projects consist of (i) Irrigation and Mainstay Swamp of South Sumatra (composed of eight sub-projects), and (ii) Flood Handling and Coastal Protection of South Sumatra (four sub-projects).

Komering Irrigation Project

Komering Irrigation Project has been implemented using APBN, and funded by Japanese ODA loan. The project is composed of three stages with a total irrigation area of 120,658ha. Actual implementation has been conducted for Stage I (20,968ha) and Phase 1 (25,589ha) of Stage II. Implementation of Phase 2 (16,510ha) of Stage II and conducting of F/S for dams proposed for Stage III has been requested for JBIC loan, but not yet accepted.

Lakitan Irrigation Project

Lakitan Irrigation Project is one of the subprojects of Project Type Sector Loan for Water Resources Development (II). This project is implemented by Water Resources Service of South Sumatra Province as APBN project, and funded by Japanese ODA loan. Potential irrigation area is 13,950ha, and water source is the Lakitan River (552 km^2). Development consists of two steps; the first step for 6,000ha irrigation area and the second step for 7,950ha of irrigation area.

Temedak Irrigation Project

Directorate General of Water Resources, Department of Settlement and Regional Infrastructure, Bengkulu Province has intension to carry out Temedak Irrigation Project. Intake site is planned at the Musi River, about 20km downstream of intake dam of Musi Hydroelectric Power Project. Irrigation area is 5,000ha, 2,000ha in Bengkulu Province and 3,000ha in Lahat Regency.

Past Swamp Development

In South Sumatra Province, tidal swamp development began from Cintamanis and Delta Upang in 1969. The next reclamations were Telang and Saleh in 1975, and Karang Agung, Pulau Rimau and Air Sugihan Kiri in 1980. Swamp development is carried out by step implementation, as follows:

In Step I, infrastructure development starts by primary and secondary drainage canal networks with low cost and simple technology. Networks are open system, and are operated and maintained in a simple and low cost way. In this step, washing of land is carried out. Period of this step is 7-14 years.

In Step II, construction of tertiary canals with gates and embankment for flood protection (optimization) is completed. Network systems have control function, and are operated and maintained intensively together with P3A activities. Period of this step is 4-7 years. Step II consists of non-modification step and modification step. In non-modification step, drainage and irrigation systems are still combined. In modification step, drainage and irrigation systems are separated.

In Step III, network systems are fully controlled, and have function of semi polder. Gates and embankment are completed, and irrigation and drainage systems are already separated. Period of this step is 4-5 years.

Those development areas are summarised, as follows:

Table 3.9.12 Developed Swamp Area of South Sumatra Province

Swamp Type	Development Step	Net Area (ha)
Tidal	Step I	95,658
	Step II	91,931
	Total	187,589
Non-tidal	Step I	18,148
	Step II	10,600
	Total	28,748

Source) Inventarisasi Daerah Irigasi Dan Rawa, Dinas PU Pengairan Propinsi Sumatera Selatan Tahun 2001

South Sumatra Swamp Improvement Project

South Sumatra Swamp Improvement Project (SSSIP) was one component of a larger plan aimed at improving infrastructure and developing agriculture. SSSIP was implemented by the Directorate General of Water Resources, Ministry of Settlement and Regional Infrastructure, and funded by Japanese ODA loan. SSSIP was undertaken between 1992 and 1999. SSSIP aimed to: (i) improve the existing drainage facilities in order to increase the paddy yield on the first holding and the coconut yield on the second holding, (ii) practice efficient on-farm water management and train farmers for the purpose of improving their farming practices, and (iii) improve basic social infrastructure such as farm roads and domestic water supply facilities.

The gross project area of SSSIP was 40,700ha, consisting of the existing swamp development schemes of Pulau Rimau (22,600ha) and Air Sugihan Kiri (18,100ha).

The total number of households in the project area was around 13,200, with a total population of 60,700, as of 2001. The major items of the project scope were: (1) rehabilitation and upgrading works of existing canals/drains; (2) construction of new canals/drains; (3) construction of water control structures; (4) construction of domestic water supply facilities (domestic water tank 13,284 units).

Integrated Irrigation Sector Project in Indonesia

Integrated Irrigation Sector Project (IISP-1) was financed by Asian Development Bank, and undertaken between 1990 and 1999. The project was designed to support the Government's development goals in the agriculture sector, namely consolidating rice productivity gains, broadening the agriculture base, creating rural employment opportunities, and achieving balanced regional development. The project was specially aimed to accelerate agricultural development in the major rice producing provinces of Central Java, Daerah Istimewa Yogyakarta, Southeast Sulawesi, South Sumatra, and West Sumatra.

The project consisted of six components: (1) irrigation development, including rehabilitation and upgrading of irrigation and drainage schemes; introduction of efficient operation and maintenance (EOM); transfer of operation and maintenance responsibilities from central to provincial agencies and water users associations (WUAs); and institutional strengthening; (2) introduction of an irrigation service fee; (3) agricultural development through tertiary development units for testing water management techniques, improvement of seed farms, land development, and strengthening of WUAs; (4) soil and water conservation; (5) women in development; and (6) strengthening of coordination and monitoring.

Telang and Saleh Agricultural Development Project in South Sumatra (TSADP) was one of four core subprojects in IISP-1, and was implemented by the Directorate General of Water Resources, Ministry of Public Works. The gross project area of TSADP was 60,000ha, consisting of the existing swamp development schemes of Telang I (26,680ha), Telang II (13,800ha) and Saleh (19,090ha). TSADP included intensive rehabilitation and institutional support on a 10,000ha pilot study area.

Tourism Development

Karang Anyar is cultural and historical site along the Musi River. The project, strengthening of water system maintenance in Karang Anyar, started in 1994/95. Land acquisition 29.2ha and canal normalization 8.4km have been completed, as of 2002. The project will complete in 2005 with a total cost of Rp. 29,882,317,000. This project is carried out under the cooperation of Dinas PU Pengairan, Dinas PU Cipta Karya and Dinas PU Bina Marga.

Hydropower Development

Electric power is one of the most important measures in meeting the energy development policy. Electric power development can promote economic activities and

social welfare, in urban areas as well as rural areas. Rural electrification also can stimulate economic activities and can enhance the intellect and welfare of the people in the rural areas. Hydropower development is conducted by PLN, and Energy Development and Mine Services, South Sumatra Province.

Future demand and supply plan has been prepared by PLN until the year 2012. Growth rates in energy (GWh) demand are assumed at 8.1% for 2002, 6.3% for 2003-2005, and 7.6% for 2006-2012. In the supply plan until 2008, Musi Hydropower Station with 3×70=210MW capacity is included as the only one hydropower scheme.

There are some potential hydropower development site, these hydropower stations, however, are not included in the power supply plan of PLN up to 2012. Economic feasibility of these hydropower projects seems not so high with the highest B/C of 0.96 for the Ranau project. Energy Development and Mine Services, South Sumatra Province identified possible site for microhydro power development as shown below.

Table 3.9.13 Potential Microhydro Power Stations in South Sumatra Province

District	Location	Installed Capacity (kW)
Lahat	Kota Agung	1,059.3
	Jarai	355.5
	Lahat Kota	92.9
	Pajar Bulan	105.6
	Ulu Musi	879.7
	Pagar Alam	921.2
	PL. Pinang	323.4
	Dempo Selatan	40.7
MURA	Ma. Beliti	1,939.4
	Rawas Ulu	39.7
OKU	PL. Beringin	818.3
	Bd. Agung	112.9
	Md. Kisam	687.9
Muara Enim	Tj. Agung	1,729.7
	Semendo	40.1
	Arumentai	190.4

Source: Energy Development and Mine Services, South Sumatra Province

3.10 Inland Waterway Transportation

3.10.1 River Navigation Condition in South Sumatra Province

River transportation in South Sumatra is generally influenced by river conditions for navigation, especially depth, width and water flow. Most of the upper streams of the Musi River depend on the seasonal conditions, which sharply fluctuate between the rainy and dry seasons, while the branches downstream depend more on the tidal water level condition. **Table 3.10.1** shows features of river navigation in the Musi main stream and eight major tributaries.

Table 3.10.1 Existing River Navigation Condition in South Sumatra Province

No.	River Name	River Length (km)		Mean Depth (m)	Mean Width (m)
		Whole Strength	Available for Sailing		
1	Musi	700	450	4.5-8	200
2.	Ogan	350	175	5	90
3.	Lematang	300	240	6	80
4.	Komering	360	280	6	75
5.	Harileko	200	160	10	40
6.	Lalan	260	220	10	150
7.	Lakitan	150	100	3	50
8.	Rawas	230	175	3	50
9.	Kelingi	80	80	2	50
	Total	2,630	1,880		

Source: Laporan Akhir, Studi Pengembangan Angkutan Sungai Di Propinsi Sumatera Selatan, 2001

The nine rivers have widths of 50 to 100 m, depths of 2 to 10 m. Of the total length of 2,630 km, 1,880 km are navigable. Therefore, river transportation in South Sumatra has a high potential in addition to the land transportation. Inland transportation from the river mouth to upstream of the Musi and Ogan rivers is centralized in Palembang. Aside from the commercial route, traditional inland transportation is still available.

Inland waterway transportation in the Musi River Basin can be categorized into two types. In the upstream-middle reach area, the waterway is basically used for fishing and passenger transportation by small boats. In the downstream area, the waterway is utilized by industrial, commercial, and agricultural establishments using larger ships.

The existing problem at the upstream-middle reaches is the difficulty of boat navigation due to the low water level during the dry season. In the downstream, sedimentation is a major problem, especially for commercial ship navigation. Discussion in the following sub-sections is for the inland waterway transportation in the downstream of the Musi River, from Palembang to the river mouth area (Ambang Luar).

3.10.2 Present Inland Transport System

Palembang Port is one of the first class river ports/harbors in Indonesia. It is located on the Musi River, with coordinates of 02°58’48” South latitude and 104°46’36” East longitude. Port operation is under the management and supervision of the Department

of Communication (DOC) and business performance itself is tasked with the Department of Finance (DOF). The agency of DOC is the *Departemen Perhubungan Ditjen Perhubungan Laut Kantor Administrator Pelabuhan Palembang* **(ADPEL)**. The agency of DOF is *PT. (PERSERO) Pelabuhan Indonisia II, Cabang Palembang* **(PELINDO II)**.

Maintenance dredging is basically conducted every year, while sounding survey on the navigation channel is done yearly by PELINDO II and by navigating vessels themselves. Based on the result of sounding, PELINDO II makes a request to ADPEL for dredging.

ADPEL (Port Administrator Office)

ADPEL is responsible for the safety of waterway users consisting of all kinds of boats and ships plying the route from the Musi II Bridge to Ambang Luar. There are 26 lights, 2 mooring buoys and 4 tower type lighting structures along the navigation channel. The other major task is the implementation of maintenance dredging of the navigation channel.

Special ports outside of PELINDO and ADPEL areas are still under the responsibility of DOC although they operate under KANPEL (Port Administration Office for non-commercial port). However, small jetties and quays located upstream of the Musi II Bridge are under the responsibility of the local government.

PELINDO II (Indonesia Port Corporation II: IPC II)

PELINDO II is responsible for the management of Palembang Port. Palembang Port consists of two locations: Boom Baru Public Port and Lais River Port. Major activities for PELINDO II are managing of port facilities and pilot of ship from and to Ambang Luar/Boom Baru for a distance of approximately 60 miles (about 100 km). Navigation time takes 6 to 7 hours. Vessels larger than 500 GRT have to use the pilot system for going in or out of the port. Docking of vessels below 500 GRT depends on the request of the ship captain. PELINDO II can provide a tugboat, a pilot boat and/or a mooring boat for safety in dock-in.

PELINDO II has five tidal gaging stations along the navigation channel. Locations of tidal gaging station are Boom Baru, Sei Lais, Selet Jaran, Kp. Upang and Tg. Buyut. PELINDO II issues the permission for ship approach from offshore to the navigation channel based on the height of tide and the clearance of ship. Most ships have their own sounding machines and if a shallow portion is found in the navigation channel, a report is sent to PELINDO II immediately.

Maintenance Dredging

The Musi River prior to the start of recorded dredging in 1966 had the maximum depth over the Outer Bar (Ambang Luar) of about 4.1 m and the maximum depths over the remaining shallow bars ranging from about 4.0 to 5.0 m at mean low water. Since 1966, maintenance dredging has been conducted in almost every year.

In 1975 a capital dredging program performed by a private contractor dredged Ambang Luar to a depth of 7.0 m and the river navigation channel to 6.0 m LLW. Bed width of the navigation channel also became 150 m and the side slope was 1:20 at the Ambang Luar area. From 1966 to 1975, Ambang Luar was gradually deepened from 4.2 m to 5.3 m by maintenance dredging. Two to four locations were dredged every year.

From 1979 to 1991, maintenance dredging was done mainly at 3 locations. Dredging width for navigation channel was reduced from 150 m to 120 m with depth of - 6.5 LWS. Dredged materials were disposed in two ways: dredged materials from locations close to the sea were dumped into the sea about 2 miles from the construction site and for the construction site from Keramat Utara up to Sungai Lais, the dredged materials were dumped into the Musi River where depth was enough for the navigation of ships.

From 1997 to 2001, maintenance dredging can be identified at 3 locations. The area at the river mouth became large, and the other 2 locations are in the Musi River channel. Volumes of pre-dredge sounding are shown in **Table 3.10.2**.

Table 3.10.2 Record of Pre-dredge Sounding: 1997-2002

No.	Location	Volume (1,000 m3)				
		1997-98	1998-99	1999-2000	2000-01	2001-02
1	Ambang Luar C1	332.47	354.18	705.80	857.52	494.88
	a. Lurus					437.12
2	Ambang Luar C2	795.49	957.70	836.87	1,011.23	1,261.81
3	Tg. Carat/Buyut	315.03	395.19	0.00	62.95	82.87
4	Payung Utara	274.42	24.49	134.52	238.93	349.99
5	Payung Barat	216.45	74.15	206.83		136.69
6	Payung Selatan	331.94	42.62	171.91		247.82
7	Penyeberangan Upang	21.57	66.63	10.55		90.72
8	Selat Jaran					
9	Muara Jaran	41.50	157.83	108.62	154.76	70.59
10	Aer Humbang					
11	Sungai Lais		101.21	92.08		194.38
	Total	2,328.87	2,173.99	2,267.18	2,325.39	3,366.85
	River Mouth	2,265.80 97.3%	1,848.33 85.0%	2,055.93 90.7%	2,170.63 93.3%	3,011.17 89.4%
	River Channel	63.07 2.7%	325.67 15.0%	211.25 9.3%	154.76 6.7%	355.68 10.6%

Source: ADPEL

As can be seen from the above data, about 90% of the dredging volume came from the river mouth area.

Unit cost for maintenance dredging between 1979 and 1989 was about 10 times different and it became more than 35 times different in the year 2002. The latest one in 1998/99 was Rp.2,900/m^3 for 2,171,000 m^3.

Maintenance dredging for 2002 was started on September 6, 2002. Based on the daily working report from the Contractor the following matters can be found: Dredging Volume of 1,500,000 m3 (1.35 million m3 in River Mouth, 0.15 million m3 in River Channel); Construction Cost of Rp.7.065 billion (National Government) and Rp.8.815 billion (Private Fund).

3.10.3 Present Inland Transport Condition

The existing Palembang Port is like a seaport, although it is located in the Musi River hinterland 60 miles from Ambang Luar. With the increasing development, industrial companies have located their offices along the Musi River. Half of the industrial companies have loading/unloading facilities for their own needs. The goods flow is around 10,000 thousands tons in these 11 years. Volume of unloading presents steady increase in these years. Passengers have increased remarkably from around 60,000 in 1995 to 260,000 in 2000.

3.10.4 Future Project of Inland Transport

Palembang Port

In line with the "Strategic Plan for 2000-2006" of PT. PELINDO, the estimation of demand for investment for the next five years with consideration on growth and minimum demand are based on the following conditions:

- The flow of goods that pass the conventional dock, especially for the next 5 years, will have the average growth of ± 6.4 %.
- The flow of bag cargo for the next 5 years will have a 5% growth rate.
- The rapid growth of liquid flow especially for CPO that flows through Boom Baru Harbour and Sungai Lais will be ± 8.9%.
- The present economic crisis in Indonesia is predicted to be stable; hence, the flow of goods through the Public Port of Palembang from 2001 to 2006 will not reach a significant increase, only 2%.

The total volume of goods between 2001 and 2006 is estimated to increase to 112%. The Special Harbour used by PT. PERTAMINA will be combined with the special port from 2002. Passengers between 2001 and 2006 have increased to 180% and 157% for debarkation and embarkation respectively

Tg. Api-api Port

Tanjung Api-api Seaport (Tg. Api-api Port) has been proposed since the 1980s to solve the sedimentation problem at the navigation channel and the river mouth area, and to save on maintenance dredging cost. Based on the study result of *Ringkasan Penelitian Geoteknik Kelautan Perairan, Tanjung Api-api, Musi Banyuasin Sumatera Selatan*, the following matters were identified:

- The estuary has a beach line characteristic with a small area of beach followed by growths of mangrove forest.
- Tanjung Api-api area was used for fishery and transportation of goods.
- The beach had alluvium deposits consisting of fluvial and volcanic materials, and containing mud, sandy mud and sand.

- Beach morphology had a low up to middle relief and the panoramic view had an old stadium with the river flow pattern equal with the U-shaped valley gradient.
- The influenced natural resource was the sedimentation process that intensively happened at the river mouth where the Musi Bayuasin River and the Musi River meet.

The Tg. Api-api Port is divided into two phases. One is the construction of access railway from Palembang to Tg. Api-api Port, and the other is construction of the sea-port. The railway project is under planning and it will be utilized mainly for coal transport. Construction of the new port is pending negotiation with the developer and looking for financial support from either a private company or government funds.

3.10.5 Issues to be Solved

Maintenance Dredging

Sedimentation is a serious problem for waterway users. Especially, it causes damage to commercial, agricultural and passenger transportation. Maintenance dredging is the common measure for sedimentation adopted by local governments and other agencies. However, sediment will be supplied continuously from the upstream reaches unless there are protection works and actions taken for this phenomenon.

Based on the site survey and study, maintenance dredging has to be conducted yearly. However, due to the increasing cost, funds from the national government is no longer sufficient so that maintenance dredging was not implemented in 2001 due to the disagreement on construction price. Maintenance dredging in 2002 is ongoing but dredging will not be made up to the required depth due to the shortage of funds.

Proposed Countermeasures for Sedimentation

Sedimentation is a phenomenon in the downstream, but the cause is in the upstream reaches. To solve this problem, it is necessary to have a comprehensive action plan covering the whole Musi River Basin. The following key factors have to be considered:

- Due to limitation of funds and manpower, the action plan has to be divided.
- Environmental protection work is a time-consuming process.
- Priority consideration of protection works is necessary.
- Waterway users and people living along rivers need to understand and support the action plan.
- The original depth of navigation channel is 4-5 m, which is the equilibrium depth for river mouth. The volume of dredging is to be reduced unless there is a change in infrastructure upstream.

3.11 Organization, Institution and Legal Systems

3.11.1 Existing Institutions and Organizational Setup for the Basin Water Management

Regional Government System in Indonesia

The new Autonomy Law (No. 22/1999) was enforced in May 1999. But the regulations for its implementation are enacted only for certain units. Thus, the present regional government system is in a transition period, awaiting the promulgation and implementation of the new regional regulation on the organization and procedures based on the new Law.

Regional Governments are categorized into two levels, namely, Level 1 and Level II. Level I Regional Governments are composed of Provinces (*Propinsi*) and Level II Regional Governments are Districts (*Kabupaten*) or Municipalities (*Kota*). Districts are governments in rural areas and Municipalities are in urban areas. Thus, Palembang Municipality (*Kota Palembang*) is a Level II Regional Government in an urban area.

Districts/Municipalities are the basic units of regional government system. Matters that affect over one District/Municipality are assumed by Provinces, while those over one Province are assumed by the Central Government.

Regional Parliaments (*DPRD: Dewan Perwakilan Rakyat Daerah*) are established at each Level of Regional Government. Approval by the Regional Parliaments is necessary for making a budget and regional regulation. In addition, each Regional Parliament elects candidate(s) of the regional government's head. Governor (*Gubernur*), the head of Province is appointed by the President, and *Bupati*, the head of District and Mayor (*Walikota*), the head of Municipality are appointed by the Governor.

Structure of regional government offices are similar both for Level I and Level II. Under the head of the regional government, established are Vice Head, such as Vice Governor (*Wakil Gubernur*), *Wakil Bupati* and Vice Mayor (*Wakil Walikota*), Secretariat (*Sekretariat Daerah*), Regional Development Planning Board (*BAPPEDA: Badan Perencanaan Pembangunan Daerah*), Inspectorate (*Inspektorat*) which reports to the head of the regional government, and Services (*Dinas*).

Under Districts/Municipalities, there are Sub-Regional Governments. They are Sub-District (*Kecamatan*), Village-administration (*Kelurahan*), and Village (*Desa*).

Related Organization in National Level

Tasks of Directorate General of Water Resources in Ministry of Settlement and Regional Infrastructure (*KIMPRASWIL*) are: (i) To conserve sustainable water resources, (ii) To coordinate and integrate water resources management, (iii) To promote just and fair water resources utilization, (iv) To control and mitigate floods, (v) To empower and improve communities for water resources management, and (vi) To

improve availability and accessibility of data and information on water resources development and management.

The Government of Indonesia made the policy reform in water resources development through WATSAP. Roles of Directorate General of Water Resources have been changed with decentralization of authority and the policy reform. Water resources development and management must sufficiently consider Provincial, District and Municipality government authorities. In the past, water resources development was based on the nature of rivers i.e. using river basin boundary (hydrological boundary) approach. The central government's role existed dominantly. By the promulgation of New Autonomy Law (No. 22/1999), government demarcations on water resources development and management are simplified. In addition, all stakeholders should have the same right and responsibility from the very beginning stage of the development.

The roles of National Development Planning Agency (*BAPPENAS*) include: (i) To formulate short-term, medium-term, and long-term national development plans, (ii) To coordinate planning, endeavoring to harmonize sectoral and regional portions, and to create integration in such planning within the national development plan.

BAPPENAS concluded earlier that implementation by the various agencies responsible for water provision was severely deficient without a national program which laid out a strategy for efficient and productive water utilization. It joined WATSAL Steering Committee and set up WATSAL Task Force.

Related Organization in Regional Level

Refer to Section 2.4 of this report for Water Resources Service of South Sumatra Province. Planning Unit was established in July 2002 (also refer to Section 2.4).

Based on the Regional Regulation No. 50/2001 (Formation of *Balai PSDA* in South Sumatra Province), Water Resources Management Office (*Balai PSDA*) for Musi River Basin has been established, which serves as a technical implementation office under Water Resources Service covering the Musi River Basin. (Refer to Section 2.4.)

Main tasks of Forestry Service (*Dinas Kehutanan*) South Sumatra Province concerning forest protection are: (i) To formulate forest conservation & protection policy, (ii) To coordinate implementation of forest conservation & protection policy, (iii) To give technical guidance and control forest conservation & protection, and (iv) To provide information on forest conservation & protection to the people.

Tasks of Regional Development Planning Agency (*BAPPEDA*) of South Sumatra Province are: (i) To study, arrange and coordinate planning on middle and long-term development in South Sumatra Province, (ii) To arrange implementation plan and budget, (iii) To coordinate international and domestic cooperation, (iv) To promote public participation in planning activities, (v) To publicize development data/information, and (vi) To evaluate and control development activities.

Major task of Settlement and Regional Infrastructure Service of Palembang Municipality is to enhance the execution of Government and development efficiently in particular in the field of operation and maintenance of the construction of roads, bridges, and city channels. Water Resource Management Sub-service's tasks are: (i) To formulate water resources management plan, (ii) To develop and improve and rehabilitate irrigation systems, (iii) To manage license on water resource utilization, and (iv) To control floods and other natural disasters as well as erosion.

Other related organizations concerning water resources management include DPE, DISTAMB, BAPEDAL, BAPEDALDA, DDN, PT PLN, and PDAMs.

3.11.2 Laws and Regulations on Water Management

Laws and regulations on water management can be divided into two areas, namely water resources, and spatial and environmental management. The basic or umbrella law of the former is Law No. 11/1974 (Water Resources), whose revision is now under discussion in the government. The latter has two main laws, Law No. 23/1997 (Environmental Management) and Law No. 24/1992 (Spatial Management). Laws and regulations are interrelated each other and look complicated with not only laws and regulations but also letters of the President and Ministers, which have the same effects as regulations.

Law No. 11/1974 (Water Resources)

The State has the responsibility for control, development and management of water resources. Priority is put on water uses for drinking, irrigation and energy in water planning and allocation. Direct beneficiaries are to participate in the operation and maintenance with the Central or Regional Government assuming the operation and maintenance responsibility.

The Water Resources Law needs to be amended with a conditionality of Water Resources Sector Adjustment Loan (WATSAL). The new law is expected to promote environmentally and socially sustainable water resources development and management by strengthening the institutional and regulatory frameworks for river basin management, pollution abatement and water quality management, and irrigation systems. A draft of the amendment is waiting for approval by the national assembly as of January 2003. Refer detail to Section 2.2.

Government Regulation No. 22/1982 (Water Management)

This Regulation sets up the basis for river basin management including the requirement for a comprehensive water resources plan for each basin which is to be incorporated in a National Water Plan as part of the National Development Plan. Except for domestic use, all water use requires license from the Provincial Government, including groundwater extraction.

Government Regulation No. 6/1981 (Irrigation Infrastructure Maintenance and Exploitation Fee)

The government regulation stipulates the detailed contents of irrigation infrastructures exploitation and maintenance (IIEM) fee.

Government Regulation No. 27/1991 (Swamps)

In order to achieve optimal use of swamps as source of water and to sustain its utilization as the implementation of Law No. 11/1974 (Water Resources).

Government Regulation No. 35/1991 (Rivers)

It declares that rivers have multi-purpose uses and delegates responsibility for their development and management to either the National or a regional government in accordance with a classification of their economic importance. Construction of river structure with the aim for public welfare and safety shall be made by the government or a state-owned corporation. In addition, operation of river and river facilities shall be made by the Government or a state-owned corporation.

Government Regulation No. 77/2001 (Irrigation)

Assuming the Presidential Instruction No. 3/1999 (Irrigation Management Policy Reform), this Government Regulation was promulgated in order to promote reforms in irrigation area with introducing transparency and accountability of government and empowerment of farmers.

Presidential Instruction No. 3/1999 (Irrigation Management Policy Reform, *PKPI: Pembaharuan Kebijakan Pengeloaan Irigasi*)

Background settings are as follows:

(1) Authority for irrigation system development, management and financing under the old top-down administrative paradigm is concentrated to central government. Farmers had almost no voice in defining water service nor controlling over funds for O&M such that they had little incentive to pay service fee.

(2) Under the socialization paradigm, farmers' awareness and consciousness regarding irrigation management have been raised. But, this strategy tends to be elaborate, slow, and too intensive such that widespread adoption of the strategy is not practical.

(3) A new paradigm so-called empowerment paradigm is currently being adopted through Water Sector Policy Reform. Through this paradigm, basic institutional change is induced to determine who benefits, who takes control, who has to be accountable to whom, etc.

(4) A shift of water value from a communal resource that is abundant and could be consumed with almost no cost to become an economic resource bearing social function. In addition, water supply scarcity, water demand competition between irrigation and other usage, irrigated land conversion to other usage need an effective irrigation management policy to sustain the irrigation system as well as to secure water right for all stakeholders.

Law No. 22/1999 on decentralization and regional autonomy, Law No. 25/1999 on fiscal balance between central and regional government, and Presidential Instruction No. 3/1999 provide the basic mandate for policy reform in irrigation management. Five key principles are:

(1) Redefinition of role and responsibilities of irrigation management institutions.

(2) Empowerment of water user associations (WUAs).

(3) Irrigation management transfer to farmers.

(4) Financing of irrigation system.

(5) Sustainability of irrigation system.

Ministerial Regulation of Ministry of Public Works No. 63/PRT/1993 (River Channel, River Usage and Non-usage Areas, Old Unfunctional Rivers)

Ministerial Regulation defines river borders and decrees details of their utilization. River borders may not be used for: dumping of garbage, solid and suspended wastes, developing permanent buildings, houses, and commercial facilities.

Ministerial Letter of *KIMPRASWIL* No. 529/KPTS/M/2001 (Procedure for Irrigation Management Authority Transfer to Water Users' Association)

Irrigation Management Authority Transfer from the Government and Provincial Government or District/City Government to the formal Water Users Associations (WUAs) must be implemented in a democratic way based on the principle "one irrigation system - one management" (Government Regulation No. 77/2001 on Irrigation).

Irrigation Management Authority Transfer is aimed to increase efficiency and effectiveness of irrigation management, to achieve sustainability of irrigation system, to establish autonomous and reliable WUAs, and to increase income of the farmers. It declares: Scope of the Irrigation Management Authority Transfer: Requirements for Irrigation Management Authority Transfer: Approaches for Irrigation Management Authority Transfer.

Ministerial Letter of Home Affairs No. 179/1996 (Organization Guidelines of Basin Water Resources Management Unit (*Balai PSDA*))

(1) *Balai PSDA*s are technical implementation units of the Provincial Office of Public Work or Provincial Office of Water Resource.

(2) A *Balai PSDA* is managed by the Head of *Balai PSDA* who is subordinate of and responsible to the Head of the Provincial Office of Public Works or Provincial Office of Water Resources.

Ministerial Letter of Home Affairs No. 50/2001 (Guidelines for Empowerment of Water Users' Associations)

Water User Associations (WUA) is established in democracy (from the farmers, by the farmers, and for the farmers).

Law No. 5/1990 (Conservation of Bio-natural Resource and Its Ecosystem)

Conservation of bio-natural resource and its ecosystem is aimed to provide efforts in sustaining bio-natural resource and balancing its ecosystem in order to support the increase of prosperity and quality of human beings.

Law No. 24/1992 (Spatial Management)

It declares that spatial plan is form and pattern of spatial utilization with or without planning and spatial planning is process of spatial designing, utilizing, and controlling.

Law No. 23/1997 (Environmental Management)

Targets are as follows:

(1) To sustain environmental function.

(2) To achieve wise-use of resources.

(3) To prevent from impacts which may lead to environmental contamination and destruction.

Law No. 41/1999 (Forestry)

Forest and land rehabilitation is meant to revitalize, sustain, and increase forest and land functions such that its bearing capacity, productivity, and role is secured in order to support living creatures.

Presidential Letter No. 32/1990 (Protected Area Management)

Protected areas mainly function to protect environment and its sustainability that cover natural resources, man-made resources, historical and cultural properties in order to achieve sustainable development.

Government Regulation No. 69/1996 (Implementation of Rights, Obligation, and Procedure of People's Participation in Spatial Management)

This regulation is for the implementation of people's participation in special management.

Government Regulation No. 47/1997 (National Spatial Planning)

To achieve sustainability of natural resources utilization for the nation prosperity, inter spatial and inter sectoral balance, and nation integrity.

Government Regulation No. 82/2001 (Water Quality Management and Pollution Control)

Authority (Article 5):

(1) (Central) government is authorized to manage international and inter-provincial water quality.

(2) Provincial government is authorized to manage inter-districts/cities water quality.

(3) District/municipality government is authorized to manage water quality within its administrative boundaries.

Water Quality Classification and Criteria (Article 8 & 9):

Water quality is classified into 4 grades:

(1) First grade: base water for drinking water and other use requiring similar criteria.

(2) Second grade: water for infrastructures/facilities for water recreation, fresh water fishing, animal husbandry, irrigation and other use requiring similar criteria.

(3) Third grade: fresh water fishing, animal husbandry, irrigation and other use requiring similar criteria.

Water Quality Monitoring (Article 13):

Water quality monitoring for water sources within a district/municipality, inter-districts/municipalities, and inter-provincial/international is conducted by the district/city government, provincial government, and central government respectively. Water quality monitoring is conducted at least once every 6 (six) months.

Authority (Article 18):

Water contamination control for water sources within a district/municipality, inter-districts/municipalities, and inter-provincial/international is conducted by the district/city government, provincial government, and central government respectively.

Central government, provincial government, and district/municipality government are authorized within their jurisdiction to:

(1) Decide contamination capacity (at least once every 5 year).

(2) Inventory and identify sources of contamination.

(3) Decide waste water criteria for application on soil.

(4) Decide criteria for waste water to be dumped to water or water sources.

(5) Monitor water quality at its source.

(6) Monitor other factors affecting water quality.

Waste Water Disposal Retribution (Article 24):

Every one dumping wastewater to waste water infrastructures provided by the district/city government is subject to pay retribution.

People's Rights (Article 30):

(1) Every one has equal right to good quality of water.

(2) Every one has equal right to obtain information on water quality status, management, and contamination control.

(3) Every one has the right to participate in water quality management and contamination control.

People's Obligations (Article 31 & 32):

(1) Every one is obliged to sustain water quality at it sources.

(2) Every one is obliged to take control on water contamination at it sources.

(3) Every one having activities is obliged to provide accurate information regarding water quality management and contamination control.

3.11.3 WATSAP

For WATSAP and related programs refer also to Section 2.3.

Introduction

Water Resources Sector Adjustment Loan (WATSAL) was approved by the World Bank in 1999 for the balance of payments assistance to support a structural adjustment program of policy, institutional, regulatory, legal, and organizational reforms in the

management of the water resources and irrigation sector. Summary of the loan is shown below:

Indonesia was suffering from the economic crisis in 1997 triggered by the currency crises in Thailand. The direct causes of crisis in Indonesia were the rapid increase in short-term private external debt in the recent years as well as long-standing shortcomings in Indonesia's banking system. At the same time, Indonesia faced the worst drought in the 20th century, a collapse in regional demands, and the lowest international oil prices. According to the World Bank's report, "What made Indonesia's crisis so much worse than other East Asian countries were critically weak institutions and endemic corruption, at a time of high political uncertainty, as the Soeharto era was drawing to a close."

The management of water resources in Indonesia has problems that severely constrain country's economic development and food security, which in turn cause serious damage on public health and its aquatic environment. Major problems include growing water shortages, limited inter-sectoral cooperation, water pollution, environmental degradation, and declining physical and fiscal sustainability of existing irrigation infrastructure facilities. Such problems arise from: (a) the combined impacts of population growth, urbanization and industrialization, (b) an ineffective sector administration guided by outdated sector policy paradigms, management institutions and data systems which cannot solve problems effectively and comprehensively. The World Bank recognized, "The challenges posed by these problems need to be addressed by comprehensive policies, integrated cross-sector strategies, improved institutions, and fiscally and environmentally sustainable programs."

Present Status of WATSAP

Government of Indonesia has been slow to meet the detailed conditionality mandated by WATSAL. There are several reasons of the delay including (Bank Information Center; www.bicusa.org):

- The complicated and cumbersome provisions of the restructuring have to be developed and implemented by a reluctant water sector bureaucracy that is fearful of losing its traditional authority and status;
- Decentralization, without adequate capacity-building and guiding directives, serves to retard governance due to the confusion it generates;
- Over-lapping responsibilities, unclear division of responsibilities between government agencies, fuzzy reporting and accountability lines between various administrative tiers of government, and issuance of parallel regulations by a number of authorities;
- Lack of coordination between government agencies, unreliable data and diagnosis are also the obstacles on the road to institutional reform; and
- New laws and corresponding regulations are not fully known to people due to lack of communication flow. It is further complicated by the lack of ownership felt

towards the process as it is believed the restructuring is being carried out at the behest of the World Bank and other external entities with limited national control.

Balai PSDA

In accordance with one of the objectives of WATSAP, "Improve provincial regulatory management of river basins and aquifers" (Objective # 2.1), establishment of Water Resources Management Units (*Balai PSDA*) has been promoted.

Historically speaking, setting-up of management corporations in a few strategic basins was discussed in an International Water Seminar held in Indonesia in 1992, which focused on the water resources management policy options. It was recognized that not only is there a need to develop and maintain river utilization structure, but also to establish water resources management affecting all basin activities. As a result, *Balai PSDA* was established in 1996, based on which pilot river basin management programs have proceeded in Java, supported by the World Bank.

The Decree by Ministry of Home Affairs No. 179/1996 (Organization Guideline and Job System of *Balai PSDA*) stipulates that a *Balai PSDA* undertakes basic hydrological data collection, water quality sampling, river infrastructure maintenance and the operation of water allocation and abstraction in compliance with the determination of the Governor. It is planned that *Balai PSDA* and River Basin Water Coordination Committee (*PPTPA*) will be established in each of the 90 legally defined River Basin Territories in Indonesia.

Progress in provincial river basin institution-building had been slow and ineffective due to 1) national policy defectiveness, 2) staffing difficulties related to the disincentives of assignment to a "non-construction" entity, and low grade levels for key positions, and 3) lack of staff and financial resources of provincial governments, according to the World Bank's report. Thus, the World Bank insists as the conditionality, "Implementing the concept of integrated water resources management will require much greater clarity of provincial government's water resources management responsibilities and the organizational and financial provisions to implement them."

Indonesia Water Resources and Irrigation Reform Implementation Program (IWIRIP)

The Government of Netherlands has provided a Grant of US$9.7 million for FY 2001-2003 piloting of water resources and irrigation sector reforms based on the WATSAL program and the changing sector administration (authorities, planning, programming and budgeting) required by UU22/99 and PP25/99.

Water Resources and Irrigation Sector Management Program (WISMP)

The Program is proposed to be undertaken using the Adjustable Program Loan (APL) lending instrument of the World Bank from FY 2004 to FY2014. A three-phase APL is proposed. It is composed of Phase I (Institution Reform Stage Stage), Phase II (Expansion Stage), and Phase III (Improvement Stage).

3.11.4 Financial Status of Organizations Related to Water Management

Fiscal Decentralization

Fiscal decentralization has been implemented in accordance with the Regional Government Law No.22 and the Government Regulation on Fiscal Balance No.25 of 1999. The Regulation No.25 stipulates how to distribute the revenue from natural resources between the central and regional governments and how to realize the fiscal balances of the regional governments by financial transfer from the central government. The sources of regional government revenue consist of original income, decentralization fund, regional borrowing, and other revenue. The decentralization fund consists of land & building tax/land right & building acquisition tax, allocation from natural resources revenue, General Allocation Fund (*DAU*) for general purposes, and Specific Allocation Fund (*DAK*) for specific purposes. **Table 3.11.1** shows the revenue sharing rates from natural resources stipulated in the Regulation No.25.

Table 3.11.1 Law Revenue Sharing Rates (%)

Kinds of revenue	Central	Province	Regency/ Municipality as producer	Regency/ Municipality as non-producer	Total
Land and building tax	10	16.2	64.8	9	100
Land right and building acquisition tax	20	16	64		100
Forestry: Fee for forest concession rights	20	16	64		100
Forestry: Forest resource provision charge	20	16	32	32	100
Mining: Fixed fee	20	16	64		100
Mining: Exploration and exploitation fee	20	16	32	32	100
Fishery	20	80			100
Petroleum	85	3	6	6	100
Gas	70	6	12	12	100

The revenue from natural resources largely varies from one region to another depending on occurrences of natural resources and it will create imbalances in revenue among regions. General Allocation Fund (*DAU*) and Specific Allocation Fund (*DAK*) are the financial transfer from the central government to the regional government to correct the imbalances. General Allocation Fund can be utilized for both current and development expenditures according to priorities of regions. Specific Allocation Fund is distributed to regional governments to correct regional imbalance of development such as infrastructure, education, health services, environment, poverty and underdevelopment, according to the condition of the regions. The rates of the both funds are as shown below:

Table 3.11.2 Rates of General and Specific Allocation Funds (%)

Kinds of revenue	Central	Province	Regency/ Municipality	Total
General Allocation Fund (*DAU*)	75	2.5	22.5	100
Specific Allocation Fund (*DAK*)	60	40		100

Development Expenditure of South Sumatra Province

Expenditures of the government are divided into two: one is current expenditure (or routine expenditure) and another is the development expenditure (or investment expenditure). The current expenditure covers salaries, cost of equipment and materials, travel expenses, loan installment, etc. and the development expenditure is spent for projects implementation. Source of the development expenditure consists of both local budget (*APBD*) and the central government funds (*APBN*), which come from General Allocation Fund (*DAU*) and Specific Allocation Funds (*DAK*) discussed above.

Actual expenditure of South Sumatra Province in 2001 was Rp.1,275 billion (approx. US$124 million). Out of this, total development expenditure was Rp.919 billion (approx. US$89.6 million), which accounted for 72% of total expenditure. This rate is significantly lower than those from 1997/98 to 2000 (83%-89%). Out of the development expenditure, allocation from the central government funds was large at Rp.705 billion or 77% while that of the local budget was Rp.214 billion or 22%. If we compare the expenditure between before and after autonomy, the expenditure of local budget (*APBD*) increased significantly in 2001 and 2002 budget. This is partly because of rapid price escalation.

Actual expenditure for water resources and irrigation in 2001 was Rp.89.4 billion (approx. US$8.7 million), which accounted for approximately 10% of the development expenditure. Out of this, Rp.11.7 billion was from *APBD* and Rp.77.7billion was from *APBN*. Since *APBN* is allocated for relatively large projects, the actual expenditure varies from year to year depending on the progress of the projects. The local budget for water resources and irrigation is constantly between Rp.10 billion to Rp.15 billion.

Table 3.11.3 Budget of Water Resources Office of South Sumatra Province in 2002

	Nos. of Proj.	Budget (Rp. billion)	%
I. Local Budget (APBD)	10	19.8	31
1. Irrigation & swamp development	5	6.1	10
2. Water resources dev.	3	6.4	10
3. Flood control	2	7.3	12
II. Central Gov. Budget (APBN)	13	43.2	69
1. Flood control	4	5.1	8
2. Irrigation and swamp dev.	9	38.1	60
III.Total	23	63.1	100

Table 3.11.3 shows breakdown of the budget of Provincial Office of Water Resources, South Sumatra Province in 2001. Total budget amounted to Rp.63.1 billion consisting of Rp.19.8 billion from *APBD* and Rp.43.2 billion from *APBN*. Irrigation and swamp development projects account for 70% of total budget while flood control projects account for 20%.

Development Budget of Regency/Municipality

The study team collects data on actual revenue and expenditure of regencies and municipality in order to grasp the scales of development expenditures and expenditures for water management sector. However, all the collected data are regarding the local budget (*APBD*) and no information on the central government funds (*APBN*) is available. Therefore, more information on *APBN* will be collected in the course of the study. Development Budget of the Regencies/Municipality are summarized below:

Table 3.11.4 Development Budget and Budget for Water Management by Regency in 2002 (APBD only, Unit: Rp. billion)

	Development budget	Budget for water resources & irrigation	Ratio in dev. expenditure
Palembang	100.8	2.7	2.7%
OKU	79.1	2.7	3.4%
OKI	142.2	8.9	6.3%
Muara Enim	133.7	3.6	2.7%
Lahat	49.1	3.6	7.3%
Musi Rawas	99.0	2.7	2.7%
MUBA	352.2	10.8	3.1%
Total	956.1	35.0	3.6%

Development budget of Musi Banyuasin is the largest at Rp.352 billion (US$39.0 million) while that of OKU is the smallest at Rp.49 billion (US$5.2 million). The budgets for water resources and irrigation sector of the regencies are between Rp.2.7 billion to Rp.10.8 billion. The shares in the development budgets are between 2.7% to 7.3%. The budget seems small but it is because the construction works of relatively large-scale infrastructures has been implemented by the central government funds (*APBN*).

When relatively large facility construction is necessary, water resources department of regency/municipality prepares a project proposal. Regent/Mayor directly submits the proposal to *BAPPENAS* and Ministry of Settlement and Regional Infrastructure in Jakarta. If the proposal is accepted by *BAPPENAS* as a result of appraisal, the central government funds (*APBN*) will be allocated.

Operation and maintenance cost of water management facilities are responsibility of Regency/Municipality after autonomy. The operation and maintenance cost is normally covered by the current budget of Regency/Municipality.

3.12 Database System Established in the Study

3.12.1 Existing Database

Through the investigation to the database system in South Sumatra Province, it was found that two GIS database system (Forestry Department and BAPPEDA GIS database) and one information network system (INFORKOM MIS) existed, and can be considered to provide GIS database to JICA study.

BAPPEDA GIS Database

BAPPEDA has used GIS for the spatial planning for a long time. The system software and hardware used in BAPPEDA GIS are PC ArcInfo 3.5, ArcView3.2, Windows98 and Windows NT platforms. However, the system is not running at present because the local GIS consultant company stopped the contract with BAPPEDA. Fortunately, some GIS data are kept back up in CD-ROM, and some data kept in paper format. Therefore, JICA study team could collect the following GIS data from BAPPEDA, namely, 1/500,000 Land Use Map in 1980; 1/250,000 Current Spatial Planning Data; 1/50,000 Current Land Use Data (150 sheets)

Forest GIS Database

It is a GIS group in forestry department to manage a GIS database, and provide GIS services to forest management group. Even the version of GIS database and system is a little old (PC ArcInfo 3.5 and Arcview3.2), the system is running smoothly and the forest GIS database is kept to be updated year by year.

Management Information System (MIS)

By the investigation to Information and Communication Department (KANTOR INFORKOM) of South Sumatra Province, it was found that a network information system is establishing. The system name is Regional Management Information System (MIS). Currently, the central system has already established in KANTOR INFORKOM and linked to Internet. As the same time, a government website has also been set up for introducing profile of the province, major production, tourism and etc. Along with the construction plan, a government Intranet will be established in the future. In the future, all state government offices will be linked by this Intranet. Then, the GIS database established in JICA study can be shared with other government agencies through this network system.

3.12.2 Establishment of Database System

According with above data collection, the GIS database specification is designed as follows.

Specification of 1:250,000 GIS Database

The 1:250,000 scale GIS data was collected from Forest Department and BAPPEDA and designed into GIS database.

Specification of 1: 50,000 GIS Database

For 1:50,000 Topographic Data, JICA Study Team purchased the data from BAKOSURTANAL. Totally 150 sheets covered whole South Sumatra Province.

The Coordinate System of GIS Database

The coordinate system used in GIS database was designed as UTM (BESSEL spheroid, and DJAKARTA datum). It is the same coordinate system that used in the 1:50,000 scale topographic map.

Image of GIS Database Structure

The files and folders construction of GIS database was designed as **Figure 3.12.1.**

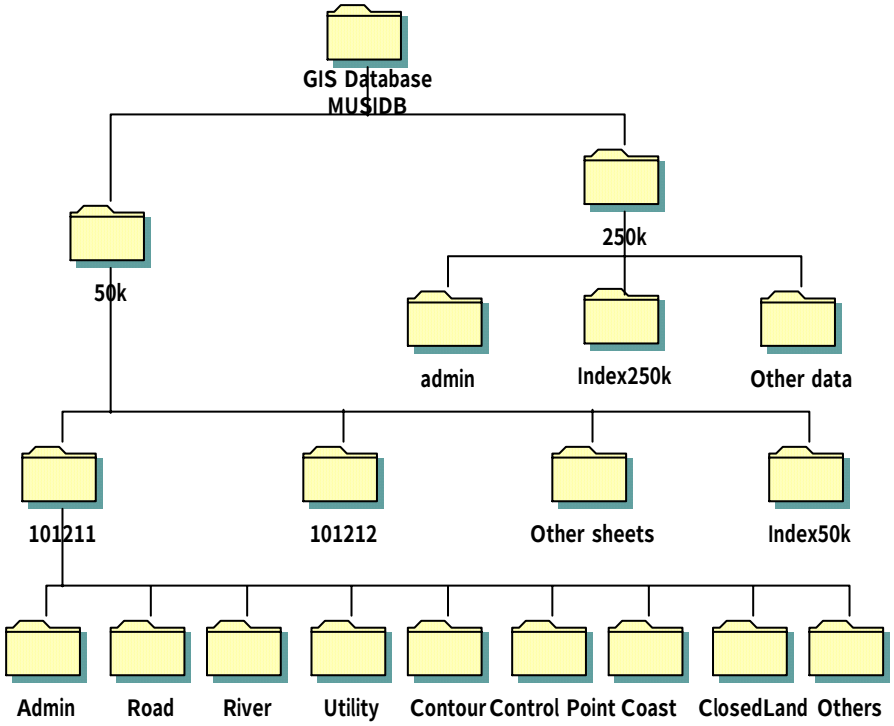


Figure 3.12.1 Files and Folders Construction of GIS Database