SECTOR J

INLAND WATERWAY TRANSPORT

1. INTRODUCTION

1.1 Site Conditions

Palembang City was called "Venice in the East" by Dutch ship crew in the beginning of the 18th Century when rivers were among the most important transportation for daily activities. In the 1950s, river transportation gave way to land transportation, however, the rapidly growing traffic and the inadequate maintenance of roads at present have caused immobility in cities or towns where access to residential areas such as those in river mouths, swamp areas, hinterlands, etc., is not yet covered by roads. In such places, river transportation is still the alternative means of transportation by the people. River transport in the Study Area can be classified by the type of navigation, as follows:

- Inter-island and overseas navigation, which are based at the Port of Palembang in Boom Baru, about 100 km from the sea. The waterway is used for commerce, industry, agriculture, fishery and passenger transport. For industry, there are five major private ports around Boom Baru.
- Inland river transport, which serves towns and villages along the rivers where the waterway network is centralized. Palembang Port is the center of both passenger and cargo movement. Rubber, timber, logs, fish and agricultural products are carried by boat from inland areas to and from Palembang. However, there are some ships plying between this port and the other domestic ports directly due to the long standby time before entry to the shallow navigation channel.

1.2 History of Palembang Port

The Port of Palembang has been famous in the 7th century through the 10th century. It existed within the Sriwijaya Golden Age, and it was also known as the center of trade among nations and the center of Buddhist culture. In 683 the Port of Palembang was located at a different location, i.e., up-stream of the Musi River nearby Sungai Tatang.

A couple of ages later, the Port of Palembang was moved to the present location in front of Benteng Kuto Besak nearby Ak Gani Hospital, but was named as "Boom Jaty". In 1914, the Palembang Port was moved to a location in the Musi River and named as "Gudang Garam".

In 1924, the Port of Palembang was moved again to an area named "Boom Baru", which is the location at present. The Dutch Governor General approved the operational area of the Port of Palembang under Public Notice 543 in 1924.

When the Indonesia Public Port Utilization was established in 1960 as Estate Owned Business under government control, it was given the authority to manage the public port from 1960 to 1992, and was named as "Port Public Company" in 1963. In 1992, some changes were made in accordance with the direction of Government Policy to support national development and to balance the growth of dynamic port servicing demand.

The second change of status of the Port Public Company into PT. PELINDO II was based on Government Regulation No. 57 of October 19, 1991 and ratified under Company Establishment Certificate No. 3 on December 1, 1992 by Imas Hatimah, SH (notary) in Jakarta.

The status as a Public Company was elevated into a Limited Company as a kind of trust by the government based on the consideration that management succession increases port utilization during this period. At present, the port is managed by the Implementing Unit under the entrepreneurship of PT. PELINDO II.

1.3 General Conditions

1.3.1 Tides

The tide at the outer bar (Ambang Luar) and in the Musi River is predominantly diurnal. Only during neap tide, a semi-diurnal component appears. The following characteristic data refer to the "*Master Plan, Feasibility Study and Engineering Design of Port", January 1985*.

High High Water	:	3.9 m + LWS
Mean High Water	:	3.1 m + LWS
Mean Sea Level	:	1.9 m + LWS
Low Low Water	:	0.3 m + LWS

1.3.2 Currents

The available information on currents on the Musi River is summarized in the following **Table J1.1.1**:

Table J1.1.1 Current Data at Musi River

Item No.	Location	Distance from Outer Bar (km)	Depth	Width	Maximum Current		Range of Tide		Mean Tide Level (m)
					Rainy Season (km/hr)	Dry Season (Km/hr)	Mean (m)	Spring (m)	
1.	Outer Bar	0	± 7.0	150	± 4.0	± 3.0	2.2	3.0	1.9
2.	Sungsang	17	± 6.5	150	± 4.0	± 3.0	2.3	3.1	1.9
3.	Upang	59	± 6.0	150	± 4.0	± 3.0	2.1	2.8	1.7
4.	Peradjin	83	± 6.0	150	± 4.0	± 3.0	1.9	2.5	1.6
5.	Palembang	101	± 6.0	150	± 4.0	± 3.0	1.7	2.4	1.4
6.	Telukkijing	217	± 4.0	150	± 5.5	± 3.5	1.4	1.9	1.1
7.	Sekayu	279	± 6.5	150	± 6.5	± 4.0	0.0	0.0	0.0
8.	Terusan	363	± 3.8	125	± 5.0	± 4.0	-	-	-
9.	Muararkligi	444	± 3.2	75	± 6.0	± 4.5	-	-	-
10.	Singainaik	525	± 1.0	25	± 9.0	± 5.0	-	-	

Sources: "*Master Plan, Feasibility Study and Engineering Design of Port", January 1985*

1.3.3 Winds

December – February:	Generally, wind velocity is 7-16 knots from NW, N and W direction
March – May:	Wind velocity is 3-10 knots from S or SE.
June – August:	Generally, wind velocity is 3-16-knots from SE and S. Occasionally the velocity can be more than 17 knots.
September – November:	Generally, wind velocity is 3-10 knots, occasionally up to 16 knots, from S and SE.

2. PRESENT WATERWAY TRANSPORTATION

Rivers are utilized as sources of water for irrigation and transportation in South Sumatra. As recognized by Bantang Hair Seminal, aside from other small rivers, nine are major rivers; namely, Musi River, Rawas River, Lematang River, Kelingi River, Ogan River, Komering River, Lakitan River, Seamus River and Bating Hair Leko River (see Annex J2.1.1). Density of river traffic for passenger and goods varies; namely, for passengers, 0.3% to 9.1%, for goods, 0.37% to 31.3%, and for ship calls, 0.31% to 1.7%.

Some canals and rivers, especially in the coastal area, are getting shallow from the east. In general, the rate of river transportation in South Sumatra is lower than in other types of transportation (bus, automobile, etc.). The cost of river transportation is also cheaper than by other transport equipment. Based on the actual condition, all eight large rivers from the confluence to Musi River are not longer than 700 km. As a whole, the nine rivers have the width of 50 to 100 m, depth of 2 to 10 m, and out of 2,630 km total length, 1,880 km are navigable. Therefore, river transportation in South Sumatra is as useful as land transportation.

Table J2.1.1 Existing River Condition in South Sumatra Province

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

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

Various ferry ways are scheduled based on the requirement level of the user. Inland transportation from river mouth to up-stream of the Musi River and the Ogan River is centralized in Palembang. Outside the commercial route, traditional inland transportation is still available.

2.1 Boats for River Transportation

There are at least six types of boats operated in river transportation or hinterland sailing transportation. Based on data obtained from the Communication and Transportation Service, Provincial Level, a total of 2,010 boats are recorded and listed for operation in the whole area of hinterland waterways in South Sumatra. The list of registered boats is shown in **Table J2.1.2** below.

Table J2.1.2 List of Registered Boat in South Sumatra

No.	Kind of Boat	Size of Ship	Amount Unit	Ratio of Boat
1	Kapal Jukung	About 100 ton	753	32%
2	Tug Boat		237	12%
3	Kapal Ketek	Less than 5 ton	767	38%
4	Speed Boat		199	10%
5	Kapal Tongkang	30-70 ton	154	8%
	Total		2,010	

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

Speedboats account for 10% of the transportation boats registered with sail licence from the Transportation Services. Tugboats that pull/push boats for kapal tongkang account for 12% of the transportation boats and this amount is 4 % bigger than kapal tongkang. Based on the site interview, there is changing of transportation destination and type of vessel by the harmful effects of sedimentation.

2.1.1 Kapal Jukung

Kapal Jukung is made of wood and utilized for shipping goods, especially for the products of agricultural estates for food, rice, coconut, copra, banana, sugar, oil, vegetables, wheat, etc. This boat has the length of 15 to 20 m and width of 2 to 2.5 m and is allowed 30 to 60 tons of cargo on board. With a 24HP engine power, it can sail long distances up to the corner of transmigration area.

Kapal Jukung serves the intercity route and some of them do routine transportation of agricultural products from the transmigration area in the hinterland to Palembang and back to the transmigration area with basic necessities for living.

Each trip takes approximately 1 to 3 days with a crew of some 3 or 4 persons. Kapal Jukung is not only for the shipment of goods but also for passengers of up to 20 persons.

2.1.2 Kapal Ketek

Kapal Ketek is a vehicle for the transport of goods and passengers in small amounts and usually serves between Seberang Ulu and Seberang Ilir as an inter-regional transportation that face each other within a short distance. This boat uses the Klotok machine with 24HP or less powered by light oil energy. Maximum transport capacity is 12 persons and size of boat is up to 9m long and 1 to 1.5m wide. In general, this boat is not equipped with proper security facilities and navigation equipment such as floating tools, rights and banners/flags.

Kapal Ketek can be found inside or outside of the city docks and it is difficult to obtain the whole number of boats operating in South Sumatra because some Kapal Keteks are not licensed or completed with insurance/security certificates. The Communication and Transportation Services on the Provincial Level has registered and listed 767 Kapal Keteks for the route in South Sumatra.

2.1.3 Speedboat

This boat has a high speed compared with other inland waterway transportation. Usually, a speedboat is provided with 40HP by gasoline and reaches the maximum speed of 40 km/hour. Size of boat is 1.5 m wide by 4 m long and can accommodate up to 12 persons.

Most of the speedboats are licensed and registered and stay in one route. Speedboats mostly operate once a day because of the long navigation distance and scheduling of passengers. However, in some places with a high mobility of people, the speedboats sail more than once a day. At hinterland areas, the activities of sailing are two or three times a week.

2.1.4 Kapal Tongkang

Kapal Tongkang is the boats using for industrials manufacturing goods, mining resource and forestry products such as coal, rubber, wood, sand and etc. This boat is unequipped machine, usually, it is owned by private company and sailed at the port and special dock.

2.2 River Flow and River Transportation

In general, Musi River and its branch flow with a characteristic aspect, i.e., wide width with gradual slope and no sharp turn or meandering.

The riverbed of up-stream is predominant with hard rock boulder areas, whereas, the down-stream is formed of sediment brought from the up-stream. The up-stream of river channel needs additional attention on navigation because of its low water level that may endanger the boat body.

The existing river transportation route can be divided into three parts; namely, (1) the route in Palembang City, (2) the inter-city route (from and to Palembang City), and (3) the local inter-village route outside Palembang.

2.2.1 The Route in Palembang

Ampera Bridge is the facility across the Musi River in Palembang City that affects the sailing activity between Seberang Ulu and the lower area. The navigation channel has enough width for transport between private and state docks. Passenger transport is served by Kapal Ketek that can accommodate 12 persons, whom waiting at the dock of Musi River. On the other, the handling of goods inside the city tends to use land transportation that requires double working time for loading and unloading. Kapal Jukung transports several goods coming from of the suburbs of Palembang City via the inland waterway that has docks not far from the market.

Based on the result of the site survey (refer to Laporan Akhir, Studi Pengembangan Angkutan Sungai Di Propinsi Sumatera Selatan, 2001) where 100 respondents were randomly chosen, passenger mobility on board Kapal Ketek is 42 persons per day with 27% of them as traders, and the remaining 73% are officers, students and so on. Kapal

Ketek users making more than 7 trips per week account for 38% and those making 3 to 7 trips per week is 30%. The others occasionally cross the river through the bridge by boats instead of circling around the city for some urgent reasons.

Thus, the above survey shows that river transportation is still one of the important transportation means for people living in Palembang City.

2.2.2 In- and Outside of Palembang

In general, the hinterland river transportation route in South Sumatra, especially the routes in and outside of Palembang City, is an important alternative of transportation services for local people living along the river.

Kapal Jukung can be found at the river docks, such as Tangga Buntung, Sekanak and 16 Ilir, for transport of goods and passengers. River transportation routes that use Kapal Jukung consist six main routes; namely, four going down-stream and two going up-stream of Palembang City, as follows:

- Sungai Lalan Cs. (down-stream Palembang)
- Sungsang (down-stream Palembang)
- Muara Sugihan (down-stream Palembang)
- Muara Lakitan Cs. (up-stream Palembang)
- Sungai Ogan and Komering (up-stream Palembang)
- Sungai Lumpur (down-stream Palembang)

Incoming boats carried full of agricultural products and passengers for an average of half-day journey. Usually, a boat stays one or two days in the dock of Palembang City and sail back with basic living necessities.

2.2.3 Local Route (Out of Palembang City)

River transportation at the outer area of Palembang is the local transportation route. This route links a village to another village located at the opposite side of the river or to an isolated village.

For villages located at the eastern coast, such as Kuala XII, Lebong Hitam and Sungai Lumpur, moreover, Tulung Selapan City, where up-stream of the Sungai Lumpur, river transportation is the only means of public conveyance. Passengers use the Kapal Ketek or speedboat for transportation, and Kapal Jukung is used for the movement of goods. However, the sailing depends on the tidal condition at the Sungai Lalan area, where is the connecting point between Bayunglincir and Karang Agung, and the river mouth area between Muara Sugihan to Muara Batang.

For the up-stream area, river transportation is done by small boats, such as Sampan and Kapal Ketek or speedboat. Such activity can be found at the area of Sungai Lematang from the transmigration area of Air Liman to Muara Enim, and the Muara Kelingi Area (refer to **Annex J2.1.1**, General Map of Inland Waterway Transportation).

3. PRESENT INLAND WATERWAY MANAGEMENT

Discussed in this section is the inland waterway transportation in the down-stream of Musi River, from Palembang to the river mouth area (Ambang Luar).

The major port facilities in the Study Area are: Port of Palembang, Port of Sungsang and other special ports. (See **Annex J3.1.1**, Location Map)

Palembang Port is one of the first class river ports/harbours under GOI. It is located in the Musi River at coordinates 02°58’48” South latitude and 104°46’36” East longitude.

Port operation is under the supervision and guidance of the Department of Communication (DOC) of GOI and business performance itself is accountable to the Department of Finance (DOF) of GOI. The agency of DOC is Departemen Perhubungan Ditjen Perhubungan Laut Kantor Administrator Pelabuhan Palembang **(ADPEL)**. The agency of DOF is PT. (PERSERO) Pelabuhan Indonisia II, Cabang Palembang **(PELINDO II)**.

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

3.1 ADPEL (Port Administrator Office)

ADPEL is responsible for the safety of waterway users on all kinds of boat and ship in the covered area from the Musi II Bridge to Ambang Luar. There are 26 lights, 2 mooring buoys (C-1, C-2) and 4 tower type lighting structures along the navigation channel. As the other major task, ADPEL is the implementing office for the maintenance dredging of the navigation channel.

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

3.2 PELINDO II (Indonesia Port Corporation II: IPC II)

PELINDO II is responsible for the management of Palembang Port. Palembang Port consists mainly of two locations: Boom Baru Public Port and Lais River Port. Major activities for PELINDO II are managing of port facilities and pilot of ships from and to Ambang Luar/Boom Baru with the distance of approximately 60 miles (about 100 km) and the sailing time of 6 to 7 hours.

3.2.1 Palembang Port

Vessels larger than 500 GRT have to use the pilot system for in or out of port operations. The operation of vessels below 500 GRT is based on the request of the ship captain. PELINDO II can provide tugboats, pilot boats and mooring boats for safe dock-in. In Palembang Port, there are five Special Ports utilized by private companies whose ships also utilize the PELINDO Pilot System. The terminal size of each public port is listed below.

Table J3.2.1 The Terminal Size of Each Public Port

Name of Port	Length (m)	Width (m)	Depth (m) LWS	Remarks
Boom Baru Port				
Cargo Terminal	375	10.5	6.0-7.0	
Containers Terminal	345	19.5	9.0	
Lais River Port	280	15	3.5	

Source: PELINDO II, *"Pedoman Tehnis Pemamduan Kapal Perairan Pandu Sungai Musi, Palembang"*, October 1996.

The terminal size of each private port is listed below.

Table J3.2.2 The Terminal Size of Each Private Port

Name of Port/Company	Length (m)	Width (m)	Depth (m) LWS	Remarks
PT. PUSRI	580	10	5-8.5.0	Fertilizer
PERTAMINA a. Gerong River	381	10	6.5-7.0	Oil/Gas
b. Plaju	291	15	4.5-6.5	
PERUM GARAM	80	5	5.0	Salt
PT. TAMBANG BATU BARA	250	10	6.0	Coal
PT. SEMEN	17	10	7 .0	Cement

Source: PELINDO II, "*Pedoman Tehnis Pemamduan Kapal Perairan Pandu Sungai Musi, Palembang*", October 1996.

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

3.2.2 Present Inland Transport Condition

The existing Palembang Port is a kind of seaport, although it is located in the Musi River hinterland 60 miles away from Ambang Luar. With the increase of development, industrial companies have located their offices along the Musi River. Half of the industrial companies have their own loading/unloading facilities for their needs. The major industries along the Musi River are listed in **Table J3.2.3**.

Table J3.2.3 Industries along Musi River

No.	Type of Industry	Production/Materials	Remarks
1	Mining	Oil, Gas, Coal, Cement	PERTAMINA PT. Bukit Asam
2	Chemical	PTA, Urea, Melmine	PT. PUSRI
3	Estate	Rubber, Palm Oil, Coffee	
4	Fishery and Livestock	Shrimp, Frog, Fish	
5	Forestry	Any kind of Wood Manufacture	

As mentioned before, Palembang Port consists of Boom Baru Port, Lais River Port, and the Special Ports. Most of the vessels used by industries are more than 500 GRT and must apply the pilot system for in/out of port operations. Therefore, records of ship cargo and types of purpose/call are with PELINDO II.

(1) Ship Call

The number of ship calls from 1990 to 2001 is shown below.

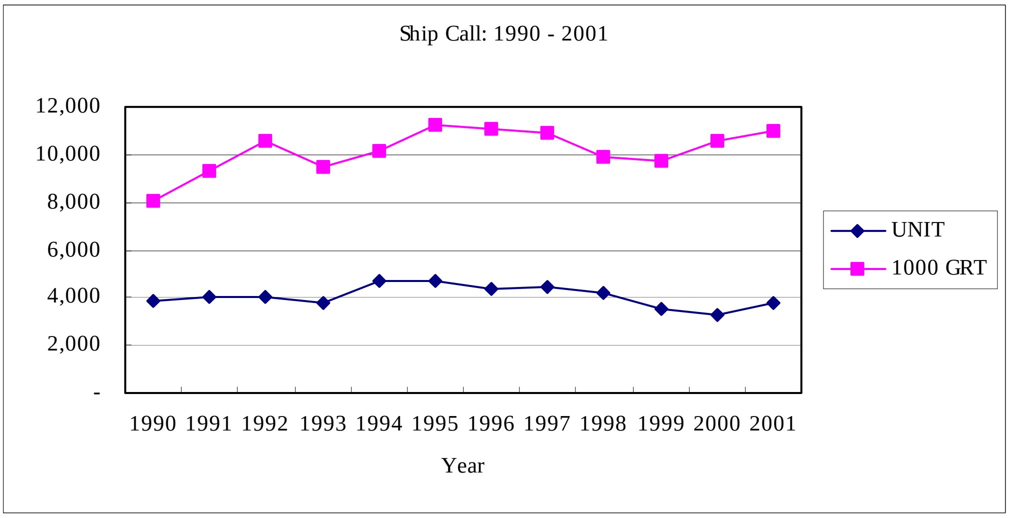

Figure J3.2.1 Number of Ship Calls: 1990-2001

The number of ship calls from 1990 to 2001 did not increase much, but total weight and vessel have gradually increased to more than 37.0%.

Goods

The growth of goods flow in the past 11 years stands at 29%, as shown in **Figure J3.2.2**.

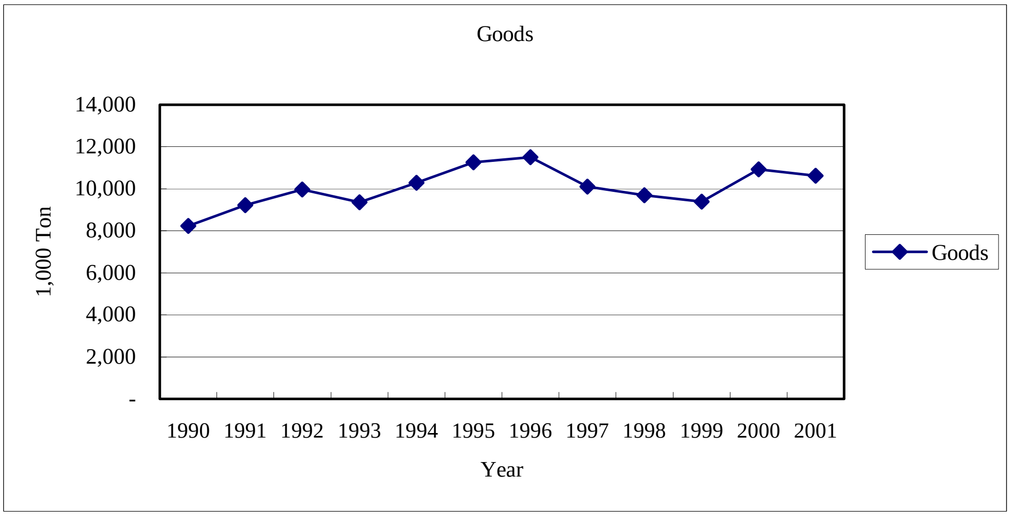

Figure J3.2.2 Total Goods Flow

(a) Goods Based on Trade

The growth of goods flow based on trade in the past 11 years had fluctuated as follows: 107% (Import), 28% (Export), -15% (Unloading in land) and 41% (loading in land).

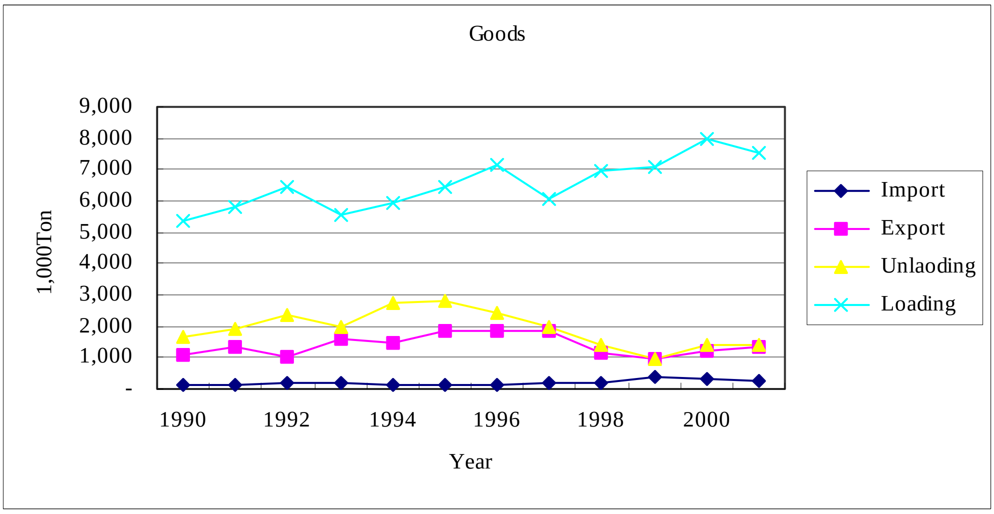

Figure J3.2.3 Goods Based on Trade

(b) Goods Based on Port Distribution

Goods based on the distribution of Port can be seen in Figure J3.2.4. The growths of goods in the past 11 years are 110% (Public Port), -28.0% (Rede), 50% (Special Port) and 24% (Special Harbour).

Special Harbour is shown as PERTAMINA and special port means remaining private ports.

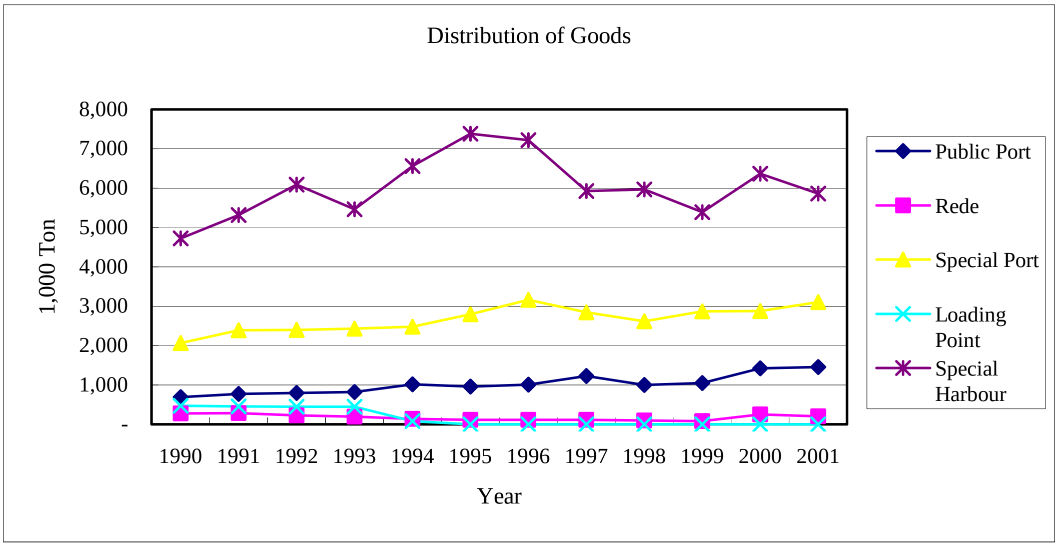

Figure J3.2.4 Distribution of Goods

(2) Passenger

The trend of passenger flow in the past 11 years has increased 23.54 times in debarkation and 16.31 times in embarkation, as shown in **Figure J3.2.5**.

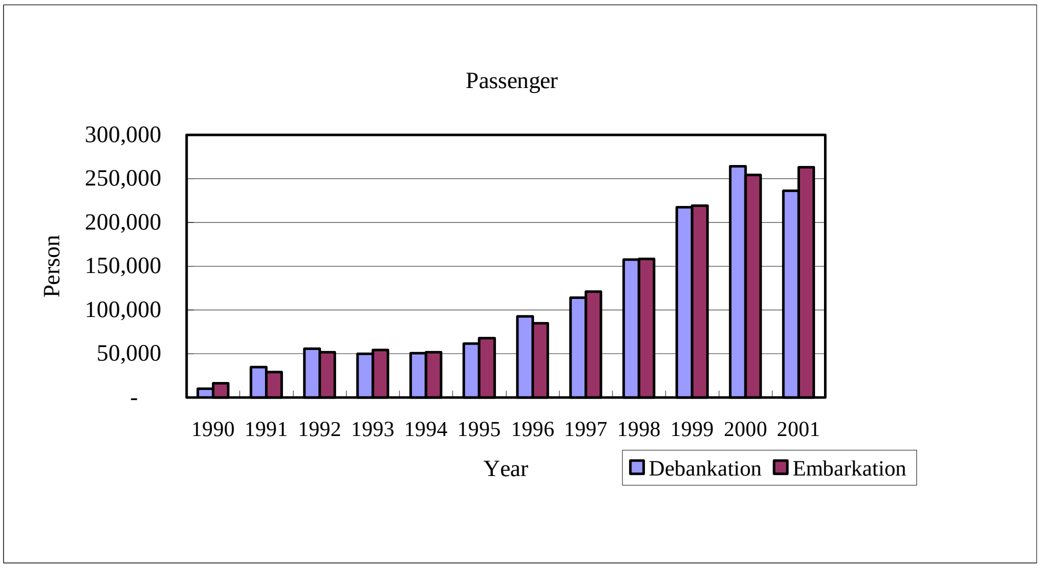

Figure J3.2.5 Flow of Passenger

3.2.3 Other Port Facilities

The size of port terminal is shown in **Table J3.2.2** and the other facilities at Boom Baru such as warehouse and yard and loading/unloading equipment are listed below.

Table J3.2.4 List of Warehouse and Yard

No.	Facilities	Unit	Area
A.	BOOM BARU	m3	
a.	Warehouse	m2	8,812
b.	Convention Yard	m2	8,173
c.	Container Yard	m2	46,100
B.	Sungai Lais		
a.	Warehouse	m2	230
b.	Storage House	m2	4,373

Source: PELINDO II, Information System & Technical Division, 2002

Table J3.2.5 List of Loading and Unloading Equipment

Loading /Unloading Equipment	Unit	Set	Remark
Forklift 2-3 ton	Unit	9	Conservation 2
Forklift 10-15 ton	Unit	3	Conservation 1
Mobile Crane	Unit	2	Conservation 1
Head Truck	Unit	5	Conservation 1
Top Loader	Unit	1	
Side Loader	Unit	1	
Container Crane	Unit	1	
Reach Stacker	Unit	1	
Chassis	Unit	6	

3.2.4 Boat Service

PELINDO II has service boats for piloting and docking the navigating vessels. The list of working service boats is given in **Table J3.2.6**.

Table J3.2.6 List of Service Boat

No.	Type of Boat/Name	Unit	Horsepower	Year Built
1.	Pilot Boat	5		
	MP-AP.17		285	1967
	MP-010		260	1977
	MP-011		375	1978
	MP-F03		2x250	1996
	MP-F01		2x400	2000
2.	Tugboat	3		
	KT. Mawar		2x900	1973
	KT. Katelia		2x1650	1968
	KT. Bintang Mas		2x1200	1968
3.	Mooring Boat	2		
	MPS-04		82	1975
	MPS-05		82	1975
4.	Water Tanker	2		
	TA. Tanjung Gede		115	1979
	TA. Tanjung Carat		115	1979

Source: PELINDO II, Information System & Technical Division, 2002

3.3 Maintenance Dredging

The Musi River prior to the start of recorded dredging in 1966 had the maximum depth of over the Outer Bar (Ambang Luar) of about 4.1 m. The maximum depths over the remaining shallow bars are in the range of about 4.0 to 5.0 m MLW. Since 1966, maintenance dredging has almost been conducted every year. During 1975 a capital dredging program performed by a private contractor dredged Ambang Luar to a depth of 7.0 m. The navigation channel was provided with a bed width of 150 m and dredged to a depth of 6.0 m LLW. Since the side slope was 1:20 at the Ambang Luar area, the volume of maintenance dredging has increased overall.

3.3.1 Past Maintenance Dredging

From 1966 to 1975, Ambang Luar was gradually deepened by maintenance dredging from 4.2 m to 5.3 m. The location of maintenance dredging is shown in **Table J3.3.1** and the dredging volume for each location is shown in **Table J3.3.2**.

Table J3.3.1 Location of Maintenance Dredging: 1966-1975

NO.	Location	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
1	Ambang Luar C1	*	*	*	*	*	*	*	*	*	*
2	Pulau Payung Utara	*		*	*	*	*	*			
3	Perajen	*	*							*	*
4	Payung Barat		*	*							
5	Pulau Payung Timur		*					*	*		*
6	Selet Jaran		*	*			*				
7	Payung Selatan				*	*	*				
8	Pulau Ayam										
9	Pulau Banjar										
	No. of Location	3	5	4	3	3	4	3	2	2	3

Source: The Palembang Port and Shipping Study, March 15, 1977

Table J3.3.2 Dredging Volume and Design Depth: 1966-1975

Unit: $1000m^3$

NO.	Location	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	Total
1	Ambang Luar C1	176	225	310	105	508	747	444	416	160	125	3,216
2	Pulau Payung Utara	79	-	225	144	242	129	308	-	-	-	1,127
3	Perajen	87	62	-	-	-	-	-	-	120	120	389
4	Payung Barat	-	101	250	-	-	-	-	-	-	-	351
5	Pulau Payung Timur	-	135	-	-	-	-	163	460	-	203	961
6	Selet Jaran	-	184	513	-	-	157	-	-	-	-	854
7	Payung Selatan	-	-	-	157	143	245	-	-	-	-	545
8	Pulau Ayam	-	-	-	-	-	-	-	-	-	-	0
9	Pulau Banjar	-	-	-	-	-	-	-	-	-	-	0
	Yearly Total	342	707	1,298	406	893	1,278	915	876	280	448	7,443
	Dredging Depth											
	Before dredging	-4.1	-4.2	-4.2	-4.3	-4.3	-4.5	-4.6	-4.8	-5.1	-5.3	
	After Dredging	-4.2	-4.3	-4.3	-4.4	-4.5	-4.7	-4.8	-5.1	-5.3	-5.5	

Source: The Palembang Port and Shipping Study, March 15 1977

From 1979 to 1991, maintenance dredging was carried out mainly in 3 locations: Ambang Luar, Payung area and Selat Jaran to Sungai Lais (refer to **Table J3.3.3**). Dredging width for navigation channel was reduced from 150 m to 120m with depth –6.5 LWS. Dredged materials were disposed in two ways. For the dredging location close to the sea, they were dumped into the sea about 2 miles from the construction site and for construction site from Keramat Utara up to Sungai Lais, the dredged materials were dumped into the Musi River where there was enough depth for the navigation of ships (refer **Table J3.3.4**).

Table J3.3.3 Location of Maintenance Dredging: 1979-1991

NO.	Location	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
1.	Ambang Luar C1	*	*	*	*	*	*	*	*	*	*	*	*	*
2.	Ambang Luar C2			*			*	*	*	*	*	*	*	*
3.	Tg. Carat				*		*							
4.	Tg. Buyut				*		*							
5.	Payung Utara	*	*		*	*	*	*	*	*	*	*	*	*
6.	Payung Barat	*	*		*	*	*	*	*	*	*	*	*	*
7.	Payung Selatan	*	*		*	*	*	*	*	*	*	*	*	*
8.	Keramat Utara							*						
9.	Parit XII						*				*			
10.	Pulau Ayam									*	*	*		
11.	Penyeberangan Upang							*	*	*	*	*	*	*
12.	Selat Jaran	*		*		*	*	*	*	*	*	*	*	*
13.	Aer Kumbang	*		*		*	*	*	*	*	*	*	*	*
14.	Sungai Lais	*	*	*		*	*	*	*	*	*	*	*	*

Source: Bahan Diskusi Alur Sungai Musi, 1992

Table J3.3.4 Dredged Materials and Disposal Location

NO.	Location	Length (m)	Materials	Disposal Area
1.	Ambang Luar C1	4,000	Silt	2 miles from C1
2.	Ambang Luar C2	4,000	Silt	2 miles from C1
3.	Tg. Carat	4,000	Silt	2 miles from C1
4.	Tg. Buyut	4,000	Silt	2 miles from C1
5.	Payung Utara	1,400	Silt	2 miles from C1
6.	Payung Barat	2,725	Silt	2 miles from C1
7.	Payung Selatan	2,700	Silt	2 miles from C1
8.	Keramat Utara	3,000	Silt	inside of river
9.	Parit XII	3,000	Silt	inside of river
10.	Pulau Ayam	3,000	Sand	inside of river
11.	Penyeberangan Upang	1,000	Sand	inside of river
12.	Selat Jaran	2,000	Sand	inside of river
13.	Aer Kumbang	500	Sand	inside of river
14.	Sungai Lais	1,700	Sand with Silt	inside of river

Source: Bahan Diskusi Alur Sungai Musi, 1992

For 1997 to 2001, maintenance dredging can be identified in 3 locations. The area at the river mouth was became a large area from Ambang Luar to Payung Selatan, and the other 2 locations are in the Musi River channel from Penyeberangan Upang to Muara Jaran and Sungai Lais. Volume of pre-dredge sounding is shown in **Table J3.3.5**.

Table J3.3.5 Record of Pre-dredge Sounding: 1997-2002

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

Source: ADPEL

Based on the above data, it is clear that about 90% of the dredging volume concentrated in the river mouth area.

Design depth was –6.5 m LWS and width was reduced from 120 m to 100 m at the top of navigation channel with slope of 1:4. Estimated slit rate was 8%.

The result of sounding is shown in Annex J3.3.1. Maintenance dredging was not conducted in 2001, because of conflict of construction cost between the Government and the Contractor.

Unit cost for maintenance dredging between 1979 and 1989 was about 10 times different and it became more than 35 times different in the year 2002. The list of dredging volume and unit cost from 1979 to 1989 is given in Table J3.3.6.

Table J3.3.6 List of Dredging Volume and Unit Cost: 1979-1989

No.	Budget Period	Dredging Location	Dredging Volume m3		Construction Cost (Rp.)	Unit Cost per m3
			Plan	Actual		
1.	1979/1980	7	2,170,075	2,308,200	654,898,300	301.8
2.	1980/1981	5	3,050,000	4,884,301	986,840,000	323.6
3.	1981/1982	5	7,500,000	8,936,830	BP	
4.	1982/1983	6	2,300,000	2,402,940	640,000,000	278.3
5.	1983/1984	7	3,250,000	3,356,000	833,327,000	256.4
6.	1984/1985	11	3,250,000	3,374,600	1,056,250,000	325.0
7.	1985/1986	10	2,491,597	2,585,460	1,240,000,000	497.7
8.	1986/1987	9	3,000,000	3,488,940	1,746,000,000	582.0
9.	1987/1988	10	2,500,000	2,704,014	2,450,000,000	980.0
10.	1988/1989	11	2,500,000	2,776,051	2,450,000,000	980.0
11.	1989/1990	10	2,500,000	2,797,416	2,450,000,000	980.0
12.	1990/1991	9	2,412,193	2,581,586	2,894,608,310	1,200.0
13.	1991/1992	9	2,500,000		4,090,900,000	1,636.4
14.	1992/1993	-	-	-	-	-
15.	1993/1994	9	2,500,000	2,584,350	4,886,375,000	1,954.6
16.	1994/1995	9	2,300,000	2,854,700	5,865,000,000	2,550.0
17.	1995/1996	9	2,300,000	2,820,300	5,865,000,000	2,550.0
18.	1995/1996	5	1,647,058	2,144,280	4,199,997,000	2,550.0
19.	1996/1997	10	2,285,876	2,569,311	4,845,000,000	2,119.5
20.	1997/1998	8	2,328,868	2,104,818	6,670,000,000	2,864.1
21.	1998/1999	10	2,171,321		6,296,832,000	2,900.0

Source
1979-1992 Bahan Diskusi Alar Sungai Musi
1993-2000 ADPEL

Note:
1 BP : Special Budget from President
2 The period of 1995/1996 had the additional cost for dredging, come from private companies.

3.3.2 Ongoing Maintenance Dredging

Maintenance dredging for 2002 was started on September 6, 2002. Based on the daily working report of the Contractor, the following matters can be found.

Contractor	:	PT. RUKINDO
Construction Schedule	:	September 6, 2002 to December 2, 2002
Dredging Volume		1,500,000 m^3 (1.35M m^3 in River Mouth, 0.15 M m^3 in River Channel)
Construction Cost	:	7.065 Billion Rp. (National Government) 8.815 Billion Rp. (Private Syndicate)
Dredger	:	KALIMANTAN II, 5386 HP, 4000 m^3 (L=109.88 m, W= 18.04 m, D=8.05 m)
Circle Time	:	110 minutes (dredging 60 min., outward 20 min., dumping 5 min., homeward 25 min.)
Silt Rate	:	40%

Maintenance dredging started from the location at Ambang Luar C1 and the dumping site was 6 miles (9.6 km) offshore from the working site where water depth was more than 17.0 m LWS. Since the working time was 24 hours, the average daily trip was 10.8 times/day during the first 12 days. Therefore, daily dredging volume iss calculated at 4,000*10.8*0.4=17,280 m^3/day. Dredged materials were a mixture of sand and silt.

There was another dredger named Sulawesi II that arrived on October 14, 2002 for dredging part of Ambang Luar C2, Payung Utara, Muara Jaran and Sungai Lais. List of daily working report and time schedule of dredgers are attached in **Annex J3.3.2**.

Due to financial constraint, the target depth was –5.5 m LWS in 2002, and this will be deepened to –6.0 m LWS in 2003. The dredging volume for 2003 is 1.5 million m^3, the same as in 2002. The budget for 2003 is 8 billion Rp., which is not enough to fund the dredging of all the calculated volume.

4. FUTURE PROJECT OF INLAND TRANSPORT

4.1 Palembang Port

Based on the "Strategic Plan for 2000-2006" of PT. PELINDO, the estimation of demand for investment in the next five years with consideration on growth and minimum demand is made under the following conditions:

- Goods that pass the conventional docks, especially in the next 5 years, will have the average growth rate of ± 6.4%.
- Bagged cargo in the next 5 years will register a 5% growth rate.
- The rapid flow of liquid cargo through Boom Baru Harbour and Sungai Lais, especially for CPO, will register a ± 8.9% growth rate.
- Indonesia is predicted to be stable under the presently existing economic crisis, so that the flow of goods through the Public Port of Palembang from 2001 to 2006 will not significantly increase, only 2%.

4.1.1 Ship Call and Cargo

Based on the above conditions, the five-year prediction is shown in the figure below. The rates of ship call and cargo between 2001 and 2006 are 70% and 129%, respectively.

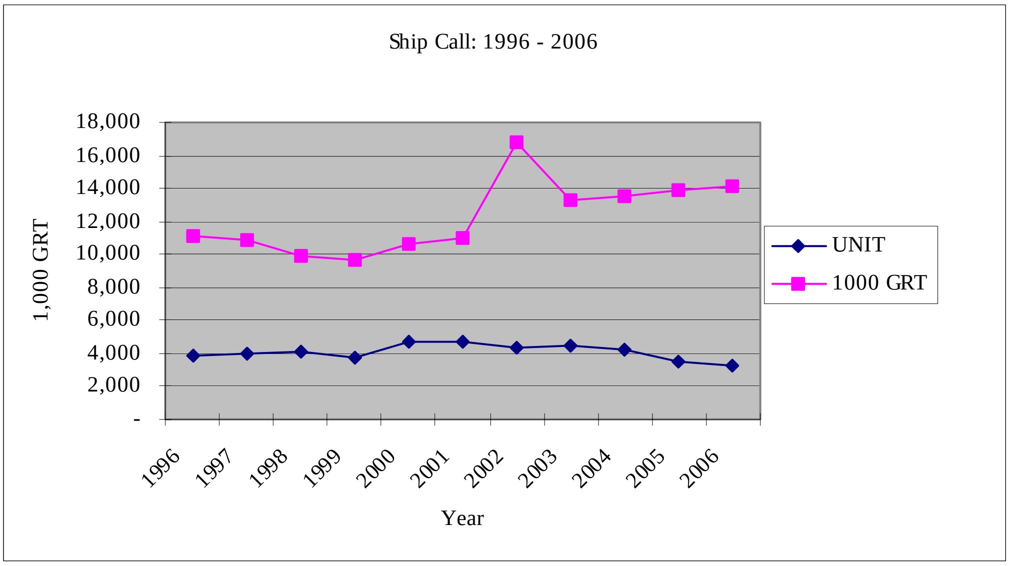

Figure J4.1.1 Prediction of Ship Call and Cargo: 2001-2006

4.1.2 Flow of Goods at the Port

The total volume of goods between 2001 and 2006 is estimated to increase to 112%. The Special Harbour used by PT. PERTAMINA will evolved into a Special Port in 2002.

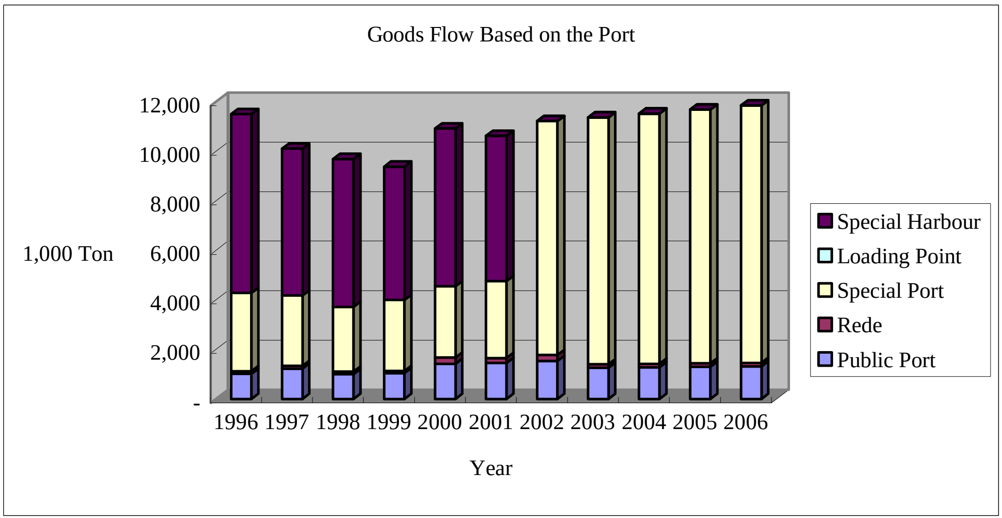

Figure J4.1.2 Flow of Goods at the Port: 2001-2006

4.1.3 Passengers

The rate of passengers between 2001 and 2006 will increase to 180% and 157% for debarkation and embarkation, respectively.

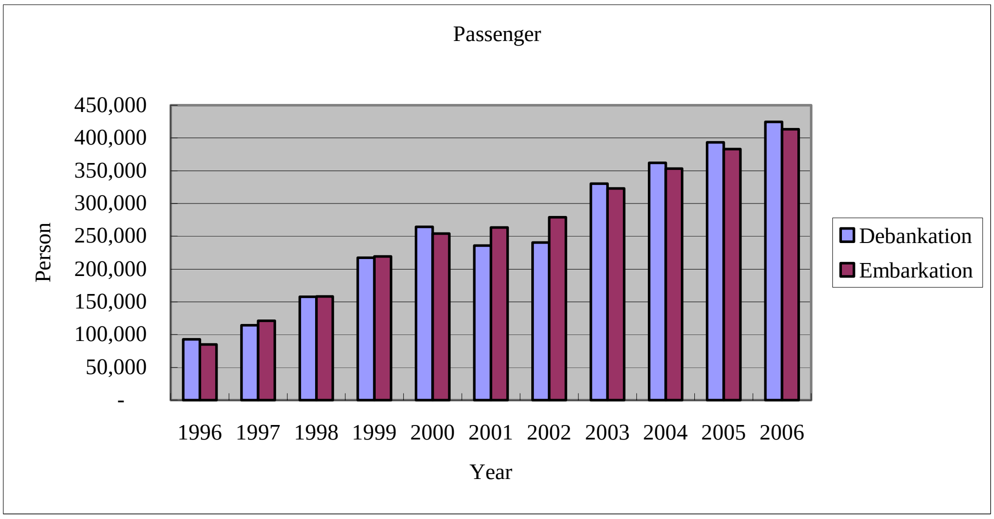

Figure J4.1.3 Passengers: 2001-2006

4.2 Tanjung Api-api Seaport

The ongoing construction of the Tanjung Api-api Seaport (Tg. Api-api Port) was proposed by the GOI in the 1980's to solve the sedimentation problem at the navigation channel and the river mouth area and to free the GOI and the local government from the burden of maintenance dredging cost. From the study results of "Ringkasan Penelitian Geoteknik Kelautan Perairan, Tanjung Api-api, Musi Banyuasin Sumatera Selatan", the following matters were identified.

- The estuary has a beach-line characteristic, i.e., a small beach area with mangrove forests.
- Tanjung Api-api was used for fishery and transportation of goods.
- The beach is formed of alluvium deposits of fluviatil and volcanic origin containing mud, sandy mud and sand.
- Beach morphology is low to middle relief; the paranomic view shows an old stadium with the river flow pattern in equilibrium with the U-shaped valley gradient.
- The natural resource was influenced by the sedimentation process that intensively happened at the river mouth where Musi Bayuasin River and Musi River meet.

The construction of Tg. Api-api Port has been divided in two phases; namely, the construction of the access railway project from Palembang to Tg. Api-api Port and the construction of the seaport. The railway project to be utilized mainly for coal transportation is presently under implementation (see Annex J4.2.1). The construction of the seaport is still pending negotiation with the developer and looking for financial support from either a private company or government funds. The plan for Tg. Api-api Port is given in **Annex J4.2.2**. However, the management office for new seaport is not mentioned clearly, because of the movement for localization by the GOI.

4.3 Other New Plan

4.3.1 Lais River Port

Lais River Port is planned to be built with dolphins by a partnership of some companies but operated by PT. PELINDO II. The flow of liquid cargo is predicted at 600,000 tons in 2006. The objective facilities are as follows:

- Four berths consisting of dolphins will be built at Lais River by a partnership of companies (3 units = 1 berth).
- Under the partnership arrangement, 3 units of Breasting Dolphin will be built by PT. Trimitra and PT. Selapan and another 3 units by PT. Indokarya in 2003, and 3 units by PT. Gutherie and 3 units by PT. LONSUM in 2004.

The master plan of the sailing wharf of Lais River Port is shown in **Annex J4.3.1**.

4.3.2 Floating Jetty for Passenger Boat

The number of passengers is increasing rapidly, as shown in Figure J4.1.3, but the existing passenger jetty is not provided with a function against tide movement, which is inconvenient for the loading and unloading of passengers. Based on the interview with ADPEL, there is a plan to construct a floating passenger jetty at Sungsang.

5. ISSUES TO BE SOLVED

In the up-stream middle reaches, the waterway is basically used for fishing and passenger transport by small boats; while, in the down-stream reaches, the waterway is utilized by ships catering to industrial, commercial, and agricultural products. The existing problem at the up-stream middle reaches is the difficulty of boat navigation due to the low water level during the dry season. In the down-stream, sedimentation is a major problem to navigation, especially for commercial ships.

5.1 Maintenance Dredging

Sedimentation is a serious problem for waterway users, because it hinders commercial, agricultural and passenger transportation activities. Maintenance dredging is the common countermeasure for sedimentation implemented by local governments and other agencies. However, sediment will be supplied continuously from the up-stream and middle reaches to the down-stream unless there are protection works and actions taken against this phenomenon.

Based on the site survey and study, maintenance dredging has to be carried out every year as being done at present. However, due to the increasing cost that could no longer be shouldered from the national government budget, maintenance dredging was not implemented in 2001 because of disagreement on the dredging price. As mentioned in Section 3.3(2), maintenance dredging was implemented in 2002, but dredging was not up to the required depth due to the shortage of funds.

<u>Proposed Measures</u>

It is known that sedimentation is a phenomenon in the down-stream but sediment is supplied from the up-stream and middle reaches. To solve this problem, it is necessary to have a comprehensive action plan covering the whole Musi River Basin with consideration on the following key factors:

- Due to limitations of budget and manpower, the action plan is to be implemented in stages.
- The implementation of environmental protection works is a time-consuming process.
- There is a need to prioritize protection works.
- There is a need for waterway users and people living along rivers to understand and support the action plan.
- The original depth of the navigation channel is 4 to 5 m, which is the equilibrium depth for the river mouth. To maintain this depth, the volume of dredging may be reduced unless there is a change in the up-stream due to the provision of new infrastructures.

Based on the above considerations, the countermeasures are to be provided in three stages called Short Term, Middle Term and Long Term, as shown in **Table J5.1.1**.

Table J5.1.1 Possible Measure for Sedimentation Problem

	Actions Taken	Problems	Recommendation	Remarks
Short Term (few years)	- Maintenance Dredging - A new task force formed to solve the sedimentation problem. (Should include waterway users, NGO and people that live along the river.)	- Not enough funds from GOI. > Cannot dredge up to the design depth. - Dredging cost go to private consortium. > Heavy risk for business. - Why only the first user pays the cost. - How long to continue maintenance dredging.	- Need to look for new funds (not only for the first user) - Tree planting can be implemented with grant aid or by NGOs. - Study the possibility to reduce size of ship. (LPG Gas) > To minimize the dredging volume. - Study the mechanism of sedimentation > To identify the major supplier of sediment. - Prepare O&M manual for Environmental Protection	Existing Design Depth: –6.5 LWS Width: 100 m Slope: 1:4
Middle Term (5-10 years)	- Maintenance Dredging - Reduce the supply of sedimentation (Bank protection, Tree planting). Annex J5.1.1 - Reduce the volume of maintenance dredging. - Dredged materials in river channel have to be dumped inland. - Create a new financial system for maintenance dredging and protection works. - Utilize NGOs and NPOs.	- Need action plan for bank protection - Prioritize the protection location. - Need additional funds. - Need public involvement	- Reduce the supply of sediment from the up-stream. - Regular financial support from local government. - To be part of road maintenance work. - Reduce size of ship. > Reduce design depth. - Study the equilibrium depth in river mouth area.	Proposed Design Depth: –5.5 LWS Width: 100 m
Long Term (10-20 years)	- Reduce the dredging volume by distinguishing a river port from a seaport. - Continue the bank protection works.	- Need to construct a new seaport. - Need a long term O&M manual	- Reduce the maintenance dredging volume. - Save on dredging cost and increase the protection cost. - Prepare O&M manual for Environmental Protection.	Proposed Design Depth: –4.5 LWS Width: 100 m Slope: 1: 5 (No maintenance dredging in river channel)

5.2 Bank Erosion by Ship Wave

A wave called “ship wave” is created by a ship navigating in the channel. When the ship speed or size is higher, the ship wave is also higher. The normal speed for ship navigation is 15 to 20 knots, but passenger ships can be operated at more than 30 knots.

Ship waves have caused river bank erosion from Palembang to the river mouth, and water goes into the houses along the river. However, bank erosion can be seen at some locations but not in residential areas. Most river bank erosions occur in paddy field areas and open spaces.

Based on the information from ADPEL, there is local regulation for all passenger and commercial shipping companies or operators to reduce the ship speed to 7 knots while passing along a residential area. Hence, the ship wave problem is not a major issue yet.