

SECTOR D

NATURAL ENVIRONMENT

1. NATURAL ECOSYSTEMS AND HUMAN IMPACTS

The population of the Indonesia in the 1950s was just 50 million. In the following 50 years, or within two generations, it grew to 240 million. The Province of South Sumatra experienced large increase of population as well. Under such high demand to support the population, even traditional activities of land use may not be sustainable any more. Human activities must be less affecting to natural systems so that following generation would be able to receive sufficient resource from the rich but fragile mother nature of tropical wet climate.

1.1 Ecosystems of South Sumatra

Based on the Koeppen climate zone system, whole South Sumatra falls in the tropical wet climate zone. Topology of Sumatra, however, have evolved diverse tectonic and volcanic events associated with the formation of the Barisan Mountains.

Natural Ecosystems of South Sumatra, therefore, directly reflects its geology and geomorphology. In 'Terrestrial Ecoregions of the Indo-Pacific: a conservation assessment' (Wikramanayake, Dinerstein, et. al. Island Press, 2001.), the World Wildlife Fund recognizes five (5) Ecoregions in South Sumatra (**Figure D1.1.1, Table D1.1.1**): Sumatran freshwater swamp forests (WWF index: IM0157), Sumatran lowland rain forests (IM0158), Sumatran montane rain forests (IM0159), Sumatran peat swamp forests (IM0160), and Sunda Shelf mangroves (IM1405).

As the names of the ecoregion suggests, the whole area of the South Sumatra was covered by forest prior to the human intervention. Descriptions of each ecoregion are listed in **Annex D1.1.1**.

In reality, however, the very existence of forest now is often dependent on the financial resources the forest can provide. When a piece of forest is found less profitable, the land is easily cleared of woods and all other vegetation to create more profitable rice field, estate, or production forest.



Note: Number after the ecoregion names refers to the index in the original source.

Source: The World Wildlife Fund "Terrestrial Ecoregions of the Indo-Pacific: a conservation assessment" Island Press, 2001

Figure D1.1.1 Ecoregions of southern Sumatra

Table D1.1.1 Applicable Ecoregions by Regencies and Municipalities

	Sumatran Montane Rain Forests	Sumatran Lowland Rain Forests	Sumatran Freshwater Swamp Forests	Sumatran Peat Swamp Forests	Sunda Shelf Mangroves
General elevation	> 600 m	Penepain, Volcanic tuff: 0 – 100 m Volcanic Quaternary: 100 – 600 m	0 – 100 m	± 0 m	± 0 m
Musi Rawas	O	O			
Lubuk Linggau	O				
Lahat	O	O			
Pagaralam	O				
Muara Enim	O	O	O		
Perabumulih		O			
Ogan Komerin Uru	O	O	O		
Musi Banyuasin		O	O		
Banyuasin		O	O	O	O
Palembang				O	
Ogan Komerin Iril		O	O	O	O

1.2 Sumateran Lowland Rain Forest

Among the ecoregions of South Sumatra, this region is experiencing the most severe pressure from human activities, such as agriculture/estate/forestry production, mining, and urban and industrial development (**Figure D1.2.1**). Since road construction is relatively easy in this area without obstructions neither from water nor steep slopes, most of the lowland rain forest is already changed to land for production. Decrease and fragmentation of habitat must have caused regional extinction of most of the fauna that require large continuous native habitat, or that avoid human activities. During the field survey, the Team was informed that wild animals such as wild boar and monkeys damages food crop fields. Such human-animal conflict will increase when human activities expand into wild, and species diversity of animal home range is decreased by forestry, estate, and agricultural development.

Lowland rain forest in South Sumatra 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 sedimentation. Among the three, sandy tuff shows low fertility, and is most susceptible against soil erosion.

Land clearance in this area may easily cause soil loss and increase of sedimentation downstream. The most serious soil erosion will occur at large-scale clearance in estates or production forest, when the land surface is not covered with vegetation for a few years before completion of reforestation. Small but numerous land clearances in the area with volcanic tuffs will also have serious impact on soil erosion and increase of sedimentation in rivers.

Since important mineral resources such as oil, natural gas and coal are deposited in this area, development of this region is expected to continue.

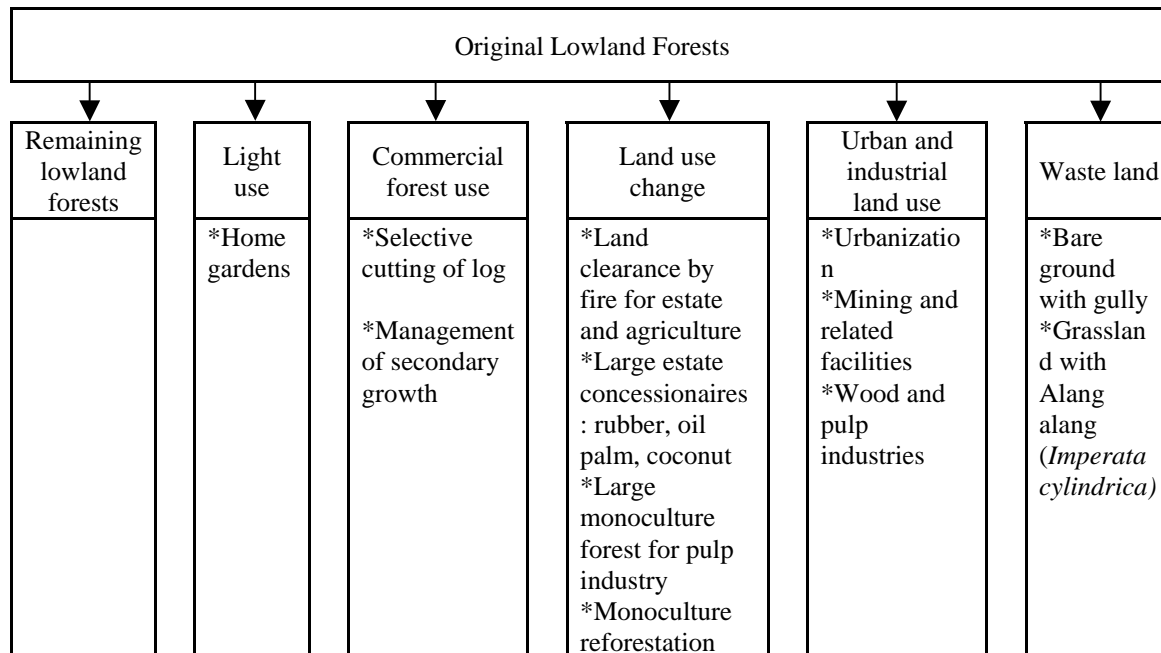


Figure D1.2.1 Major Human Impacts on Sumateran Lowland Forests

1.3 Sumateran Freshwater Swamp Forest

Freshwater swamp forests grow on fertile alluvial soils. The Sumatran freshwater Swamp Forests used to contain many of the endangered and characteristic Sumatran species found in the lowland rain forests. The endangered tiger, Asian elephant, estuarine crocodile, clouded leopard, several primate species all lived in freshwater swamp forests. All will be in danger of local extinction within ten years. The Asian elephant is found in numerous populations throughout Sumatra, but only five populations number more than 200 individuals. Way Kambas Forest Reserve in Lampung Province (420 km²) contains one of these populations, and is the only existing protected area in this ecoregion.

The forests are highly productive and have been cleared by logging and agriculture to establish plantations and agricultural field (**Figure D1.3.1**). The rich soil and access to fresh water made the region the most suitable area for rice farming.

Currently, pristine freshwater swamp forest is difficult to find.

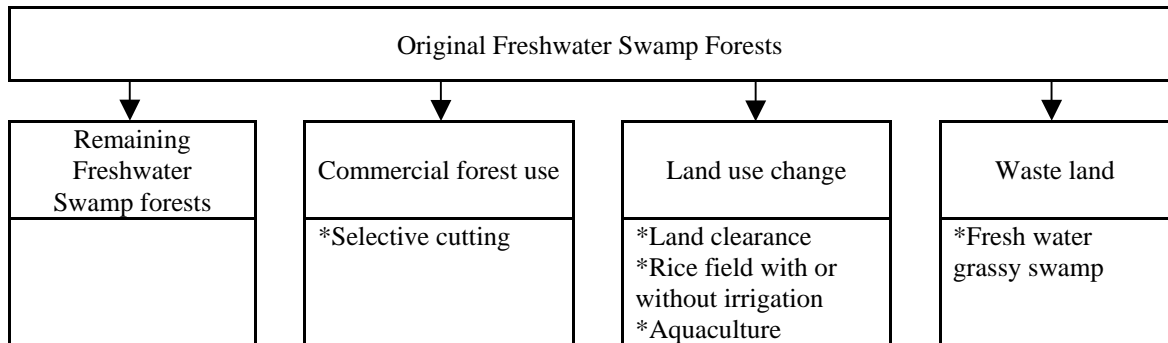


Figure D1.3.1 Major Human Impacts on Sumateran Freshwater Swamp Forests

1.4 Sumateran Peat Swamp Forest

The peat swamp forests in Sumatra 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 southern Sumatra (**Figure D1.4.1**).

Peat soil is composed of high organic matter, often exceeding 65 percent. The peat deposits usually are at least 50 cm thick but can extend up to 20 m. The center of the peat swamp is higher compared to the adjacent river. Because peat swamps are not drained by flooding, they are nutrient deficient and acidic, with a pH usually less than 4. Tropical peat contains large amount of woody material, compared to mostly grassy peat in Temperate Zones. Because of the uneven structure and low ratio of hard materials (higher void ratio), land level in this area tend to subside unevenly after drainage and chemical decomposition.

Peat swamp forests do not support an abundance of terrestrial wildlife. However, many animals in lowland forest such as Sumatran tiger and Asian elephant are found in this region as well.

Berbak National Park (1,310 km²) in Jambi Province is the largest protected area that overlap with this ecoregion.

Since 1970s, peat swamp forest of South Sumatra is developed by the Province (approximately 460 km² in total) as rice field based on national policies of food production and transmigration. Currently, the large fields and their residents are experiencing many serious problems; soil acidity, soil erosion, clogged canal, land subsidence. In the area such difficulties occur, many residents leave their allocated land

to utilize surrounding forest. These unregulated actions further degrade the remaining peat swamp forest. Above negative factors are explained in following paragraphs.

Acid soil (pyrite): In many places in peat swamp, FeSO_4 is accumulated in clay under the peat. When such clay is drained (artificially, or in dry season) and exposed to air by cultivation, H_2SO_4 is released into the air. The acidity of soil reaches to pH 2 to 3, and not only that crops do not grow on such soil, but surrounding vegetation can be damaged by the released acid in the air and water. Technology applied to cope with this situation is to drain the acid with water for 5 to 10 years, and wait for the acid to be washed away. In successful cases, the soil acidity will recover to pH 4.5 - 6. Another measure is to add CaCO_3 to neutralize acidity.

Land subsidence and soil erosion: When peat swamp is drained, the accumulated dead trees are compressed, the ground subsidized, sometimes as low as beneath the water level. Regular cultivation also oxidizes the peat and oxidized peat soil decomposes into water. In addition to this fragile peat, soil under the peat is consisted of alluvial deposit of sand and silt. When vegetation cover over the peat is destroyed, the soft deposit is easily eroded with water movement into rivers and canals. The Team was informed that in many places in the irrigation project tertiary and secondary canals are clogged by eroded soil from the field, making tidal irrigation from the main canal impossible. Where soil acidity is not a problem, it is recommended by the Department of Estate to excavate soil in the drainage and return to fields so that the eroded soil does not reach larger canals and rivers.

Illegal land clearance and waste land: With such a difficult soil to negotiate, popular activities in agricultural development in this region is to try for rice farming for a few years, and when difficulty occurs abandon the land for new land. Remain in the behind is acid grassland or pond useless for farming, and will not naturally be rehabilitated as peat swamp forest. The regulation of swamp development requires 2 km buffer zone between rivers and fields. Because of the lower yield and water shortage in clogged canal, however, farmers tend to develop this buffer zone to have better soil and access to water.

River bank erosion: During the field survey, the Team observed that river / canal bank erosion occurs at many places. Where the river makes curve, outside bank tends to be eroded by the power of flowing water. In addition to such natural cause, wave from high-speed vessels is said to disturb stability of river bank. At the same time, there are many places where river bank looks stable. It is recommended to study such areas to find the clue to stabilize river banks.

Proposed port development: The access road, rail and other infrastructure for the proposed port at Tanjung Api Api will cross the peat swamp forest. On the ground with dynamic activities of water by day, month and year, impacts from such linear infrastructure on wildlife, vegetation, water quality and quantity can be serious, if the water movement is disturbed by the construction and the structure itself.

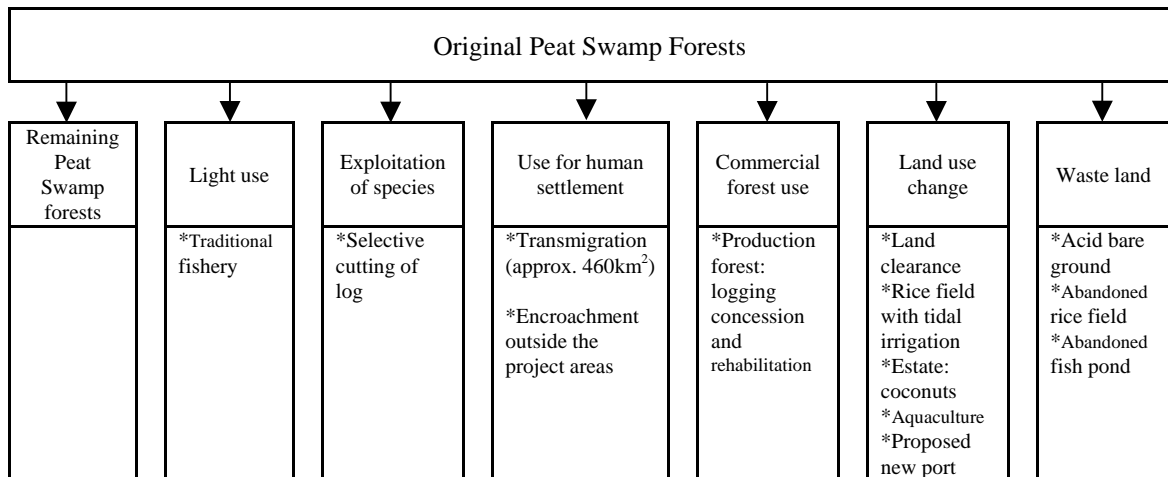


Figure D1.4.1 Major Human Impacts on Sumateran Peat Swamp Forest

1.5 Sunda Shelf Mangroves

The Sunda Shelf Mangroves are some of the most biologically diverse mangroves in the world. They provide vital ecological functions. The ecological functions of mangroves are preserved when total system of terrestrial, marine, and interface environment is working healthy. Mud flat and young saplings at the edge of forest function as this interface or transition environment. This mud flat is exposed when the tide is low, and is a very important environment for many migrating waterfowls. During the field survey of the Team, very wide mud flat was observed extending from the mangroves of Tanjung Api-Api.

Most part of mangrove forest in South Sumatra is designated as “Protected Forest” bearing special characteristics functioning mainly for protection of water source, flood protection, erosion control, saline water intrusion prevention, and soil fertility maintenance. Northern most, Former Sembilang Conservation Forest (HSA), just across the Banyuasin River from Tanjung Api Api (outside of the Study Area), was enlarged to include whole watershed and designated as Sembilang National Park in 2001.

The Berbak National Park, about 80 km north of Tanjung Api Api, is nominated as one of the two Ramsar Convention wetlands in Indonesia.

Mangrove management in Indonesia is mandated in several Government Decrees. The Director General of Commercial Forestry Directive No. 507/IV-BPHH/1990 states the width of mangrove that cannot be disturbed. Under Law No. 24 1992 on Land Classification, the utilisation and disturbance of mangrove can be differentiated according to primary function that is protection or production. Under Presidential Decree No. 32.4990 on the management of Protected Areas, mangroves can be classified as protected forests, nature reserves, wildlife preserves, national parks, public forests and preserves with eco-tourism.

Regarding the proposed port development at Tanjung Api Api, the Team could obtain one document on its possible environmental impact: Overseas Bechtel, Inc., SSED, “Tanjung Api Api Port and Coal Terminal Pre-Feasibility Study Final Report, Technical Volume, Appendix – Pre-feasibility Environmental Review” 1997.

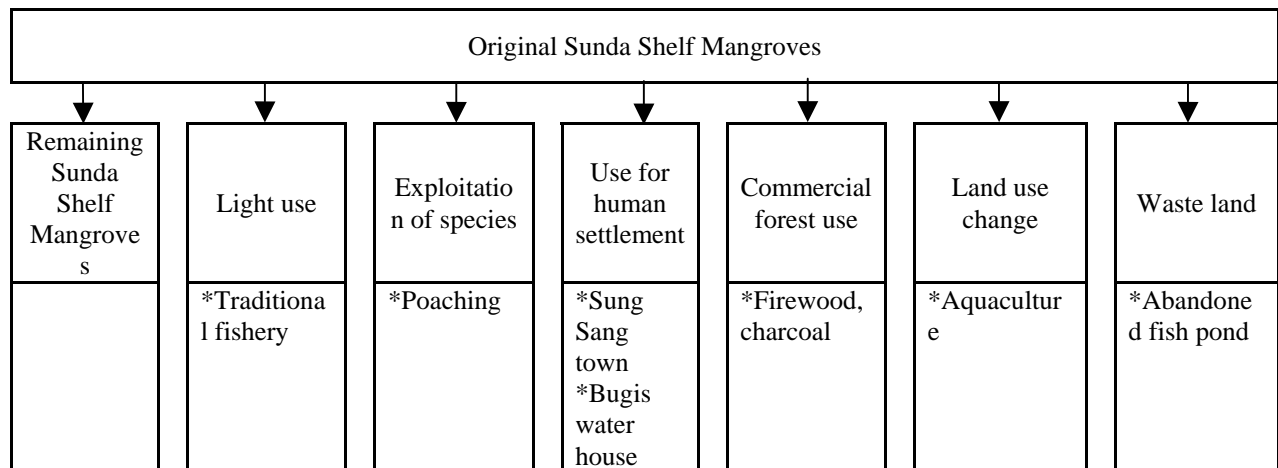


Figure D1.5.1 Major Human Impacts on Sunda Shelf Mangroves

1.6 Sumateran Montane Rain Forest

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 (**Figure D1.6.1**).

Sumatra’s montane forests contain far higher levels of mammal and bird endemism than the lowland forests, in part because of their longer periods of isolation and distinctive forest types. Despite Sumatra’s dense human population, this montane ecoregion contains several large blocks of intact forest, stretching along the Barisan Mountain Range, running the length of the island. The Kerinci-Seblat National Park is the largest reserve in Sumatra covering 7,960 km², and protects the watersheds of two of Sumatra’s most important rivers: Musi and Batang Hari (in Jambi Province). To the south, Bukit Barisan Selatan in Bengkulu and Lampung Province, another of Sumatra’s large reserves, also extends into this ecoregion, covering more than 1,620 km².

Water of upper Musi is planned to be diverted to the watershed in Bengkulu Province when the Musi Hydroelectric Power Project (Musi Hepp) starts commercial operation in the year 2006. The water for the hydropower will be diverted from Musi River to the outlet at Simpangaur River in Bengkulu Province. This plant discharge to Simpangaur River is designed at 62.0 m³/s under the conditions of six hours of peak generation period per day. Minimum discharge for Musi River downstream is designed at 1.6 m³/s. This reduction of water flow and controlled flow regime will lead to different pattern of sand and silt deposition, water depth, water navigation possibility and ecosystems of the river and surrounding areas. On the other hand, the power plant is planned to produce

electricity of 1,120 GWh. The plant discharge will also be used for irrigation (about 22,000 ha) and clean water supply (2 - 6 m³/s) in Bengkulu Province.

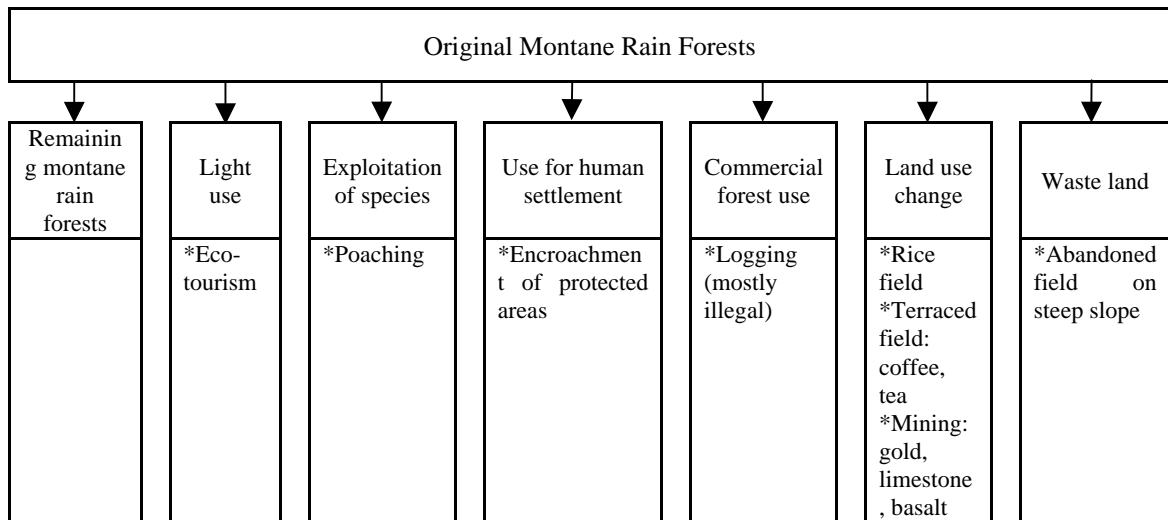


Figure D1.6.1 Major Human Impacts on Montane Rain Forest

1.7 River and Lake Ecosystems

1.7.1 Rivers

In the Pre-PCM meeting, silt and sand sedimentation in river is mentioned as serious issue in many areas within the river basin. Illegal logging is named as one of the major cause of the sedimentation. During the field survey of the Team in lowland and highland area, however, the Team found that vegetation along small streams close to the cleared land looked almost stable, without excessive sedimentation of sand. Rather, the Team found many locations where sandy bank of major tributaries is eroded by water.

The Team also observed sand and rock mining in rivers. Capacity and location must be announced.

Sand deposition in Komerin River has greatly changed the river environment. Impact of weirs on fish population is also undocumented.

River fauna data was not available. Commercial, cultivated fish species in the Study Area are; gold fish (Ikan Mas), Ikan Tawes, Mujair, Ikan Nila, cat fish (Lele), Tembakang, Gurame.

1.7.2 Lake Ranau

During the field survey, the Team did not find serious problems regarding water quality and bank stability. In Banding Agung, water stagnation was observed behind the beach road. Sanitary management is recommended.

2. URBAN AND INDUSTRIAL ENVIRONMENT

2.1 Urban Environment

Among the basic environmental needs for healthy urban life, issues in water supply, water quality, and flood protection are documented in other sections of this report.

Regarding air pollution, voluntary check of exhaust from vehicles just started in Jakarta. On major roads and cross sections in Palembang, air quality seems to be affected by large number of cars. Street trees are effective in reducing concentration of polluting chemicals and particle matters in air. Large street trees must be conserved and additional new planting is recommended. Haze caused by fire of land clearance is now an international concern that may cause respiratory problems to not only local residents but people in large area.

Municipalities are responsible for gathering and dumping of domestic garbage. Dumping site is selected at outside of the populated area. Besides dumping, the Team observed burning activities at the dumping site of Lubuk Linggau. During the local hearing, the Team was informed by a few officers that there is no serious problems from such dumping site so far. The shortage of the number of truck to gather the garbage is the most serious difficulties in many offices. In the near future, handling of toxic waste from small industries, and recycling of plastics may be raised as issues in large cities.

When a city grows, it is necessary to create open spaces for the residents close to their homes to take refuge from their crowded houses. An open space system is desirable for large cities, consisted of neighbourhood parks for small children and elders, to district parks for group activities, and to a large multi-purpose park with variety of athletic and cultural facilities. The Pundi Kayu, a recreation forest, and Old Fort in Palembang are good resources for outdoor activities and experience of nature and history of the city. The river side square in front of the Old Fort is also a good place to experience the unique character of Palembang.

Small rivers and flood drains in urban area tend to attract low income families, because of accessibility to free water, to create slums. The water is usually polluted by sewage and garbage from the city. Besides regular effort in public works to provide sufficient infrastructure for the city as a whole, a special project must look at these slum areas in a city to secure minimum necessary condition for healthy life.

In Baturaja, the Team was informed that the asphalt plant in the city was originally located outside of the populated area. Recent growth of the city, however, surrounded the facility with houses. Odor and smoke that were not a serious problem before are now considered nuisance by the neighbours.

2.2 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, pipe lines, and oil refinery may pollute soil, ground water, and surface water with toxic chemicals (**Table D2.2.1**). Food factories, palm oil factories, fertilizer plants, and saw mills may pollute surface water with organic materials. During the field survey, the Team observed that saw dust is accumulated on river bed waiting to be washed out by the water in rainy season. Although the material itself is natural and organic, by accumulation, the saw dust may nutrify the water downstream.

The Team did not hear anything related, but chemicals used for treatment of timber are highly toxic and may need attention.

The Ministry of Energy and Mineral Resources is responsible for ground water development.

Table D2.2.1 Mineral Resources in South Sumatra (under development / under survey)

	Oil	Natural gas	Coal	Gold	Lime stone	(Granite)	(Basalt)
Musi Rawas	O	O		PT. BTM		O	O
Lahat	O	O					
Muara Enim	O	O	PT Bukit Asam				
Ogan Komerin Uru				Bukit Sadau, Desa Ujan Mas	PT Semen Baturaja		
Musi Banyuasin	O	O					
Ogan Komerin Iiril	O	O				O	O (Muara Dua Kisam)

Note: (): under survey

3. LAWS AND INSTITUTIONS FOR ENVIRONMENTAL MANAGEMENT

3.1 General Land Use Plan

General land use plan including areas for conservation is prepared by Provincial BAPPEDA with coordination with related institutions. Regency also is entitled to prepare land use plan.

Following the autonomy policy started in 1999, it is proposed that certain per cent of revenue from the natural resources would be returned to provinces of origin. Therefore, Provinces are currently motivated for development of natural resources within their boundary.

3.2 Conservation of Natural Environment

3.2.1 International Condition

Indonesian Government has signed following international conventions and treaties related to natural environment.

- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 1973
- Ramsar Convention on Wetlands, Ramsar, Iran, 1971: Berbak (08/04/92; Jambi; 162,700 ha), Danau Sentarum (30/08/94; Kalimantan Barat; 80,000 ha), total surface area of 242,700 hectares.
- Convention Concerning the Protection of World Cultural and Natural Heritage (UNESCO, World Heritage Convention) 1972
 - 1991 Borobudur Temple Compounds, Ujung Kulon National Park, Komodo National Park, Prambanan Temple Compounds,
 - 1996 Sangiran Early Man Site,
 - 1999 Lorentz National Park
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) 1979
- Convention on Biological Diversity Nairobi, 1992

There are other international environmental conventions affecting Indonesia that are listed below.

- Marine Pollution
 - 1958 Geneva Conventions
 - 1982 UN Convention on the Law of the Sea
- Marine Environmental Protection

- 1973/78 MARPOL
- 1972 London Convention
- 1969 Intervention Convention
- Noumea Convention
- Land-Based Pollution
 - UN Convention on Law of the Sea
 - Agenda 21
 - 1995 Washington Declaration
- Climate Change
 - 1985 Vienna Convention for the Protection of the Ozone Layer
 - 1987 Montreal Protocol on Substances that Deplete the Ozone Layer
 - 1997 Kyoto Protocol to UNFCCC
- Regional International Environmental Law
 - 1976 Convention on the Conservation of Nature in the South Pacific
 - 1985 ASEAN Agreement on the Conservation of Nature and Natural Resources
 - 1986 Convention for the Protection of the Natural Resources and Environment of the South Pacific
 - 1995 Agreement on the Cooperation for Sustainable Development of the Mekong River

(Source: <http://www.law.usyd.edu.au/~acel/REBUILD/Indonesian%20Trainees%202001%20-%20April%20Group/Lectures/Don%20Rothwell/session~2.doc>)

There are 20 species listed in the IUCN (International Union for Conservation of Nature) Red List of Animals that occur in southern part of Sumatra (except non-vertebrate). Their habitats are diverse, but many species are related to swamp or rivers in forests, environment that is also suitable for human settlement and agriculture.

Indonesia is also a member country of the International Tropical Timber Organization that promotes conservation of tropical forest and healthy trade of timber in the world market.

3.2.2 National Condition

National laws related to environmental conservation and prevention of pollution are summarized in **Table D3.2.1**. Further information on these laws and regulations are explained in Sector Report K.

Ministry of Forestry is responsible for conservation of natural environment. Law No. 5, 1990 describes the policy for conservation of nature and ecosystems. Based on the Law, there is national list of 294 species that are recognized endangered in the country.

Table D3.2.1 IUCN Red Data Animals for southern Sumatra

	Species		Status*			Major habitat types				
	English name	Academic name	CR	EN	VU	Montane Rain Forests	Lowland Rain Forests	Fresh-water Swamp Forests	Peat Swamp Forests	Sunda Shelf Mangroves
Mam-mals	Flat-headed Cat	<i>Prionailurus planiceps</i>			O			O	O	
	Sumatran Tiger	<i>Panthera tigris sumatrae</i>		O		O	O	O	O	O
	Indonesian Mountain Weasel	<i>Mustela lutreolina</i>		O		O				
	Otter-civet	<i>Cynogale bennettii</i>		O				O	O	O
	Sumatran Rhinoceros	<i>Dicerorhinus sumatrensis</i>	O			O	O	O	O	O
	Sumatran Rabbit	<i>Nesolagus netscheri</i>	O			O				
Birds	Storm's Stork	<i>Ciconia stormi</i>		O				O	O	
	Wallace's Hawk-eagle	<i>Spizaetus nanus</i>			O		O	O	O	O
	Crestless Fireback	<i>Lophura erythrophthalma</i>			O		O			
	Crested Fireback	<i>Lohura ignita</i>			O		O			
	Salvadori's Pheasant	<i>Lophura inornata</i>			O	O				
	Silvery Wood-pigeon	<i>Columba argentina</i>			O		O	O	O	O
	Wrinkled Hornbill	<i>Aceros corrugatus</i>			O		O			
	Schneider's Pitta	<i>Pitta shneideri</i>			O	O				
	Straw-headed Bulbul	<i>Pycnonotus zeylanicus</i>			O		O	O		
	Sumatran Cochoa	<i>Cochoa beccarii</i>			O	O				
Rep-tiles	Spatula-tooth Snake	<i>Iguanognathus weneri</i>			O			O	O	
	Painted Terrapin	<i>Callagur borneoensis</i>	O							O
	Spiny Turtle	<i>Heosemys spinosa</i>			O			O	O	
	Asiatic Giant Softshell Turtle	<i>Amyda cartilaginea</i>			O			O	O	
Total	20		3	4	13	7	8	11	10	6

*: CR: Critical, EN: Endangered, VU: Vulnerable.

Source: Obara et.al., "Animals of World Heritage- Red Data Animals 5: Islands of South-East Asia" Kodansha Ltd., 2000, ISBN4-06-268755-0

Table D3.2.2 Laws and Regulations Related to Environmental Conservation in Indonesia

Law No. 11/1974 (Water Resources)
Government Regulation No. 22/1982 (Water Management)
Government Regulation No. 27/1991 (Swamps)
Government Regulation No. 35/1991 (Rivers)
Ministerial Letter of Home Affairs No. 179/1996 (Organization Guidelines of Basin Water Resources Management Unit (<i>Balai PSDA</i>))
Law No. 5/1990 (Conservation of Bio-natural Resource and Its Ecosystem)
Law No. 24/1992 (Spatial Management)
Law No. 23/1997 (Environmental Management)
Law No. 41/1999 (Forestry)
Presidential Letter No. 32/1990 (Protected Area Management)
Government Regulation No. 69/1996 (Implementation of Rights, Obligation, and Procedure of People's Participation in Spatial Management)
Government Regulation No. 82/2001 (Water Quality Management and Pollution Control)
Watershed Management Guideline (Pedoman Penyelenggaraan Pengelolaan Daerah Aliran Sungai, Direktorat Jenderal Rehabilitasi Lahan dan Perhutanan Sosial, Jakarta, 2000)
Forest Rehabilitation Guideline (Pola Umum dan Standar Serta Kriteria Rahabilitasi Hutan dan Lahan , Direktorat Jenderal Rehabilitasi Lahan dan Perhutanan Sosial, Jakarta 2000)
Ministerial Decree No. 52/2001 on Watershed Management (KEPUTUSAN MENTERI KEHUTANAN Nomor : 52 /Kpts-II/2001 Tentang PEDOMAN PENYELENGGARAAN PENGELOLAAN DAERAH ALIRAN SUNGAI MENTERI KEHUTANAN)

Based on the Ministerial Decree No. 52/2001, Ministry of Forestry prepared priority list of watershed to be rehabilitated using the reforestation fund money (DR) (**AnnexD3.1.1**). Also, the Ministry is cooperating with KIMPRASWIL to select another set of priority watershed for bi-sectoral program on watershed management (**AnnexD3.1.2**). As the Team writes this Master Plan, that is July 2003, Musi River is not included in either of the priority list. For powerful execution of this Master Plan, it is necessary that the Province and Kabupatens to persuade the Ministry of Forestry and KIMPRASWIL so that Musi River watershed is selected as one of the priority watershed for reforestation and land rehabilitation.

3.2.3 Provincial Condition

(1) Related Offices

Under the Ministry of Forestry, there are five offices in South Sumatra that are responsible for nature conservation and rehabilitation of forests (**Table D3.2.3**). Also, Provincial Department of Forestry has staff and equipment for forest inventory, planning, management, preservation and rehabilitation. Planning work is coordinated with the Provincial BAPPEDA.

Officers in those institutions are usually educated in forestry. After the recruitment, the staffs are trained in courses for nature conservation and management.

Table D3.2.3 Coordination of Offices

Provincial		National			
Office	Dinas Kehutanan	Office	Balai Konservasi Sumber Daya Alam (BKSDA)	Balai Perbenihan Tanah Hutan (BPTH)	Balai Pengawasan Daerah Aliran Sungai Musi (BEPEDAS)
Responsibilities	*Reforestation for production, conservation and protection. *Production: manage the logging concession, monitors the activities of concessionee whether they obey the guideline.	Responsibilities	*Species conservation, forest police	*Seed stock	*Seedling nursery
		Office	Balai Penelitian dan Pengawasan Hutan Tanaman (BALITAMAN)	Balai Sertifikasi Benuaian Hasil Hutan (BSPHH)	-
		Responsibilities	*Tree crop management	*Certification	-

There are not many NGOs in nature conservation sector in South Sumatra. The Wetland International has been working to create the Sembilang Conservation Forest as national park. The Wetland International conducts monthly monitoring of the designated National Park area, and also has education and coordination capacity with local scouts and grassroots associations. For the Kerinci Seblat National Park, there is a World Bank-supported project office located in Sungai Penuh near Lake Kerinci in Jambi Province.

(2) Protected Areas

There are two types of protected areas, in addition to National Park (Tables D3.2.4, D3.2.5 and D3.2.6). Conservation forest is where biodiversity and ecosystem are to be conserved. Conservation forest is divided to nature protection forest (HSA), as core areas and surrounding buffers, and nature conservation forest that can be used by people in sustainable manner. Conservation forest is also called as conservation area (Kawasan Konservasi) in Law No.51 1990. Protection forest (HL) is, on the other hand, aimed to conserve water resource and soil fertility of the area and downstream. In South Sumatra, there are two National Parks, 10 conservation forests, and 18 protection forests.

There is no special designated area for protection of aquatic environment.

Table D3.2.4 Definition of Forest Areas in South Sumatra

Conservation Forest	Hutan Konservasi	Area for biodiversity conservation of flora and fauna and its ecosystem.
Nature protection forest	Hutan Suaka Alam (HSA)	Within the conservation forest, area for biodiversity conservation of flora and fauna and its ecosystem and functioning also as buffer system of living creatures.
Nature conservation forest	Hutan Pelestarian Alam	Within the conservation forest, area for protection of buffer system of living creatures, biodiversity conservation of flora and fauna, and sustainable utilization of bio-natural resource and its ecosystem.
Protection Forest	Hutan Lindung (HL)	Area for protection of water source, flood protection, erosion control, saline water intrusion prevention, and soil fertility maintenance.
Production forest	Hutan Produksi (HP)	Area for forest production managed by government (concession may be available).
Forest without designation		Private forest

Table D3.2.5 Designated Forest Area in South Sumatra

	Area	HSA	HL	Production Forest HP	HSA+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 Komerin Ilir	2,136,700	4,828	105,159	843,899	953,886	45%	1,182,814
Ogan Komerin 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
South Sumatra	10,104,400	711,778	539,645	2,522,034	3,773,457	37%	6,330,943

HSA: Conservation Forest, HL: Protection Forest

Source: Statistik Kehutanan, Propinsi Sumatera Selatan, 2001

Table D3.2.6 Protected Areas in South Sumatra

	Area of Regency ha	Conservation Forest HSA ha	Protection Forest HL ha	Protected Forest HSA+HL ha	Protected forest %	Distribution
Musi Banyuasin	2,619,100	342,479	68,823	411,302	16%	33%
Ogan Komerin Ilir	2,136,700	4,828	105,159	109,987	5%	9%
Ogan Komerin 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

Table D3.2.7 Area of Eco-Regions and Ratio of Protected Forests

Ecoregions		Montane Rain Forests	Lowland Rain Forests	Freshwater Swamp Forests	Peat Swamp Forests	Sunda Shelf Mangroves
Number of Protected Area	National park (TN), conservation forest (HSA)	4	2	0	5	4
	Protection forest (HL)	6	6	0	0	6
Protected Area Total km ²		5829.66	726.28	0	4362.89	*
Original Area km ² (approx.)		10,104.40 (10 % of Province)	50,522.00 (50%)	3,031.32 (3%)	37,386.28 (Peat Swamp 35%, Mangroves 2%)	*
Protected %		58%	1%	0%	12%	*

*: Protected area and original area of peat swamp and mangrove are added in the table.

Table D3.2.8 Number of Staff at Conservation Forest (SM, HSA, TWA)

Location	Civil staff	Forest police	Other	Total
SM. Padang Sugihan	2	9	0	11
SM. Bentayan	2	5	1	8
SM. Dangku	2	5	0	7
SM. Gumai Pasemah	3	6	0	9
SM. Isau Isau Pasemah	2	5	2	9
HAS. Sungai Sembilang	2	7	1	10
TWA. Punt Kayu	0	0	0	0
PLG/TWA. Bukit Serelo	4	2	0	6
Total	17	39	4	60

Source: Balai KSDA Sumatera Selatan

Table D3.2.9 Protected Areas of South Sumatra

Name	Regency	Ecoregion
National Park		
TN Kerinci Sebilat	MuRa	Montane
Conservation Forest		
HSA Terusan Dalam	MuBa	Mangrove
HSA S. Betet	MuBa	Mangrove
HSA Sembilang	MuBa	Mangrove
HSA Alang Gantang	MuBa	Mangrove
SM Bentayan	MuBa	Peat
HSA Padang Sugihan	OKI ,MuBa	Peat
SM Dangku	MuBa	Low/peat
HSA Gumai Tebing Tinggi	Lahat	Mon/Low
HSA Isau Isau	Lahat	Mon/Low
SM Gunung Raya	OKU	Mon/Low
Protection Forest		
HL Plau Rimau	MuBa	Mangrove
HL Telasig?	MuBa	Mangrove
HL Upang	MuBa	Mangrove
HL Sakeh Barat	MuBa	Mangrove
HL Muara Saleh	MuBa	Mangrove
HL S. Lumpur Mesuji	OKI	Mangrove
HL Meranti S. Jernih	MuBa	Low
HL Meranti S. Kadenbah	MuBa	Low
HL Meranti is Dangku	MuBa	Low
HL Bukit Serelo	Lahat	Low
HL Bukit Asam	Lahat	Low
HL Saka	OKU	Low
HL Bukit Cogong	MuRa	Low/Mon
HL Gumai Tebing Tinggi	Lahat	Mon/low
HL/HP/HPT Bukit Balai	Lahat	Mon/Low
HL Bukit Dingin	Lahat	Montane
HL Bukit Nanti	OKU, MuEn, Lahat	Montane
HL Peraduan Gistang	OKU	Montane

HSA: Nature protected forest Hutan suaka alam, TN: National park, HL: Protected forest, Hutan lindung
Source: Forest Plan Map, Dinas Kehutanan

(3) Protected Species

Based on several ordinances, currently there are 64 species listed as protected animal species of South Sumatra (**Table D3.2.10**). (Source: Statistik Kehutanan, Propinsi Sumatera Selatan, 2001 (referring Balai KSDA Palembang 2002))

Table D3.2.10 Protected Species of South Sumatra

	Common name	Academic name	English Name	Mammals	Birds	Reptiles	Others
1	Binatng Hantu Singa Puar	<i>Tarsius</i>					
2	Semua jenis kera tak berbuntut	<i>Hylobatidae</i>					
3	Badak	<i>Rhinoceros sondaicus</i>					
		<i>Rhinoceros sumatraensis</i>					
4	Tapir	<i>Tapirus indicus</i>					
5	Kambing Hutan	<i>Capricornus sumatrensis</i>					
6	Trenggiling, Peusing	<i>Manis javanicus (javanica)</i>					
7	Burung dara laut	<i>Sternidae</i>					
8	Wili-wili, ular, bebek laut	<i>Esacus magnirostris</i>	Bush Thick-knee				
9	Marabu, bangau tong-tong	<i>Leptotiles javanicus</i>					
10	Buwok	<i>Ibis eimerus</i>					
11	Angsa Hitam	<i>Ciconia episcopus</i>	White-Necked Stork				
12	Angsa laut	<i>Pelecanidae</i>					
13	Kuntul, bangau putih	<i>Egretta, bubulcus ibis</i>					
14	Ibis putih platuk besi	<i>Threskiornis aethopica (aethiopicus)</i>	Sacred Ibis				
15	Ibis hitam rako-rako	<i>Plegadis falcinellus</i>	Glossy Ibis				
16	Alap-alap putih, Alap-alap Tikus	<i>Elanus hypoleucus</i>					
17	Burung udang, raha udang	<i>Aleedinidae</i>					
18	Julang, anggag, rangkong	<i>Bucerotidae</i>					
19	Kasumba, suruku, burung, luntur	<i>Trogonidae</i>					
20	Burung paok, burung cacin	<i>Pettidae</i>					
21	Burung madu, juntingan, klaces	<i>Neotarinidae</i>					
22	Burung sesap, pengisap madu	<i>Maliphagidae</i>					
23	Gajah	<i>Elephas maximus</i>					
24	Menjangan, rusa sambar	<i>Cervus sp.</i>					
25	Kijang muncak	<i>Muntiacus muncak (muntjac)</i>					
26	Kancil, planduk, napu	<i>Tragulus</i>					
27	Kuan	<i>Argus, Argusianus argus</i>	Great Argus Pheasant				
28	Burung alap-alap	<i>Accipitridae</i>	eagles and hawks				
		<i>Falconidae</i>	falcon				
29	Harimau sumatera	<i>Panthera tigris sumatrae</i>	tiger				
30	Bajing tanah, tupai tanah	<i>Lariscus insignis</i>					
31	Kelinci liar sumatera	<i>Nesolagus netshceri</i>					
32	Musang air	<i>Cynogale bennettii</i>	Otter civet				
33	Itik liar	<i>Cairina scutulata</i>	White-winged Duck				
34	Beruag madu	<i>Helaratus(Helarctos) malayanus</i>	Malayan Sun Bear				
35	Jelasang	<i>Ratufa bicolor</i>					
36	Kubung, Tando	<i>Cynocephalus Variegatus</i>					
37	Pecuk Ular	<i>Anhinga melanogaster</i>	Darter				
38	Burung Kipas	<i>Rhipidura javanica</i>					
39	Kuching Hutan, Meong Congkok	<i>Felix(Felis) bengalensis</i>					
40	Kuwuk	<i>Felix marmorata</i>					
41	Harimau Dahan	<i>Neofelis nebulosa</i>	Clouded Leopard				
42	Malu malu	<i>Nycticebus concang(coucang)</i>	slow loris				
43	Senyulong, Buaya sapit	<i>Tomistoma schlegelli(Schlegeli)</i>	False gavial, False gharial, Schlegel's garial, Malayan gharial				
44	Biawak Abu-abu	<i>Varanus nebulosos</i>					
45	Tuntong	<i>Batagur baska</i>	River terrapin				
46	Kura-kura Gading	<i>Orlitia boorneensis(borneensis)</i>					
47	Labi-labi Besar	<i>Chitra indica</i>					
48	Trulak Jawa	<i>Vanellus semipalmatus(vanellus)</i>					
49	Blekek Asia	<i>Limnodromus semipalmatus</i>					
50	Trining tutul	<i>Tringa guttufar(guttifer)</i>					
51	Bajing terbang	<i>Lomys horfieldi</i>					
52	Bajing tanah, tupai tanah	<i>Lariscus insinis(insignis)</i>					

Source: Statistik Kehutanan Propinsi Sumatera Selatan Tahun 2001

3.3 Forestry, Agriculture, and Estate Development

Forestry, estate, and agriculture are managed by separate offices at the National and Provincial level. Their responsible land types are described in **Table D3.3.1**. Extension offices (Penyuluh) of these departments are transferred 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, and provision of information regarding soil conservation is a part of such consultation.

Table D3.3.1 Coordination of Provincial Departments

	Forestry (Dinas Kehutanan)	Estate (Dinas Perkebunan)	Agriculture (Dinas Pertanian)
Responsibilities	<ul style="list-style-type: none"> * Conservation forest * Reforestation for production, conservation and protection. * Production forest, manages the logging concession, monitors the activities of concessionee whether they obey the guideline. 	<ul style="list-style-type: none"> * Tree crops for non-wood products: coconut, rubber, palm oil * Mono-culture, large-scale estates developed by the province or private sector with concession. * Small-scale estates developed by individual farmers. 	<ul style="list-style-type: none"> * Food crops, fruits, spices, domestic animals * Usually cultivated by individual farmers. Farmers may be organized as cooperation. * Rice field * Irrigated area may be managed by water users' association.
Existing Technical and Educational Functions		<ul style="list-style-type: none"> * Conducts comprehensive consulting at the fields once in 2 months. 	<ul style="list-style-type: none"> * In year 2000, total 1800 staff worked to provide information for farmers.

Table D3.3.2 Number of Office and Staff of Agriculture Extension by Regency Year 2000

Location	Office	Rank II	Rank III	Rank IV	Other	Total
Musi Banyuasin	17	305	30	0	59	394
Ogan Komering Ilir	11	187	69	0	52	308
Ogan Komering Ulu	16	284	44	1	32	361
Muara Enim	15	127	35	0	16	178
Lahat	14	145	37	0	35	247
Musi Rawas	13	207	45	0	35	287
Palembang	2	40	27	0	0	67
Province	1	0	28	6	0	37
Total	89	1295	315	7	229	1846

Source: Statistik Tanaman Pangan p. 106, 107

3.3.1 Forestry

(1) Logging concession and illegal logging

Forest area in South Sumatra is decreasing rapidly (**Table D3.3.3**). The decrease between 1995 and 2000 was largest in OKI district. In average, 1,000 km² of forest cover is lost in South Sumatra. At production forests, not only the loss of forest cover, but also the loss of biological diversity and forest structure is a problem that may decrease the value of the production forest (**Figures D3.3.1 and D3.3.2**). The ITTO recommends selective cutting of valuable species within a species-rich tropical forest. Careful management of secondary growth will lead to full recovery of forest resource. On the contrary, clear cutting of tropical forest easily diminishes the fertility of soil, and plantation of single species may provide short-term profit, but will never lead to the recovery of original species diversity.

There are 65 production forests in South Sumatra. Among them, 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. Therefore, legally, there should not be any log production from the production forests besides the production from the three acacia forests.

Table D3.3.3 Forest Area Decrease 1995-2000 (ha)

	1995	2000	Difference	Year average
Musi Banyuasin	734,780	695,897	-38,883	-7,777
Ogan Komerin Ilir	337,068	150,739	-186,329	-37,266
Ogan Komerin Ulu	115,531	22,010	-93,521	-18,704
Muara Enim	204,152	123,547	-80,605	-16,121
Lahat	130,727	97,015	-33,712	-6,742
Musi Rawas	381,270	313,970	-67,300	-13,460
	1,903,528	1,403,178	-500,350	-100,070

Source: Statistik Kehutanan, Propinsi Sumatera Selatan, 2001

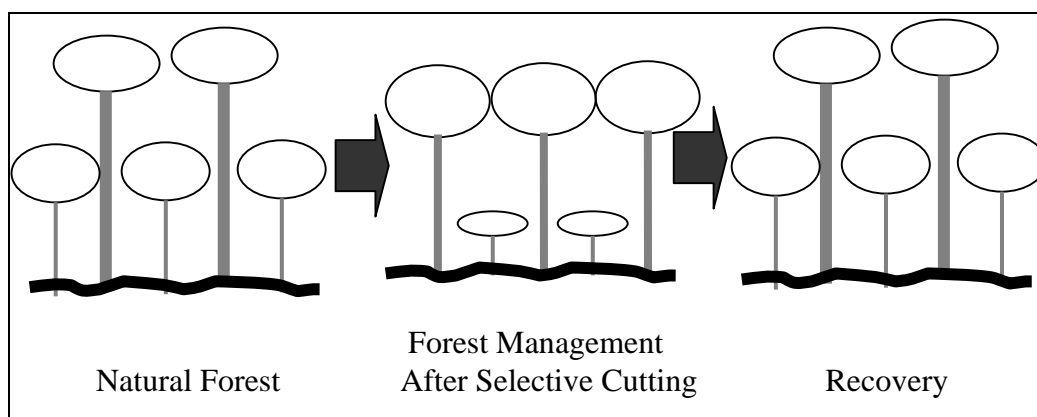


Figure D3.3.1 Selective Cutting and Secondary Growth of Production Forest

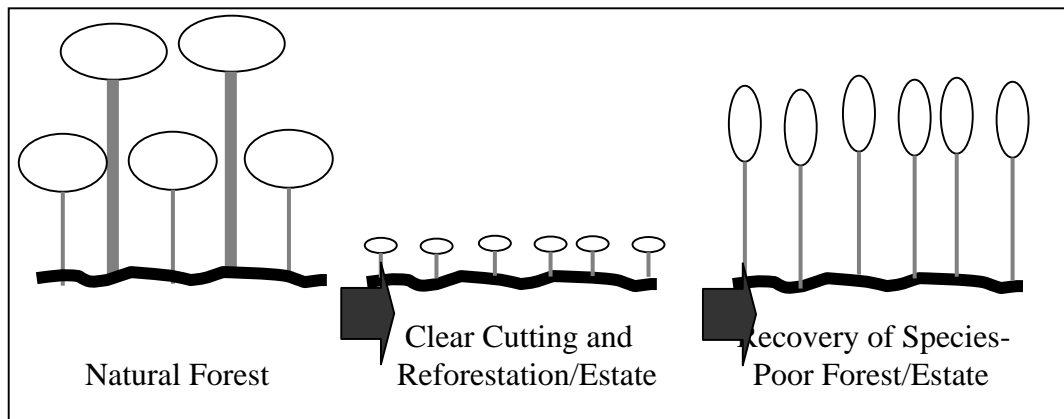


Figure D3.3.2 Production Forest with Acacia Plantation and Forest Converted to Estate

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”. Illegal logging tends to occur where there is good road for transportation of the logs. Very steep slopes in mountain area discourage the loggers.

The concession system itself has had some problems. The ITTO technical mission to Indonesia in 2001 recognized that cutting permits can be issued by various authorities (district, provincial and central). There have even been cases where cutting permits have been issued covering the same area by different authorities to different parties.

(2) Forest Production in South Sumatra

Forest production in South Sumatra is summarized in **Table D3.3.4**. The amount of production is reduced in all types of products except pulp, reflecting the closure of logging concession in the Province.

According to the Jakarta Post, September 9, 2002, business associations in forestry sector is raising their concern that such closure of concession would cause massive closure of companies and lay-offs in the forestry industry.

The ITTO, on the other hand, recognizes that current size of forestry-related industry may surpass sustainable level of production capacity, therefore, suggests solution to downsize/restructure the industry.

Table D3.3.4 Forest Production in South Sumatra

	1999	2000	2001
Sawed wood (m ³)	192,334	187,540	163,598
Plywood (m ³)	113,410	88,241	64,266
Moulding wood (m ³)	96,608	55,845	36,554
Block board (m ³)	16,588	29,815	1,826
Veneer (m ³)	6,782	1,108	1,179
Medium Density Fiber (m ³)	9,202	-	-
Total volume (m ³)	436,923	364,549	269,424
Pulp(t)	62,952	-	409,276

Source: Statistik Kehutanan, Propinsi Sumatera Selatan, Tahun 2001

There is a possibility that the effort for forest rehabilitation may instead invite an increase of land clearance in private land. The closure of concession and adjustment of market price to international level pushed up the timber price. Because of the high price, the Team observed that most of new houses use brick for housing material. Brick kilns are operated actively in South Sumatra. High demand of such kilns may encourage local residents for active production of firewood (**Figure D3.3.3**). It is necessary for the Department of Forestry to look carefully at the firewood market, and persuade farmers to apply selective cutting, not land clearance.

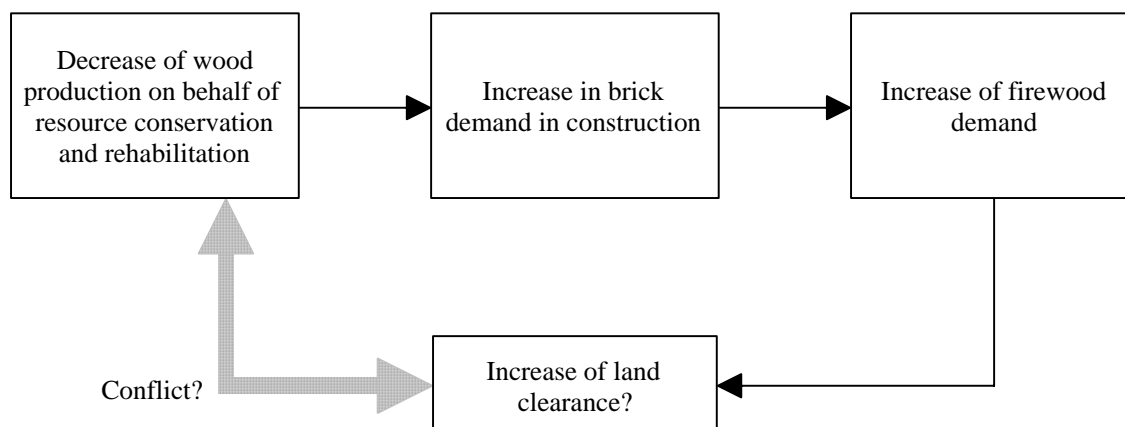


Figure D3.3.3 Possible Conflict between Forest Conservation and Increase of Land Clearance

(3) Reforestation, Rehabilitation and Guideline for Sustainable Forestry

Reforestation Fund (DR) is collected from the concessionees 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.

Concessees, in current system, receives the Reforestation Fund (DR) when they obtain secondary forests tagged as “logged over and degraded”. Once the payment from the government has been received, the concessee lose interest to plant. The money should be made available only after the work of planting, or more strictly, after certain length of suitable management.

(4) Social Forestry Projects

In the Musi River Basin, there are at least two social forestry projects are conducted with the aid of JICA. From 1983 to 1986, at least 400 ha in Muara Enim Regency were chosen for a model project for reforestation, nursery development, fire prevention, and expansion of agroforestry activity.

In 1994 to 1998, Regency in Bengkulu Province was chosen for the target area for social forestry development funded by JICA. The purpose of the project was to improve the quality of life of the local residents at the same time with conservation of forest resource and water and land resource. A social forestry development plan was formulated based on workshops with the related residents. Also, as a model of the implementation of the plan, a project plan for a trial plot was formulated. In Social Forestry projects, non-wood products such as fruit, rubber, and rattan are produced.

According to the statistics of the Department of Forestry in 2001, such social forestry projects initiated by private farmers are continuing. The total area of forest that received intentional diversification reached to 50,451 ha in the Province. Project type varies, but main species used in these projects are cassava (sengon), acacia (akasia), eucalyptus, cinnamon (kayu manis), teak (jati), and rubber (karet).

Recent projects in Social Forestry usually have private companies as partners. In such case, the company would conduct large scale forest clearance and plantation, and local residents are invited to use the area surrounding the plantation as a part of compensation of limited access to the land.

(5) Conversion Forest

In the Forest Plan of the Department of Forestry, Conversion Forest and Limited Production Forest are designated based on the previous forest law. These two designations were included in the Production Forest in the 1999 Forestry Law. Conversion Forests were originally designated to provide more land for mono-culture estate or agriculture development, under high land use pressures in 1970s and 1980s. The former Conversion Forests are still under pressure of conversion with land clearance, when a proposal of local people is handed through the

hierarchy of governments and passes through the evaluation of the national government.

(6) ITTO Assessment and Recommendation

The International Tropical Timber Organization, on the request of the Indonesian Government, conducted a Technical Mission to identify ITTO support for especially in formulating plans and programmes to achieve sustainable forest management in 2001. The mission identified the unsustainable development of forests, particularly of logging concession system. The mission proposed project ideas in the following sectors: curbing illegal logging, restructuring forest industries, forest plantations for resource creation, recalculating timber value, decentralising the forestry sector.

ITTO recognizes that productivity of forest plantations of all categories in Indonesia is considerably lower than the achievable optimum, therefore, low profitable. This is essentially due to the deficiencies in management: inadequate attention to nursery practices; lack of care in site-species matching; inappropriate technological inputs; lack of maintenance; lack of protection from pests, diseases and fire; insufficiency of skilled human resource; poor infrastructural facilities.

3.4 Environmental Impact Assessment (AMDAL process)

According to KEP. 11/MENLH/3/94, water related activities that are subject to AMDAL process are listed in **Table D3.4.1**. The assessment process will involve related departments and the Regencies. There will also be a need to consult with BAPEDALDA to determine the type of AMDAL that will be required. The approach to BAPEDALDA will be through a formal meeting involving both the consultant who will be preparing the AMDAL and the owner of the project.

Table D3.4.1 Water-related projects that are subject to environmental impact assessment

Development of dam or reservoir	Height >15m or Inundation >100 ha
Development of irrigation area	Irrigation area > 2,000 ha
Development of tidal/freshwater swamp	Area > 500,000 ha
Coast line protection in major cities	Population > 500,000
River training in major cities	Population > 500,000
Development of canal/flood drain in major cities	Length > 5 km or width > 20 m
Other development of canal in coastal area, swamp area, or others	Length > 25 km or width > 50 m

Source: Ministry of Environmental Affairs, KEP. 11/MENLH/3/94, 19 March 1994

The AMDAL process will be managed by BAPEDALDA through a central committee.

The process for the AMDAL involves the following steps:

- Terms of Reference for AMDAL
- ANDAL, RPL, and RKL Preparation
- Submission of the AMDAL documentation
- Review of the AMDAL by BAPEDALDA
- Decision on the AMDAL

In addition to required environmental impact assessment, following Environmental Licences and Permits Required for Water Sector may be required.

- Analisa dampak lingkungan-ANDAL: Decision on the environmental analysis
- Rencana Pemantauan lingkungan-RPL Decision on the environmental monitoring plan
- Rencana Kelola lingkungan-RKL Decision on the environmental management plan
- Izin pengambilan air permukaan dan air bawah tanah- Authorisation to use and discharge surface / non-underground water
- Ijin pengambilan air bawah tanah- authorisation to drill for , take out, use and discharge underground water
- Approvals are required separately for the location, reclamation, construction and operation of a wharf / jetty
- Izin undang-undang gangguan / Ho dan izin tempat usaha- hindrance ordinance permit

4. EXISTING AND POTENTIAL ENVIRONMENTAL ISSUES

4.1 Goals and Current Issues

Environmentally healthy watershed can be described by many indicators. Major indicators applicable to the Musi River basin are listed below.

- Laws, regulations, institutions, and working system are coordinated under common vision of sustainable management of watershed.
- Information on environmental condition is provided to public, and environmental education for citizens in all sectors and age classes is realized.
- Use of land and resource is planned and regulated in the manner to avoid expansion of degraded, wasted land, to avoid pollution of environment, to provide healthy living environment for people within the sustainable capacity of local environment, and to maximize the production of natural resources in the long term (time period of 30 – 100 years, and more).
- Resource development and industry are planned and managed in the manner to minimize the use of resources (to maximize the efficiency of resource use), to minimize the use of toxic substances, to minimize emissions to air and water, to minimize release and emission of CO₂, to maximize the re-use and recycle of resources.

Comparing the above indicators and existing conditions, as well as proposed policies and plans for the basin, the Team recognizes following existing and potential environmental issues.

- Existing threat from activities in forestry, estate, and agriculture in lowland area
- Existing and potential impact from water development
- Low effectiveness of nature conservation policies in wetland and mountain area
- Potential degradation of urban and industrial environment
- Needs for careful research and planning for tourism development
- Environmental Research, Education and Public Participation

4.2 Existing Threat from Activities in Forestry, Estate, and Agriculture

4.2.1 Expansion of Wasted Land and Erosion

Current activities in forestry, estate and agriculture are creating useless, wasted land (**Figure D4.1.1**). Examples of wasted land are areas with acid soil (pyrite) in peat swamp that need drainage for 5 – 10 years before sufficient yield, bare ground left without vegetation cover after land clearance usually on slope, and over-used land where only Alang alang can grow. Since the productivity of land is the most valuable

resource in South Sumatra, all policies in any sector must try to avoid the expansion of wasted land.

The deficiencies of such wasted land are;

- Productivity is very low and is difficult to use for forestry, estate, or agriculture again.
- Such low productivity land is also useless as habitat of native wildlife.
- Rain water that falls on to such land flows quickly to downstream, reducing catchment capacity of the land for ground water.
- Because of the fast flow of surface water and thin vegetation cover, soil and sand easily erode into tributaries. When accumulated, the washed out soil causes serious sedimentation in downstream.
- When the farmers find the land less profitable, they tend to move on to adjacent, more fertile land and land clearance is repeated, causing expansion of tree-less land.

Currently, it seems that there is no statistical study to recognize the area and distribution of land with low productivity. The local government must be prepared to take charge of sustainability of its land and resource.

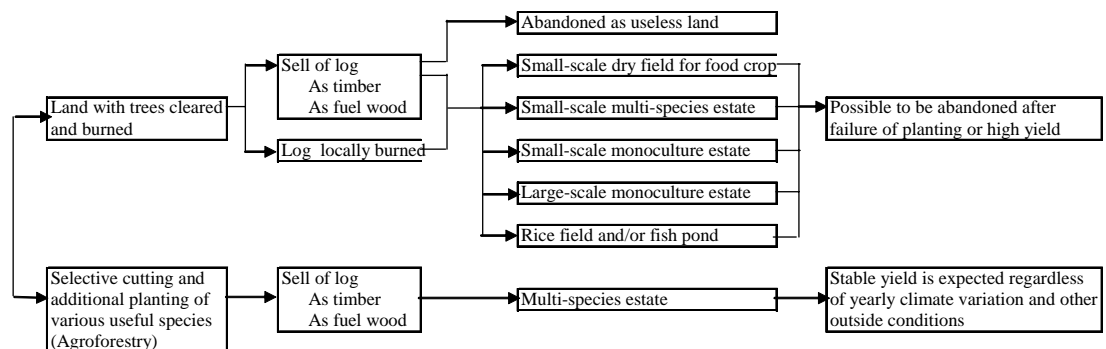


Figure D4.1.1 Land Use Transformation in South Sumatra

(1) Sedimentation in Rivers

In the Pre-PCM meeting, silt and sand sedimentation in river is mentioned as serious issue in many areas within the river basin. During the field survey, however, the Team found that vegetation along small streams close to the cleared land looked almost stable, without excessive sedimentation of sand. Rather, the Team found many locations where sandy bank of major tributaries is seriously eroded. Also, in peat wetland, there are many places in the irrigation project where tertiary and secondary canals are clogged by eroded soil from the field, making tidal irrigation from the primary canal impossible. Based on that information, it is recommended that the analysis of sedimentation look at the

impact both from land clearance in upper stream, and from bank erosion close to the sedimentation area.

(2) Peat Wetland and Mangroves

Peat swamp development in South Sumatra shows successful and unsuccessful cases. Unsuccessful development cause the residents move into surrounding forests, causing decrease of forested area. Causes of unsuccessful cases includes; FeSO₄ in clay soil, loss of peat soil by oxidization of organic matter, water shortage caused from sedimentation in secondary and tertiary canal.

When rehabilitation of existing project or design of new project is considered, project design must include research for distribution of the acid soil (pyrite), so that development of such land is avoided.

For existing projects, evaluation of the all project areas is necessary so that the limited budget is used for rehabilitation of most urgent, serious locations. Technical assistance and training of farmers is necessary to minimize the impact from the problem, to change the product for better adjustment to the existing condition, and to rehabilitate the wasted area.

(3) Lowland and Mountain Areas

During the field survey, the Team observed many places where vast land is cleared of either rubber trees or oil palm in large estates. Even large stumps were uprooted. It was anticipated that when such bare ground is left as it is before recovery of vegetation cover, quite large amount of soil will be eroded into the nearest river. Regeneration of estate crops in large estate must follow a sustainable guideline.

Also during the field survey, the Team observed that farmers clear of vegetation on quite steep slopes for agriculture activities or to create small estates.

Farmers must first measure the steepness of the slope. Only when the land is flat or gentle slope, current land clearance may be continued. On steeper slope, technique to stop the soil loss must be applied. Terrace engineering will be costly and difficult to apply in low productive area. In such case, logs may be laid, or native shrub species in neighboring forest may be planted following the contours. When the slope is really steep, land clearance must be prohibited, the vegetation cover must be conserved, and improvement of the land must use method of selective cutting and additional planting in the existing vegetation. Supporting tool for such sustainable activities will be a slope scale that is easily manufactured and used by farmers themselves.

In addition to the steepness of slope, volcanic sandy tuff is the type of surface material most susceptible to erosion. Soil fertility is also low. Therefore, the best production type in this area is permanent forest crop. When land clearance is conducted, it is important to keep the nutrient rich ash on the surface, using

techniques that reduce surface water runoff. Farmers need to be well informed that land clearance on steep slopes in this area will cause serious erosion, and will not be economically productive.

4.2.2 Poor Species Diversity in Forestry, Estate, and Agriculture

If Indonesia's forest-based industries are to retain their important role in the future, efficiency in forest utilization through diversification of production would be increasingly necessary.

Agroforestry activities and its indigenous version of home gardens are popular in West Java. Both agriculture technologies uses limited area of land but creates vertical multi-layer with many crop species such as durian, mango, mangostine, coconut, cocoa, coffee, banana, maize, sugar cane, cassava, potatoes, vegetables, and even fish pond. Such spatial hierarchy is designed with deep knowledge about demand of light and shade of each species.

In South Sumatra, however, slash and burn activity is widely applied. Land clearance not only maximizes the threat of soil erosion and surface runoff of rain water, but also it minimizes the diversity of vegetation that recovers in the land.

Lowland forest area makes up nearly half of the area of South Sumatra. Most part of the area is already under the influence of human activities. Therefore, it is significant and urgent task of land managers to rehabilitate the diversity of vegetation in order to conserve the ecosystems of the lowland forest area. For individual farmers, it must be encouraged to keep as many tall trees as possible, at the same time plant a mix of useful local species in addition to commercial crop. For large-scale production forest, reforestation should not use only the commercially valuable species, but as a steward of the land, the concessionee must also mix native tree and shrub species that are useful for local animals. There must be a study for diversification of large-scale estate and industrial plantations as well, without significant impact on their production. There large land owners must recognize and fulfil their share of responsibility in conservation of natural resources.

For implementation of diversified production, demonstration plot must be prepared in each ecoregion, for each types of farming (forestry, estate, and agriculture).

4.2.3 Forest Fire and Haze

Now the haze in tropical forest area is an international problem that causes poor visibility and respiratory problems. The Province has monitoring function of hot spots and fires using satellite image. The Province provides the information to the media as well as to related Regencies. The cause of haze is mainly land clearance. The controlled fire, however, sometimes extends to forest fire and also to ground fire in peat swamps that is difficult to stop.

4.3 Existing and Potential Impact from Water Development

Large-scale water development project, such as listed in the Sector Report for Water Use, may cause impacts such as listed below:

- Reduction of water flow in the area down stream of the project
- Disturbance of migration of fish and other organisms at the constructed facilities
- Disturbance of natural cycle and scale of flooding down stream of the project
- Reduction of supply of sediments and nutrients to flood plain down stream of the project
- Drainage of wetland, or water stagnation in the area affected by the project
- Intrusion of salinity caused by the reduction of surface and ground water.
- Ground subsidence in peat wetland or soft alluvial deposit.

It is necessary that help is provided to organize stake holders and that a regular communication system must be established throughout the project cycle, before the project design and after the commencement of operation. There are a few guidelines for environmental assessment of wetland and water resource project: “Scoping manual for environmental impact assessment in tropical wetland” (Howe, et. al.), “Manual for consolidating the function and benefit of freshwater ecosystem and water development project” (United States Development Bank).

An action that causes irreversible impact to watershed is to divert water across the watershed. Total, long-term impact from such action is beyond assessment with current human capacity.

4.4 Needs for Strong and Coordinated Conservation Policy

The goal of sustainable nature conservation is to protect and conserve the whole set of regional ecosystem in healthy, reproductive condition. In South Sumatra, that means to conserve mangrove, peat swamp forest, freshwater swamp forest, lowland rain forest, and montane rain forest. Currently, most of the protected areas are designated in mountain area and mangrove area. Under the autonomy policy, it is an urgent task of the Province to keep strong monitoring and guiding power over conservation action of Regencies in these protected areas, at the same time, to improve natural conditions in lowland forest and swamp areas, and to facilitate good and effective coordination with local government. Currently, the task of resource development and nature conservation is divided to many offices of provincial and national level. From 2001, Regency offices are also a part of conservation system. The Province must act as a good coordinator and balance-maker among these offices to achieve responsible autonomy and good governance in South Sumatra. The Province must have a clear long-term vision of its natural resources and the use of them by residents and industries.

4.4.1 Placing Musi Watershed in National Priority List

As the Team writes this Master Plan, that is July 2003, Musi River is not included in national priority lists for reforestation or rehabilitation of land (see **3.1**). To secure the support from national and international level for execution of this Master Plan, it is necessary for the Province and Kabupatens persuade the Ministry of Forestry and KIMPRASWIL so that Musi River watershed is selected as one of the priority watersheds for reforestation and land rehabilitation.

4.4.2 Review and Update of Protected Areas

(1) Weaknesses of Current Land Use Plan

- Clear purpose of conservation/protection for each designated area must be stated, and indicator of the achievement of conservation/protection must be monitored in every few years.
- Most of the major conservation/preservation areas are located close to the provincial border. Land use plan must be coordinated with neighbouring provinces so that conservation effort in one province is effective to the maximum potential.
- The present condition of the designated Conversion Forest based on the older forestry law need to be reviewed. When the forest is in good condition, the designated area must be swapped with more degraded production forest to conserve its permanent forest existence. Also in the spatial plan prepared by the BAPPEDA, there are many pieces of land designated with two numbers, conservation and productive use, surrounding conservation and protection forest. The designation need to be reviewed so that conservation purpose maximizes. Such review must be conducted at regular interval, i.e. 5 years, so that the land management policy will be implemented with continuity, and not vulnerable to the dynamic market condition.
- In the spatial plan prepared by the BAPPEDA, legend for transmigration area must reflect land use types, i.e. estate, settlement, agriculture.
- In the spatial plan prepared by the BAPPEDA, the largest portion of land in the Province is designated as “Others” and “Mixed use”. Land use regulations and guidelines for these areas must be prepared to prevent degradation of natural biodiversity and living environment (water and air pollution) in the Province.

(2) Ideas for Future Improvement of Land use Plan

GAP analysis: Based on the geographic information of protected areas and existing good environment, an analysis project need to be launched to increase the effectiveness of conservation policy. In the analysis, gaps between the current designation and remaining good habitat must be clearly shown on a map,

then, a new set of conservation policy must be prepared for the area that contains good environment but remain without proper conservation/protection measures, and under the threat of land clearance.

Considerations on National and International importance: In any place in the world, the value of local environment is perceived as granted by the residents and local governments. Good education is necessary to make the residents appreciate the local nature's national and international value. When the autonomy policy is further realized in near future, the Province must provide good advice to Regencies and Cities so that their planning and land management policy include value system based on the province, national and worldwide view point.

Strategic planning of habitat network: In South Sumatra, habitat for wildlife is lost, fragmented, and degraded. To maximize the function of remaining habitat to support as much wildlife as possible, strategic planning of habitat network is recommended. In each ecoregion, remaining natural forest and multi-species secondary growth can be designated as core areas, where diverse animals may reproduce and their population is sustainable. As there are many animals that use different types of environment as their habitat, i.e. Sumatran tiger and Asian elephant, habitat corridors such as mountain ridges and rivers will be necessary to connect the core areas, allowing free movement of animals from one habitat to the other.

Recognition of local heritage: Besides the provincial network of habitats, it will be a good idea if local government and residents select their own heritage forests and heritage trees, based on their cultural, historical, religious and aesthetic importance.

Compensation for development at Tanjung Api Api: In strategic conservation, expected habitat loss must be compensated with designation of different protected area and stronger rehabilitation of degraded areas. When the development at Tanjung Api Api reaches to the realization stage, but before the commencement of deforestation of mangrove, it is recommended that new reserve be created in mangrove and peat swamp area. Conservation of mangrove forest must include conservation of mud flat at the front. Mud and silt may be brought not only from Musi and Banyuasin rivers but also by north-south current of sea water in Bangka Strait.

4.4.3 Peat Wetland and Mangrove Need More Attention

Since the peat wetland in the Basin is designated for food production development, there has not been much study on the biology, species diversity, and environmental function of peat wetland. Development in peat wetland is also causing threat to mangrove forest because of the encroachment of the residents in the project.

Traditional, long standing management custom in the wetland and mangrove environment is rapidly lost as modern technology gain popularity among the original residents in the area. Detailed record of such wisdom inherited in local residents must be researched and recorded, to apply to sustainable use of the natural resource.

4.4.4 Improvement of Guidelines

(1) Guideline for Reforestation and Forest Rehabilitation

Currently, the word 'Reforestation' is used for various meanings from mono-culture plantation of timber wood to diversification of forest in social forestry project. The word does not strongly suggest recovery of native species or species diversity. Since most of the vegetation in South Sumatra is secondary, effort must be concentrated to wise management of secondary growth. Species diversity in the area needs to be recovered by human management action.

Right species mix for right purpose: Reforestation guideline should specify the appropriate mix of species to be used for different purposes. Log production still better have food trees for animals, otherwise there will be conflicts in areas for social forestry competing for food.

Food-rich forest must be re-established in the areas as large as possible. Monitoring of wildlife intrusion in agricultural area will indicate the priority area for such rehabilitation. Where many intrusions are reported, forest besides farming area must be rehabilitated for wildlife use. Abandoned rubber plantation with coffee as undergrowth is one of the example of food-poor forest for wildlife, only useful for resting birds.

Right guideline for large and small projects: The guidelines must be prepared both for large public forest, large commercial reforestation project, and small reforestation operated by local farmers.

(2) Guideline for Estate and Agriculture

Individual farmers respond rather quickly to market situation, and the behaviour makes it difficult to have effective control on land use. Instead of trying to control the individual economic activities, the guidelines must rather encourage farmers to diversify their source of income from the beginning. Having mixture of source for income and food has been a local wisdom in this region. The mixture would be consisted of marketable products and products for domestic use, such as tree crops, rice, food crops, fruit, aquaculture and fishery. Depending on one or two sources of income at one time will lead drastic land use change depending on the environment of dynamic world-wide market. For a long-term, stable land management, it is recommended to encourage farmers to diversify their land use and minimize the short-sighted conversion.

(3) Guideline for River Bank Protection

For the better access to water and transportation, riverside is prone to development. Once bank erosion occurs at such developed site, however, economic damage can be serious. It is best to keep wide vegetation along the river to prevent bank erosion, minimize economic impact, and to conserve ecosystems of water and land.

4.4.5 Transparent Civil Management

Existence of police and army in forest management started at national border to prevent smuggling. In the long term, the function of patrol and border control must be transferred to civilians. In fact, border patrol and monitoring of the designated forest area will produce good amount of employment for local people who are expected to have good information about the forests.

4.4.6 Allocation of Budget for Training

Training of human resource is the most important ingredients for the implementation of the autonomy policy. All effort must be made to allocate sufficient budget for training from the sources such as foreign aid, national budget, and international exchange (barter).

4.5 Potential Degradation of Urban and Industrial Environment

City Planning: In the cities of South Sumatra, Lubuk Linggau, Pagaralam, Perabumulih, and Palembang, detailed city planning is recommended to be prepared. The plan may be drawn with 1:10,000 scale to show both the major infrastructure system and the detailed land use regulation for each parcel. Necessary amount of infrastructure, such as schools, parks and hospitals, must be stated in regulation, and be realized.

City limit: It is recommended to clearly draw the city limit in the city plan. The major reason for the city limit is to concentrate the investment for infrastructure within the limit. The secondary reason is to divide the residential area and the area that may cause harm to the residents.

Waste management: When a city supports many population and various industries, waste management becomes more important. At the common practice of waste landfill, it is necessary to monitor the leaking liquid for bacteria, heavy metals, and other toxic substances. Outdoor burning of waste can not be recommended. Burning at low temperature leads to uncontrolled chemical reaction that may create many toxic chemicals. Smoke, odour, and such chemicals are hazardous for neighbouring residents.

Reduction of CO₂ emission: In Europe and Japan, burning of agriculture waste such as rice husk is now prohibited. It is recommended that local technology to be developed for use of nutrients in such waste without rapidly releasing carbon in the materials.

4.6 Needs for Careful Research and Planning for Future Tourism Development

Resource for tourism: Tourists from developed countries expect for exotic destination a relaxed time and experience of local people, culture, nature, and scenery. The most effective resource for such needs is something local people place their value. The mysterious many gods in Bali attracts tourists from both western and eastern culture. Tourism can be used for conservation of local value and culture.

Necessary infrastructure for tourism: It is necessary to be aware that tourism development requires adequate road access, accommodation, eating facilities, energy, and water. Such facilities will dispose waste and sewer. Environmental and social impacts from the construction of such facilities must be assessed parallel to the resource-finding phase of the project. Facilities are recommended to be limited to the level that local capital and man-power can renovate. Food resources are recommended to be provided by local communities as well. Good guides and interpreters are also very important for successful tourism development. It is recommended to find the human resource who knows about the management of the tourism resource. The staff must be able to explain the value of the resource to tourists.

Haze limits the visibility and value of the scenery: Tourism in montane region must provide impressive view of higher mountains. Haze diminishes the economic value of the view.

4.7 Environmental Research, Education, and Public Participation

4.7.1 Monitoring

Monitoring of production forest: Procedures must be generated for assessing changes of biological diversity of the production forests, compared with areas in the same forest type kept free from human intervention. Post harvest surveys need to be conducted to assess the effectiveness of regeneration.

Public participation in monitoring: Basic monitoring skill need to be transferred to local residents. Monitoring activities may create jobs in local community. The monitoring also will benefit from the experience of locals. Transfer of information on environmental condition is also expected by hiring local residents for the position.

4.7.2 Recording of Traditional Technology

Traditional, long standing management habit in each ecoregion need to be recorded in detail. For example, the management of the wetland and mangrove environment is rapidly lost as modern technology gain popularity in the region. Slush and burn technology currently used in the lowland to montane area by people who immigrated from other area of the country may be different from the one Detailed record of such wisdom inherited in local residents must be researched and recorded, to apply to sustainable use of the natural resource.

4.7.3 Consulting for Integrated Land Management

Since it is recommended for farmers to mix their source of income, consulting for them must cover all aspects as well. The consultation on integrated land management may include the variety and technique for higher yield and market value, and at the same time, may provide more fundamental information such as soil capability; analysis of site factors such as slope; site preparation and improvement such as terracing; preparation of planting materials including living fences; control of fires, and diversification of plant materials in considerations on rehabilitation of local species diversity.

4.7.4 Education, Training, Communication, Employment

The target of environmental education has three layers: top, middle, base. The focus of topic and educational tool will be different for each layer. The top layer is the decision-makers such as the head of government and the law makers / council members in the local assembly. Information on long-term value of environmental conservation, or the amount of cost that may be avoided by good research and planning, must be provided for the decision-makers. Information related to the national or international concern may also be raised by these people. The importance of mutual understandings of residents in upstream and downstream of a river in consolidated watershed management, and the value of tropical forest as effective CO₂ stock are the examples of values based on wider vision. The middle layer is consisted of more numerous local leaders such as extension workers, school teachers, leaders of community groups, and leaders of business associations. Education for these local leaders is the 'Training of Trainers'. Through these trainers, the principle idea of environmental consideration is expected to adjust to the condition of each locality, and expected to be applied widely. The base layer is the most numerous target, local residents and children. Environmental consideration may not produce quick income. And the behaviour people are used to from their ancestral age will not change easily. The trainer for this base layer needs patience and careful eye on his/her responsible area for a chance of making change both beneficial to environment and the land owner's economic gain. Such chance provided, the trainer must be able to take a quick action to provide useful information and materials for farmers with problems.

In past decades, information regarding crops and effective technologies has been successfully transferred to individual farmers through small, government-supervised demonstration projects. Alternative, sustainable models must be presented through well designed pilot trials in demonstration sites. The date for a show is announced by the extension workers to each household. Interested farmers volunteer to gather to the demonstration site. Emphasis must be placed in the future that experiences of preparation of such demonstration site and communication with farmers must be used as training opportunities for local leaders in governmental and private sectors.

Scoping of stake holders: In distribution of information, it is important that all stake holders in the matter share the same information. For example, regarding the proposed port development at Tanjung Api Api, same information must be made available in various form, such as newsletters and posters, for all the residents, land owners,

fishermen who visit the area, and researchers, NGOs. The scoping process that determines who should be involved as stake holders is very important.

Inter-sub basin communication: For a democratic and sustainable development of water resource in Musi River Basin, it is important that the merit and demerit of each sub-basin from the development is recognized and balanced. An irrigation project upstream may conflict with water use downstream. When round water recharge in upstream decreases, in down stream, there would be flood in wet season and draught in dry season. Therefore, a regular inter-sub basin communication must be established. Such communication may start between governments. In the future, it is desirable that informal sectors such as Water Users' Association and private companies in logging and estate industry are directly involved in such communication. By communicating with people with different interest, attendants are expected to recognize their responsibility as steward of land, and the responsibility is shared with all related residents and institutions.

4.7.5 Desirable Capacity of Extension Office

In the research and communication for environmental conservation, the role of extension offices is very important. To fulfil the task of the extension, each office is expected to be consisted of at least four units: Planning and logistics, Monitoring, Demonstration field and nursery, Production/Communication/Consultation. The Production unit may need to be divided into two sub-units, one for large estate production, and one for small scale farmers. These offices must be prepared with good source of information regarding the development plans of Regency, River Basin, and the Province.

5. GOALS AND OBJECTIVES OF WATERSHED REHABILITATION AND CONSERVATION (MASTER PLAN COMPONENT 3)

5.1 Goals and Objectives

In the management of natural environment in the Musi River Basin, watershed rehabilitation is the most important measure to achieve the following four purposes:

- To decrease flood, and to stabilize water regime
- To decrease soil erosion in the watershed and hence reduce sedimentation in rivers
- To conserve and rehabilitate ecological resources
- To increase groundwater resource

As direct actions against soil erosion, the Plan proposes three programs: 1) reforestation on land with major constraints for agriculture development, 2) law enforcement on production forest (HP) and logging in general, and 3) inner- and inter-basin coordination of policies and projects.

For healthier, sustainable natural environment in the future, the Plan also proposes additional three programs for conservation within the watershed: 4) forest area increase, 5) conservation of river environment, and 6) conservation of swamp and mangrove forest.

These six programs cover most part of the Province. The following **Figure D5.1.1** shows conceptual locations of project target areas. **Figure D5.1.2** explains overall scheme for rehabilitation and conservation of the river basin.

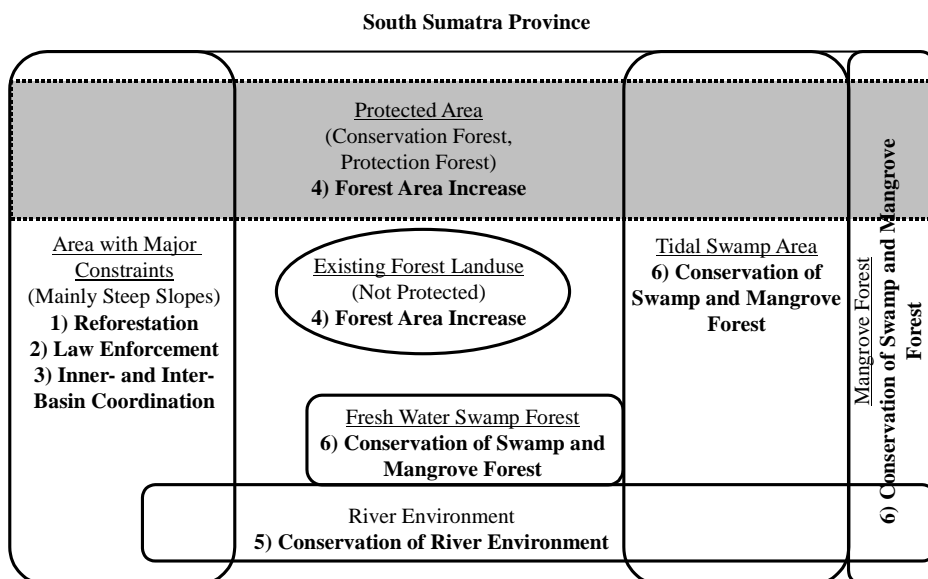


Figure D5.1.1 Conceptual Map of Target Areas

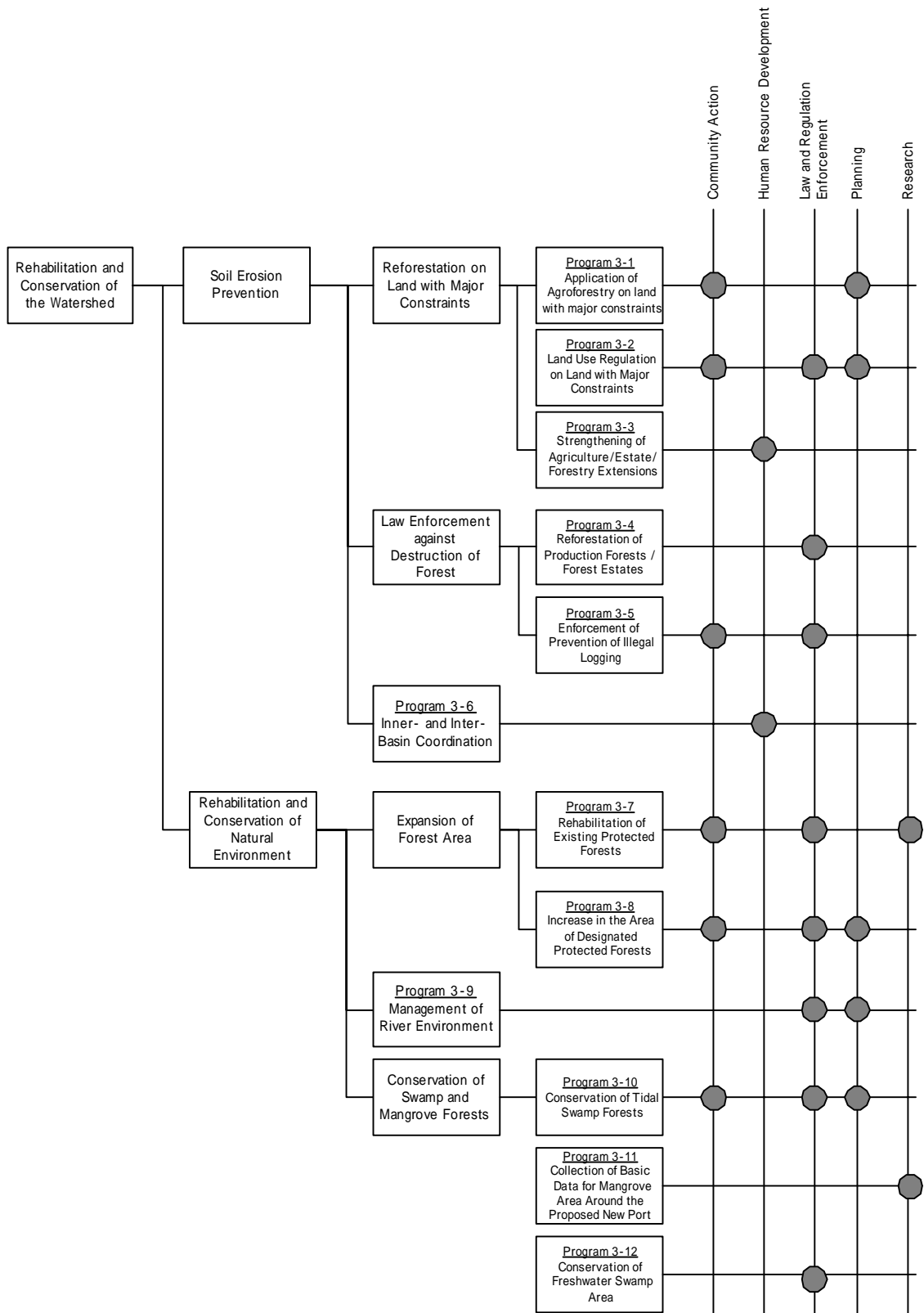


Figure D5.1.2 Overall Scheme for Rehabilitation and Conservation of the River Basin.

5.2 Relationship with Other Sectors

Institutional strengthening and monitoring network establishment are essential bases, and desirably prerequisites for implementation and monitoring of natural environment conservation.

Flood plain management and water use management may cause both positive and negative impacts on water environment and environment in the area between water and land, such as swamps and mangroves.

6. PROGRAMS FOR WATERSHED REHABILITATION AND CONSERVATION (MASTER PLAN COMPONENT 3)

6.1 Soil Erosion Prevention

6.1.1 Reforestation on Land with Major Constraints

This sub-section discusses reforestation on land with major constraints as a part of soil erosion prevention. The objectives are: to introduce better land management on the most critical areas within the Musi River Basin, and to convert garden-type land use on steep slopes to forest-type land use.

Leading institutions shall be; Kabupaten-level and Kecamatan-level forest, estate, and agriculture office, and extension offices, in cooperation with Provincial offices. Also, Provincial- and Kabupaten-level BAPPEDA shall responsible for legislative action for land use regulation. Forest rehabilitation and community involvement in such action is now experimented in the Kerinci Seblat National Park. Researchers and NGOs involved in such action are expected to take further leading role within the Musi River Basin.

Duration of the project shall be as follows: Preparation of land use regulation will need discussion with Kabupatens, and may take 3 years. Drawing and formalizing the regulation may need 2 more years. Public hearing and consultation at areas that will be subject of the regulation must be started during these 5 years. After the first 5 years, detailed zoning of the target area will start, followed by projects for land use change and modification of agriculture technology (**Figure D6.1.1**).

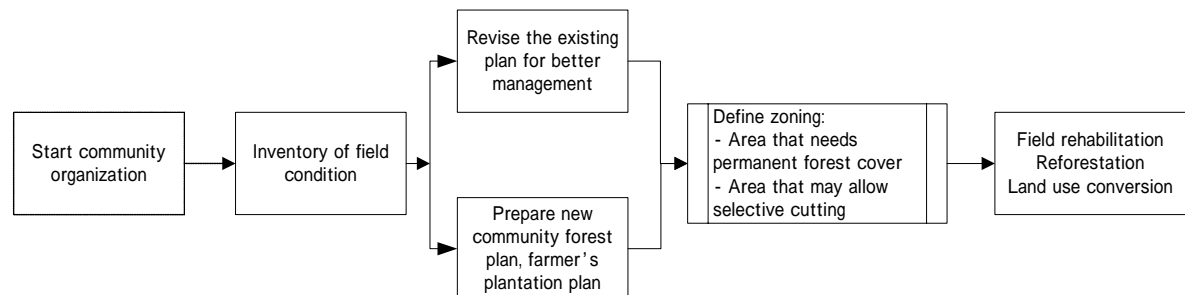
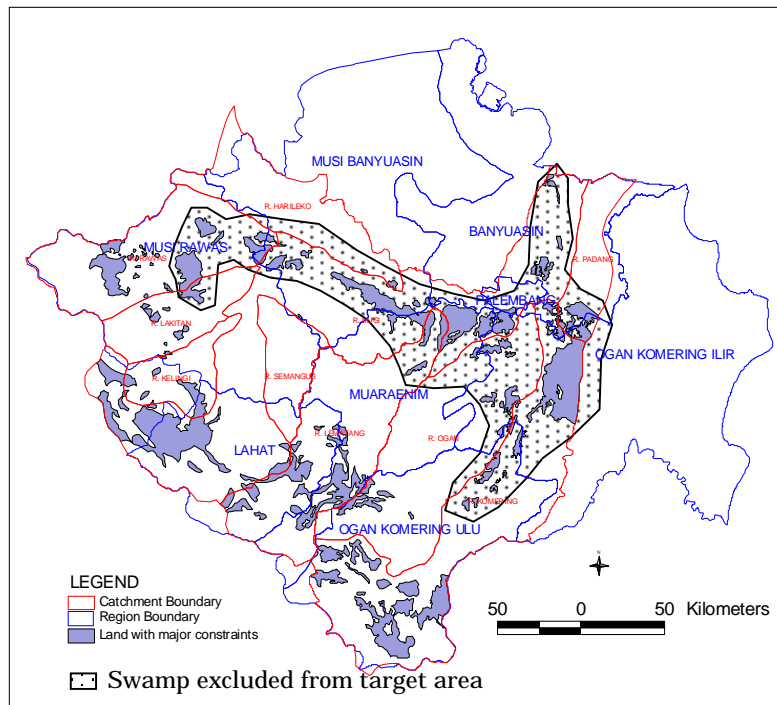


Figure D6.1.1 Introduction of Agroforestry on Land with Major Constraints

The Musi River Basin Study (December 1989) found land unsuitable for agriculture in the area listed in **Annex D.6.1.1**. The area is shown in **Figure D6.1.2** and breakdown by Kabupaten is shown in **Table D6.1.1**. Existing land use types within the area is predominantly the farmer's plantation (Perkebunan Rakyat) (**Figure D6.1.3**). When divided into the sub-basins, however, each sub-basin has specific character (**Figure D6.1.4**, **Table D6.1.2**, and **Annex D.6.1.2**).

Project target for erosion prevention in the land with major constraints should, therefore, concentrate on farmer's plantation area. Priority areas area recommended to be chosen from areas that already have plan for farmer's plantation development, and areas that have community organization to prepare or implement such plan.

In sub-basins of Rawas, Musi, Ogan, and Komerling, plantations must also be included as target area. Owners and operators of these plantations must be notified the limitations of their land for better management and sustainable production of the areas.



**Figure D6.1.2 Land with Major Constraints
(Not Suitable for Agricultural Use)**

Table D6.1.1 Land Area that has Major Constraints by Sub-Basin

Sub-Basin	Sub-Basin Total (km ²)	Area with Major Constraints (km ²)	Area with Major Constraints (%)
Rawas	6,026	331.85	5.5%
Lakitan	2,763	115.83	4.2%
Harileko	3,765	8.59	0.2%
Musi	15,320	1,498.57	9.8%
Kelingi	1,928	153.27	7.9%
Lematang	7,340	589.52	8.0%
Ogan	8,233	290.09	3.5%
Komerling	9,908	801.69	8.1%
Padang	2,513	68.31	2.7%
Total	57,796	3,410.04	5.9%

Source: Musi River Basin Study, Final Report, Annex No. 3 page 6-8, Republic of Indonesia, Ministry of Public Works, Directorate General of Water Resources Development, and Commission of the European Communities, December 1989, Consultancy Contract No. HK 020301-Da/1148

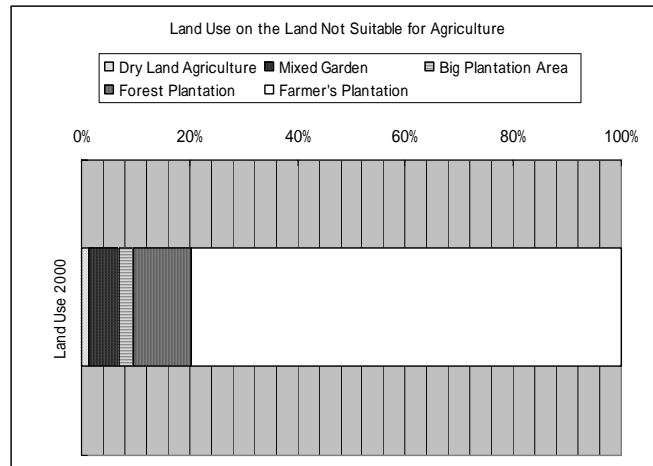


Figure D6.1.3 Land Use Types within the Constraints Area

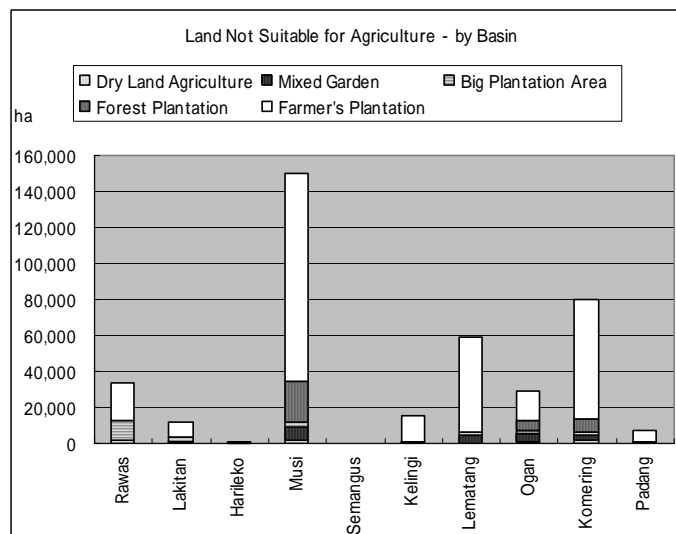


Figure D6.1.4 Land Use Types within the Constraints Area by Sub-Basin

Table D6.1.2 Target Land Use Types for Erosion Prevention

Whole Basin	Farmer's plantation area
Additional area	
Rawas	Big plantation area
Musi	Forest plantation, mixed garden
Lematang	Mixed garden
Ogan	Forest Plantation, mixed garden
Komerling	Forest Plantation, mixed garden

(1) Application of Agroforestry on Land with Major Constraints (Program 3-1)

Farmers who are using the land with major constraints are encouraged to introduce agroforestry (tumpang sari) method in their garden (pertanian rakyat), mixed garden, and estate (perkebunan rakyat) (Figure D6.1.5). By this conversion, farmers can obtain various food crops near their house with less

labour, and some crop for market for cash income. Currently, such lot is used mainly for rubber and coffee, and market-keen farmers often cut down their trees and change their strategy for income. Introducing agroforestry expect to lower farmers' temptation for this short cycle of tree cutting.

Also, farmers must receive stronger education of agricultural technology about farming on slope for their individual plantation. Technique for soil conservation, such as terracing, alley cropping and check dam must be applied by all farmers on slope. As an effective measure for soil conservation, no-tilling farming is gaining popularity in many countries in the world, including those in tropical climate. For example, soybean farmers have been successful with less labour on steep slopes in Peru. The technology keeps roots and other remnants of crop on or in soil as mulch cover. Farmers either dig holes or do light tilling for next crop. By this method, soil is covered most of the year, and nutrients are kept there.

Slope more than 15 % is recommended to be converted to permanent forest. Farmers must be educated so that they themselves can measure the steepness of slope with simple tools. Non-wood products such as honey, latex, and spices may be obtained from the permanent forest.

Agroforestry is a traditional, self-sufficient style of farming in West Java area. Each household is surrounded by a home garden, where many different crops from coco, banana, yam, or cassava are grown. Firewood is collected in home gardens too. Hens and goats may be raised in a part of the garden. Fish pond is also common to add protein source to self-sufficient style diet of farmers. Such home gardens can be found in South Sumatra Province in old transmigration area where people from Java area are relocated.

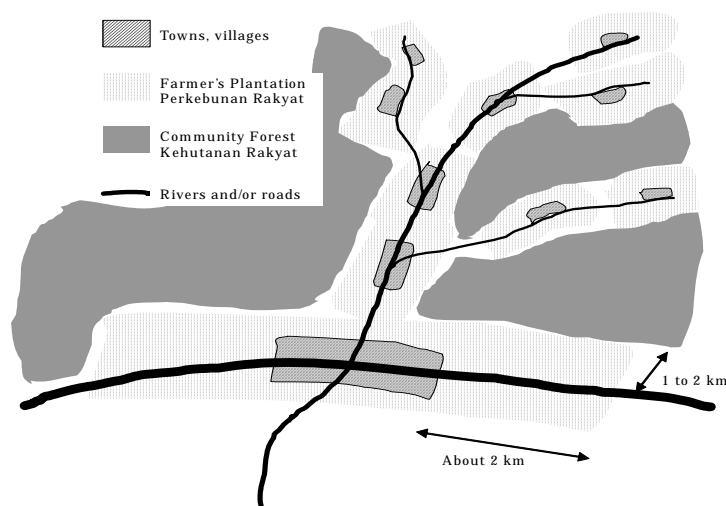


Figure D6.1.5 Conceptual Relationship of Road, River, Village and Farmer's Plantations

(2) Land Use Regulation on Land with Major Constraints (Program 3-2)

The area of land with major constraints must be recognized in Kabupaten and Provincial level spatial plan. The spatial plan must also state a list of suitable land use (ex. permanent forest) for the area. The draft of the plan must be explained to all the stake holders and communities possibly affected by the designation. The scientific base of the regulation must be well explained, and mitigating measures for impact on local economy must be sought both by the government and local community.

To realize the plan, a land use regulation ordinance regarding the area must be prepared and activated. Based on the regulation, local government should start community projects for tree planting, terrace preparation, check dam construction, and other prevention measures against soil erosion. **Figure D6.1.6** explains the steps of action.

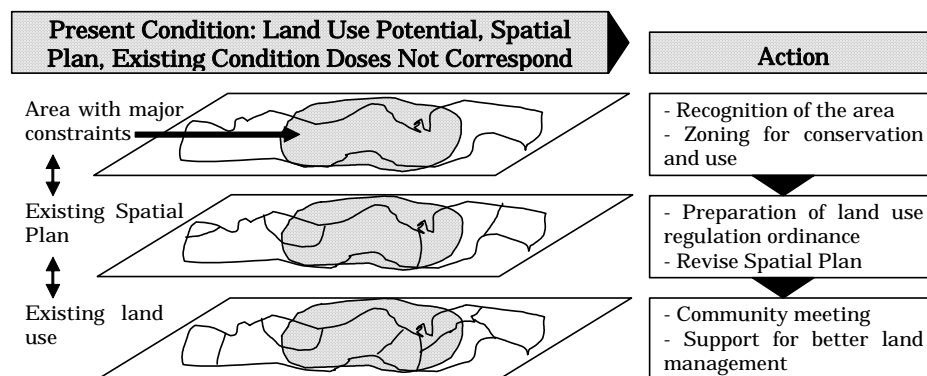


Figure D6.1.6 Land Use Regulation on the Land with Major Constraints

(3) Strengthening of Agriculture/Estate/Forestry Extensions (Program 3-3)

In the autonomy society, government office that directly face with local residents need to play the most important function. It is expected to gather opinions of residents, at the same time to provide information about policies and projects of the government.

For better land management, integrated consulting must be provided for farmers. Such consulting may cover technique for collecting non-tree crops from permanent forest, site preparation, terracing; living fences.

In past decades, such consulting has been provided to individual farmers through small, government-supervised demonstration projects at extension offices.

In the year 2000 (pre-autonomy), there were 89 agriculture extensions in South Sumatra Province (number of forestry extension was not available) (**Table D6.1.3**). In average, each office had 21 staff (including Rank II to other). Given that agriculture land use (dry land agriculture, farmer's plantation, mixed

garden, rice field) amounts 30,752 km² in the Province, each office is expected to supervise 346 km², or 19 km² for each staff (Rank II to Rank IV). (If farmer's plantation is excluded, 78 km² for one office and 4.3 km² for one staff)

To fulfil the expected task of the extension, each office is expected to be consisted of at least four units: Planning and logistics, Monitoring, Demonstration field and nursery, Production/ Communication/ Consultation. Since the staff need to know the local people and their economic condition well, it is best to hire them from local community (**Figure D6.1.7**).

Management of nursery may also create jobs in local community. The monitoring also will benefit from the experience of locals. Transfer of information on environmental condition is also expected by hiring local residents for such positions.

Table D6.1.3 Number of Office and Staff of Agriculture Extension by Regency Year 2000

Location	Office	Rank II	Rank III	Rank IV	Other	Total
Musi Banyuasin	17	305	30	0	59	394
Ogan Komering Ilir	11	187	69	0	52	308
Ogan Komering Ulu	16	284	44	1	32	361
Muara Enim	15	127	35	0	16	178
Lahat	14	145	37	0	35	247
Musi Rawas	13	207	45	0	35	287
Palembang	2	40	27	0	0	67
Province	1	0	28	6	0	37
Total	89	1,295	315	7	229	1,846

Source: Statistik Tanaman Pangan p. 106, 107

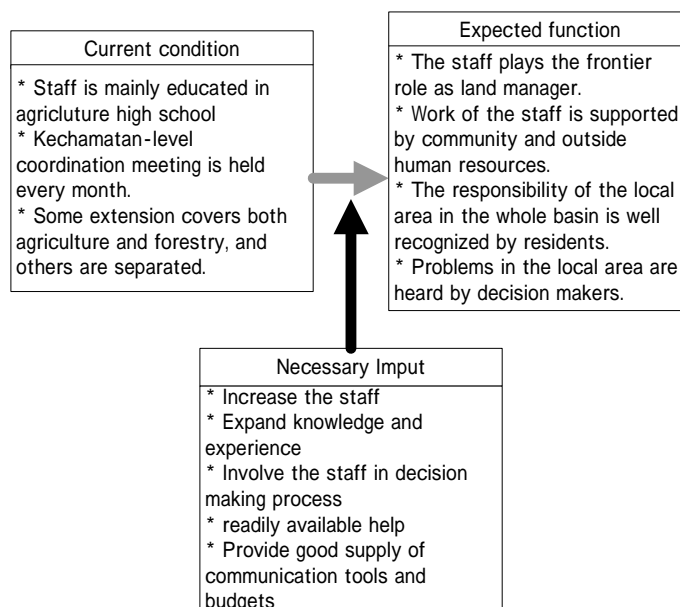


Figure D6.1.7 Expected Function and Necessary Input for Agriculture/Estate/Forestry Extensions

6.1.2 Law Enforcement against Destruction of Forest

Law enforcement against destruction of forest is a part of soil erosion prevention and consists of two programs, namely, Reforestation of Production Forest, and Enforcement of Prevention of Illegal Logging.

(1) Reforestation of Production Forest and Forest Estate (Program 3-4)

(a) Project Reorganization

Enforce reforestation obligation at Production Forests and Forest Estates.

Every concessionee of the Production Forests and Forest Estates in the Province receives logging concession from the Provincial Forest Office. When a concessionee makes contract for secondary forest that was logged already, the concessionee receives reforestation fund (DR) the money is given prior to the reforestation action, and an international organization, ITTO, found that reforestation is not realized. Therefore, the fund is not functioning, money is wasted, good forest land is left devastated.

This project is to legalize inspection and monitoring by the Province, the concession provider on reforestation activities by the concessionees, or the previous concessionees.

The total area of Production Forests covers 25 % of the Province. Just management is essential for safe and prosperous life in South Sumatra for long term (Table D6.1.4).

Table D6.1.4 Production Forests in South Sumatra Province

Type	Area (km ²)	Forest with Limited Production	Production Forest	Conversion Forest	Total Number	Total Area (km ²)	%
MuBa	26,191	2	11	8	21	8,487.77	32%
MuRa	21,513	1	8	5	14	3,780.10	18%
Lahat	7,719	2	2	0	4	536.28	7%
MuEn	9,575	1	4	0	5	2,861.07	30%
OKI	21,367	1	5	9	15	8,438.99	39%
OKU	14,679	2	5	0	7	1,116.13	8%
Total	101,044	9	35	22	66	25,220.34	25%

Source: Statistik Kehutanan, Propinsi Sumatera Selatan 2001, VI-1

(b) Objectives

To make sure that the obligation of reforestation by the forest companies are fulfilled as intended. To rehabilitate forest resource of the Province for sustainable use in the future.

(c) Leading Institution

Provincial Forestry office, in cooperation with Forest Police, Kabupatens, and forestry extension offices in each Kechamantans.

Provincial Forest Office will need close communication with existing and former concessionaires and their business associations to share understandings of the common merit of reforestation (**Annex D6.1.3**).

Provincial Forest Office may also need to report to and consult with Ministry of Forestry to establish stronger legal action to monitor the use of Reforestation Fund.

The Jakarta Post (writer Rendi A. Witular) reported as what is said by an official at the Ministry of Forestry, that the national government plans to liquidate state owned Inhutani V, and transfer the firm's control of badly damaged forest to the local community and private firms. If this liquidation actually happens, it will be extremely difficult to monitor the use of already paid DR money, or have the money returned and re-invested for new forest users. The article even reports that transferred Production Forest may possibly be turned into plantation estates.

(d) Duration of the Project

Preparation of the project for three (3) years. Monitoring and reforestation execution will follow.

(e) Project Area

There are about 25,220 km² production forests in the Province. The area is divided into 66 locations (**Table D6.1.4**). The major concessionaires are listed in **Annex D6.1.3**.

Among those 66 production forests, all areas that have received the Reforestation Fund must be investigated.

Areas, however, that falls in either one of following three criteria may be considered as special priority sites: 1) those that directly located along the major tributaries, 2) those on the land with major constraints, or on steep slopes, and 3) those that located next to protected forests (HSA and HL). Names of these priority sites for inspection are listed in **Table D6.1.5**.

Priority also may be given to Kabupatens that expressed stronger concern for their own natural resource, and willingness to cooperate in the investigation.

Table D6.1.5 Priority Sites for Investigation for Reforestation*

Priority Criteria		Name
Directly located along the major tributaries	MuBa	HP Mangsang Mendis
On the land with major constraints, or on steep slopes		HP Rawas Utara HP Rawas Lakitan HPT Rawas Lakitan HP/HPT Bukit Balai HP Gumai Tebing Tinggi HPT Isau Isau HP Air Empelu HP Bukit Asam HPT Saka
Located next to Protected forests	MuRa	HPT Rawas Lakitan
	MuBa	HPT Meranti S. Kapasis Saka Suban HPT Meranti LB Buah HP Meranti S. Bayat S. Bahar HP Meranti S. Merah HP Mangsang Mendis HP Sungai Lalan
	Lahat	HP/HPT Bukit Balai HPT Gumai Tebing Tinggi HP Bukit Asam
Located next to Protected Forests	MuEn	HPT Isau Isau HP Air Empelu
	OKI	HP Simpangheran Beyuku** HP Mesuji III**
	OKU	HPT Air Tebangka HPT Saka HP Saka

Note: *: Table does not include Conversion Forests because individual name was not given in the Forest Plan Map. **: Located outside of the Musi River Basin.

(f) Project Component

To secure the required reforestation done, three types of policies need to be implemented: 1) Guidance and communication, 2) Encouraging actions for reforestation, and 3) Enforcing actions. Components of these actions are explained in **Table D6.1.6**.

Table D6.1.6 Actions for Reforestation of Production Forests

Guidance and communication	
<ul style="list-style-type: none"> * The Province must make sure that all forest company that obtain concession in the Province has sufficient number of reforestation staff in local offices. The staff must be educated and trained well according to the ITTO international guideline for rehabilitation and reforestation of tropical forests. * An investigation team must be formed to evaluate the achievement of concessors, as well as to discuss better systems to encourage sustainable forest production. The team should include members from forest industry, forestry research, environmental NGOs, and provincial and local government. 	
Encouraging Actions	Enforcing Actions
<ul style="list-style-type: none"> * Corporation that achieved its reforestation obligation is given priority consideration at renewal of concession. * Additional grant may be considered to support maintenance work for reforestation. 	<ul style="list-style-type: none"> * The timing of DR payment must be delayed to after completion of reforestation. * Sabotage fine must be charged for those received the DR but missed to achieve agreed reforestation. * Names of the companies that failed obligatory reforestation must be announced in mass media. * Log production allowance must reflect amount of reforestation work achieved. Those failed to realize obligatory area/number must be limited their production.

(2) Enforcement of Prevention of Illegal Logging (Program 3-5)

(a) Project Upgrade

The objective of the program is to minimize logging activities without proper concession.

Illegal logging may be defined in four types as described in **Table D6.1.7**.

Table D6.1.7 Types of Illegal Logging

Location	Condition
Production Forest	Log cut with improper licence, or without any licence.
Protected forest (HSA, HL)	Any tree cut down without proper permission.
Farmer's plantation or private land	Log cut and transported without proper recognition of village leader.
Forest or tree stands without any legal designation	Any tree cut down without proper permission.

Since national moratorium for logging is in effect, all logging concession in the Province besides those for pulp industry has been stopped in 2002. However, the concession system itself has had some problems. The ITTO technical mission to Indonesia in 2001 recognized that cutting permits can be issued by various authorities (district, provincial and central). There have even been cases where cutting permits have been issued for the same area by different authorities to different parties.

It is reported that most loggers are not local residents, but chain-saw men hired by corporations in wood industry in Palembang or other areas.

(b) Objectives

To create atmosphere in local community against illegal logging activities.
To catch and punish those that involves in illegal logging activities.

(c) Leading Institution

Provincial Forestry Office and Forest Police. Daily patrol and alert raising effort need cooperation of local residents and local government.

Center for International Forest Research (CIFOR) in Bogor has good experience in research and proposal against illegal logging. It would be of great help to have help from the Center to coordinate local plan and training of monitoring staff.

Fundamental achievement to halt illegal logging needs restructuring of political and economic situation in Indonesia. Severe loss of local natural resource can not wait for such long-term social change. This plan, therefore, tries to do what can be done just with the effort of local people and their government.

(d) Duration of the Project

Coordination of investigation team and planning of work may take 3 years. Investigation and community education will follow.

(e) Project Area

Since most of remaining forest is now located in remote area in mountain and swamp, illegal logging activities area reported from these areas as well. In that case, target area may be Kabupatens Banyuasin, OKI, MuRa, Lahat, and OKU.

Priority also may be given to Kabupatens that expressed stronger concern for their own natural resource, and willingness to cooperate in the investigation.

Since the Province is wide and population is sparse, it is difficult to monitor logging activities in remote area. Effort must be concentrated on counter measures that can take place close to where people live.

(f) Project Component

The Five Year Strategic Plan for Forestry Development 2000-2004 lists following projects in its priority list (**Table D6.1.8**).

Table D6.1.8 Actions for Reforestation of Production Forests

No				Program
III.	1	1.3	b.	The development of illegal logging prevention and supporting facilities, infrastructures also followed up by result of securing activity (fast justice processing)
III.	1	1.3	c.	The empowerment, utilization and availability of PPNS of Forestry, forestry police and PPKBRI
III.	1	1.3	f.	Information and guideline for society to support activity successful of illegal logging and illegal trade combatant.

Source: Rencana Strategis Pembangunan Kehutanan, Propinsi Sumatera Selatan, Tahun Dinas 2000-2004

Major tasks that should be realized in the Province are described in **Table D6.1.9**.

Table D6.1.9 Examples of Counter Measures against Illegal Logging

Licence control	* Kabupatens and Province monitor and control licensing activities, over-rule and stop any licensing that is against the moratorium policy.
Education and community organization	* Local communities near illegal logging site must be given information about how logging on steep slope increase threat of flooding and landslide. * Local residents must be encouraged to report any illegal or suspicious activities to Provincial Forest Office or other appropriate public offices.
Patrol and police work	* In mountain area, access to forest is limited to certain roads. In swamp area, logs are cut and stored in small canals or rivers in dry season, so that they can be flush out in wet season. By patrolling in such limited area, evidences of logging activities will be collected, and arrests may be made with less effort.
Counter-action	* Loggers usually construct wooden log-road in forest to pull the cut log on it. Destroying such log-road repeatedly would express local decision to fight with the loggers and discourage logging activity.

6.1.3 Inner- and Inter-Basin Coordination (Program 3-6)

(1) New Project

Organize and practice inter-sector coordinating body (PPTPA) for the Musi River Basin.

Organize and practice sub-basin level coordination so that local interest and problems are better reflected to the decision making of whole Musi River Basin.

(2) Objectives

To realize sound and comprehensive resource management of the Musi River Basin. To encourage local government manage their own land and water resources in coordination with other government body within the same sub-basin.

(3) Leading Institution

For formation of Musi River Basin PPTPA, leading institution will be the Governor's Office, in cooperation with various related provincial office, academic researchers, and NGOs.

For sub-basin level organization similar to the PPTPA, leading institution will be Kabupatens, with help from Provincial Governor's Office, and the PPTPA itself. Member of sub-basin level organization will be consisted of similar combination as the PPTPA, but from local level.

(4) Duration of the Project

Formation of sub-basin or Kabupaten level organization may be started prior to the PPTPA, or after, depending on willingness of Kabupatens.

(5) Project Area

For the PPTPA, the project area is the whole Musi River Basin.

Since the whole basin is so large, it is difficult for representatives of Kabupatens to gather often at one place. At the same time, specific interests of each region will make discussion at the PPTPA difficult to focus on particular issues.

For better communication, concentrated efforts for resource management, and for empowerment of local autonomy, the Plan proposes to establish Kabupaten or sub-basin level inter-sector organization.

For example, sub-basins are grouped in **Table D6.1.10** by their common concern in water and land resource problems. **Table D6.1.11** shows Kabupatens/Kotas and sub-basins they belong to.

Table D6.1.10 Sub-Basins and Shared Concerns

Groupings of Sub-basins	Shared Concerns
Rawas, Lakitan	National Park management and control of logging and encroachment
Lematang	Water resource conservation for urban and industrial water needs
Musi, Harileko, Semangus, Kelingi	Water resource conservation
Ogan, Komering	Reduction of sand deposition, increase of water flow

Table D6.1.11 Kabupatens and Sub-Basins

	Rawas, Lakitan	Lematang	Musi, Harileko, Semangus, Kelingi	Ogan, Komering
OKU				O
OKI				O
MURA		O	O	
Lahat	O	O		
Muara Enim	O	O		
MUBA		O		
Banyuasin			O	
Palembang			O	
Perabumulih		O		
Lubuk Linggau		O		
Pagaralam		O		

(6) Project Component

The organization will be consisted of public offices, local communities, and NGOs, related to spatial planning, forestry and conservation, agriculture, water resource management and other related sectors (**Figure D6.1.8**).

This project aims to form such inter-sector organization at Province and local level, to have broad information shared in the organization, and to form, implement, and monitor land management projects that handle the local issues. To make the organization function, the organization and its members must be given authority and responsibility to propose inter-basin projects, implement and monitor the projects, and report the achievement (**Figure D6.1.9**).

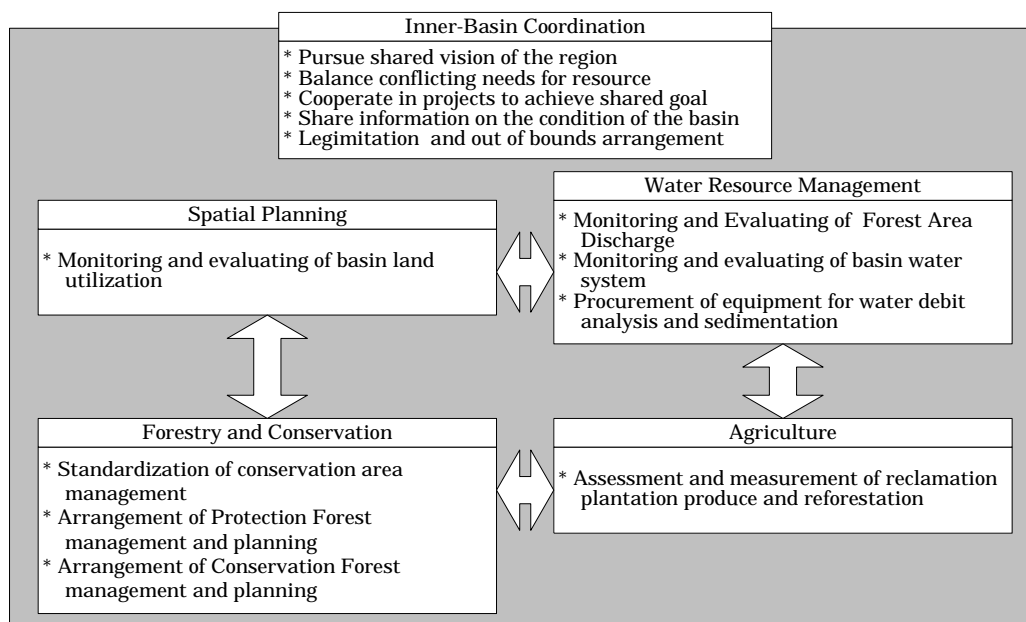


Figure D6.1.8 Image of Coordination within Inter- and Inner-Basin Organization

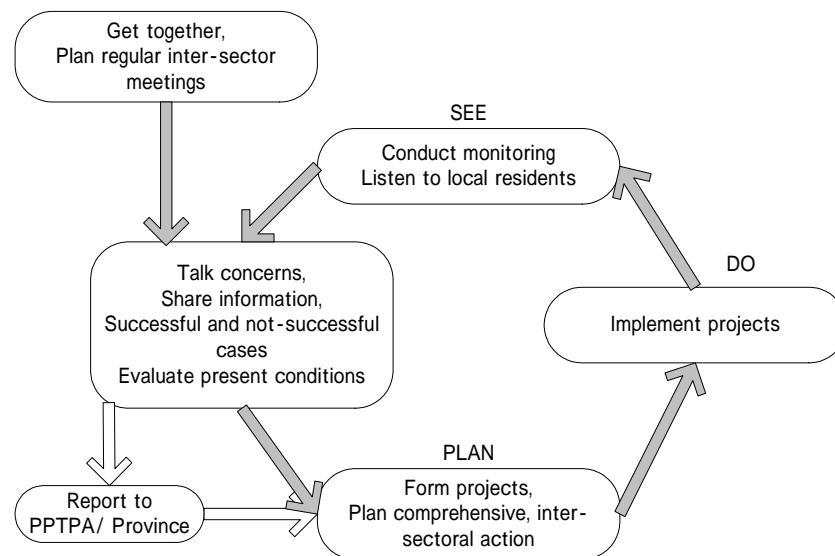


Figure D6.1.9 Actions Expected for Inter- and Inner-Basin Organization

6.2 Rehabilitation and Conservation of Natural Environment

6.2.1 Expansion of Forest Area

(1) Rehabilitation of Existing Protected Forests (Program 3-7)

(a) Project Upgrade

Rehabilitation and conservation of existing Conservation Forests (HSA, Kawasan Konservasi) and Protection Forests (HL).

(b) Objectives

To cover the designated area with tree species native to the locations.

To rehabilitate biodiversity within the designated protected areas.

(c) Leading Institution

For HSA, national Balai KSDA and Provincial Forestry Office.

For HL, Kabupatens in cooperation with Provincial Forestry Office.

(d) Duration of the Project

Upgrade planning with involvement of extension officers for 3 years. Implementation will follow.

(e) **Project Area:**

Within the existing Conservation Forests (HSA), and Protection Forests (HL).

As in **Figure D6.2.1**, 80 % of the area HSA and HL is covered by natural land use. The rest of 20 %, or 1,555 km² is the target area for reforestation. Also, forest land use of 8,477 km² (72%) is the target area for rehabilitation of natural habitat.

Table D6.2.1 shows that existing forestland use in the Province is much smaller than legally protected forest area. Rehabilitation of forest stands at least within the legally designated area will substantially increase the ratio of forest cover in the Musi River Basin.

For definition of forest and non-forest land use type, see **Annex D6.2.1**.

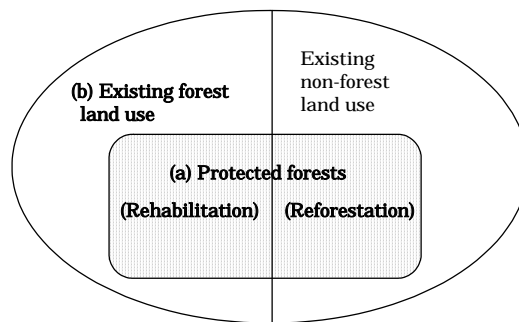
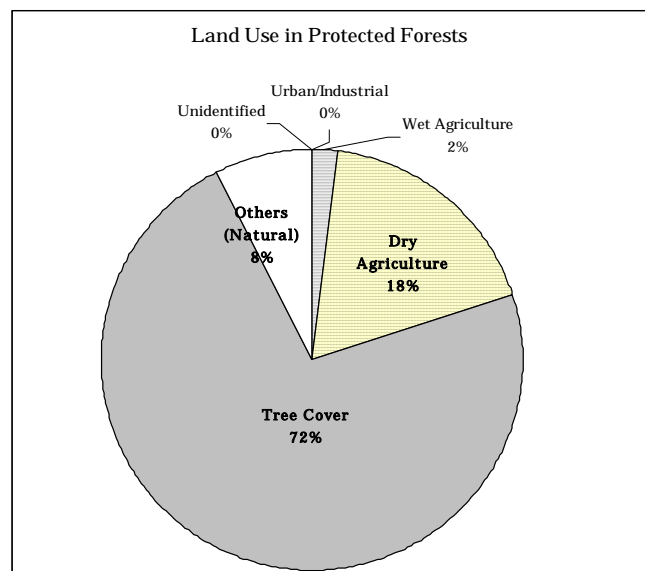


Figure D6.2.1 Designated Protected Forest and Forest Land Use



Source: Land Use 2000

Figure D6.2.2 Land Use in Protected Forests

Table D6.2.1 Area of Sub-Basins and Ratio of Protected Forests

Sub-Basin	TN, HSA (km ²)	HL (km ²)	Protected Area Total (km ²)	Sub- Basin Total (km ²)	Protected %	Forest Land Use Area (km ²)	Forest Land Use %
RAWAS	1,663.59	0	1,663.59	6,026	28%	315.10	5.2%
LAKITAN	748.45	20.65	769.10	2,763	28%	109.02	3.9%
HARILEKO	175.19	192.37	367.56	3,765	10%	8.59	0.2%
MUSI	511.07	785.55	1,296.62	15,320	8%	1,409.18	9.2%
KELINGI	42.92	9.55	52.47	1,928	3%	148.14	7.7%
LEMATAN G	190.83	1,045.76	1,236.59	7,340	17%	548.40	7.5%
OGAN	0.13	562.01	562.14	8,233	7%	237.83	2.9%
KOMERING	0.00	1,046.97	1,046.97	9,908	11%	752.34	7.6%
PADANG	587.67	190.58	778.25	2,513	31%	64.19	2.6%
Total	3,919.85	3,853.44	7,773.29	57,796	13%	3,592.79	6.2%

Source: Protected Area: Provincial Forestry Office Sub-basin area: Progress Report Annex 2.7.1
Forest land use area: Land Use 2000

(f) Project Components

For rehabilitation of protected forest, six actions are needed to be implemented simultaneously. They are, 1) forest border construction, 2) forest rehabilitation (priority on where currently not covered by tree vegetation), 3) habitat rehabilitation (priority on where tree vegetation remains), 4) law enforcement, 5) human resource development, and 6) monitoring and research (**Table D6.2.2**).

As of 2001, there is 60 staff of Balai KSDA for management of protected forests. They are stationed at seven locations (**Table D6.2.3**). Considering whole protected forest, however, simple calculation tells that one staff is responsible for 129.55 km² of protected forest in average. Number and training of station staff is the key to successful rehabilitation of protected forest.

Table D6.2.2 Project Components for Rehabilitation of Protected Forest

Forest Border Construction	Reconstruction of Forest Area boundary
	Maintenance and secure of Forest Area boundary
Forest Rehabilitation	Maintenance of area, which is forest fire/ cutting wood/ damaging/ illegal digging, which is already rehabilitation year before.
	Rehabilitation of conservation area that already damage by natural or artificial succession and make priority for local plant.
Habitat Rehabilitation	Identification of concerning biodiversity potency in preserved area
	Perpetuation and rehabilitation of rare flora and fauna
Law Enforcement	Making of patrol road/ Zones border
	Making of spying tower (height \pm 12 m, border \pm 4 m ²)
	Shelter construction (12 m ²)
	Gate construction
Human Resource Development	Arrangement planning of preserved forest management unit
Monitoring and Research	Habitat guideline
	Evaluation of conservation area function
	Inventory of preserved area

Table D6.2.3 Number of Staff at Conservation Forest 2001

Location	Civil staff	Forest police	Other	Total
HSA. Padang Sugihan	2	9	0	11
HSA. Bentayan	2	5	1	8
HSA. Dangku	2	5	0	7
HSA. Gumai Pasemah	3	6	0	9
HSA. Isau-Isau Pasemah	2	5	2	9
HSA. Sungai Sembilang	2	7	1	10
PLG/TWA. Bukit Serelo	4	2	0	6
Total	17	39	4	60

Source: Balai KSDA Sumatera Selatan

(2) Increase in the Area of Designated Protected Forests (Program 3-8)

(a) Project Upgrade

Identification of remaining forest area, and expand existing borders and new designation of Protected Forests

(b) Objectives

To include as much remaining tree stands within protected areas.

(c) Leading Institution

Identification will be conducted by Provincial Forestry Office, in cooperation with national Nature Conservation office (Balai KSDA). Detailed identification and coordination with land owners will be conducted by Dishut Kabupaten (Kabupaten-level forest office) and Desa-level Penyuluh (extension).

Kabupatens and Kecamatans must be encouraged to nominate local protection forests. Such local protection forests may include historical sites, area with religious or cultural importance. Area may be as small as a few hectares. Regulation of use in the area may be decided by local residents, as long as the area remains to be covered mostly by tall woods. Maintenance and patrol activities may also be conducted by local residents.

(d) Duration of the Project

Forest identification may be revised every 5 years. Effort for new designation may continue throughout the target years.

(e) Project Area

Forest identification will be done for whole Province outside of already protected forests (HSA, HL). Priority for identification work, however, may be set for one or more sub-basins or Kabupatens for quick execution of the policy.

Designation of protected forests may also concentrate on priority areas. Examples of priority consideration are summarized in **Table D6.2.4**.

Table D6.2.4 Priority Area for New Designation of Protected Forest

* Remaining forests within Freshwater Swamp Forests and Lowland Rain Forests eco-region definitely have priority to be conserved, since they are not currently protected. (see Table D6.2.5)
* Expansion of existing border has priority to new designation, since that will improve ecological function of existing protected forest. Where substantial forest is located close to already designated Protected Forest, but not yet protected legally, the existing border must be expanded to include such forest.
* Musi, Komerang, and Lematang sub-basin has the largest land area that has major constraints for any agriculture production. Such area with difficulties may better be included in Protected Forest System. (see Table D6.2.6)
* Ogan and Komerang Sub-Basins can be priority areas because they need urgent rehabilitation in terms of soil erosion.
* Kelingi, Ogan, and Musi sub-basin have least per cent of protected area compared to the total area of sub-basin. (see Table D6.2.7)

Table D6.2.5 Area of Eco-Regions and Ratio of Protected Forests

Ecoregions		Montane Rain Forests	Lowland Rain Forests	Freshwater Swamp Forests	Peat Swamp Forests	Sunda Shelf Mangroves
Number of Protected Area	National park (TN), conservation forest (HSA)	4	2	0	5	4
	Protection forest (HL)	6	6	0	0	6
Protected Area Total km ²		5829.66	726.28	0	4362.89	*
Original Area km ² (approx.)		10,104.40 (10 % of Province)	50,522.00 (50%)	3,031.32 (3%)	37,386.28 (Peat Swamp 35%, Mangroves 2%)	*
Protected %		58%	1%	0%	12%	*

*: Protected area and original area of peat swamp and mangrove are added in the table.

Table D6.2.6 Land with Major Constraints by Sub-Basin

	Sub-Basin Total (km ²)	Area with Major Constraints (km ²)	Area with Major Constraints (%)
Rawas	6,026	331.85	5.5%
Lakitan	2,763	115.83	4.2%
Harileko	3,765	8.59	0.2%
Musi	15,320	1,498.57	9.8%
Kelingi	1,928	153.27	7.9%
Lematang	7,340	589.52	8.0%
Ogan	8,233	290.09	3.5%
Komering	9,908	801.69	8.1%
Padang	2,513	68.31	2.7%
Total	577,960	3,410.04	5.9%

Table D6.2.7 Area of Sub-Basins and Ratio of Protected Forests

Sub-Basin	HSA (km ²)	HL (km ²)	Protected Area Total (km ²)	Sub-Basin Total (km ²)	Protected %	Forest Land Use Area (km ²)	Forest Land Use %
RAWAS	1,663.59	0	1,663.59	6,026	28%	315.10	5.2%
LAKITAN	748.45	20.65	769.10	2,763	28%	109.02	3.9%
HARILEKO	175.19	192.37	367.56	3,765	10%	8.59	0.2%
MUSI	511.07	785.55	1,296.62	15,320	8%	1,409.18	9.2%
KELINGI	42.92	9.55	52.47	1,928	3%	148.14	7.7%
LEMATANG	190.83	1,045.76	1,236.59	7,340	17%	548.40	7.5%
OGAN	.13	562.01	562.14	8,233	7%	237.83	2.9%
KOMERING	.00	1,046.97	1,046.97	9,908	11%	752.34	7.6%
PADANG	587.67	190.58	778.25	2,513	31%	64.19	2.6%
Total	3,919.85	3,853.44	7,773.29	57,796	13%	3,592.79	6.2%

Source: Protected Area: Provincial Forestry Office
Sub-basin area: Progress Report Annex 2.7.1
Forest land use area: Land Use 2000

(f) **Project Components**

Data of the remaining forest may be obtained from the NOAA satellite images obtained daily for forest fire control. This project uses the data and takes a prevention measure against forest fire and forest clearance.

Forest identification may be conducted mainly in Palembang. After the preliminary forest map is prepared, major task will be transferred to field, and the leading agency will be Kabupatens or Kecamatans. Project duration from on-site identification to commencement of forest conservation actions may take about 5 years.

It is very important that local communities are involved in the earliest stage into the designation process. Identification of forested area, inventory of forest resources are good opportunities for government to work together with local residents. The draft of forest plan must be explained to communities possibly affected by the designation. The scientific base of the regulation must be well explained, and mitigating measures for impact on local economy must be sought both by the government and local community.

Steps for designation of new protected forest are summarized in **Figure D6.2.3** and **Table D6.2.8**.

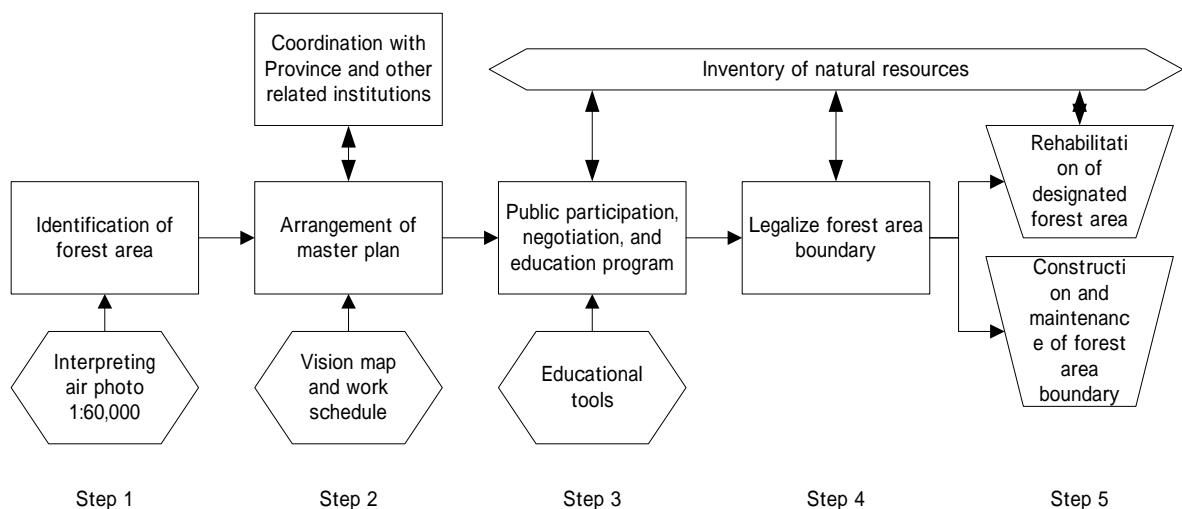


Figure D6.2.3 Five Steps for Designation of New Protected Forest

Table D6.2.8 Project Components for New Designation of Protected Forests

Component	Tasks	Province Level		Kabupatens , Kecamatans
		Forestry	Nature Conservation	
Forest identification	Satellite photo preparation	O		
	Field observation (sample)	O	O	O
	Differentiation standard model	O		
	Preparation of preliminary forest map	O		
On-site identification	Forest map improvement	O	O	O
	On-site marking of forest to be conserved		O	O
	Identification of human pressure on forest, stake holders		O	O
Forest conservation	Alternative resource development with consultation with stake-holders	O		O

6.2.2 Management of River Environment (Program 3-9)

(1) New Project

This program aims to conserve multi-functional river environment

(2) Objectives

To recognize the location, area, and condition of mining, fishing and other economic activities in rivers.

To control and separate above activities safely so that impacts from activities would not conflict each other.

(3) Leading Institution

Provincial Water Resource Management Office, in coordination with Kabupatens and Kecamatans. Also Provincial and local BAPPEDA for water quality monitoring, and Kota social workers for compromising conflicting resource use.

In local level, it is desirable to have various department share information on human activities, since major activities in river area varies from mining (sand and gravel), fishing, water intake for various purpose, and water use for daily housework.

(4) Duration of the Project

Preparation of river map for 3 years, implementation of monitoring and management up to 2020, and longer.

(5) Project Area

All eight (8) major tributaries in the Musi River Basin. However, it would be possible to select priority areas for urgent investigation and control. The priority areas must be chosen from; 1) areas under active sand/gravel mining activities, 2) areas under potential threat of chemical water pollution, and 3) areas suffering from significant sedimentation.

Monitoring must also be conducted in the area major water diversion is planned for irrigation, power generation, and other uses. The pre-project condition must be documented and utilized by planners and engineers to avoid substantial impact from the planned activities.

As far as the Team observed, priority areas may include sections of the rivers listed in **Table D6.2.9**.

Table D6.2.9 Example of River Sections under Significant Human Influences

River	Section, Town Nearby	Observed Human Activities/Influences
Komering	Martapura – Kayu Agung	Serious sedimentation and loss of water.
Lematang	Lubuk Sepang - Lahat - Niru	Sand and Gravel Mining, Urbanization, Diesel Power Plant (Lahat, Muara Enim), Pulp Factory, Oil Refinery (Niru), Oil Pipeline
Lematan (Air Enim)	Sugi Waras – Muara Enim	Gravel mining

(6) Project Component

Kota is recommended to prepare local land use regulation and enforce it. The regulation must include following guidelines. Project schedule is proposed in **Figure D6.2.4**.

- Recognition of the river area and locations and types of domestic, economic, and recreational activities. A map must be prepared that shows each structures outside of the riverbank or outer-most linear structure like roads. Scale of the map may be 1:25,000 to 1:50,000.
- Prohibition of activities that will have conflict with existing use of river environment by land use ordinance. (eg. waste water release above intake for agriculture or domestic water.)
- Fish catching by bombs or toxic materials, and landfill in the river area must also be prohibited. Existing landfill is recommended to be removed by the owner of the structure above.

Component	Tasks	2003	2004	2005	2006
River area identification	Preparation of preliminary river area map	■			
	On-site survey		■		
	River area map improvement		■		
	Identification of location with problems		■		
	Preparation of river area ordinance			■	
River area conservation	Informational meeting with communities			⋯	→
	Monitoring of construction activities				→
	Enforcement of order of recovery at problematic sites				→

Figure D6.2.4 Project Schedule for Management of River Environment

6.2.3 Conservation of Swamp and Mangrove Forests

(1) Conservation of Tidal Swamp Forests (Program 3-10)

(a) Project Upgrade

This program aims to conserve remaining tidal swamp forest, and regulate land clearance.

Data of the remaining swamp forest may be obtained from the NOAA satellite images obtained daily for forest fire control. This project uses the data and takes a prevention measure against forest fire and forest clearance.

(b) Objectives

To recognize the location, area, and condition of remaining swamp forests.
To stop local farmers to clear those remaining forests.

(c) Leading Institution

Provincial Forestry office, in cooperation with national Nature Conservation office (Balai KSDA), Kabupatens, and agriculture/estate/forestry extension offices in each Kecamatan.

A few international institutions and NGOs have already conducted related studies in the area. It is recommended that these institutions are consulted at project design phase of this study and implementation. An NGO, Wetland International (WI), is working mainly for the greater Berbak-Sembilang peat swamp-mangrove area and has good experience in research on the natural resources. WI has project office in Palembang. Another institution, the Center for International Forestry Research (CIFOR), with the US Fish and Wildlife Service, has conducted a study on the cause of

forest fires in Musi Banyuasin. The European Union has been conducting the Forest Fire Prevention and Control Project (FFPCP). The project office is located in Palembang.

(d) Duration of the Project

Preparation phase 3 years, implementation up to 2020.

(e) Project Area

Tidal swamp area in Banyuasin and OKI Kabupatens, excluding the transmigration project areas.

Priority area may be chosen based on the criteria listed in **Table D6.2.10**.

Table D6.2.10 Priority Areas for Conservation of Tidal Swamp Forest

* Area in which serious forest clearance (forest fire) is recognized
* Area close to successful transmigration project. (pressure for forest may not be serious, and residents may be cooperative in conservation effort)
* Area inside of designated conservation forests.
* Area that has good transportation access.

(f) Project Component

Forest identification may be conducted mainly in Palembang. After the preliminary forest map is prepared, major task will be transferred to field, and the leading agency will be Kabupatens or Kecamatans. Project duration from on-site inventory and forest conservation may take about 5 years (**Table D6.2.11, Figure D6.2.5**).

It is very important that local communities are involved in the earliest stage into the designation process. Identification of forested area, inventory of forest resources are good opportunities for government to work together with local residents. The draft of forest plan must be explained to communities possibly affected by the designation. The scientific base of the regulation must be well explained, and mitigating measures for impact on local economy must be sought both by the government and local community.

Since forest fire in swamp area causes long-standing haze, it is recommended that training of forest fire extinguisher is given during the community involvement.

Table D6.2.11 Project Components for Tidal Swamp Forest Conservation

Component	Tasks	Province		Kabupatens , Kecamatans
		Forestry	Nature Conservation	
Forest identification	Satellite photo preparation	O		
	Field observation (sample)	O	O	O
	Differentiation standard model	O		
	Preparation of preliminary forest map	O		
On-site inventory	Forest map improvement	O	O	O
	On-site marking of forest to be conserved		O	O
	Identification of human pressure on forest, stake holders		O	O
Forest conservation	Alternative resource development with consultation with stake-holders	O		O

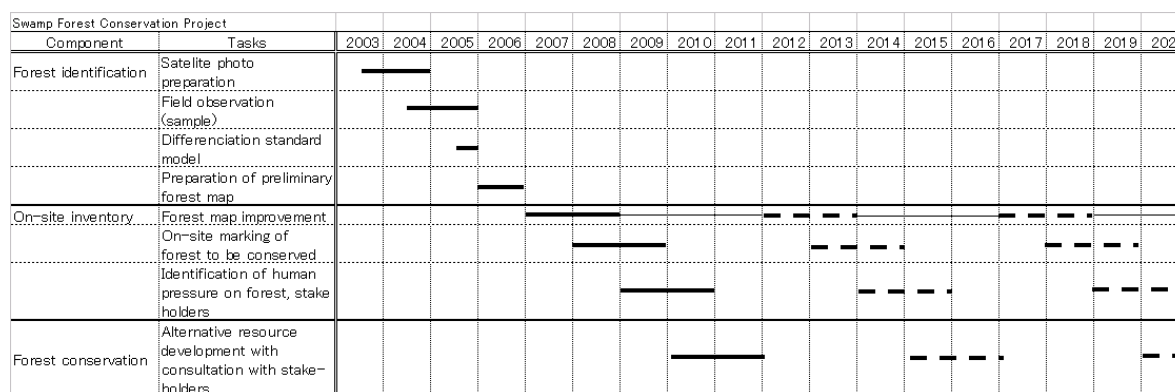


Figure D6.2.5 Project Schedule for Tidal Swamp Forest Conservation

(2) Collection of Basic Data for Mangrove Area around the Proposed New Port (Program 3-11)

(a) New Project

Acquiring basic data of mangrove ecosystems around the proposed site for the Tanjung Api-Api Port.

(b) Objectives

To prepare for the detailed environmental impact assessment of the port. To obtain data on natural environment to predict the impacts from construction and operation activities.

(c) Leading Institution

Provincial BAPPEDALDA, in cooperation with national and provincial office and research institutions for communication and transportation, fishery, nature conservation, trade and economics, and spatial planning.

(d) Duration of the Project

Research period of three years will be at least necessary for good observation of seasonal dynamics of natural environment.

(e) Project Area

At least 5 km radius from the proposed site of the port. Must include Sunsang town for study on social environment. Precise study area must be determined in the preliminary phase of the research project, to include the possible area to be affected by the port.

(f) Project Component

The study must include natural and social environment. The scope of the study is described in **Table D6.2.12**.

Table D6.2.12 Scope of Study for Existing Condition at Tanjung Api Api

Natural environment	Water flow (marine, river, and seasonal flooding)	
	Sedimentation	Speed and amount of sedimentation, origin of the material,
	Aquatic animals	Marine, blackish, and swamp animals, especially the designated Endangered Species. Life cycles and habitats used at each phase of life cycle.
	Terrestrial animals	Mammals, birds, especially the designated Endangered Species. Life cycles and habitats used at each phase of life cycle.
	Vegetation	Non-affected vegetation, as well as vegetation that is affected by human activities, and vegetation that is in recovering phase after human destruction. Flora and spatial structure of vegetation.
Social environment	History of the area, and traditional rights to land and other resources	History of settlement, types of resources under traditional rights, traditional know-how of resource management.
	Present population, economic activities, and productivity/ income	
	Areas of cultural and religious value	

(3) Conservation of Freshwater Swamp Area (Program 3-12)

(a) New Project

This program aims land use regulation in freshwater swamp.

(b) Objectives

To conserve the swamp function of retaining the floodwater in wet season, to avoid serious flooding in downstream, especially in Palembang City.

(c) Leading Institution

Kabupaten BAPPEDA, in cooperation with Provincial BAPPEDA, and Kabupaten agriculture office (for rice farming).

(d) Duration of the Project

Three years for preparation of local land use ordinance. Regular budget for monitoring and implementation of the ordinance.

(e) Project Area

Freshwater swamp area in 5 Kabupatens; OKI, Muara Enim, Musi Rawas, Musi Banyuasin, and Banyuasin.

(f) Project Component

Each of the 5 Kabupatens is recommended to prepare local land use regulation and enforce it. Implementation schedule is proposed in **Figure D6.2.6**. The regulation must include following guidelines.

- Recognition of the freshwater swamp area. A map must be prepared based on the soil type.
- Prohibition of landfill in the swamp area.
- Limitation of land use type in the swamp area. The swamp area must be used either as rice field, fishpond, or natural open space.
- Conservation of remaining natural environment. In the area that escaped agricultural development, it is recommended to conserve the natural environment. In addition, where rice farming is stopped, it is recommended to designate the area as rehabilitation area for nature.

Component	Tasks	2003	2004	2005	2006
Swamp area identification	Preparation of preliminary swamp area map	■			
	On-site survey		■		
	Swamp area map improvement		■	■	
	Identification of location with problems		■		
	Preparation of swamp area ordinance			■	
Swamp area conservation	Informational meeting with communities			→
	Monitoring of construction activities				→
	Enforcement of order of recovery at problematic sites				→

Figure D6.2.6 Project Schedule for Freshwater Swamp Conservation

7. SELECTION OF PRIORITY PROGRAMS

Proposed programs are evaluated based on four points (**Table D7.1.1**). Evaluation is made in three numerical points, 5, 3, and 1, and the points are summed up. A program that gains larger points is understood to have higher priority.

‘Prerequisite to other programs’ means that the realization of certain program is required to start other programs.

‘Degree of seriousness’ means that the issue the program is meant to solve is a serious one that require fast and substantial action.

‘Requirement of early start’ means either that the environmental problem is acute and requires urgent action, or that the program is required to start as early as possible because it is expected to take a long time to solve the problem.

‘Cost scale’ is for the project cost that is expected for public sector to provide. Project cost that is expected to be paid by private sector is not included.

As a result, following projects are chosen for higher priority.

- Program 3-1 Application of Agroforestry on Land with Major Constraints
- Program 3-3 Strengthening of Agriculture/ Estate/ Forestry Extension
- Program 3-4 Reforestation of Production Forest and Forest Estate
- Program 3-6 Inner- and Inter-Basin Coordination
- Program 3-7 Rehabilitation of Existing Protected Forests

Table D7.1.1 Evaluation of Priorities for Each Proposed Programs

Programs of Watershed Management	Prerequisite to Other Programs	Degree of Seriousness	Requirement of Early Start	Cost Scale	Total	Priority Order
Soil erosion prevention						
3-1: Application of agroforestry on land with major constraints	5	5	5	3	18	1
3-2: Land use regulation on land with major constraints	5	5	5	1	16	6
3-3: Strengthening of agriculture/estate/ forestry extension	5	5	5	3	18	1
3-4: Reforestation of production forest/Forest estate	5	5	5	3	18	1
3-5: Enforcement of prevention of illegal logging	3	5	3	5	16	6
3-6: Inner- and inter-basin coordination	5	3	5	5	18	1
Biodiversity rehabilitation and conservation						
3-7: Rehabilitation of existing protected forests	5	5	5	3	18	1
3-8: Increase designated protected forests	3	5	3	3	14	8
3-9: Management of river environment	1	1	1	5	8	11
3-10: Conservation of tidal swamp forests	1	3	3	3	10	10
3-11: Collection of basic data for mangrove area around the proposed new port	5	3	3	1	12	9
3-12: Conservation of freshwater swamp area	1	3	1	3	8	11

Note) Score 5 (High Priority); 3 (Middle Priority); 1 (Low Priority)

Cost Scale 5 (Provincial Budget), 3 (National Budget), 1 (International Budget)

8. COST ESTIMATION AND IMPLEMENTATION PROGRAM OF THE PRIORITY PROGRAMS

8.1 Soil Erosion Prevention

8.1.1 Application of Agroforestry (tumpang sari) on Land with Major Constraints (Program 3-1)

(1) Project Area

Project is recommended to be implemented on any types of cultivated area on the land with major constraints (**Figure D8.1.1**).

According to the Forestry Statistics, the area covers 3,651 km² (**Table D8.1.1**).

Table D8.1.1 Landuse on the Land with Major Constraints

Sub-basin	Ra	La	Ha	Mu	Se	Ke	Le	Og	Ko	Pa	Total
Dry Land Agriculture	17	3	0	18	0	4	4	7	16	0	49
Mixed Garden	0	4	0	71	0	1	37	45	34	4	192
Open-type land use	17	7	0	89	0	5	41	52	49	4	241
Big Plantation Area	115	30	0	26	0	0	22	22	12	0	83
Forest Plantation	0	0	4	228	0	0	0	54	75	5	367
Farmer's Plantation	201	80	5	1,155	0	148	526	161	665	59	2,719
Sub-Total	350	124	9	1,587	0	158	630	341	851	72	3,651
Forest-type land use	315	109	9	1,409	0	148	548	238	752	64	3,169
Total	665	233	18	2,996	0	306	1,178	579	1,603	136	6,820

Sub-basin: Ra: Rawas La: Lakitan Ha: Harileko Mu: MusiSe: Semangus
Ke: Kelingi Le: Lematang Og: OganKo: Komerling Pa: Padang

For a realistic program plan, the Team recommends that;

- One program site to cover about 200 ha of Farmer's plantation area on Bappeda Land Usemap. Since the area of Farmer's plantation in one Kecamatan usually is about 200 ha, one program can be designed as a Kecamatan project.
- The land with major constraints can be grouped into six (6) regions. Therefore, the team recommends to initiate 200 ha program in each six regions, 1,200 ha in total.
- To expand the agroforestry effort as wide as possible, the team recommends to plan five (5) 200 ha projects in each region for the first phase, that is from year 2003 to 2011. First phase projects will cover 6,000 ha (60 km²) in total (5 x 200 x 6) (**Figure D8.1.2**).

(2) Program Cost

Program cost for Agroforestry Projects in Farmer's Plantation (Program 3-1) is shown in **Table D8.1.2**.

Table D8.1.2 Program Cost for Agroforestry Projects in Farmer's Plantation (Program 3-1)

		Unit	Unit Price (Rp.)	Q'ty	Amount (Rp. Million)
	Priority site selection				
Planning and Design	Arrangement of Areal Pattern Unit plan for community forest management. (approximately Kecamatan level)	100-200ha	14,706,000	30	441.2
	Arrangement of technical design for social forestry	ha	78,595	6,000	471.6
	Making of controlling dam design	location	2,233,000	30	67.0
	Making of bench terrace design	ha	195,925	6,000	1,175.6
Land Preparation	Making of grass barrier and erosion plot	Unit, or 10 ha	25,450,000	600	15,270.0
	Maintenance of grass barrier for first, second, third, fourth and fifth year	Unit, or 10 ha	19,950,000	600	11,970.0
Nursery Preparation and maintenance	Maintenance of seed sources (first year)	10 ha	20,940,000	30	628.2
	Maintenance of seed sources (second up to fourth year)	10 ha	16,110,000	24	386.6
	Maintenance of seed sources (fifth up to eight year)	10 ha	22,110,000	6	132.7
Tree Plantation	Making of social forestry plantation	ha	1,258,910	6,000	7,553.46
	Maintenance of social forestry plantation in first year (manual)	ha	629,455	6,000	3,776.7
	Maintenance of social forestry plantation in second year (manual)	ha	361,900	4,800	1,737.1
Training	Training of community forest farmer	50 person, 5 days	22,525,000	30	675.8
	Technical guidance of social forestry	location	40,840,000	30	1,225.2
Grand Total		Rp. Million			45,511.2
		US\$ million eq.			5.0
		Yen million eq.			614.6

(3) Implementation Schedule

Implementation schedule for Agroforestry in Farmer's Plantation (Program 3-1) is shown in **Figure D8.1.3**.

Program 3-1: Application of Agroforestry in Farmer's Plantations		1st Year				2nd Year				3rd Year				4th Year				5th Year				6th Year				7th Year							
No.	Activities	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1	Project Formation	█				█				█				█				█				█				█							
	Form a task team	█				█				█				█				█				█				█							
	Choose the project sites	█				█				█				█				█				█				█							
2	Planning and Design	█				█				█				█				█				█				█							
	Negotiate with the community leaders	█				█				█				█				█				█				█							
	Form a model project scheme	█				█				█				█				█				█				█							
	Start community organization	█				█				█				█				█				█				█							
	Inventory of field condition	█				█				█				█				█				█				█							
	Revise the existing plan for better management	█				█				█				█				█				█				█							
	Prepare new community forest plan, farmer's plantation plan	█				█				█				█				█				█				█							
3	Project Implementation	█				█				█				█				█				█				█							
	Training	█				█				█				█				█				█				█							
	Land Preparation	█				█				█				█				█				█				█							
	Check Dam Construction	█				█				█				█				█				█				█							
	Nursery Preparation and Maintenance	█				█				█				█				█				█				█							
	Tree Planting	█				█				█				█				█				█				█							
	Forest / Field Maintenance	█				█				█				█				█				█				█							
4	Monitoring, Reporting	█				█				█				█				█				█				█							
	Develop monitoring and evaluation scheme	█				█				█				█				█				█				█							
	Conduct monitoring and reporting	█				█				█				█				█				█				█							
	Revision of project scheme	█				█				█				█				█				█				█							
	Sharing project experience in inter-project communication	█				█				█				█				█				█				█							

Figure D8.1.3 Implementation Schedule for Agroforestry on Land with Major Constraints (Program 3-1)

8.1.2 Strengthening of Agriculture/Estate/Forestry Extensions (Program 3-3)

(1) Project Area

Priority area is the same area with Program 3-1. The number of Extensions within the area is not known. As an assumption, therefore, the Team estimated that the number of the 200-ha-project sites corresponds with the number of managing extension offices. After the priority sites are decided for Program 3-1, training, staff allocation, and upgrading equipments will be provided for 30 existing or newly established extensions in two years. The target offices will be mainly agriculture extensions. But it is essential that same knowledge and technology to be shared with forestry office, so that farmers can receive consistent guidance from any instructional institutions.

For long-term goal, the number of Extensions is recommended to be increased from current 89 to at least 140, which is the number of Kecamatan in the Province in 2002.

From environmental view point, following three criteria must be looked at in deciding priority sites. Names of these 21 priority sites for inspection are listed in **Table D8.1.4**. The total area amounts to 12,730 km². The project cost is consisted of the research cost for the 21 sites.

- those that directly located along the major tributaries,
- those on the land with major constraints, or on steep slopes, and
- Those that located next to protected forests (HSA and HL).

Priority also may be given to Kabupatens that expressed stronger concern for their own natural resource, and willingness to cooperate in the investigation.

Table D8.1.4 Priority 21 Sites for Reforestation*

Priority Criteria	Kab.	Name	Area (km ²)
Directly located along the major tributaries	MuBa	HP Mangsang Mendis	599
On the land with major constraints, or on steep slopes		HP Rawas Utara	47
		HP Rawas Lakitan	445
		HPT Rawas Lakitan	276
		HP/HPT Bukit Balai	272
		HP Gumai Tebing Tinggi	46
		HPT Isau Isau	12
		HP Air Empelu	22
		HP Bukit Asam	92
		HPT Saka	114
Located next to Protected forests	MuRa	HPT Rawas Lakitan	(276)
	MuBa	HPT Meranti S. Kapas S. Saka Suban	967
		HPT Meranti Lb. Buah	40
		HP Meranti S. Bayat S. Bahar	576
		HP Meranti S. Merah	419
		HP Mangsang Mendis	(599)
		HP Sungai Lalan	2,778
	Lahat	HP/HPT Bukit Balai	(272)
		HPT Gumai Tebing Tinggi	(46)
		HP Bukit Asam	(92)
	MuEn	HPT Isau Isau	(12)
		HP Air Empelu	(22)
	OKI	HP Simpangheran Beyuku**	4,579
		HP Mesuji III**	1,027
OKU	HPT Air Tebangka	246	
	HPT Saka	(114)	
	HP Saka	173	
Grand Total			12,730

Note: *: Table does not include Conversion Forests because individual name was not given in the Forest Plan Map.

** : Located outside of the Musi River Basin.

(): Listed more than two times. ND: Area data not available.

(2) Program Cost

Program cost for Strengthening of Reforestation of Production Forest/ Forest Estate (3-4) is shown in **Table D8.1.5**.

Cost for reforestation is expected to be provided as the Reforestation Fund from the national budget.

Table D8.1.5 Program Cost for Reforestation of Production Forest/ Forest Estate (Program 3-4)

	Unit	Unit Price (Rp.)	Q'ty	Amount (Rp. Million)
Organization of supervising committee	organization	0*	1	0
Preparing/ research of Industry Plantation Forest location	location	4,182,000	21	87.8
Grand Total	Rp. Million			87.8
	US\$ million	eq.		0.0
	Yen million	eq.		1.2

Note: *: Expected to be covered ordinary governmental management budget.

(3) Implementation Schedule

Implementation schedule for Reforestation of Production Forest/ Forest Estate (3-1-4) is shown in **Figure D8.1.5**.

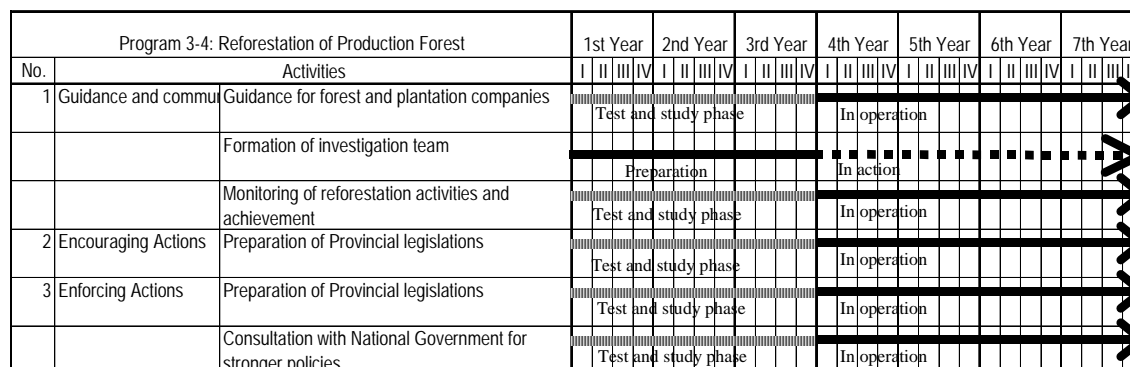


Figure D8.1.5 Implementation Schedule for Reforestation of Production Forest/ Forest Estate (Program 3-4)

8.1.4 Inner- and Inter-Basin Coordination (Program 3-6)

(1) Project Area

Strengthening of organization aims to target the whole Musi River Basin. One PPTPA is expected to be established for the whole river basin.

In addition to the Musi PPTPA, the program recommends to establish four sub-basin organizations (Tables D8.1.6 and D8.1.7).

Table D8.1.6 Sub-Basins and Shared Concerns

Groupings of Sub-basins	Shared Concerns
Rawas, Lakitan	National Park management and control of logging and encroachment
Lematang	Water resource conservation for urban and industrial water needs
Musi, Harileko, Semangus, Kelingi	Water resource conservation
Ogan, Komering	Reduction of sand deposition, increase of water flow

Table D8.1.7 Kabupatens and Sub-Basins for Groups of Sub-Basins

	Rawas, Lakitan	Lematang	Musi, Harileko, Semangus, Kelingi	Ogan, Komering
OKU				O
OKI				O
MURA		O	O	
Lahat	O	O		
Muara Enim	O	O		
MUBA		O		
Banyuasin			O	
Palembang			O	
Perabumulih		O		
Lubuk Linggau		O		
Pagaralam		O		

(2) Program Cost

Refer to Program 6-5-3 'Establishment of PTPA/PPTPA as soon as possible.'

(3) Implementation Schedule

Coordination of the sub-basin level may start prior to the establishment of the PTPA/PPTPA, or may wait for the PTPA/PPTPA establishment for the whole Musi River basin.

8.2 Rehabilitation and Conservation of Natural Environment

8.2.1 Rehabilitation of Existing Protected Forests (Program 3-7)

(1) Project Area

There are eleven (11) Conservation Forests (HSA) and seventeen (17) Protection Forests (HL).

Full-time staff is stationed to six (6) Conservation Forests (**Table D6.2.3**). Both reforestation and rehabilitation program may be initiated at these Conservation Forests first, then, expand to other designated forests as forest staff is stationed to other areas.

(a) Reforestation Program

For reforestation program, priority must be placed for the following two types of area.

- (i) The area that does not have tree cover, excluding urban area (relocation will have social impact), and rice fields and open water (they are natural element in the region). This category covers 75.8 km² (**Table D8.2.1**).
- (ii) The existing big plantation located in the area that should be reserved for natural function. This category covers 49.8 km² (**Table D8.2.1**).

Table 8.2.1 Landuse Other Than Forest Cover within the Protected Forests in All Protected Forests

	HSA km ²	HL km ²	Total km ²
Mining area	0.2	0	0.2
Dry agriculture	12.3	25.7	38
Temporally opened land	35	2.6	37.6
Sub-total	47.5	28.3	75.8
Big plantation	45.7	4.1	49.8
Grand total	93.2	32.4	125.6

To start the program as soon as possible, the Team recommends selecting the six HSAs that already have resident staff as the priority site.

This program aims to prepare 10 ha nursery, 10 km patrol road or forest border, one watch tower, two road gates, and 40 ha of reforestation in each six HSA sites for five years starting from the third year (40ha x 6 locations x 5 years = 1200ha in total).

(b) Rehabilitation Program

For rehabilitation program, priority must be placed for the area that does have tree cover, but where natural function as wildlife habitat or soil erosion prevention is not high as expected for conservation and protection areas. This category will include One Type Forest, One Type Land, and Farmer's plantation. The area covered by those three landuse types amounts 2,005 km². Further, first priority may be given to 68.8 km² of One Type Forest in Conservation Forests (**Table D8.2.2**).

Comparing to the urgency of reforestation in protected forests, rehabilitation of forest area and habitat may be started after the reforestation program reaches certain achievement. The Team recommends that this rehabilitation program to start in the last seventh year.

Table D8.2.2 Target Area for Forest Rehabilitation Program in All Protected Forests

	HSA (km ²)	HL (km ²)	Total (km ²)
One Type Forest	68.8	443.6	512.4
One Type Land	0.2	8.2	8.4
Farmer's Plantation	384.1	1,100.5	1,484.6
Total	453.2	1,552.3	2,005.4

(2) Program Cost

Program cost for Rehabilitation of Existing Protected Forests (Program 3-7) is shown in **Table D8.2.3**.

(3) Implementation Schedule

Implementation schedule for Rehabilitation of Existing Protected Forests (Program 3-7) is shown in **Figure D8.2.1**.

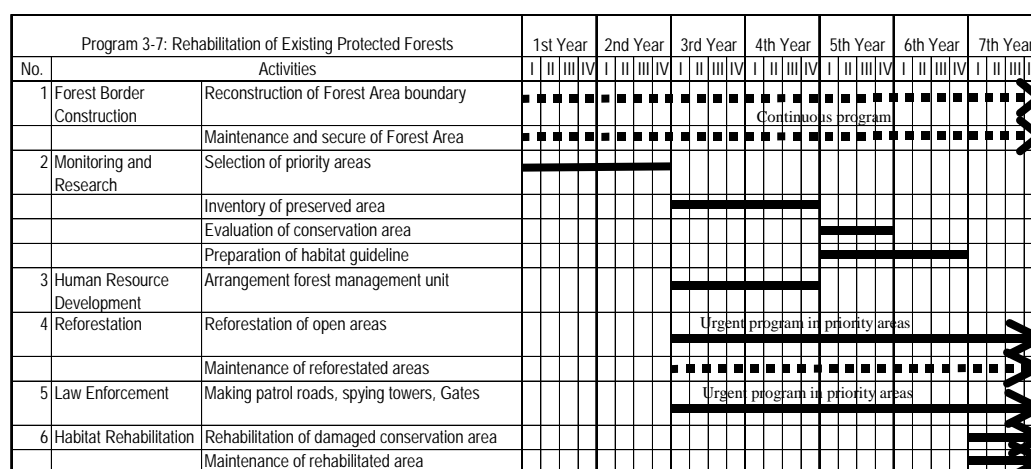


Figure D8.2.1 Implementation Schedule for Rehabilitation of Existing Protected Forests (Program 3-7)

**Table D8.2.3 Program Cost for Rehabilitation of Existing Protected Forests
(Program 3-7)**

		Unit	Unit Price (Rp.)	Q'ty	Amount (Rp. Million)
Forest Border	Reconstruction of Forest Area boundary	1 location or 30 km	34,800,000	42	1,461.6
Construction	Maintenance and secure of Forest Area boundary	1 location or 25 km	18,352,000	42	770.8
	Selection of Priority areas	Committee		1	0.0
Monitoring and Research	Inventory of preserved area	book	11,350,000	6	68.1
	Evaluation of conservation area function	Location	11,050,000	6	66.3
	Habitat guideline	book	15,400,000	6	92.4
Human Resource Development	Arrangement planning of preserved forest management unit	Unit	24,950,000	6	149.7
Reforestation	Reforestation of open areas	ha	1,258,910	1,200	1,510.7
	Maintenance of reforested areas	ha	629,455	1,200	755.3
	Maintenance of seed sources (first year)	10 ha	20,940,000	18	376.9
	Maintenance of seed sources (second up to fourth year)	10 ha	16,110,000	18	290.0
	Maintenance of seed sources (fifth up to eight year)	10 ha	22,110,000	6	132.7
	Maintenance of social forestry plantation in first year (manual)	ha	629,455	1,200	755.3
	Maintenance of social forestry plantation in second year (manual)	ha	361,900	960	347.4
Law Enforcement	Making of patrol road/ Zones border	km	10,600,000	300	3,180.0
	Making of spying tower (height ± 12 m, border ± 4 m2)	location	17,625,000	30	528.8
	Gate construction	Location	18,355,000	60	1,101.3
Forest Rehabilitation	Rehabilitation of area, which is ex. Fire forest/ cutting wood/ damaging/ illegal digging	ha	9,500,000	200	1,900.0
	Maintenance of area, which is forest fire/ cutting wood/ damaging/ illegal digging, which is already rehabilitation year before.	ha	6,150,000	0	0.0
	Grand Total	Rp. Million US\$ million Yen million	eq. eq.		13,487.3 1.5 182.1

9. PROGRAM EVALUATION

9.1 Application of Agroforestry on Land with Major Constraints (Program 3-1)

9.1.1 Social Evaluation

Selection of project area and coordination of participating farmers will empower local municipalities and promote public communication. This project therefore supports the national objective of local autonomy.

In short term, there is possibility that difference in agriculture income is created in local community when successful agroforestry project provide increased income for participating farmers. In such case, the municipality is recommended to take the opportunity to persuade the non-participating farmers into next phase project. Economic heterogeneity may affect stability of local community, but at the same time, it can be used as strong incentive to promote the project.

9.1.2 Economic Evaluation

Agroforestry aims to grow stable ground coverage to conserve the soil, and to diversify the product obtained from the field. When the project is successful, the income from the field will be less affected by the trend of world market. At the same time, diversified products will support the farming family directory, diminishing the need for cash to the minimum. In the long run, it is expected that the project will support with the local population by a stable and reliable income source.

9.1.3 Financial Evaluation

Development expenditure of Forestry Service (*Dinas Kehutanan*) of South Sumatra Province was Rp.3.8 billion in FY2001. Out of this, allocation from non-APBN sources is Rp.3.5 billion.

Table D9.1.1 Comparison of Program Cost and Development Expenditure (Program 3-1)

Executing Agency	Period (year)	Program Cost (Rp. m)			Dev. Expend. in 2001 (Rp.m)		Ratio (Ann. cost/APBD)
		Total	Annual	O&M	Total	(non-APBN)	
Forestry Service and Agriculture Service of South Sumatra Prov. and local governments	6	45,511	441 - 12,515	0	3,832	3,523	12 - 355%

The total cost of this program is estimated at Rp.45.5 billion for 6 years implementation. Annual required cost of the program is approximately Rp.441-12,515 million or 12%-355% of the development expenditure of non-APBN sources of the Service (*Dinas Kehutanan*). Since the required costs is quite large, financial contribution by beneficial districts (Regencies, Kabupatens) and sub-districts (Kecamatans) will be necessary.

Furthermore, in order to produce the incentive of the beneficial farmers to maintain agroforestry properly, ownership feeling of the program is indispensable. Bearing of a part of the cost by the farmers will be necessary with an appropriate farm credit system.

9.1.4 Technical Evaluation

Basic technologies of agroforestry, such as terracing and mixing of useful plants are already implemented in the Province. Educational effort is most needed for wide and rigorous application, as well as for flexible exercise according to the land condition or the market environment. Support for such training will be available from the World Agroforestry Centre that is operating strategic research program in Lampung and Jambi (<http://www.worldagroforestrycentre.org/home.asp>, <http://www.worldagroforestrycentre.org/sea/index.asp>). Their South East Asia Regional Office is located at Bogor (Southeast Asia Regional Office, Jl. CIFOR, Situ Gede, Sindang Barang, PO Box 161, Bogor 16001, Indonesia. Phone: +62 251 625415 or 625417, Mobile: +62 251 625416. Email: icraf-indonesia@cgiar.org).

9.1.5 Environmental Evaluation

Wide application of agroforestry method reduces slash-and-burn type farming. With semi-permanent ground cover with trees, soil erosion will be prevented. Native ecosystems and biodiversity including birds and insects are expected to be recovered to the level that balances with human activities in agriculture.

9.2 Strengthening of Agriculture/Estate/Forestry Extensions (Program 3-3)

9.2.1 Social Evaluation

Similar to the program 3-1, stronger and more informative extension offices will make a focal point for local community that will empower local municipalities and promote public communication. This project therefore supports the national objective of local autonomy.

In short term, there is possibility that difference in agriculture income is created in local community when successful agroforestry project provide increased income for participating farmers. Economic heterogeneity may affect stability of local community, but at the same time, it can be used as strong incentive to promote competition between extensions for better achievement.

9.2.2 Economic Evaluation

When the project is successful, extension offices will be able to provide more material resources such as seedlings from nursery, and more informational resources for technology or variety of crops. In the long run, it is expected that the project will support with the local population by a stable and reliable income source.

9.2.3 Financial Evaluation

The total cost of this program is estimated at Rp.6.7 billion for 6 years implementation. Annual required cost of the program is approximately Rp.801-1,295 million or 23-37% of the development expenditure of non-APBN budget of the Service (*Dinas Kehutanan Sumsel*). Therefore, the cost will not be a burden on the finance of the Service.

Table D9.2.1 Comparison of Program Cost and Development Expenditure (Program 3-3)

Executing agency	Period (year)	Program Cost (Rp. m)			Dev.Expend. in 2001 (Rp.m)		Ratio (Ann. cost/APBD)
		Total	Annual	O&M	Total	(except APBN)	
Forestry Service and Agriculture Service of South Sumatra Prov. and local governments	6	6,663	801-1,295	-	3,832	3,523	23 - 37%

From the financial viewpoint, the cost will better be divided between Forestry Service, Agriculture Service, and related beneficial offices at local government level. Furthermore, in order to produce the incentive of the beneficial farmers to maintain agroforestry properly, ownership feeling of the program is indispensable. Bearing of a part of the cost by the farmers and farmer's corporations will be necessary with an appropriate farm credit system.

9.2.4 Technical Evaluation

Basic technologies of agroforestry, such as terracing and mixing of useful plants are already implemented in the Province. Educational effort is most needed for wide and rigorous application, as well as for flexible exercise according to the land condition or the market environment. Support for such training will be available from the World Agroforestry Centre that is operating strategic research program in Lampung and Jambi Their South East Asia Regional Office is located at Bogor.

9.2.5 Environmental Evaluation

With better equipped extension offices, wide application of agroforestry will be possible, that leads reduction of slash-and-burn type farming. Soil erosion is expected to decrease, and native ecosystems and biodiversity are expected to be rehabilitated through this project.

9.3 Reforestation of Production Forests / Forest Estates (Program 3-4)

9.3.1 Social Evaluation

Wood resource in production forests are not only the resource for managing companies, but the resource for all residents of the Province. Reforestation of degraded production forest will rehabilitate social capital of the Province greatly.

At the same time, this project forces the companies that received the Reforestation Fund to achieve the obligated reforestation. Realization of social justice is aimed through this project.

To start reforestation projects in many parts of the Province, local nurseries may be needed and employment may be created in local communities. This project, however, does not seem to create negative impact in local communities.

9.3.2 Economic Evaluation

For local communities close to the production forest, needs for nursery and field workers will create source of income during the reforestation period.

In the long run, the total asset of natural resources of the Province will be greatly rehabilitated by the program.

9.3.3 Financial Evaluation

The total cost of this program is estimated at Rp.88 million for 2 years implementation. Annual required cost of the program is approximately Rp.46 million or 1.3% of the development expenditure of non-APBN budget of the Service (*Dinas Kehutanan Sumsel*). Therefore, the cost will not be a burden on the finance of the Service.

Table D9.3.1 Comparison of Program Cost and Development Expenditure (Program 3-4)

Executing Agency	Period (year)	Program Cost (Rp. m)			Dev.Expend. in 2001 (Rp.m)		Ratio (Ann. cost/APBD)
		Total	Annual	O&M	Total	(APBD)	
Forestry Service, South Sumatra Prov. and other	2	88	46	-	3,832	3,523	1.3%

From the financial viewpoint, implementation of the program is possible with financial arrangement of the development budget of the Service.

9.3.4 Technical Evaluation

Indonesian Government already has good technical guidelines for reforestation of production forest. Also, the International Tropical Timber Organization (ITTO) publishes a series of guidelines that may be applied in the program listed in **Table D9.3.2**. Good application of these guidelines is essential for the success of this program .

Table D9.3.2 ITTO Guidelines on Tropical Production Forests

ITTO Guidelines for Sustainable Management of Natural Tropical Forests 1990
Guidelines for the Establishment and Sustainable Management of Planted Tropical Production Forests 1993
Guidelines for the Conservation of Biological Diversity in tropical Production Forests 1993
Guidelines on Fire Management in Tropical Forests
ITTO Guidelines for the Restoration, Management and Rehabilitation of Degraded and Secondary tropical Forests 2002

9.3.5 Environmental Evaluation

Reforestation of degraded primary and secondary forests will greatly improve local and regional ecosystems and biodiversity. Reforestation may reduce soil erosion at seriously degraded areas.

9.4 Inner- and Inter-Basin Coordination (Program 3-6)

9.4.1 Social Evaluation

Similar to the program 3-1, stronger and more informative communication among the municipality officers and extension offices will create the atmosphere of self governance. When a decision making system is provided closer to local communities, more opinions will be heard by the system, and public participation in local policy making will become more active. This project therefore supports the national objective of local autonomy.

9.4.2 Economic Evaluation

When sub-basin level coordination is formulated, local economic interest will be directly reflected to the land use and land management plan within the sub-basin.

9.4.3 Financial Evaluation

No significant amount of additional cost will be accrued for establishment of PPTPA for both provincial and district levels.

9.4.4 Technical Evaluation

Technical and organizational coordination and guidance for the coordination of the committee will be provided by the National Government and the World Bank.

9.4.5 Environmental Evaluation

Information exchange among the local public officers will create better understanding of the environmental condition of the watershed, which will lead better planning and implementation of the conservation and rehabilitation policies.

9.5 Rehabilitation of Existing Protected Forests (Program 3-7)

9.5.1 Social Evaluation

Defining the border of protected forests is a sensitive project. When existing protected forests (HSAs and HLs) still has border areas that local communities have not agreed on, careful negotiation and reasonable mitigation measures, such as preparation of buffer area with economic tree species, must be planned and implemented. Although the delineation is a sensitive issue, it is possible to solve the conflict in the way both the community and the conservation institution improve their conditions.

9.5.2 Economic Evaluation

For local communities close to the protected forest, needs for nursery and field workers will create source of income during the reforestation and rehabilitation period.

9.5.3 Financial Evaluation

The total cost of this program is estimated at Rp.13 billion for 7 years implementation. Annual required cost of the program is approximately Rp.0.3 billion - Rp.3.7 billion. Development budget for environment and land planning of the Province was Rp.2.8 billion consisted of Rp.1.3 billion from APBD and Rp.1.5 billion from APBN in 2002. The development budget of the Forestry Service of the Province was Rp.3.8 billion. Even if the cost for the program is allocated from both the sectors, the cost for the program will be a burden of the sectors. Other source of finance will be needed to implement the program such as foreign grant aid, soft loan, etc.

9.5.4 Technical Evaluation

Indonesian Government already has good technical guidelines for reforestation of tropical forest. Also, the International Tropical Timber Organization (ITTO) publishes a series of guidelines that may be applied in the program listed in **Table D9.5.1**. Good application of these guidelines is essential for the success of this program.

Table D9.5.1 ITTO Guidelines on Tropical Forest Conservation

ITTO Guidelines for Sustainable Management of Natural Tropical Forests 1990
Guidelines on Fire Management in Tropical Forests
ITTO Guidelines for the Restoration, Management and Rehabilitation of Degraded and Secondary tropical Forests 2002

9.5.5 Environmental Evaluation

Reforestation of degraded primary and secondary forests will greatly improve local and regional ecosystems and biodiversity. Reforestation may reduce soil erosion at seriously degraded areas.