

## CHAPTER 3

### PRESENT CONDITION OF THE BASIN AND BASIC ANALYSIS

#### 3.1 General Natural Conditions

##### 3.1.1 Topography

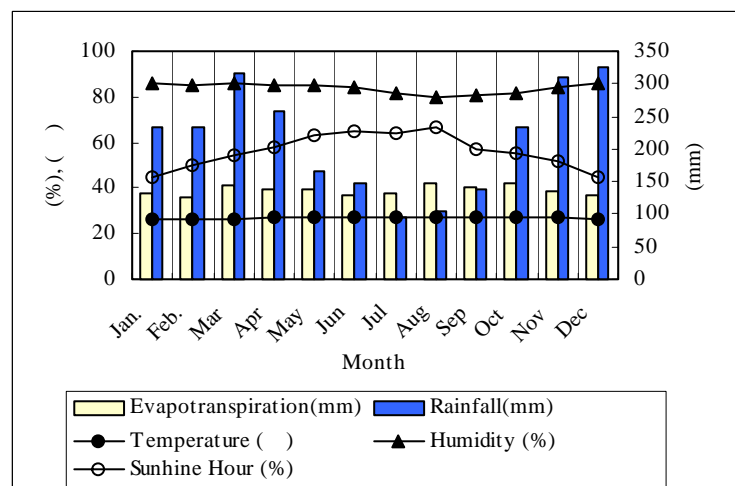
The Musi River Basin covers a total of 59,942 km<sup>2</sup> in the south of Sumatra Island between 2°17' and 4°58' South latitude and between 102°4' and 105°20' East Longitude. The topography of the Musi River Basin can be broadly divided into five zones. The Mountain Zone comprises the northwestern to southwestern part of the study area and is composed of valleys, highland plateaus and volcanic cones. The Piedmont Zone is an approximately 40 km wide transition belt between the Mountain Zone and the Central Plains. It is an undulating to hilly area with some flat plains. The central plains consist of three sections, uplands, flood plains and river levees. The Inland Swamps comprise the natural river levees and back swamps. The back swamps are less elevated than the river level and flooded during the rainy season. The Coastal Plain comprises the lowlands along the coast and the deltaic northeastern lowlands, naturally covered with peat swamp forest.

##### 3.1.2 Geology

The geology consists of the oldest formations of undifferentiated intrusive and metamorphic rocks of Pre-Tertiary age from Eocene to Pliocene and the quaternary formations comprising undifferentiated volcanic rocks of Pleistocene and Holocene, and swamp deposits and alluvium. Surface geological materials are classified for the purpose of land and soil classification as peat, alluvium, detritus sedimentary, volcanic sedimentary, acid igneous rocks, basic igneous rocks, marble and limestone, and other metamorphic rocks.

##### 3.1.3 Meteorology

The meteorological conditions in the Musi River Basin are affected by tropical monsoon, which give hot and humid climate through the year to this area. The Meteorological condition is shown in **Figure 3.1.1**. Mean annual rainfall varies between less than 2,000 mm in the coastal plain and 3,500 mm in Lahat located in the eastern foot of the Barisan Range.



**Figure 3.1.1 Meteorological Condition at Palembang**

### 3.1.4 Hydrology

The lower Musi River, downstream stretch from the confluence of the Komerling River has an average flow of about 2,500 m<sup>3</sup>/s with fluctuations in dry and wet seasons between 1,400 and 4,200 m<sup>3</sup>/s. Normally, the flow of the Musi River and its tributaries has the highest peak between February and March, and the lowest between July and September. The water level of the Musi River is +1.2 m above mean sea level as the highest and +0.0 m as the mean in the dry season. In the rainy season, the water level of the Musi River is +1.8 m above mean sea level as the highest and +1.0 m as the mean.

### 3.1.5 Groundwater

In the Barisan Range, an unknown but presumably substantial potential of groundwater exists for new and extended schemes exploiting spring sources and shallow aquifers. In the Piedmont Zone, groundwater potential seems to be less significant. Deep aquifers are less likely to bear any major potential for groundwater exploitation. The Pre-Pleistocene Peneplains including the surroundings of Palembang are in general not suited for groundwater exploitation from deep formations.

### 3.1.6 Soils

Six soil units classified for the Musi River Basin. Organosols are formed on deposits of peat and are distinguished by depth and decomposition of the peat. The largest continuous extent of Regosols occurs in the Belitang area in the Southeastern part of the Study Area. Alluvial soils are formed on recent alluvial deposits and are therefore associated with the courses of rivers and streams and also with coastal areas. Rendzina covers small areas in the basin. Podzolic soils are the most widespread soils in the catchment area, because they result from the dominant soil forming process on dry-land sites at low elevations. Andosols are recent volcanic soils generally with weakly developed surface horizons and cambial horizons overlying volcanic materials, either consisting of more than 60 % of volcanic materials.

## 3.2 Socioeconomic Conditions

The restructuring of the local autonomy is underway in South Sumatra Province. Since the restructuring was conducted quite recently, almost all the available data on socioeconomy are still based on the previous administrative systems, thus the previous administrative division is used to grasp the socioeconomic condition of the study area. The relation of the previous system and the latest one is summarized in **Table 3.2.1**.

**Table 3.2.1 Restructuring of Autonomy in South Sumatra Province**

Previous Administrative Division	New autonomy as of September 2002	
Kotamadya Palembang	Kotamadya Palembang	
Kab. Musi Banyuasin	Kab. Musi Banyuasin	Kab. Banyuasin
Kab. Muara Enim	Kab. Muara Enim	Kotamadya Perabumulih
Kab. Lahat	Kab. Lahat	Kotamadya Pagaralam
Kab. Musi Rawas	Kab. Musi Rawas	Kotamadya Lubuk Linggau
Kab. Ogan Komering Ilir	Kab. Ogan Komering Ilir	
Kab. Ogan Komering Ulu	Kab. Ogan Komering Ulu	

### 3.2.1 Administrative System

The Musi River Basin stretches over four provinces. South Sumatra, Bengkulu, Jambi occupy approximately 96%, 3.6%, 0.4% of the total basin area, respectively, while Lampung occupies the small areas along its provincial boundary. Kabupaten and Kotamadya in the South Sumatra Province are as listed in **Table 3.2.1**. Study area for each Kabupaten is shown in **Table 3.2.2**.

### 3.2.2 Population and Labor Force

According to the latest population census 2000, Indonesia had a population of 205.8 million. This population increased by 27.3 million as compared with the census 1990. During 10 years from 1980 to 1990, the average annual growth rate of the population was 2.0 % but that from 1990 to 2000 slowed down to 1.4 %. **Table 3.2.3** shows area, population by sex, population density, number of household, and average family size of the Regencies and Municipality in South Sumatra Province in 2000.

**Table 3.2.2 Area by Kab.** (km<sup>2</sup>)

Province / Regency	Musi River Basin
<b>South Sumatra</b>	
Ogan Komering Ulu* <sup>1</sup>	10,762
Ogan Komering Ilir	5,349
Muara Enim	8,909
Lahat	6,839
Musi Rawas	13,261
Musi Banyuasin	12,212
Palembang	235
<b>Bengkulu</b>	
Rejang Lebong	2,130
<b>Jambi</b>	
Batang Hari & Others	245
Total South Sumatra	57,567
Total Study Area	59,942

\*1 include Lampung Province

**Table 3.2.3 Population Density, and Average Family Size of South Sumatra**

Regency/Municipality	Area (km <sup>2</sup> )	Population			Population density (person/km <sup>2</sup> )	Number of household (1,000)	Average family size (person/family)
		Male (1,000)	Female (1,000)	Total (1,000)			
Palembang	401	719.0	732.4	1,451.4	3,623	293.8	4.9
Ogan Komering Ulu	13,661	590.0	569.7	1,159.7	85	251.3	4.6
Ogan Komering Ilir	21,387	489.8	486.3	976.2	46	222.6	4.4
Muara Enim	9,575	358.9	358.8	717.7	75	161.9	4.4
Lahat	7,252	338.5	331.6	670.1	92	146.2	4.6
Musi Rawas	21,513	323.7	318.1	641.8	30	140.5	4.6
Musi Banyuasin	26,099	624.2	616.2	1,240.4	48	272.9	4.5
Total	99,888	3,444.1	3,413.3	6,857.4	69	1,489.2	4.6

Source: Sumatera Selatan Dalam Angka 2001, BPS Sumatera Selatan

Population of the Musi River Basin has been estimated by sub-basin as presented in **Table 3.2.4**.

**Table 3.2.4 Population by Sub-basin of the Musi River Basin**

Sub-basin	Population (1,000)	Household (1,000)	Sub-basin	Population (1,000)	Household (1,000)
Musi	2,758	592	Kelingi	152	33
Komering	1,125	249	Lematang	623	139
Ogan	918	200	Semangus	79	18
Harileko	114	25	Padang	182	38
Rawas	161	34	Total	6,338	1,377
Lakitan	226	50			

### 3.2.3 National and Regional Accounts

**Gross Domestic Product (GDP)** of Indonesia in 2001 was Rp.1,490,974 billion (approx. US\$ 145 billion) and per capita GDP in the same year was Rp.7.1 million (approx. US\$ 690). Due to depreciation of Rupiah through the economic crisis, GDP and per capita GDP in 2001 are only 60 % of those in 1996 when converted into US dollars. Annual growth rate of GDP in 1996 was 7.8% and that of per capita GDP was high at 5.9%. However, because of the crisis, - 13% of a large negative growth was occurred in 1998.

**Gross Regional Domestic Product (GRDP) of South Sumatra Province** in 2001 was Rp.45,383 billion (approx. US\$ 4.4 billion), which accounted for 3.0% of GDP of Indonesia. Per capita GRDP in the same year was Rp.6.5 million (approx. US\$ 630), which is 8.4% lower than that of Indonesia. Real economic growth for last 7 years remains 1.9% p.a. with oil/gas, and 1.0% p.a. without oil/gas due to grave impact of the crisis. Per capita GRDP of South Sumatra Province without oil/gas was Rp.4.3 million (US\$417), which was 30% lower than that of Indonesia, Rp.6.1 million (US\$594). Mining sector has increased its share in GRDP since 1996 and accounted for one third of total GRDP in 2001. Conversely, other sectors have reduced their shares gradually during the same period. This shows that economy of South Sumatra Province has increased dependence on mining sector, especially on oil/gas, again taking a cue from the economic crisis.

**GRDP of the regencies and municipalities in the Musi River basin** has been estimated at Rp.40 trillion (US\$4.7 billion) in 2000. Palembang, Muara Enim, and Musi Banyuasin are the greatest contributor for GRDP of the basin accounting for 23%, 25%, and 22% of total GRDP, respectively. OKU, Muara Enim, Musi Rawas, and MUBA are oil-producing regencies. The differences of GRDP of these regencies between with and without oil/gas are very large. GRDPs of Muara Enim and MUBA in 2000 were Rp.9.6 trillion and Rp.8.6 trillion, respectively. However, those without oil/gas were only Rp.3.1 trillion, and Rp.4.5 trillion, respectively.

Per capita GRDP without oil/gas may be more relevant to see people's livelihood since oil/gas revenue have little impacts on the regional economy. Palembang's per capita GRDP is the largest at Rp.5.6 million among the regencies, while that of Musi Rawas is the smallest at Rp.2.7 million (see **Table 3.2.5**).

**Table 3.2.5 Per Capita GRDP without Oil/Gas by Regency**

Regency/ Municipality	Year							
	1993	1994	1995	1996	1997	1998	1999	2000
Palembang	1,701	1,942	2,261	2,691	3,051	4,454	5,046	5,612
Ogan Komering Ulu	886	1,030	1,199	1,356	1,548	2,323	2,532	2,785
Ogan Komering Ilir	938	1,066	1,251	1,469	1,682	2,358	2,698	2,986
Muara Enim	1,477	1,550	1,860	2,337	2,953	3,891	4,271	4,360
Lahat	1,018	1,160	1,372	1,550	1,890	2,774	3,024	3,369
Musi Rawas	910	1,068	1,218	1,406	1,663	2,274	2,386	2,665
Musi Banyuasin	1,219	1,360	1,591	1,806	2,058	2,941	3,262	3,628
Rejang Lebong	1,165	n.a.	1,714	1,872	2,003	3,298	3,445	n.a.

Source: Produk Domestik Regional Bruto, BPS each regency

### **3.2.4 Industries**

In **agriculture sector**, South Sumatra Province achieved self-sufficient in food (rice production) at the end of Repelita IV (1984-1989). Since then, the province has contributed to the national food stock. In 2000, the production of paddy was 1,964,700 tons from 579,600 hectares, which accounted for 3.8% of total production and 4.9% of total cultivation area of Indonesia. Musi Banyuasin, OKU, and OKI are the biggest rice producer in the area with 564,700 tons, 374,100 tons, and 414,400 tons, respectively. Since more than half of paddy cultivation land is still depending on rain, crop production varies largely from year to year depending on climate.

**Fishery** production of the regencies in the Musi River Basin was 137,200 tons in 2001. Catch of 50,400 tons were from marine fishery, 72,905 tons from inland fishery, and 13,831 tons from brackish water pond. Average annual growth of the production is 7% p.a. during 5 years from 1996 to 2001.

**Manufacturing industry** had served as an engine of economic growth in the region before the economic crisis. However, it was badly hit by the crisis in 1997/98, and more recently has had to cope with recession in major export markets. The manufacturing sector had grown fruitfully until 1996. After the economic crisis, recovery of the sector is quite weak, especially that of non-oil/gas manufacturing is very slow.

In **tourism sector**, South Sumatra Province had 18,600 foreign and 260,500 local tourists in 2001. Musi River tour is one of the tourists attractions in Palembang area. Tourists can enjoy the unique scenery of floating houses, Benteng Kuto Besak (the fort of Big Town under development), Ampera Bridge, and the tiny delta of Kemaro Island, Island of Viharas the famous place for Buddhist pilgrims.

The supply of **electricity** and its infrastructure in South Sumatra is served by District IV of the State Electricity Company (PLN) using inter connection system with Bengkulu and Lampung provinces. Electricity was supplied for 625,300 households, which was 41% of total household in the province. In Lahat and Palembang, the ratios of electricity user are very high at 99% and 88% respectively, while those in OKU and MUBA are low at 16% and 11%.

**Municipal water** companies (PDAM) are responsible for delivering water supply service in urban areas. PDAM is financially autonomous. Households that use water supply for drinking water were only 17.7%, while those in Palembang were 69.6% (Susenas 2000). The most dominant sources of drinking water were protected and non-protected well, which accounted for 38% and 21%, respectively. River water is used as drinking water by 12.8% of household. In MUBA, 29.5% of households use rainwater for drinking in order to avoid saline groundwater.

### **3.2.5 Projection of Socioeconomic Framework to the Target Year**

In this study, the future **population projection** was conducted based on "Proyeksi Penduduk Indonesia per Kabupaten/Kotamadya 1990-2000", and the population growth

target set in the PJP-II was referred. The estimated future population by regency is summarized in **Table 3.2.6**.

**Table 3.2.6 Population Projection and Annual Growth Rates (1,000 people)**

Regency/Municipality	2002	2005	2010	2020
Palembang	1,506 (2.1%)	1,598 (2.0%)	1,752 (1.8%)	2,058 (1.5%)
Ogan Komering Ulu	1,202 (1.7%)	1,263 (1.6%)	1,365 (1.5%)	1,568 (1.3%)
Ogan Komering Ilir	1,019 (2.1%)	1,083 (2.0%)	1,189 (1.8%)	1,403 (1.5%)
Muara Enim	749 (2.1%)	795 (2.0%)	873 (1.8%)	1,028 (1.5%)
Lahat	690 (1.3%)	717 (1.3%)	763 (1.2%)	853 (1.1%)
Musi Rawas	672 (2.3%)	717 (2.2%)	794 (2.0%)	946 (1.6%)
Musi Banyuasin	1,309 (2.9%)	1,422 (2.7%)	1,609 (2.4%)	1,984 (1.9%)
Total	7,146 (2.1%)	7,565 (1.9%)	8,344 (2.0%)	9,840 (1.7%)

In order to formulate the **economic growth target** until the target year 2020, GRDP without oil/gas is selected considering that price of oil/gas is largely affected by external factors; even after the fiscal decentralization, the revenue accruing from oil/gas industries are not net regional receipt, but large part of it is transferred into the central government account; and, the absorption of labor force in the oil/gas sectors is relatively low and their contribution to regional welfare is insignificant.

Three scenarios are conceived as follows: Scenario 1: Low growth due to slow economic recovery; Scenario 2: Moderate growth due to sound economic recovery; Scenario 3: Fast growth due to rapid economic recovery. The results of estimation of the future GRDP are presented in **Table 3.2.7**.

**Table 3.2.7 Results of Future GRDP Estimation  
(without oil/gas, 2000 constant price)**

Regency/ Municipality	Actual GRDP in 2000 (Rp. bn)	Scenario 1		Scenario 2		Scenario 3	
		GRDP in 2020 (Rp. bn)	Growth 2000-2020 (% p.a.)	GRDP in 2020 (Rp. bn)	Growth 2000-2020 (% p.a.)	GRDP in 2020 (Rp. bn)	Growth 2000-2020 (% p.a.)
Palembang	8,147	13,973	2.7	18,858	4.3	28,621	6.5
OKU	3,230	5,807	3.0	6,967	3.9	9,285	5.4
OKI	2,916	5,266	3.0	6,205	3.8	8,078	5.2
Muara Enim	3,129	5,211	2.6	5,986	3.3	7,526	4.5
Lahat	2,258	4,108	3.0	4,815	3.9	6,231	5.2
Musi Rawas	1,710	3,061	3.0	3,623	3.8	4,740	5.2
MUBA	4,501	7,885	2.8	9,429	3.8	12,466	5.2
Total	25,890	45,311	2.8	55,883	3.9	76,947	5.6

### 3.3 Land Use and Watershed Management

#### 3.3.1 Land Classification

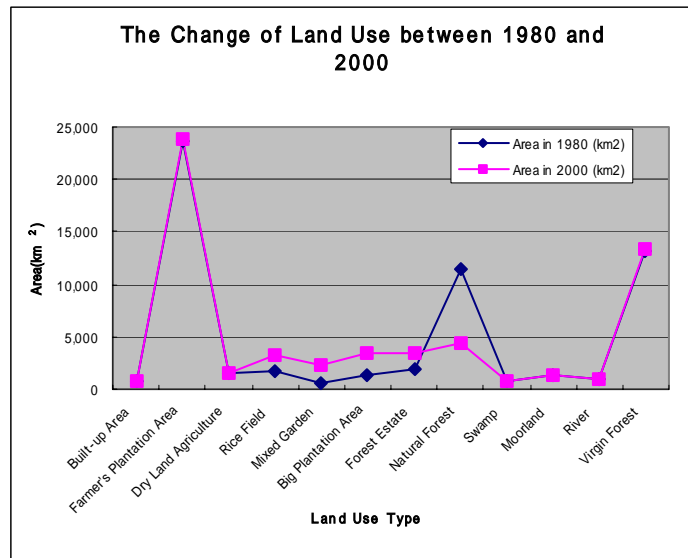
The land of the Musi River Basin is grouped into seven major landforms; namely, Mountains; Steep Hills; Hilly Land; Undulating and Rolling Plains; Inter-mountain Plains; Inland Riverine Plains; and Flood Plains and Swamps. Each landform consists of several land systems. The land systems are classified through GIS analysis with Geology, Topography, Soil, and Vegetation from Satellite Images, Aerial Photograph

Interpretation, and Reconnaissance Field Surveys. Totally forty-two land systems have been separated in the study area.

### 3.3.2 Historical Changes in Land Use

JICA study team converted the land use map (scale 1:500,000) in 1980 to digital GIS data, and the area of each land use type was summed up through GIS analysis. The land use data (scale 1:50,000) in 2000 was made by BPN through a BAPPEDA project. JICA study team fixed diversity errors from features and projection, appended all the data together and regenerated it to GIS database. Also, for comparing with land use in 1980, the land use types were also reclassified.

To compare the land use in 1980 and in 2000, it is easy to find that the natural forest area was dramatically dropped from 19% in 1980 to 7% in 2000. Conversely, other agriculture land, sort of rice field, mixed garden and agriculture plantation are increased. The **Figure 3.3.1** shows the land use changes during 1980 and 2000.



**Figure 3.3.1 Comparison of Land Use in 1980 and 2000**

### 3.3.3 The Processes of Forest Disappearance

This section is discussed for the whole area of South Sumatra Province (87,225 km<sup>2</sup>), and not for the Musi River Basin (59,354 km<sup>2</sup>). In 1980, the total forest area in South Sumatra Province is about 43,721 km<sup>2</sup>. The protection forest is 11,826 km<sup>2</sup>, and the production forest is 31,895 km<sup>2</sup>. The current forest was interpreted from LANDSAT TM satellite image in 2000 at only 14,141 km<sup>2</sup>. It is more clear to see the forest disappearance during 1980 and 2000 by breaking down the total forest to protection and production forest as shown in the following table.

**Table 3.3.1 Reduction in Forest Area from 1980 to 2000**

Forest Type	Forest Area in 1980 (km <sup>2</sup> )	Forest Area in 2000 (km <sup>2</sup> )
Protection Forest	11,826	7,404
Production Forest	31,895	6,737
Total	43,721	14,141

To overlay the forest in 2000 with the forest, legal logging area, and transmigration area in 1980, it is easy to find following two illegal logging phenomena. Firstly, a large part of forest in middle land and low land was destructed. And the forest destruction areas are usually the transmigration areas. Therefore, the reasons of forest destruction in these

areas can be considered as illegal logging, slash and burn farming for developing agriculture land. Secondly, the protection forest areas in high land are also reduced fast.

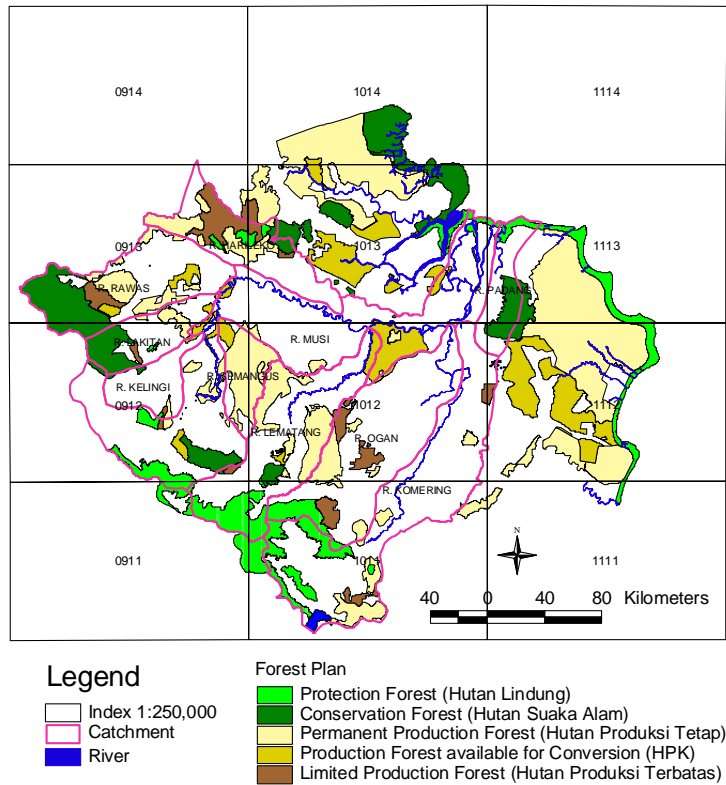
### 3.3.4 Present Watershed Management Conditions

Due to above forest destruction status, the government of South Sumatra Province made a forest land use plan in 1999 for expanding forest estate area. The plan includes expanding the forest area from 14,141 km<sup>2</sup> to 35,440 km<sup>2</sup> within 15 years (refer to **Figure 3.3.2**).

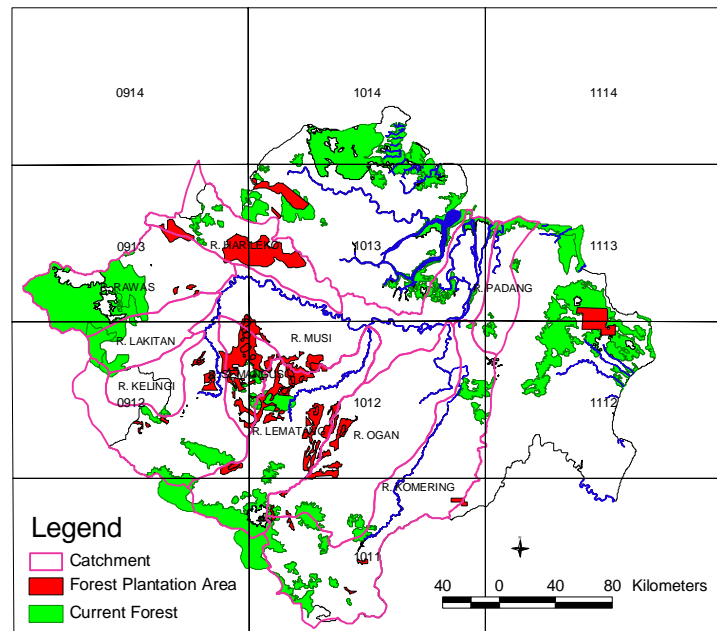
For this purpose, several forest estate projects have been implemented. The estate projects are being conducted by private estate company with a total area of 4,129 km<sup>2</sup> (refer to **Figure 3.3.3**).

### 3.3.5 Future Spatial Plan

The spatial plan of South Sumatra Province was established in 1992 and then revised in 1999. The expired time of this plan is 2014. However, considering the current economic situation of Indonesia, this spatial plan can be fully considered to revise again without big update. Therefore, it is possible to use this spatial plan as in 2020. In 1994, Palembang Municipality made the first spatial plan for target years from 1994 to



**Figure 3.3.2 Current Forest Planning**



**Figure 3.3.3 Forest Estate Area and Current Forest**



2004. Five years late in 1998, a new spatial plan 1999 to 2009 was designed, however, the data used in the new spatial plan was the same as the one in the old plan 1994 to 2004. Considering the current economic status of Indonesia and the annual budget of Palembang municipality, the spatial plan 1999 to 2009 for Palembang municipality can be also considered to revise again to 2020 without much update.

### **3.4 Natural Environment**

#### **3.4.1 Natural Ecosystems and Human Impacts**

Natural Ecosystems of South Sumatra Province directly reflects its geology and geomorphology. The World Wildlife Fund recognizes five Ecoregions in South Sumatra Province. **Sumatran Lowland Rain Forests** is experiencing the most severe pressure from human activities, such as agriculture, estate, forestry production, mining, and urban and industrial development. It can be divided into three sub-regions by geological character: peneplain with tertiary marine sediment, rolling hills with volcanic sandy tuffs, and mountain foot area with volcanic quaternary sediment. Sandy tuff shows low fertility, and is most susceptible against soil erosion. Important mineral resources, e.g. oil, natural gas and coal are deposited in this area, thus development of the region is expected to continue.

**Sumatran Freshwater Swamp Forests** grow on fertile alluvial soils and contains many of the endangered and characteristic Sumatran species. The forests are highly productive and have been cleared by logging and agriculture to establish plantations and agricultural field. The rich soil and good access to fresh water made the region the most suitable area for rice farming. **Sumatran Peat Swamp Forests** are less threatened than the freshwater swamp forests because of the poor productivity and difficulty of access. In recent years, however, significant areas of peat swamp forests have been burned, and only a few blocks of habitat remain in the Province. Negative factors such as acid soil, land subsidence, and soil erosion prevent high yield from the rice field, et.

**Sunda Shelf Mangroves** are some of the most biologically diverse mangroves in the world. Most part of mangrove forest in South Sumatra Province is designated as "Protected Forest". **Sumatran Montane Rain Forests** contain far higher levels of mammal and bird endemism than the lowland forests, because of their longer periods of isolation and distinctive forest types. At the current rate of deforestation in lower area, the only remaining natural forests in Sumatra may be the hill and montane forests of this ecoregion. This ecoregion is extremely fragile and sensitive to disturbance. The Kerinci Seblat National Park is the largest reserve in Sumatra covering 796,000 ha.

#### **3.4.2 Urban and Industrial Environment**

BAPEDALDA of Municipalities and Ministry of Trade and Industry are responsible for handling industrial waste. The Ministry of Energy and Mineral Resources is responsible for handling wastes from related facilities. There are a few industrial facilities that may cause serious environmental pollution if not provided good management. Mining of coal, oil, and other minerals, pipelines, and oil refinery may pollute soil, groundwater,

and surface water with toxic chemicals. Food factories, palm oil factories, fertilizer plants, and saw mills may pollute surface water with organic materials.

### 3.4.3 Laws and Institutions for Environmental Management

Under the Ministry of Forestry, responsible for nature conservation and rehabilitation of forests is Balai Konservasi Sumber Daya Alam (Balai KSDA) and others. Provincial Department of Forestry also has staff and equipment for forest inventory, planning, management, preservation and rehabilitation. Planning work is coordinated with the Provincial BAPPEDA. There are not many NGOs in nature conservation sector in South Sumatra Province.

There are two types of **protected areas**, conservation forest and protection forest, in addition to national park. Conservation forest is where biodiversity and ecosystem are to be conserved. It consists of nature protection forest (HSA), as core areas and surrounding buffers, and nature conservation forest (also called as conservation area: kawasan konservasi in Law No.51, 1990) that can be used by people in sustainable manner. Protection forest is, on the other hand, aimed to conserve water resource and soil fertility of the area and downstream. In South Sumatra Province, there are ten conservation forests and 18 protection forests. The total of designated protected area is 1,251,423 ha, that is 12 % of the total area of the Province (**Table 3.4.1**).

**Table 3.4.1 Protected Areas in South Sumatra Province**

	Area of Regency ha	Conservation Forest HK ha	Protection Forest HL ha	Protected Forest Total HK+HL ha	Protected area %	Distribution
Musi Banyuasin	2,619,100	342,479	68,823	411,302	16%	33%
Ogan Komering Ilir	2,136,700	4,828	105,159	109,987	5%	9%
Ogan Komering Ulu	1,467,900	50,950	151,021	201,971	14%	16%
Muara Enim	957,500	9,440	71,700	81,140	8%	6%
Lahat	771,900	52,829	141,100	193,929	25%	15%
Musi Rawas	2,151,300	251,252	1,842	253,094	12%	20%
Total	10,104,400	711,778	539,645	1,251,423	12%	100%

Source: Statistik Kehutanan, Propinsi Sumatera Selatan, 2001

**Forest** area, estate, and agriculture field are managed by separate offices at the National and Provincial level. Management of extension offices (Penyuluh) of these departments is transferred from Province to Regency and Municipality in 2001. Since then, such offices are consolidated in some areas for more efficient and comprehensive communication with farmers. Such local office conducts general consulting for farmers. Provision of information regarding soil conservation is a part of such consultation.

There are 65 **production forests**, 2,522,034 ha in total, in the Province (**Table 3.4.2**). Of these, three are forests with artificially planted trees, Acacia, for pulp and paper industry. The rest of the production forests are for selective cutting of logs. Based on a national policy to rehabilitate tropical forests in the country, all logging concession has been stopped by 2002 until further announcement. Therefore, legally, there should not be any log production from the production forests besides the production from the three acacia forests. Logging from forests on private land is monitored by villages. All trees

that are cut, sold and moved from the place of origin are mandated to receive certification from the village chief. With above condition, any logs that are cut in production forest without logging concession, and that are cut from private land without certification from the village chief is classified as “illegal logging”. Naturally, any logs cut from protected areas are also “illegal”.

**Table 3.4.2 Designated Forest Area in South Sumatra Province**

Province	Area	HK	HL	Production Forest HP	HK+HL +HP ha	Forest %	Other land use ha
Musi Banyuasin	2,619,100	342,479	68,823	848,777	1,260,079	48%	1,359,021
Ogan Komerling Ilir	2,136,700	4,828	105,159	843,899	953,886	45%	1,182,814
Ogan Komerling Ulu	1,467,900	50,950	151,021	111,613	313,584	21%	1,154,316
Muara Enim	957,500	9,440	71,700	286,107	367,247	38%	590,253
Lahat	771,900	52,829	141,100	53,628	247,557	32%	524,343
Musi Rawas	2,151,300	251,252	1,842	378,010	631,104	29%	1,520,196
Total	10,104,400	711,778	539,645	2,522,034	3,773,457	37%	6,330,943

HK: Conservation Forest, HL: Protection forest

Source: Statistik Kehutanan, Propinsi Sumatera Selatan, 2001 page IV-1

**Reforestation Fund (DR)** is collected from concessionaires by the Ministry of Forestry. The money is expected to be used for new planting in concession area or in area damaged by fire, for conservation of forest and wildlife, or for social forestry projects. Concessionaires, in current system, receive the Reforestation Fund when they obtain secondary forests tagged as “logged over and degraded”. The ITTO mission states that once the payment from the government has been received, the concessionaires lose interest to plant.

### 3.4.4 Existing and Potential Environmental Issues

Team recognizes following existing and potential environmental issues, namely, existing threat from activities in forestry, estate, and agriculture to natural environment and water resource; existing and potential impact from water development; needs for strong and coordinated conservation policy; and, environmental research, education, and public participants.

## 3.5 Water Quality

### 3.5.1 Relevant Information of Water Quality

The Musi River Basin can be divided into ten river systems. Each river system consists of one to eight sub-basins. The total population of the Study Area amounts to approximately 6.3 million people. Of these, approximately only less than 5% are presently supplied from piped water, while more than 95% exploit surface water. Most water-consuming industries are located in or around Palembang City and do not use groundwater to any substantial extent. Many waterborne and water-related diseases have been counted in the Study Area.

### 3.5.2 Pollution Sources

A high percentage of people in the Musi River Basin live in riverine areas. Domestic wastewater is currently discharged into rivers with no treatment or with septic tank through the small ditches or channels. All the analysis data of factory effluent are not available for this Study because of confidentiality; thus, available data is very limited. The existing pollution load runoff of BOD in dry season by each point and non-point source was calculated, as shown in **Table 3.5.1**.

**Table 3.5.1 Total BOD Pollution Load Runoff**

(Unit: ton/day)

Source	MU	KO	OG	HA	RA	LA	KE	LE	SE	PA	Total	(%)
Point (domestic)	55.2	22.5	18.4	2.3	3.2	4.5	3.0	12.5	1.6	3.6	126.8	55.8
Point (industry)	31.1	3.6	7.1	3.9	1.8	0.7	0.3	8.4	0.7	2.3	60.0	26.5
Sub-total	86.3	26.1	25.5	6.1	5.0	5.2	3.3	20.9	2.3	5.9	186.8	82.3
Non-point (livestock)	4.9	8.2	3.7	0.6	1.2	0.6	0.2	3.0	0.5	0.5	23.5	10.4
Non-point (land)	4.7	3.0	2.6	0.7	1.4	0.7	0.7	1.9	0.4	0.4	16.5	7.3
Sub-total	9.7	11.2	6.3	1.3	2.7	1.2	0.9	4.9	0.8	0.9	40.0	17.7
Total	96.0	37.3	31.8	7.4	7.7	6.5	4.2	25.8	3.1	6.8	226.7	100

MU: Musi Main, KO: Komerling, OF: Ogan, HA: Harileko, RA: Rawas, LA: Lakitan, KE: Kelingi, LE: Lematang  
SE: Semangus, PA: Padang

### 3.5.3 Present Water Quality Condition

**BAPEDALDA** has been analyzing surface water, industrial wastewater effluent, domestic wastewater effluent, and agricultural effluent of the Study Area since 1985. Available water quality data in the Musi River Basin are limited with those observed by BAPEDALDA in 2001, and those observed through Clean River Project during 1993-1998, etc.

The **present water quality** is characterized as follows: The level of organic pollution in the Musi River Basin is low. Solid contents (TSS) in some sections are increased with the highest values in the mountain areas, confluence points of the Lematang River with the Enim River that flows through devastated land, and the coal mining area where this pollution has obviously originated. DO concentrations in the Musi River are moderate, and in the middle reaches it is below 6.0 mg/l, the standard for drinking water resources. Fecal coliforms are found in concentrations that exceed the allowable limits. Very low pH values are detected in the small rivers that originate in peat swamps. Pesticides are detected. Although the detected concentrations are below the allowable limits, the evidence of pesticides in the rivers that serve as drinking water resources should be further analyzed. Toxic substances such as heavy metals, cyanide and phenol were analyzed for the Ogan and Komerling rivers in 2001. Average values of these toxic substances show that toxic substances were not detected or in very small concentrations compared with the standard quality.

The Government of Indonesia had enacted “Regulation Number 82 of Year 2001 concerning Water Quality Management and Water Pollution Control.” In compliance with this national regulation, the Governor of South Sumatra prescribed the standards of river water and wastewater effluents. The **permissible limits of industrial wastewater**

**quality** and maximum pollution load discharged into rivers are prescribed in the Decision of the South Sumatra Governor. According to this Decision, 32 types of industry should comply with the regulations. Factories have to monitor their industrial wastewaters by themselves, analyze with their own small laboratories and submit the analysis results to BAPEDALDA. BAPEDALDA has been observing the wastewater quality of 60 factories once to four times a year for the purpose of cross-check. PDAM has a **quality standard to control the water quality of piped water**, and performs periodical analyzes of water quality before and after treatment.

BAPEDALDA organizes water quality monitoring under the finance provided by municipal and central governments. Provincial BAPEDALDA has a central laboratory. According to the **existing equipment** line-up of BAPEDALDA, general parameters including heavy metals could be analyzed. However, no GC or GCMS necessary for the analysis of toxic substances such as insecticides, herbicides, pesticides, etc., has been provided; hence, activities on environmental monitoring are limited at present.

### **3.5.4 Specific Issues to be Solved**

The water quality monitoring is essential for the water quality management in the Study Area and monitoring results should be widely utilized in relevant institutions and open to the general public. The existing water quality monitoring activities are not sufficient to cover the whole Musi River Basin. BAPEDALDA has a plan for water quality monitoring; however, the plan has not been well-functioning due to the shortage of budget and monitoring equipment.

## **3.6 Social Environment**

### **3.6.1 Social Environment Overview**

The numbers of schools, hospitals and health centers in proportion to the population are compared with other Provinces in Indonesia. The ranks are almost the 20th in 26 Provinces (data in 2000). The population below poverty line is ranked at 12th among 26 Provinces. Humans have been inhabited in South Sumatra since prehistoric times. The native people in South Sumatra consist of various ethnic groups with local languages and dialects. South Sumatra has been one of the most important destinations since its low population density. The majority of transmigrants from Java are cultivating rice, rubber or coffee in rural centers.

### **3.6.2 Results of Questionnaire Survey**

Although **river utilization** are in variety, they are very important for the people's daily lives as they are used for the water source of drinking and washing clothes almost everyday by the majority of the people (68.0% and 62.7% in total respectively). In addition, more than 45% says they use rivers for toilet. Usage of rivers other than drinking and washing are different in areas. Transportation of people and fishery are the first and the second highest in the lower area while transportation of people is not the

first although fishery is the second in the middle area. In the upper area, agriculture and fishpond are the first and the second.

Sedimentation is the highest **problems on river water** in both the lower and the middle area. Its percentage increases from upper to lower. On the other hand, smell is relatively low percentage and almost the same among areas. Low water level is a kind of local problems but it is the second highest in the middle. Contamination increase from upper to lower and it is the second highest in the lower area.

Only one third use irrigation channel for **agriculture** while a half use rivers. Percentage distribution differs in areas. The upper area increases irrigation channel. The middle area increases river and decreases well. The lower increases river and decreases irrigation. More than a quarter use irrigation channel for **aquaculture** in wet season. Especially in the upper area, nearly 40% use irrigation channel all the seasons. River is the most important water source for industry and service. In the middle area, well is also an important source.

### 3.6.3 Issues on Spatial Planning

Government Regulation No. 35/1991 (River) decrees protection, development, utilization and control over rivers including lakes and reservoirs. Ministerial Regulation No. 63/PRT/1993 defines river borders and decrees details of their utilization. In spite of regulations mentioned above, so many houses are built in the river borders in urban areas. As a matter of fact, it would be extremely difficult to enforce the regulations by removing such illegal buildings without preparing alternate lands nor a program of returning the inhabitants to their original villages.

### 3.6.4 Conservation of Forest Area

Conservation and sustainable use of forest ecosystem and forest biodiversity are critical components to alleviate poverty and support sustainable development. **Encroachment** is an invasion to forest areas by people farming the land without concession. Encroachment is a serious problem. Firstly, it changes the ecosystem of the forest area, and also increase land erosion and decreases water-holding capacity of land. Secondly, people often give up farming and leave the land not maintained and clear new lands when the fertility of land deteriorates. Thirdly, people invade natural conservation forests or protected forests, and causes biodiversity problems in the former case while it causes problems on water source, flood protection, erosion control, etc. in the latter case. The primary reason why people encroach is land scarcity in accordance with population growth as well as lack of awareness of the people. It is sometimes another reason that the border of forest conservation area is unclear. This problem cannot be solved simply by law enforcement since the many factors are inter-related.

**Illegal logging** is the log cutting for the purpose of making wood products without receiving concession from governments. Only bared land is left after illegal logging because the loggers have no interest in the land that they clear.