Part 2 PRESENT CONDITIONS

2. SOCIO-ECONOMIC CONDITIONS IN INDONESIA

2.1 - 2.3 Existing Socio-economic Conditions in Indonesia

The Indonesian economy had been expanding rapidly up to its economic crisis which began in 1997. The country is resource rich and on the basis of oil, minerals, estate crops and a vast pool of labour, albeit mainly unskilled, has developed its secondary and tertiary sectors. In particular, it has developed manufacturing, services, real estate and the construction sectors.

Population is also growing and passed 200 million in the late 1990's.

However, the basis of some of this expansion has been extensive borrowing and the political system, and when the crisis struck, the government and the private sector were not well placed to absorb the shock unlike some of its neighbours like Thailand and Malaysia.

Up to the crisis, GDP had been expanding by about 7 percent per year in real terms and exports and manufacturing had been growing even faster.

In 1998 GDP contracted by 13 percent and a small recovery appeared in 2000. GDP in 2001 was again hit by political problems and the September 11 events in the USA affected world growth and Indonesia's GDP. It is now expected that GDP in 2001 will have grown by some 3 to 4 percent.

The massive devaluation of the Rupiah did not give the expected boost to exports for a number of reasons including shortage of trade finance, but principally because of the uncertain economic and political future. Tourism has been particularly hard hit by both internal and external problems.

A new government accompanied by the introduction of decentralisation has meant continued uncertainty and the lack of will or means to implement the stated reform programme. Bad loans and a weak banking sector has meant very little progress with reform and privatisation to which the government is nominally committed.

Indonesia's main trading partners have also had their own problems including Japan, the USA and some European countries. China is a growth area, but to some extent competes with Indonesian products.

National port traffic trends indicate that total port cargo had been increasing by 11 % per year over the past decade with exports increasing by 12 %.

Recent traffic trends at all 7 study river ports, indicated a lower growth of about 6 % per year, with public cargo growing by 8% and containers by 21 % per year from a very low base, and only since the mid 1990's.

2.4 Port Development Policy

2.4.1 National Transportation System (SISTRANAS, Ministerial Decree No.15/1997)

In December 1996, Indonesian Government issued the National Transportation System (SISTRANAS) as the first step in formulating a nationwide master plan of transportation. SISTRANAS describes the objectives and functions of the national transportation system as well as the future structure of transportation network. According to SISTRANAS, the function of the national transportation system is to support and stimulate the national and regional development, to strengthen the unity of the entire country and to promote international exchange. SISTRANAS categorizes ports into two groups, trunk port and feeder port.

2.4.2 Regional Transportation System (SISTRAREG)

SISTRAREG was prepared to elaborate on SISTRANAS and to establish a detailed transportation system at the regional level. SISTRAREG is developed for the following five regions: Sumatra, Java-Bali, Kalimantan, Sulawesi, Nusatimi (including Irian Jaya and Maluku

2.4.3 Shipping Law (Law No. 21/1992)

Shipping Law No. 21/1992 categorizes the ports in Indonesia into two groups, public ports and special ports. Currently, Indonesia has 656 public ports and 1,233 special ports. The government decided that four Indonesian Port Corporation (IPC) should manage 110 public ports on a commercial basis. The remaining 546 public ports are managed non-commercially by the government.

Shipping Law stipulates that 131 ports are open to international trade in order to achieve the national and regional economic development.

2.4.4 Port Regulation (Government Decree No. 70/1996)

Port Regulation identifies basic roles of the nation's ports and classifies them into several categories. Its main items are the following:

National port structure, functions of ports, capacity of the government relative to port development and operation, area of public ports, development and operation of ports, cooperation with the private entities, and relationship between public ports and special ports.

It allows special ports to handle public cargo only in limited conditions.

2.4.5 Revised Port Regulation (Government Decree No. 69/2001)

DGSC has revised the Port Regulation in line with the Law for Autonomy and Law for Fiscal Balance. It went into effect in October 2001.

2.4.6 Cooperation between the Government and Private Sector for the Development and /or Management of Infrastructure (Presidential Decree No.7/1998)

Presidential Decree No. 7, 1998 is concerned about private sector participation in the infrastructure sector including transportation, telecommunication, power supply, and water supply.

2.4.7 Network Development Plan of Port Infrastructure in the National Port Arrangement

DGSC and IPC are jointly preparing the Network Development Plan of Port Infrastructure in the National Port Arrangement. This effort started inspired by the JICA Study on the Port Development Strategy.

2.4.8 Strategic Plan of Sea Transportation Structure 2001-2005 (RENSTRA)

DGSC issued the Strategic Plan of Sea Transportation Structure 2001-2005 (RENSTRA) in June 2000. This plan covers the entire marine transportation sector. It identifies seven policy goals in line with the policy agenda proposed in PROPENAS.

2.5 Port Administration Policy

2.5.1 Government Organization related to Transportation

Indonesia is a republic created by the 1945 constitution. Ms. Megawati Soekarnoputri became the president on August 9/2001. Ms. Megawati administration formed the " Gotong Royong" (mutual help) Cabinet composed of 31 ministers. The Ministry of Communications (MOC) administrates land, sea, and air transportation, port, seamen, maritime safety, and meteorology by Presidential Decree (No.168/2000). It also administrates posts and telecommunications. MOC coordinates its development policy with BAPPENAS.

2.5.2 Port Management in Indonesia

The Indonesian government has often revised its decrees regarding port administration. Currently, port administration is carried out according to the Shipping Law (No.21/1992) and the Government Regulation (No.69/2001). Indonesian ports can be classified into two groups: 656 public ports which are under the jurisdiction of MOC and IPC, and 1,484 special ports (including special wharves) which are operated by the private sector. Within the 656 public ports, 110 commercial ports are managed by four Indonesian Port Corporations (IPC). The remaining 546 non-commercial ports are directly managed by MOC.

2.5.3 The Marine Safety Administration

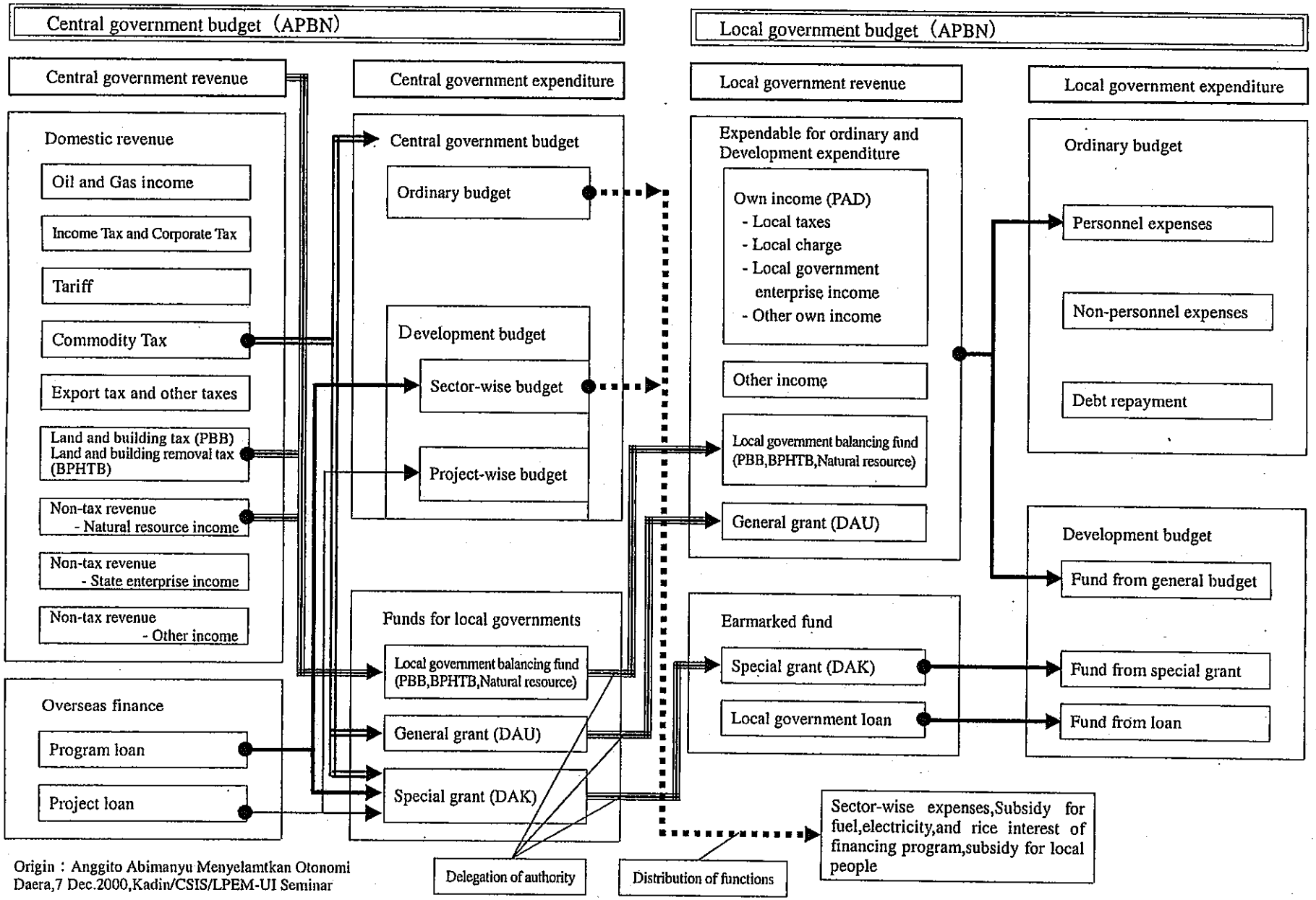
Directorate of Maritime Safety Seamanship and Directorate of Guard & Rescue of DGSC are responsible for maritime safety according to the Shipping Law (No.21/1992) and the Government Regulation (No.81/2000). The four (4) port administrator offices (ADPEL) established in the first class commercial ports, are under the direct control of the Minister of MOC. The eighty-four (84) ADPEL established in the second to fourth-class commercial ports, are under the direct control of DGSC. KANPEL is established in 189 non-commercial ports.

2.6 Decentralization and Privatization

2.6.1 The Government 's New Policy on Decentralization

In accordance with the Regional Government Law (No.22/1999) and the Financial Balance Between Central and Regional Government Law (No.25/1999), the Indonesian government has just taken a step forwards to decentralization. The central government explained the laws to the relevant provinces in order to increase awareness on this matter. After having their response, the Port Regulation was revised on October 2001 by the Government Regulation No.69/2001.
Since the decentralization process started, the procedure for regional development planning and the distribution of financial responsibility have greatly changed.

Figure 2.6.1 shows the Relation of Central Government Budget and Local Government Budget.
Figure 2.6.2 shows the Process of the regional development plan before/after decentralization.
Table 2.6.1 shows the Indonesian National Budget.

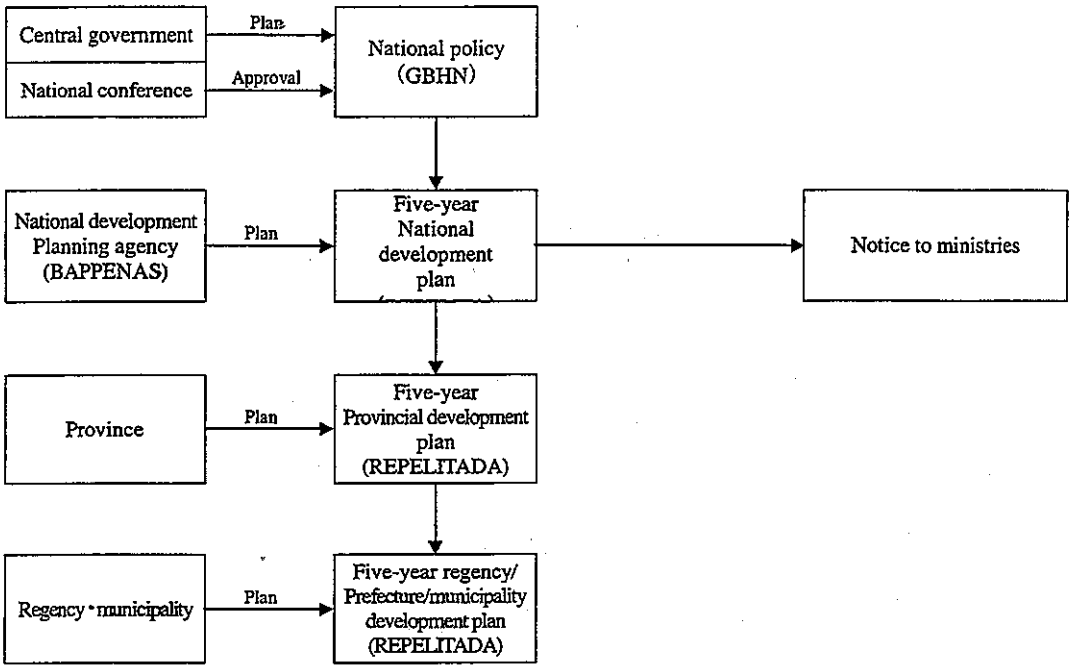


Origin : Anggito Abimanyu Menyelamtkan Otonomi Daera,7 Dec.2000,Kadin/CSIS/LPEM-UI Seminar

Figure 2.6.1 The Relation of Central Government Budget and Local Government Budget

<Process of the Regional Development Plan before Decentralization>

(Five-Year Regional Development Plan)



<Process of the Regional Development Plan after Decentralization>

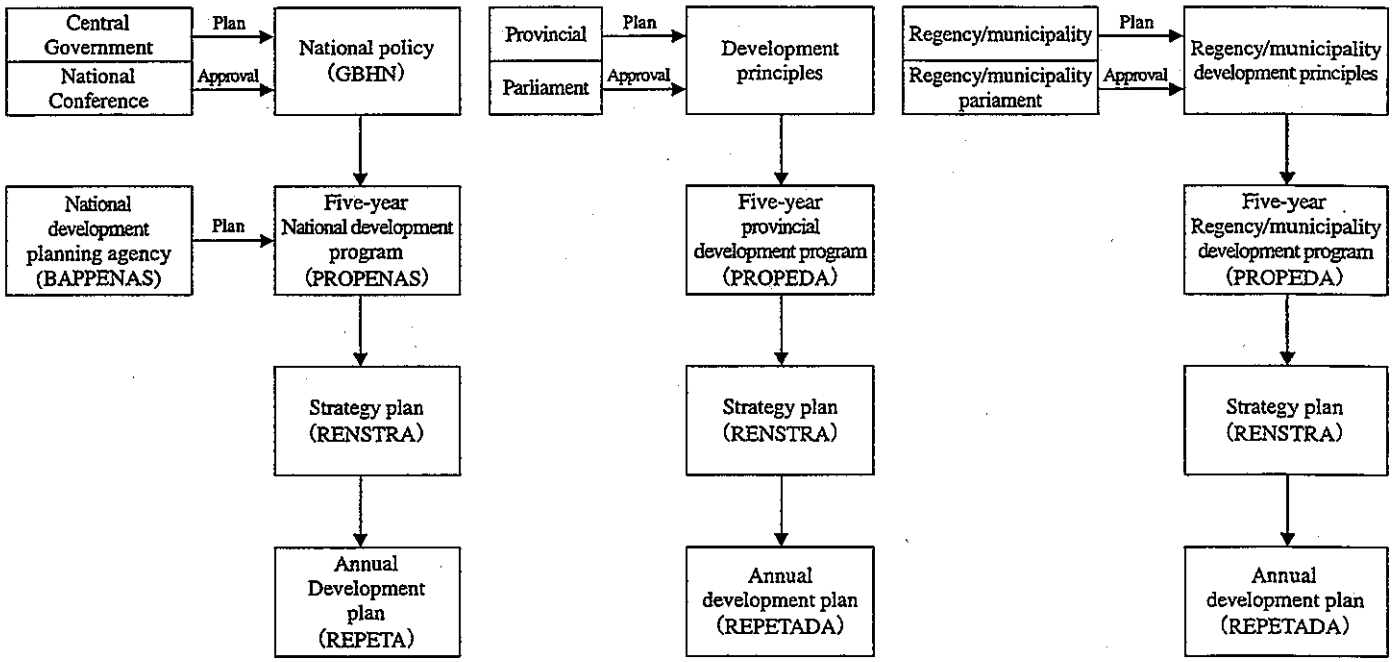


Figure 2.6.2 Process of the Regional Development Plan before/ after Decentralization

Table 2.6.1 Indonesian National Budget

(Unit: billion Rp.)

Item	2000		2001	
	Budget	G DP %	Budget	G DP %
Annual Expenditure	197,030.3	21.6%	315,756.1	22.2%
1. Ordinary Expenditure	137,311.1	15.1%	190,092.2	13,4%
a. Personnel Costs	30,682.1	3.4%	39,968.7	2.8%
b. Procurement	9,440.5	1.0%	9,688.9	0.7%
c. Subsidy	30,828.4	3.4%	53,951.7	3.8%
d. Debt Interest Payment	54,623.4	6.0%	76,549.6	5.4%
e. Others	11,736.7	1.3%	9,933.3	0.7%
2. Development Expenditure	26,196.8	2.9%	43,987.4	3.1%
a. Sector	10,166.8	1.1%	21,722.4	1.5%
b. Project	16,030.0	1.8%	22,265.0	1.6%
3. Balancing Fund	33,522.4	3.7%	81,676.5	5.7%
Annual Revenue	152,896.5	16.8%	263,226.6	18.4%
1. Tax Revenue	101,436.8	11.1%	179,892.0	12.6%
a. Domestic Tax	95,538.0	10.5%	169,520.0	11.9%
b. Tariff	5,898.8	0.6%	10,372.0	0.7%
2. Non-tax Revenue	51,459.7	5.7%	83,334.6	5.8%
a. Natural Resource	40,082.4	4.4%	64,458.2	4.5%
b. Surplus of State Enterprise	5,281.3	0.6%	10,500.	0.7%
c. Others	6,096.0	0.7%	8,376.4	0.6%
3. Gratuitous Capital	-	-	-	-
Loan	44,133.8	4.8%	52,529.5	3.7%
1. Domestic Finance	25,400.0	2.7%	33,500.0	2.4%
a. Privatization of State Enterprises	6,500.0	0.7%	6,500.0	0.5%
b. IBRA Asset Sales	18,900.0	2.0%	27,000.0	1.9%
2. Overseas Finance	18,733.8	2.1%	19,029.5	1.3%
a. Program Loan	11,299.8	1.2%	13,727.7	0.9%
b. Project Loan	16,030.0	1.8%	22,265.0	1.6%
b. External Debt Payment	▲8,696.0	▲0.9%	▲16,963.2	▲1.2%

Note: Budget of 2000 is for nine months from April to December 2000.
Budget of 2001 year is for 12 months from January to December 2001.

2.6.2 Privatization Policy on Port Management

Private sector participation in the development and management of infrastructure has become a global trend. Indonesia is no exception to this trend. It is becoming more and more common to introduce foreign capital and privatize government enterprises to increase efficiency. Electric power, road construction, railway, communication, and port construction/management are suitable for management by the private sector/fund and foreign capital.

IPC II and Hutchison jointly operate and manage some of the container berths in the Tanjung Priok port. In IPC III, the extension of the container terminal at Tanjung Perak (Port Surabaya) was undertaken by a JV comprising IPC III and P& O. It is expected that privatization will continue in the transportation sector.

2.7 Transportation Network

2.7.1 Outline of Transportation

While the land transportation demand (road and railway) grew, the domestic air passenger/cargo decreased last five years. The sea freight transportation for inter island freight slightly increased and that for international freight demand shows practically no change while the sea passenger traffic grew.

2.7.2 Sea Transportation

Ports in Indonesia consists of 656 public ports and more than 1000 special ports. The public ports can be further classified into 112 commercial ports, to which PELINDO I – IV are responsible, and 544 non-commercial ports. DGSC of MOC designate 25 strategic ports out of the commercial ports. Annual throughput of ports in Indonesia had grown through 1997, then decreased in 1998 and 1999. After the economic recession, international cargo throughput at ports in Indonesia did not reach to the level of year 1995 whereas inter island cargo throughput decreased slightly and passenger embarkation/disembarkation have already exceeded the pre-recession level. As for domestic sea passenger, Sumatra and Kalimantan were main origins while Sumatra, Java and Kalimantan were main destination.

2.7.3 Land Transportation

The total length of Indonesia roads in 1998 reached 355 thousand km or 0.18 Km/Km2, an increase of 4.1% compared to the previous year. The proportion of road length was 47.3% of asphalted, 43.7% of non-asphalted and 9.0% of other type. Our target ports, Ports of Pekanbaru, Jambi and Palembang in Sumatra, are connected with the Trans Sumatra Highway running midst low land on a parallel with the coasts. However, connection between these capital cities and the coast has not been well established except connection road between Pekanbaru and Dumai. In Kalimantan, road development is limited. The Trans Kalimantan Highway has been partly developed connecting the capital cities of Central, South and East Kalimantan provinces. In West Kalimantan, the Highway only connects Pontianak with Singkawang, and Kuching, capital city of Sarawak, Malaysia. Connection between the coastal area and the inland is not developed.

Railway is operated in Java Island and in Banda Aceh, North Sumatra, West Sumatra, South Sumatra and Lampung of Sumatra Island. Only Port of Palembang has a railway connection out of our seven target ports at the moment

2.7.4 Air Transportation

Indonesia has 123 airports (Class I-V) and 371 airstrips (non-Class). DGAC selected 31

strategic airports out of the Class airports. Both the domestic and international passengers decreased drastically in 1998, and the international demand started regaining from 1999 although the domestic demand continued to decrease. One third of domestic air passenger took off and landed at DKI Jakarta.

2.8 Shipping

In Indonesian Shipping, foreign flag ships are predominant for export/import trade. Therefore for consideration the problem of Indonesian Shipping, the effort of foreign flag ships should be taken into account. Indonesian shipping companies number more than 1,300 and most are competitively small and weak. Accordingly, if it is possible to consolidate these small and weak companies into a small number of large and strong companies, the cargo collecting ability of the consolidated companies will increase and cargo lots will become larger. The amount of topping cargo which is not related to the restriction of allowable ship draft will decrease.

Share of cargo transport

	Indonesian flag ship (%)	Foreign flag ship (%)
Export / Import cargo	4.8	95.2
Domestic cargo	50.5	49.5

It stands to reason that the foreign flag ships are predominant because the largest part of export cargo is transported by FOB (free on board) contract, and therefore the transport of these cargo by Indonesian flag ships is very small. On the other hand, the larger part of import cargo is transported by CIF (cost, insurance and freight) contract and therefore the transport of these cargoes is very rare. Under these circumstances, the balance of shipping trade of Indonesia is consistently in red.

Indonesian flag ships are not competitive with foreign flag ships in freight market in terms of ship safety. It is said that ratification of International Maritime Rules and Regulations is acceptable, but the preparation of relating domestic Maritime Rules and Regulations is lagging. All the Indonesian flag ships are registered and classified by BKI (Indonesian Classification Society) relating to ship safety. BKI is the only ship classification society founded in South-East Asia, but BKI is not yet a member of International Association of Classification Societies (IACS). Indonesian ship-owners, therefore when they insure their ships, they have to class their ships with NK (Nippon Kaiji Kyokai) or other International Classification Societies who are members of IACS.

For the Principal River Ports in Indonesia, transport by barge, LCT (landing craft transport) and wooden sailing ship (KLM) should be considered. Shallow draft barges and tug boats etc. navigate freely the outside of the channel. It seems that such barges and tugs, etc. are efficient to decrease the traffic demand for a dredged channel.

Indonesia had fleet modernization programs such as Caraka Jaya project and scrap & build program of PERTAMINA. Caraka Jaya project started in 1983, but this project has not made as much progress as had been expected due to the economic crisis of 1997. If this program of building a standard ship is well conducted, it will assist the modernization of the Indonesian fleet.

2.9 Environmental Conservation Policy in Indonesia

2.9.1 Environmental Policy and relevant agency in Indonesia

Upon establishment of a new environmental management law in 1997, the former 1982 law was repealed. The characteristics of the new law are as follows:

a) Strengthen environmental enforcement for the project activities,
b) Strengthen penalties for violation of environmental regulation,
c) Strengthen environmental dispute treatment,
d) Instillation of the regulations of environmental information rights for the Indonesian people.

Regarding the relevant environmental agency in Indonesia, the Ministry of Environment is in charge of Indonesian general environmental policy, such as establishment of laws and regulations. One of the agencies within the Ministry is the Environmental Impact Management Bureau (BAPEDAL; Badan Pengendalian Dampak Lingkungan).

BAPEDAL functions as the examination organization of AMDAL (EIA). Under BAPEDAL, there are environmental monitoring and information centers which gather environmental data and information for the EIA reports. Moreover, there are BAPEDAL branch offices in some provinces.

2.9.2 Environmental Impact Assessment Procedure

AMDAL (Analisis Mengenal Dampak Lingkungan, the analysis of environmental impacts) is an integrated review process to coordinate the planning and proposed development activities with their ecological, socio-economic and cultural components.

Indonesian environmental impact assessment law was revised in 1999; and the new EIA procedure took effect in November 2000. According to it, development projects larger than a certain scale are now required to follow certain procedures for approval of their environmental impact assessments (EIA), including making the contents of implementation of the EIA (the EIA terms of reference; TOR) available for perusal by the public and submitting the Environmental Management Plans and Environmental Monitoring Plans to public hearings for approval after approval of the TOR.

The major difference in the new law from the former one is public participation in the assessment works from its start and requiring hearing of opinions from the persons (parties) concerned with the project activities.

In carrying out the present study, which is the first development study to take place under the new system, there will be full consultation and cooperation with not only Indonesian counterparts, but also the Environmental Management Agency (BAPEDAL). A report will be drawn up that can serve as sufficient basis for preparation of a draft environmental impact assessment document.

The aim is to help smooth implementation of environmental impact assessment by doing everything necessary to make it possible for the government agency in charge of the project to expeditiously prepare the environmental impact assessment document after completion of the study.

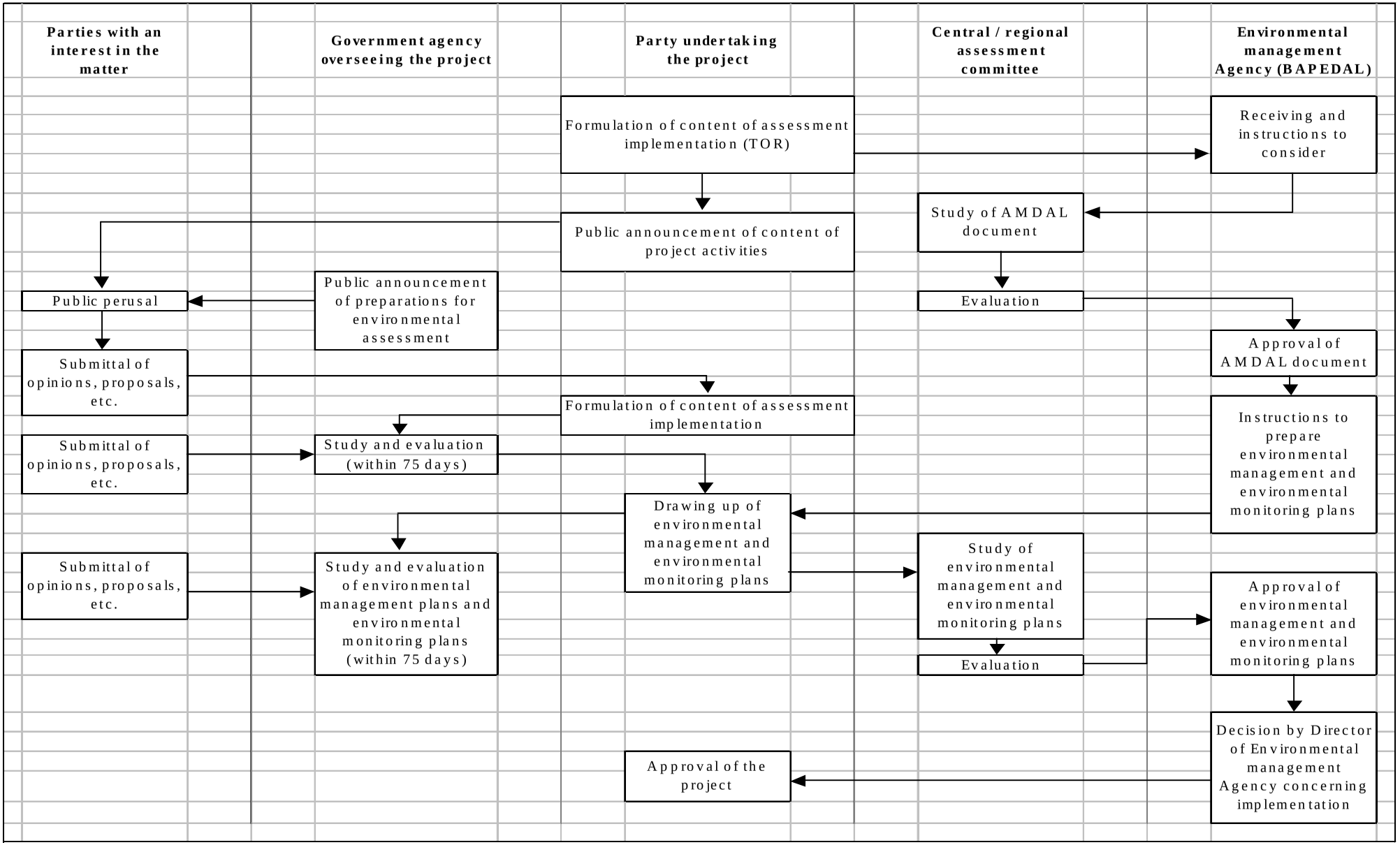


Figure 2.9.1 Procedure of Environmental Impact Assessment in Indonesia

2.10 Major Trading Partners and Outlook

The assessment of trading partners is complicated by the crisis which affected Asian economies the most, by the use of Singapore as a transit port, and which shows as being a very large destination for Indonesian goods far beyond its capacity to absorb such traffic itself and by the difference when looking at tonnages and US dollar values.

(1) Developing Asia

Asean absorbed some 33 percent by weight and 17 percent by value of Indonesian exports in 1999. This includes Singapore.

In tonnage terms, ASEAN exports have been declining by 11 percent per year but increasing in US terms by 6 percent per year between 1995 and 1999.

(2) Japan

Exports to Japan comprise mainly oil and gas and timber based products and amounted to 23 percent in tonnes and 21 percent in value in 1999. Both tonnage and value had been declining over the period perhaps reflecting stagnation in Japan's economy and fluctuating Yen / Dollar values.

(3) HK and Rest of Asia

Hong Kong and rest of Asia absorbs some 29 percent by tonnage and 24 percent by value in 1999 with Hong Kong a relatively small amount of this. These markets have been growing consistently in both value and tonnage terms.

(4) Europe

Exports to Europe have been growing and in 1999 made up 6 percent by tonnage but 15 percent by value of Indonesia's exports. The growth in tonnage has been strong but value growth has been small reflecting perhaps price sensitivity in this market for consumer goods and furniture.

(5) North America

The USA market for Indonesian exports dominates the North American market. The N American market makes up about 3 percent by weight and 4 percent by value of Indonesian exports and has been growing steadily since 1995.

(6) Total Exports

Since 1995, total exports by value have increased by 2 percent per year but in tonnage terms have been declining marginally, reflecting higher value goods. Due to the depreciation of the Rupiah, the value of exports in Rupiah terms has increased by over 350 percent between 1995 and 1999.

2.11 Basic Figures Needed in the Economic Analysis

Economic evaluation in this study is a two stage process. This is because two ports must be selected from the original seven ports. Therefore, the first stage involves a mainly qualitative process by which each main criteria, and economic is one of the main criteria, is used to assess each development alternative at each port. Each project is thereby ranked and two priority ports selected.

After the two priority ports are selected, the selected port will be studied in significantly more detail.

Economic evaluation consists of several key aspects as follows:

(1) Project Capital Costs
(2) Benefits and Costs
(3) Indirect Benefits And Costs
(4) Intangible Benefits And Costs
(5) The Evaluation Process

Within this project, the EIRR and NPV will be calculated as well as other methods if appropriate.

3. PRESENT CONDITIONS OF THE PRINCIPAL RIVER PORTS IN SUMATRA

3.1 Regional Development

3.1.1 General

Sumatra Island has topographical characteristics that mountains stretch in a raw and form the west edge of the island and that, contrarily, the eastern regions are formed of low land and swampy coasts especially in provinces of Riau, Jambi and South Sumatra. Many rivers are running from the west mountains to the east coasts. Our target ports, Ports of Pekanbaru, Jambi and Palembang, are located on the banks of such rivers midst the low land.

Population density of Sumatra Island is lower than that of Indonesia, and those of the tree provinces are further lower than that of Sumatra.

The mountain regions are rich in mineral resources such as coal, gold, tin, etc., whereas the lowlands can provide rich oil/gas fields and cultivation land suitable for plantation of oil palm, rubber, etc.

Transportation in Sumatra is greatly affected by the topography. The east-west land transportation in the island is interfered by mountains. Three trunk roads, however, are running in a parallel with the coasts, on the west coast, along the east skirt of the mountains and midst of the low land servicing north-south transportation. These trunk roads are called the Trans Sumatra Highways and connect main cities situated along rivers and on the coast each other.

The rivers play important roles as east-west inland waterway routes, especially cargo outlet and gateway to/from the eastern sea through Ports of Pekanbaru, Jambi and Palembang, our target ports. The other main ports, Ports of Belawan, Dumai, Padang, Bengkulu and Lampung are located on the coast.

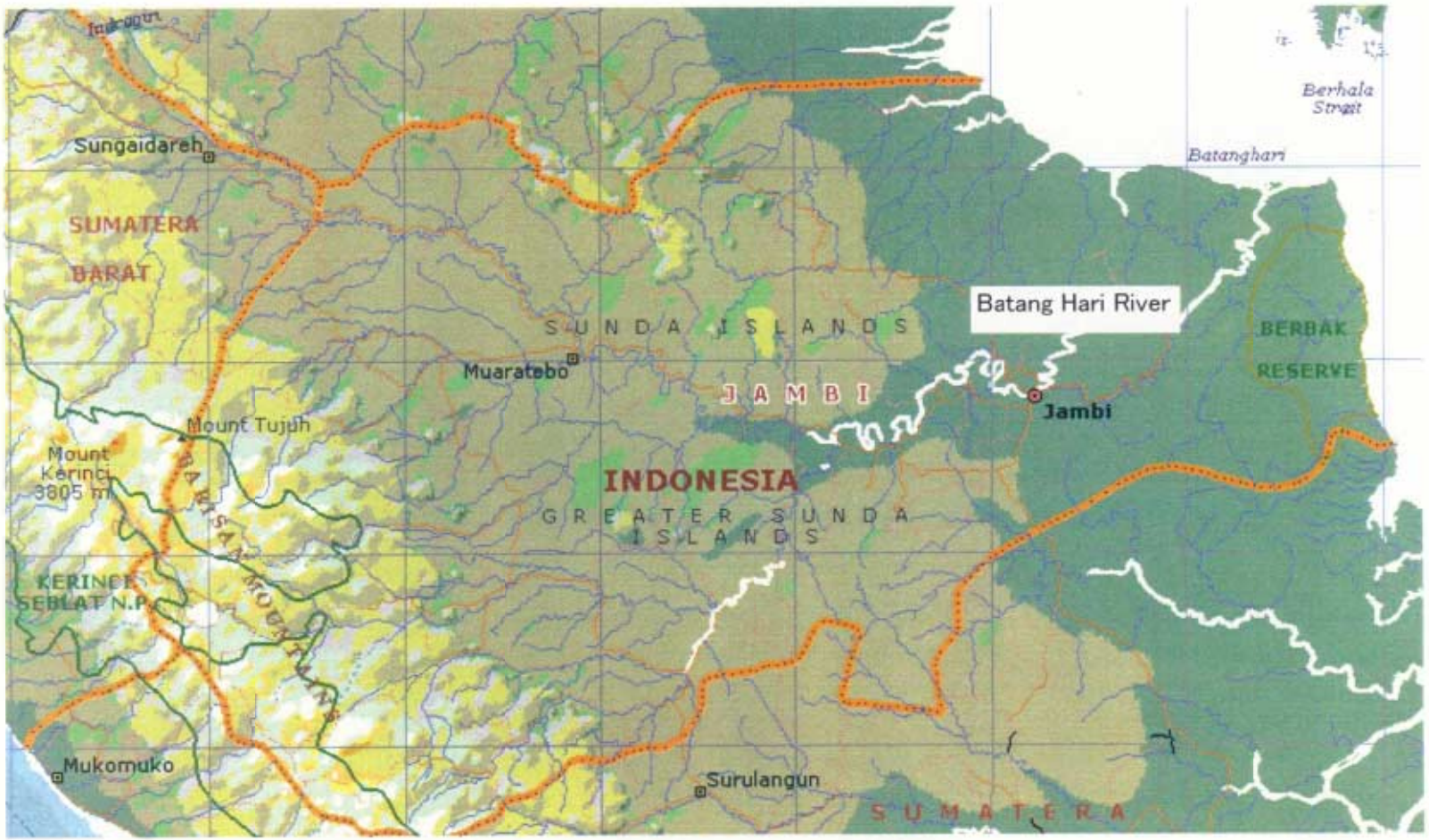
Moreover, railways are operated in Ache/North Sumatra West Sumatra and South Sumatra/Lampung regions for transportation of mineral resources as well as for passenger.

Forest is another asset of Sumatra. Logging in both mountains and low lands is important industry in the island.

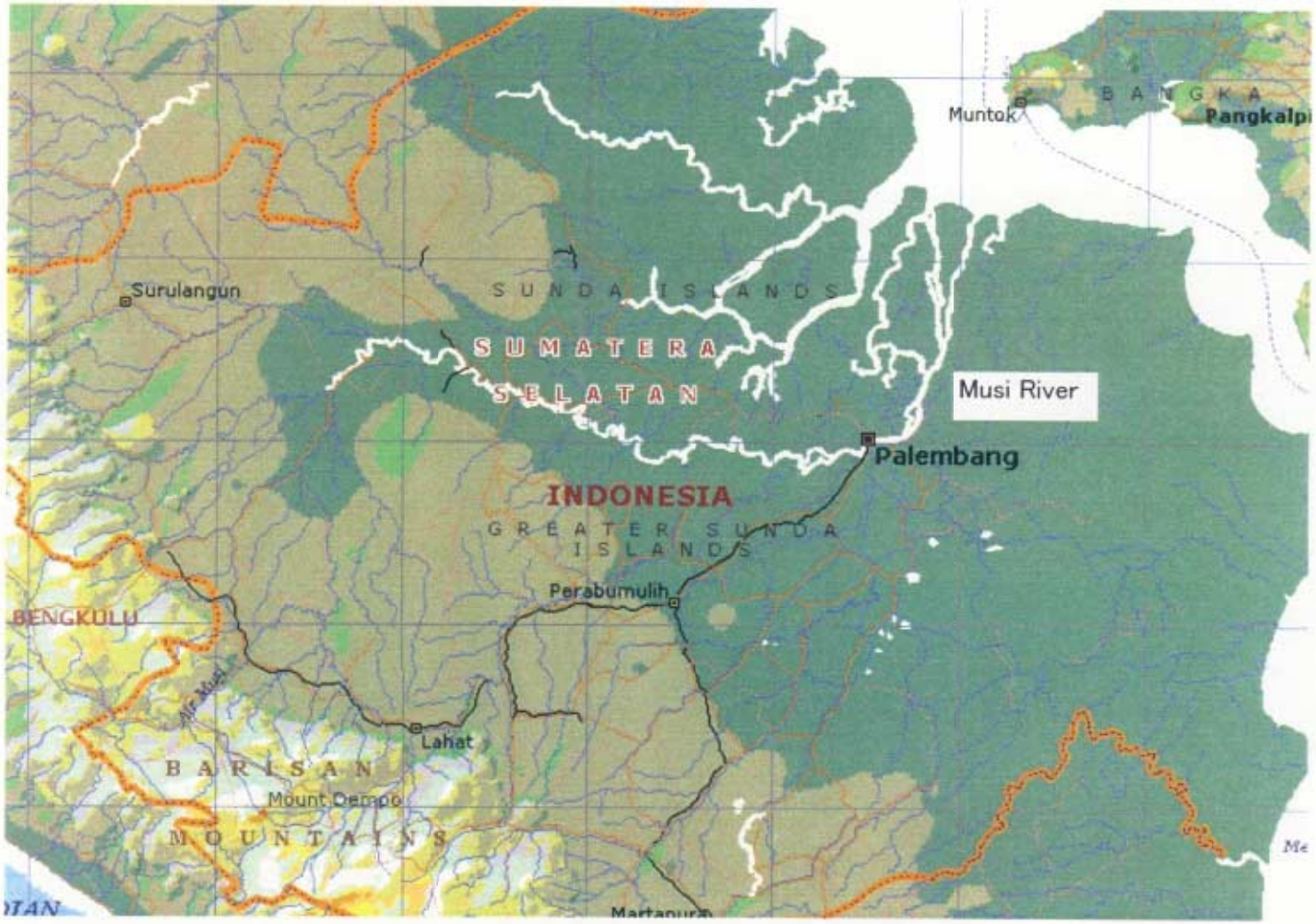
Under these conditions, oil and gas production, oil refinery, coal mining, wood processing, paper/chip production, agricultural plantation, and CPO production have been developed as main industries in Sumatra Island.

Per capita GRDP of Riau is placed at the third rank in Indonesian 27 provinces (as of 1999) and is more than twice the state average. Production of oil and gas greatly contributes to the high

Pekanbaru and Siak River



Jambi and Batang Hari River



Palembang and Musi River

rank, but it falls to the state average level when oil and gas are excluded.

Per capita GRDP of Jambi is the second lowest in Sumatra, Rp. 2,641,168, following Bengkulu and about half of the nation's average. Main industries in Jambi at the moment are agricultural plantation of palm oil, and rubber

Per capita GRDP of South Sumatra is lower than the state average both in cases with and without oil and gas. Without oil and gas, difference to the national average is bigger than that with oil and gas, which shows the provincial economy depends on oil and gas to some extent. As the province has largest area of agriculture estate in Sumatra, the economy depends on agriculture as well as mining and manufacturing.

3.1.2 Agriculture, Forestry and Fishery

Comparing proportion of crop area against total area by province, Jambi accounts for 8.8% or about 1.5 times the state average whereas Riau is almost on the state level and South Sumatra falls below it.
Evaluating forestry industry by area of production forest, the area in Riau overwhelms other provinces in Sumatra having about 13% of the state total.

Also fishery is relatively active in Riau and South Sumatra.

Agriculture estates, i.e. plantation area, have been developed in various scales. Development of small scale estates predominate for rubber and coconut and large-scale estates, contrarily, for palm oil. And large-scale estates are established more than two times the small scale estates.

Production of palm oil has grown recently while those of rubber and coconut show no significant changes. Riau, Jambi and South Sumatra have high production level of rubber and palm oil and large volume of coconut and coffee are produced in Riau and South Sumatra.

Due to the shortage of processing capacity, a large amount of CPO and palm kernel is transported to neighboring provinces for processing. Expansion of CPO processing capacity is one of the challenges in Sumatra.

South Sumatra has the largest agricultural estates area in Sumatra Island. The estates produce about 400,000 tons of rubber (27% of the state total), 616,000 tons of palm oil (12%, ditto) and 139,000 of coffee (35%, ditto).

Since forestry resources are abundant in Riau, wood processing is another main industry. Sawn wood, plywood, pulp are the main products.

Saw timber and plywood are main forestry products in Jambi and main export products from Jambi Port. Production of plywood in Jambi accounts for 631,000 M3 or 9% of the state total. Also, pulp is produced in Jambi. Wood processing production in South Sumatra is also active comparing with Riau and Jambi.

3.1.3 Industrial Development

The output of Riau is the largest and it increased rapidly and that the rest of provinces except Central Kalimantan give similar movements to the national total.

Reason why Riau has the large output is that output of machinery sector of Batam Island is included. In case without machinery, Riau has almost the same situation as the other two provinces.

Riau is rich in oil and gas. Ten oil fields in the province at Minas, Duri etc. Minas, located 20km north of Pekanbaru, is the one of the largest oil fields in Indonesia. Duri is another big oil field. Annual crude oil production in Riau accounts for about 300 million barrels per annum or 60% of the national total in 1998. Crude oil is transported to Dumai Port or refinery of Purtamina through pipeline and exported using the private loading facilities.

South Sumatra is also rich in oil. Currently, however, oil production accounts for 35 million barrels per annum. Oil/gas wells are located at Prabumulih and Musi Banyuasin. On the south bank of Musi River at Palembang, refinery complex has been established and operated by Purtamina.

Development of a new coal mine with deposit of 100 million tons is under consideration. If started, two million tons of high calorie coal will be produced a year.

South Sumatra has the largest coal mine in Indonesia at Tanjung Enim, which is currently producing about 10 million tons per annum and holds a quite big deposit, and coal mining company, PT BA (Tambang Batubara Bukit Asam) has plan of expansion of production up to 20 million tons per annum.

One of largest pulp/paper company in Indonesia, PT Indah Kiat Pulp & Paper, is located on Siak River at Perawang, consumes logs and chips to produce pulp and paper. Another large paper company, PT. Riau Andalan Pulp & Paper, is also located in Riau

In South Sumatra, heavy industries such as oil refinery, cement and fertilizer production have been founded because mineral resources needed for the industries have been supplied sufficiently. Cement industry could be established by using limestone and coal produced in the province. A fertilizer maker, PT Psri, located on the north bank of Musi River near Bom Baru terminal of Palembang Port, produces 2.2 million tons of urea per annum.

3.1.4 Prospects for Industrial Development

Industrial development of the three provinces will capitalize on their rich natural resources and large arable land. Further plantation will be developed with CPO taking a leading role. CPO production will increase and CPO processing industry needs to be strengthened.

Forestry utilization is likely to continue as it is, keeping cutting volume within allowance trying to maintain forest resources.

Productions of oil and gas are likely to be maintained as it is because any more large oil deposits have been found recently.

Development and expansion of coal mining is expected in Jambi and South Sumatra.

Development of a hydraulic power plant is under consideration in Jambi. Industrial development capitalizing on the power plant is also planned.

Although all the three provinces have a plan of new industrial estates, their prospects are unclear.

3.2 Existing Port Facilities

3.2.1 Pekanbaru

Public wharves are located in two areas, Pekanbaru and Perawang Draft limitation, sharp bends in the access channel, and poor access roads are the major problems of Pekanbaru port. Perawang port has certain advantages over Pekanbaru port as it can accommodate larger vessels and its terminal can be extended and/or expanded.

The port area of Pekanbaru extends from the existing port to the river mouth including public wharves and private wharves. Many factories of the pulp and plywood industry are operating alongside the Siak River and they have their own wharves.

Siak Haska Container Terminal is a private wharf, but it is handling container cargo of common users. Public containers therefore need to be properly allocated between the Siak Haska terminal and Perawang public terminal.

3.2.2 Jambi

Public wharves are located in three areas, Talang Duku, Muara Sabak, and Kuala Tungkal. Talang Duku terminal can accommodate vessels up to 1,000-1,500 DWT and currently caters for general cargo, bag cargo, and container cargo for the areas behind the port. Muara Sabak port can accommodate larger vessels (up to 5,000-6,000 DWT) and it can dramatically reduce the navigation time from the river mouth. A new wharf was constructed in 1999-2000 with the financial assistance from Japan. Kuala Tungkal can accommodate vessels up to 1,000-1,500 DWT and mainly serves as a passenger terminal because of its proximity to Batam.

The port area of Jambi is quite extensive, including the Batanghari River and Tungkal River. Many factories of the sawmill and plywood industry are operating alongside the Batanghari River and they have their own wharves. For that reason, private wharves are handling 19 times as much cargo as public wharves.

3.2.3 Palembang

The port area of Palembang extends from the existing port, Boom Baru, to the new site, Sungai Lais. This is a marked difference from Pekanbaru and Jambi, whose port area extends to the sea.

Many factories of the petroleum, fertilizer, and plywood industry are operating alongside the Musi River and they have their own wharves. For that reason, private wharves are handling more cargo than public wharves. These private wharves need to be taken into account when

evaluating the port capacity.

(1) Public wharves

Public wharves are located in two areas, Boom Baru and Sungai Lais. Among them, Boom Baru is the main facility with 9m depth, handling both container and bulk cargo. Currently, there are only dilapidated seawalls in Sungai Lais. Log handling at this seawall has been stopped since its inland transportation changed from water transport to trucking. IPC 2 is planning to develop this area as CPO farms counting on the private sector participation.

A lot of wharves are operating along the Musi River handling petroleum, fertilizer, coal, and wood products in a large amount.

3.3 Access Channels

3.3.1 Pekanbaru

Pekanbaru is located 96 miles from the river mouth. The access channel is 60-100m in width and 10-15m in depth for most of its span (a lot shallower near the river mouth).

The traffic regulation issued by DGSC requires that LOA of calling vessels should be less than 90m at Perawang and less than 50m at Pekanbaru. The draft of calling vessels should be less than 6m at Perawang and less than 50m at Pekanbaru. Night navigation (6 PM - sunrise) is not allowed from Perawang upward. Pilot is compulsory for vessels larger than 150 GRT.

Sharp bends from Perawang upward seem to pose serious navigational difficulty.

3.3.2 Jambi

Jambi is located around 90 miles from the river mouth. The access channel is 50-80m in width and 2.5-4.5m in depth.

The traffic regulation issued by DGSC requires that LOA of calling vessels should be less than 115m at Muara Sabak and less than 75m at Jambi. The draft of calling vessels should be less than 6.5m at Muara Sabak and less than 5m (rainy season) or 3m (dry season) at Jambi. Pilot is required for vessels over 105 GRT.

According to the above regulation, vessels of over three meter in draft, when passing the Kelemak Channel, are requested to wait until about three hours after the high tide at designated places.

In order to maintain the water depth of 5 m around the river mouth, maintenance dredging is required around the estuary. Maintenance dredging is carried out every two years.

3.3.3 Palembang

Palembang is located some 100 km from the outer bar. The access channel has a minimum width of 120m and a minimum depth of 4.9m.

According to a sea pilot in Palembang, maximum LOA allowed to call is 185m. Vessel traffic is allowed 24 hours. Two-way traffic is allowed throughout the channel except for foggy days, which occurred once every 4-5 years. In that occasion, the channel traffic is one-way alternating the direction every 24 hours

Sharp bends at Sedumara, to the south of Pulau Singgis, and Tg. Kramat, to the east of Pulau Kramat pose navigational difficulty. The channel becomes narrower at the two bends as well.

The access channel within the outer bar area requires maintenance dredging every year due to the severe sedimentation. 35 navigational aids are installed throughout the channel.

3.4 Existing Port Development Plans

3.4.1 Pekanbaru

DGSC and IPC 1 jointly carried out a master plan study on Pekanbaru in 1996. After comparing three alternative locations, the Study chose Perawang as the site for long-term development. This study projects that the traffic will reach 600 thousand tons in 2015 increasing from 250 thousand tons in 1995.

Considering the study findings, DGSC constructed a 58m-wharf at Perawang in 1997-1998. DGSC has a plan to construct an additional 100m-wharf next to the existing one, but this plan is not authorized yet.

3.4.2 Jambi (Muara Sabak)

IPC 2 carried out a master plan study on Muara Sabak in 2000. This study projects that the traffic at Muara Sabak will reach 2.35 million tons (break bulk), 250 thousand tons (container), 540 thousand tons (CPO), and 450 thousand tons (coal) in 2025. Traffic projection up to 2025 is given in this study. In this case, Muara Sabak will be handling 77% of the total of the Jambi's three terminals. This report proposes the creation of 1,100 m-quay, 300m of which is for container. FIRR (financial internal rate of return) is found to be around 5%.

In 1996, DGSC carried out a comprehensive port development study for the Southern Sumatra and West Java Region. Jambi and Muara Sabak are included in the study. The plan for Phase 1 development of Muara Sabak includes a 500m multi-purpose quay. Muara Sabak and Tanjung Api-Api are similar in development concept, aiming to provide a deeper draft port catering for the cargo from Jambi Province. The report concluded that Tanjung Api-Api would provide a lot deeper draft than Muara Sabak.

3.4.3 Palembang

Numerous studies have been carried out on the deep-water port development at Tanjung Api-Api. In 1996, DGSC carried out a comprehensive port development study for the Southern Sumatra and West Java Region. Palembang and Tanjung Api-Api are included in the Study.

Taking the assumptions shown below, the study projected that Tanjung Api-Api would handle 32 million tons of dry bulk, 6.59 million tons of liquid bulk, and 2.83 million tons of break bulk.

1) 75 % of the cargo from the South Sumatra province will be handled at Tanjung Api-Api

and the rest will be transferred mid-stream and handled at other ports.
2) 50 % of the cargo from the Jambi province will be handled at Tanjung Api-Api and the rest will be transferred mid-stream and handled at other ports.

The following are the conclusions and recommendations of the study.

1) If the private sector develops a coal port together with land access to Tanjung Api-Api, development of a public port at Tanjung Api-Api seems viable.
2) Otherwise, public port development at Tanjung Api-Api is doubtful.
3) Accordingly, the final decision on public port development at Tanjung Api-Api can be made only after an overall scheme of coal exports and associated infrastructure is determined.

3.5 Inland Transportation Network

3.5.1 Road

Road development of all the three provinces is behind the state average.

The Trans Sumatra Highway is the main road in this area providing a north-south link between the major cities located inland. The east-west road link is not well established, though.

Road between Pekanbaru and Dumai has been developed connecting the two areas in four hours by a passenger car. The road conditions are not sufficient to cater for heavy trucks.

A road from city of Jambi to Muara Sabak is under construction. It takes 2.5-hours' drive and about a half is paved The road will be improved within a few years.

A 68km access road between city of Palembang and Tanjung Api-api is under construction. A part of the road has already been developed with a provisional section. Out of the entire span, only a 15 km section is paved and about half of the pavement is already badly damaged. This project is likely to need quite a while due to the soft soil condition in the swampy area.

3.5.2 Railway

Only South Sumatra has railway in the tree provinces of the target ports. The railway connects Lampung, Baturaja, Perabumulih, Palembang, Muara Enim, and Lahat. This railway is used carry minerals like coal as well as passengers.

There is a plan to construct a railway from Palembang (Simpang) to Tg. Api-api.

3.5.3 Airport

Riau has five airports with a runway of 1,300m or longer in the main land. Jambi has Sultan Thaha Airport with a runway of 1,900m at City of Jambi. In South Sumatra, there are two airports with runway of 1,300m or longer.

3.6 - 3.8 Port cargo, Passengers and Calling Vessels in Sumatra River Ports

For Sumatra, it is important to note that most of cargo coming under the 'jurisdiction' of the port office is handled at private wharves. Much of this cargo is composed of coal, palm oil, cut timber and processed wood, pulp and fuel, the same as at other ports.

Palembang is the largest of the 7 study ports both in terms of total cargo (almost 11 million tonnes) and public berth cargo (1.4 million tonnes) in 2000. However, traffic has been growing the slowest of all the Sumatran ports, at about 3 % per year over the last 10 years.

Pekanbaru handles about 5.6 million tonnes in total of which 0.9 million tonnes is public. Private traffic has been growing by over 10 % per year, but public cargoes only by 3 percent.

Jambi handles about 3.5 million tonnes in total of which only 0.2 million tonnes passes through public port facilities. Total traffic has been growing at about 7 percent per year, but public cargoes have stagnated, partly due to the lack of port facilities and the low water depth available in the river at Jambi city (which is a long distance upriver).

In general, container traffic has rarely been handled at all the river ports for 5 or 6 years because of lack of equipment and various other reasons. However, container volumes have grown rapidly each year even if they are still at low absolute volumes.

Curiously, and partly due to its private sector run container facilities, Pekanbaru handles the most containers at present, many based on the pulp and paper industry located there. The number of containers (TEUs) handled at Palembang, Pekanbaru and Jambi in 2000 were 50,000, 90,000 and 25,000 respectively. In many locations where container handling is not developed, private wharves are also handling a relatively large amount of containers.

Passenger volumes have continued to grow over the last 10 years, and the economic crisis seems to have given it an added impetus with many ports throughout Indonesia registering 10-20 % growth per year over the last few years.

In line with increasing cargo volumes, the number of ship calls have grown. Since international bound traffic has often been in larger ships so these ships have registered lower growth in GRT. Domestic vessels, being small, have tended to increase in average size at a much faster rate.

3.9 Port Management Systems

Sumatra Island consists of 8 provinces. As for public ports, Sumatra has 40 commercial ports (including 9 river ports) and 130 non-commercial ports (including 12 river ports). There are 422 special ports.

The Indonesia Port Corporation (IPC) I manages 24 commercial ports located in D.I. Aceh, North Sumatra and Riau, while IPC II is responsible for 18 commercial ports located in Jambi, West Sumatra, South Sumatra, Lampung and Bengkulu. The branch offices of IPC in each port are in charge of the port's daily operation. Port Administration Offices (KANPEL) are responsible for the management of these ports. They are now under the control of DGSC.

3.10 Cargo Handling System and Productivity

3.10.1 Pekanbaru

Cargo handling in the public wharf in Pekanbaru is provided for 24 hours and seven days a week. However, Perawang container terminal is operated only during the daytime due to the lack of lighting.

The productivity in 1999 was 16t/gang/hour for break bulk and 21t/gang/hour for bagged cargo. Berth occupancy ratio was 59 %. Average turn around time (from a request for entry into the channel to the departure from the port) was 110 hours.

3.10.2 Jambi

Cargo handling in the public wharf in Talang Duku is provided for 24 hours and seven days a week.

The productivity in 1999 was 21t/gang/hour for break bulk and 12t (domestic shipping)-25t (overseas shipping)/gang/hour for bagged cargo. Berth occupancy ratio was 42 %. Average turn around time (from a request for entry into the channel to the departure from the port) was 73 (domestic shipping)-76 (overseas shipping) hours.

3.10.3 Palembang

Cargo handling in the public wharf in Boom Baru is provided for 24 hours and seven days a week.

The productivity in 1999 was 23t (domestic shipping)-36t (overseas shipping) for break bulk and 23t (domestic shipping)-30t (overseas shipping)/gang/hour for bagged cargo. Berth occupancy ratio was 63 %. Average turn around time (from a request for entry into the channel to the departure from the port) was 74 (domestic shipping)-50 (overseas shipping) hours.

3.11 Maintenance Dredging of Channels

(1) Dredging in River Channels

One of the most serious difficulties facing river ports in Sumatra and Kalimantan is the large volume of the maintenance dredging of their navigation channels. Out of the higher ranked 30 Indonesian ports, 17 are classified as River Ports.

Expenses for dredging in Rupiah shows an extremely high rising tendency after the fiscal year 1991. While the dredged volume was almost flat for the fiscal years 1990 and 1998 (1990/91: 16.1 million m^3/year – 1998/99: 15.4 million m^3/year), government expenses for the dredging increased by three times (1990/91: 16.8 billion Rp. – 1998/99: 51.6 billion Rp.). Hence, the expenses for maintenance dredging have become a big share in the governmental budget for port development/construction in recent years.

(2) System of Channel Administration

The responsibility of administration for the port area and navigation channel is prescribed by laws (i.e., PP* No.70/1996 and KM* No.26/1998) as follows.

* PP: Peraturan Pemerintah (Governmental Regulation)
KM: Keputusuan Menteri (Ministerial Decree)

(i) DLKR (Daerah Lingkungan Kerja; Port Working Area)

DLKR (Port working area) is defined for the water area and/or land area in the port administrative area. The Public Port Corporation (PT. Pelabuhan Indonesia) has the rights and responsibility of the administration of DLKR in the commercial port and bears the expenses for the maintenance dredging of the harbour basin and navigation channels within the area of DLKR.

(ii) DLKP (Daerah Lingkungan Kepentingan Pelabuhan; Port Interest Area)

DLKP (Port interest area) is defined for the port and related, important water areas surrounding the water area of Port Working Area to support safety of ships, such as access channels and/or navigation channels. The central government has the rights and responsibility of the administration.

In the former system under PP No.11/1983, DLKP was not clearly defined for the use of water area but only for land area. The rights and responsibility on the security and maintenance of navigation channels belonged to the central government. The wide range of modification of system was conducted by the above-mentioned laws and decrees (PP No.70/1996 and KM No.26/1998).

The administration of the navigation channels of the Study Areas is as follows.

Samarinda: The navigation channels along the Mahakam River belong to DLKR from Port of Samarinda to the river mouth.

Sampit, Kumai:	DLKR
Pontianak:	DLKR
Jambi:	DLKR
Palembang:	The navigation channels along the Musi River belong to DLKP from Sungai Lais to the river mouth.

(3) Dredging Program

DGSC of MOC establishes the yearly dredging program of the navigation channel according to the proposal from the public port corporations.

(4) Maintenance Dredging in the Channel

1) Pekanbaru (Sungai Siak)

30,000 m^3 of dredging work was carried out in the navigation channel in 1998 in the vicinity of the Perawang Port. This is the only actual result of the dredging in the latest 10 years in Sungai Siak. The necessity of maintenance dredging in the navigation channel is judged negligible.

2) Jambi (Sungai Batanghari)

10 km of navigation channel for Port of Jambi is maintained by dredging in the estuary of Sungai Batanghari. The annual average volume of the dredging is around 350,000 m^3/year and the dredging work has been carried out for four times in the recent eight years.

3) Palembang (Sungai Musi)

The total extension of the navigation channel for Port of Palembang maintained by dredging reaches about 25 km in Sungai Musi. The annual average volume of the dredging reaches 2.3 million m^3/year and the dredging work has been carried out every consecutive year.

85 – 90 % of the dredged volume comes out from the channels from downstreams of the Payung island and the area of Outer Bar. The public expense for Palembang accounts for about 24 % of the government annual budget for the dredging for the commercial ports.

To cope with the heavy burden of the maintenance cost of the navigation channels, a measure has been implemented to share the cost by the syndicate comprising IPC-II and other companies that have their private wharves along the river channel (e.g.

PERTAMINA, PUSRI, BUKIT ASAM, etc.)

3.12 Structural Design

3.12.1 General

Table 3.12.1 shows the outline of existing port facilities. Since all sites, except for Tanjung Apiapi (Palembang), are located along a river, the effect of marine phenomena such as wave, current, corrosion loss on steel materials by saline water and etc. are expected to be less. On the other hand, however, another kind of issue is unavoidable: the siltation/sedimentation which will cause change to water depth and navigation channel.

Table 3.12.1 Outline of Port facilities

Location		**Sumatra**							
		Pekanbaru		**Jambi**			**Palembang**		
Province		Riau		Jambi			South Sumatra		
Port Office		IPC-I		IPC-II					
Name of Port		**Pekanbaru**	**Perawang**	**Jambi**	**Talang Duku**	**Muara Sabak**	**Boom Baru**	**Sungai Lais**	**Tg. Apiapi**
Situation		Existing	Existing	Closed	Existing	Not used	Existing	Existing	Plan
Name of River		Sungai Siak		Sg. Batang Hari			Sungai Musi		Sg. Banyu Asin
Dist. from river mouth		178 km	134 km	157 km	147 km	15 km	111 km	105 km	
Navigation channel	Length			10 km			111 km		Natural navigational approach
	Width	150 m		70 m			120 m		
	Depth (LWS)	- 7 m		N.A.	-4.5 m		-6m		
	Side slope				1:8		1:4		
	Volume				350,000 m3/yr		2,450,000 m3/yr		
Port area					50 ha		4.6 ha		N. A.
Berthing facility	Length	278m	88 m		67 m x 3	80 m	736 m	280 m	
	Depth	-3.5/-5 m					-7 to 9.2 m	-3.5 m	
	Width		20 m		10 m		10.5-19.5 m	15 m	
	Max. Ship	1000 DWT							
	Structure	*Concrete Deck on piles *Sheet pile	Concrete deck on piles		Pontoons 2x Conc. 1x Steel, With movable access	Concrete deck on piles	Concrete deck on piles	Sheet pile wall	
Port yard	Gen. Cargo		0.2 ha				0.8 ha	0.4 ha	
	Container	0.34 ha	0.5 ha		8 ha	3 ha	3.6 ha		

(Cont'd)

(Cont'd) **Table 3.12.1 Outline of Port facilities**

Name of Port	**Pekanbaru**	**Perawang**	**Jambi**	**Talang Duku**	**Muara Sabak**	**Boom Baru**	**Sungai Lais**	**Tg. Apiapi**
CFS			N.A.	NA				N.A.
Warehouse(unit/m2)	3/1920					8972		
Passenger terminal (person)	150					196		
Power supply (KVA)	62			105				
Water supply(m3/hr)	30							
Road access	Available	Available		Available	Available	Available	Available	
Remarks		Operation started in April '99	Closed in 1997	Operation started in April '97	Not used		For local boat	

3.12.2 Design Standard

In this report, the basis of the technical overview were the Indonesian and Japanese design standards and some other reference literatures such as UNCTAD reference book.

3.12.3 Sub-soil Conditions

At a majority of the Study ports, sub-soil consist of rather soft stratum with N-value less than 10. At some port sites such as Pontianak, the hard stratum extends deeper than –60 m below LWS (Low Water Spring).

3.12.4 Water Level

The range of water level fluctuation is affected not only by tide but also by the flood of river water. The tidal range of each Study port is not large except for Jambi where water level fluctuated more than 5 m.

3.12.5 Design Criteria

(1) Live loads

The design load conditions for planned facilities are determined on the bases of present load conditions and future required load intensity.

(2) Seismic Load

A precise seismic load condition on the existing port facilities was not obtained from each Port except for Muara Sabak. The design seismic factor is, therefore, estimated by using regional seismic coefficient for each port site, which varied between 0 to 0.094.

(3) Ship berthing velocity

As to the ship berthing velocity, a little bit higher speed is recommendable to secure safe berthing against the flow of the river stream. 15 to 20 cm/sec of design berthing speed is preferable.

3.12.6 Dimension of Navigation Channel

According to the several design standards, 85 m to 131 m wide channel is required to allow two-way ship passage.

3.12.7 Structural Type of Port Facilities

Most of existing quay facilities consist of "Concrete deck on piles" type. Some use batter/raking piles to resist lateral force. Many variations on pile materials such as RC, PC and steel pipe were observed. A determination will be made on the materials of the foundation piles taking the effects of steel corrosion by seawater into consideration.

3.12.8 Cargo Handling Equipment and Port Service Boats

Among the Study ports, only Pontianak is utilizing container gantry crane, while all others are still using mobile crane or top-loader/forklift for container handling. Although the desire of each Port branch office to obtain gantry crane and yard transfer crane system is understandable, the future container cargo handling system for each port should be examined on the basis of the future port development stages, which depend on the scale of the future container cargo volume for each Study port.

3.13 Conditions of Construction Procurement

3.13.1 General

For the purpose of estimation of construction cost, unit price of each element such as labour, major construction material and equipment are to be determined.

The costs of imported products are to be estimated using the average exchange rate of the currencies (Rupiah, Japanese Yen, US Dollar, etc.).

The basic costs of the construction works and unit prices are to be determined based on the availability of materials, labor, construction equipment and accessibility to the sites.

The capacity and capability of the local contractors are to be determined.

3.13.2 Findings in the Each Region

(1) Jakarta and Surabaya (Java)

Many construction companies exist which have experience in the construction of the port facilities. Almost all the construction materials are available in the Java region.

(2) East Coast of Sumatra, West, Central and East Kalimantan

Some branch offices of the construction companies in this region exist which have experience in port facilities construction.

3.13.3 Basic Cost of Construction Work

(1) Basic Cost of the Works

The breakdown of unit costs of the construction works are to be prepared by accumulating costs of labour, materials, equipment and also the indirect costs such as general temporary works, overheads, profit and so on.

(2) Depreciation Periods of Port Facilities

The depreciation periods of port facilities are to be assumed based on the report “Taksiran Umur Ekonomis Tetap” (source: IPC2, 1995).

3.14 Natural Conditions of Study Areas

3.14.1 Pekanbaru (Sungai Siak)

(1) Position

Port of Pekanbaru is located on Sungai Siak (Riau Province) about 90 miles (165 km) upstream from the river mouth (00º32'29"N, 101º26'21"E). The entrance and navigation channel to the port is via Selat Bengkalis (Bengkalis Strait) and Sungai Siak (Siak River).

(2) River basin and discharge

Topography of the river basin of Sungai Siak is flat lowland and swamp covered by mangrove (bakau) forest still remaining undeveloped around Pekanbaru. The elevation of the urban area of Pekanbaru is 3-5 m above mean sea level (MSL).

Sungai Siak has a catchment area of 12,474 km^2 and total length of the main stream (including the branch stream) 572 km. The average yearly discharge is given as 15,744 x 10^6 m^3/year (Source: Kantor Menteri Negara Pekerjaan Umum; 2000).

The width of the river channel varies 75 - 100 m, the water depth of the channel ranges from 3-5 m (at the river mouth confluence at Selat Bengkalis) to 15-20 m (at mid stream). The extension of the navigable channel is 261 km (source: Dinas Pekerjaan Umum, Propinsi Riau).

(3) Climate

Climate in Pekanbaru has rainy season (November to April) and dry season (May to October). In rainy season, average rainfall in the area is 150 – 250 mm with total 15-20 rainy days per month. It is usually fine weather in dry season with rainfall of 50 – 100 mm and 7-12 rainy days per month.

(4) Tide and water level fluctuation

Average tidal range is 2.20 m at spring tide and 0.60 m at neap tide. The of tidal form is mixed semi-diurnal. Amplitude (in cm) of tidal constituents at Sungai Siak is as follows (source: Tide Table; Dinas Hidro-Oseanografi, 2001).

M_2: 68, S_2: 40, N_2: 12, K_2: 11, K_1: 9, O_1: 25,
Number of tidal type $F = (K_1 + O_1)/(M_2 + S_2) = 0.315$ (mixed semi-diurnal)

Water level fluctuation in the river channel has the range of 1.5-2 m at Pekanbaru and still maintains semi-diurnal tidal characteristics.

(5) Current

Maximum current speed (2.5 knots) in the river channel occurs at ebb tide about 2.5 hours before low water. At flood tide, maximum current is 2 knots and occurs about 2.5

hours before high water (source: Informasi Pelabuhan; Dinas Hidro-Oseanografi, 2001).

3.14.2 Jambi (Sungai Batanghari)

(1) Position

Port of Jambi is located on Sungai Batanghari (Jambi Province) about 85 miles (155 km) upstream from the river mouth (01º35'15"S, 103º50'48"E). The entrance channel to the port is facing Selat Berhala (Berhala Strait) and was relocated by dredging from the old channel at the neighboring east shoal.

(2) River basin and discharge

Topography around the port area is flat lowland and swamp formed by alluvial deposit. The elevation of the urban area of Jambi is 8-10 m above MSL.

Sungai Batanghari is the largest river in Sumatra; it has a catchment area of 44,554 km^2 and stretches over three provinces (Jambi, West Sumatra and Riau). The total extension of the main stream (including the branch) is 691.5 km. The width of the river channel varies 300 - 500 m, the water depth of the channel ranges 6-7 m.

Average normal discharge of Sungai Batanghari in rainy season is about 3,400 m^3/sec and the minimum discharge in dry season is 300 m^3/sec. The average yearly discharge is given as 46,826 x 10^6 m^3/year (Source: Kantor Menteri Negara Pekerjaan Umum; 2000).

(3) Climate

Oceanic tropical climate is dominant in this area. Climate in Jambi seems to have rainy season (November to April) and dry season (May to October).

The dry season is June and July in the area and sometimes rainfall of 80-95 mm per month. The biggest of rainfalls are in November/December and in March/April when the rainfall averages 300-400 mm per month.

(4) Tide and water level fluctuation in river

Average tidal range at the river mouth (Kuala Niur) is 3.5 m at spring tide and 0.7 m at neap tide. The tidal form is mixed semi-diurnal. Amplitude (cm) of tidal constituents at Kuala Niur is as follows (source: Tide Table; Dinas Hidro-Oseanografi, 2001).

M_2: 78, S_2: 19, N_2: 12, K_2: 9, K_1: 67, O_1: 48, P_1: 5, M_4: 6, MS_4: 7,
Number of tidal type $F = (K_1 + O_1)/(M_2 + S_2) = 1.186$ (mixed semi-diurnal)

Maximum current speed (2.5 knots) in the river channel occurs at ebb tide.

Yearly water level fluctuation in the river channel is rather big in Sungai Batanghari and has its range of 5-6 m at Talang Duku (Jambi) between dry season and rainy season. In the rainy season, the high water level following flood discharge continues for 3 – 4

weeks.

3.14.3 Palembang (Sungai Musi)

(1) Position

Port of Palembang is located on Sungai Musi (South Sumatra Province) about 105 km upstream from the river mouth (02º58'48"S, 104º46'36"E). The estuary area faces Selat Bangka (Bangka Strait) and the large Outer Bar area is formed by silt sedimentation. The entrance channel to the port is narrow and maintained by dredging.

(2) River basin and discharge

Topography from the urban area of Palembang to the coastline is flat lowland and swamp formed by alluvial deposit. The elevation of the urban area of Palembang ranges 0-20 m above MSL.

Sungai Musi has a catchment area of 77,234 km^2 and it accounts for 70 % of the area of the province. The water depth of the river channel is generally more than 5 m below LWS and the width of the river channel is 300 - 600 m.

Average normal discharge of Sungai Musi (at Boom Baru) in rainy season is about 3,500 m^3/sec and the minimum discharge in dry season is 1,800 m^3/sec. The average yearly discharge is given as 78,260 x 10^6 m^3/year (Source: Kantor Menteri Negara Pekerjaan Umum; 2000).

(3) Climate

Climate in Palembang seems to have two rainy seasons in a year (i.e., March – July and October – January). In the main rainy season from October to January, it has rainfall of 250 – 350 mm per month

(4) Tide

Average tidal range is 3.80 m at spring tide. The tidal form is diurnal. Amplitude (cm) of tidal constituents at the river mouth is as follows (source: Tide Table; Dinas Hidro-Oseanografi, 2001).

M_2: 27, S_2: 13, N_2: 5, K_2: 4, K_1: 80, O_1: 60, P_1: 23,
Number of tidal type $F = (K_1 + O_1)/(M_2 + S_2) = 3.50$ (Diurnal)

(5) Current

Maximum current speed (2-3 knots) in the river channel occurs at ebb tide and the characteristics of current is diurnal similar to the tide. The current of the river without effect of tide has maximum speed 0.6 knots.

3.15 The Environmental Outline of East Coast of Sumatra

The large swamp areas landward from coast is characteristic in the provinces of Riau, Jambi and South Sumatra in the east coast of Sumatra Island.

Mangrove communities mainly mangrove species Api-Api (family Ververaceae), distribute on the mudflat at river estuaries. Since the mudflat at the estuaries slopes very gently, mud sedimentation was hastened and then, a marvelous Api-Api forest took root on the coast of Riau, Jambi, South Sumatra provinces.

Since Nipa palm communities distribute along the river in brackish area (brackish plateau), the people living in the area use its long leaves for roofing materials.

The vast fresh water swamps distribute in the plateau covered with peat, forming the following forests: 1) lowland forest, 2) peat swamp forest, and 3) fresh water swamp forest. These 3 types of forest area occupy 82 % of whole Jambi provincial area. This tendency is the same as in Riau and South Sumatra provinces. The three study areas in Pekanbaru, Talang Duku, and Palembang are situated at the edge between the plateaus covered with peat to hill.

Land accretion can be recognized in the behaviors of mangrove species distributions. Some mangrove formations occur around the estuary of the river. These mangrove forests are distributed in ecological zone strip-shapes which implies each mangrove species distributes to different types of forest strips from the sea to landward depending on the specific characteristics and frequency of inundation, salinity contents in forest floor (species genus: *Avicennia* (Api-Api), *Sonneratioa*, *Rhizophora*, *Buruguiera*).

The pioneer mangrove species Avicennia forms mangrove forest at the mouth of the river first. The flow velocity from the upstream of the river decreases by the friction of the mangrove floor. Thereafter, soil sedimentation accumulates on the forest floor. The land level gradually rises with the soil sedimentation, and behind it, strip species form. The pioneer species Avicennia (Api-Api) further advances seaward.

Recent research in this area indicated that the rate of advancement of shore lined can be estimated as 20 m per year.

Environmental outlines in each study area are described as follows.

(1) Pekanbaru (Siak River)

Marvelous natural forests of mangrove Api-Api are distributed from the estuary of Siak river to Kampaar river along the coast, which is specified as a provincial natural mangrove conservation area. There are five natural conservation areas in Riau province at present.

(2) Jambi (Batanghari River)

Mangrove area and tropical peat swamp are distributed landward from the estuary of Batanghari River. Soil property in this area is not suitable for paddy fields because of the high salinity contents of brackish water. Rapid forest degradation by conversion from primeval forest to oil palm plantation has caused soil erosion at the river basin from 1960s', which is supposed to be a source of riverbed sedimentation.

Lowland forest occupies the largest area (60%) of the vegetation in Jambi Province. Peat swamp forest, mountainous forest, mangrove forest, and fresh water swamp are next in order after lowland forest. 22 plant species are listed as protected as well as 28 species of mammal, 1 fish, 4 reptiles, 25 birds.

Jambi provincial government has conducted measurement of 4 parameters of water quality sampled from 14 points in Batanghari River quarterly each year. The results of the measurement show COD, BOD, pH, SS and Coliform do not exceed the environmental standards of Jambi Province. Water quality grade in Batanghari River is categorized as fair or good throughout the year. pH values downstream are higher, caused by the saline water, while pH values upstream are lower, caused by acid forest soil in the river basin.

The Berbak Protected Area is one of the precious swamp forest area spread out on the right bank of river. Five protected areas distribute in the Province of Jambi. Some of rare birds (Brahminy kite and Sea eagle) were observed during the Study Team survey.

(3) Palembang (Musi River)

Since Outer Bar opens widely and the sea is shallow for some distance from the shore, soil sedimentation at the estuary of Musi River is intensive. Consequently, vast Api-Api forest spread around the estuary the same as the other two rivers (Siak river and Batanghari river). Regarding the Api-Api forest along the east coast of Sumatra, it is not an exaggeration to say that Api-Api forest along the coasts are the most majestic of this species forest in the world.

Five natural protected areas are defined in South Sumatra Province. Precious species hornbill and crocodile have been observed in the Musi River basin before. From the results of interviews, these species don't inhabit around the proposed study area. Some rare birds (Brahminy kite and Sea eagle) were also observed during the Study Team survey.

4. PRESENT CONDITIONS OF THE PRINCIPAL RIVER PORTS IN KALIMANTAN

4.1 Regional Development Plans

4.1.1 General

Indonesian Kalimantan occupies three fourths of the Kalimantan Islands. The border between Indonesia and Malaysia is made up of high mountains, from which many long rivers flow down into Karimata Strait, Jawa Sea and Makassar Strait, forming huge low land. Our target ports, Ports of Pontianak, Kumai, Sampit and Samarinda, are located near the estuaries of Kapuas River, Kumai River, Mentaya River and Mahakam River, respectively.

Population density of the Kalimantan Island is lower than that of Indonesia. Population density of Central and East Kalimantan Province is further lower than that of West Kalimantan Province.

The mountain regions are rich in coal, whereas the lowlands can provide rich crude oil / natural gas fields and cultivation land for plantation of oil palm, rubber coconut and so on.

Transportation in Kalimantan is greatly affected by the topography. The east-west land transportation in the island is interfered by the traversing high mountains. Trans-Kalimantan Highway has been proposed to connect main cities and towns in Kalimantan, but is still under construction. Coast-to-inland highway system is also very poor. Thus, the rivers are playing very important roles as coast-to-inland waterway routes, especially cargo outlet and gateway to / from the larger market places other than Kalimantan, through Ports of Pontianak, Kumai, Sampit and Samarinda, our target ports. Forest is another asset of Kalimantan. Logging is important industry, especially in West and East Kalimantan Province. Under these conditions, oil and gas production, oil refinery, coal mining, wood processing, agricultural plantation, and CPO production have been developed as main industries in the Kalimantan Island.

Per capita GRDP of West Kalimantan is almost the same as the nation average both in cases with and without oil and gas. The economy of West Kalimantan is depending on agriculture and manufacturing rather than oil and gas production. In these days, CPO plantation has been rapidly developed to increase palm oil export to neighboring countries.

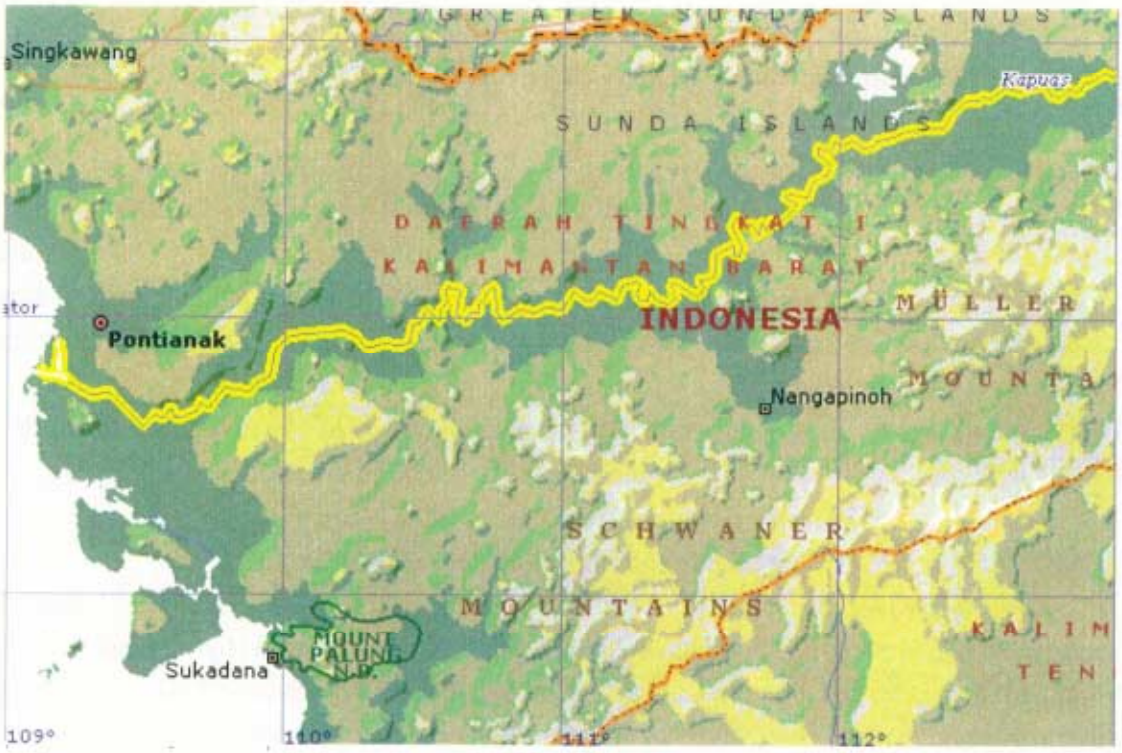
Per capita GRDP of Central Kalimantan is higher than the nation average both in cases with and without oil and gas. Since the Province has the largest area of agriculture and forest estate in Kalimantan, the economy is highly depending on agriculture as well as forestry.

Per capita GRDP of East Kalimantan is placed at the highest rank in Indonesian 27 provinces (as of 1998). Needless to say, production of oil, gas, and coal in East Kalimantan greatly contributes to the successful status in terms of per capita GRDP.

4.1.2 Agriculture, Forestry and Fishery

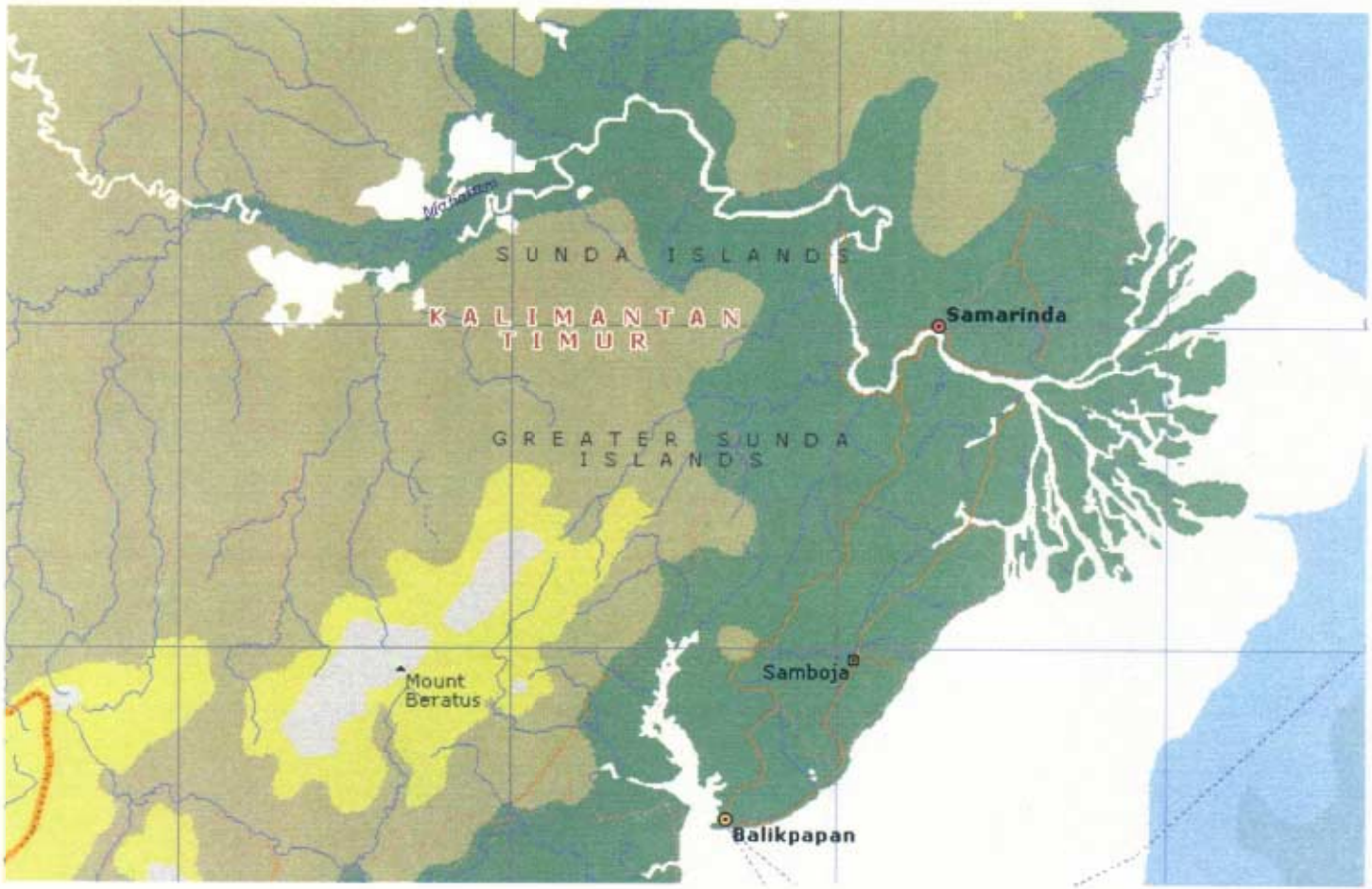
Comparing proportion of crop area against total area by province, West Kalimantan accounts for 4.9%, whereas Central and East Kalimantan account for 2.4% and 1.2%, respectively, which show further lower rank in land for crop than the nation average (6.0%).

On the other hand, evaluating forestry industry by area of production forest, the area in Central and East Kalimantan overwhelm West Kalimantan. Fishery is also very active in East Kalimantan, but not active



Pontianak and Kapuas Kecil River

Kumai and Kumai River, Sampit and Mentaya River



Samarinda and Mahakam River

in Central Kalimantan.

Agricultural estates, i.e. plantation area, have been developed in various scales. West, Central and East Kalimantan Provinces have high production level of palm oil. Those three provinces produce some 820 thousand tons of palm oil (15 % of the nation total) in 1999. Rubber is mainly produced in West and Central Kalimantan. Those two provinces produce some 339 thousand tons of rubber (23 % of the nation total) in 1999.

Forestry resources are abundant in Central and East Kalimantan, not in West Kalimantan. Central Kalimantan produces some 15 % of logs in Indonesia, but value-added production of wood remains very low. East Kalimantan produces some 29 % of logs in Indonesia, and wood processing is also main industry, there. Sawn timber, plywood and molding are main forestry products in East Kalimantan, to be exported from Samarinda and Balikpapan Port through Surabaya Port in East Jawa..

4.1.3 Industrial Development

The output of manufacturing in East Kalimantan is the largest and it has increased rapidly. The output of manufacturing in West Kalimantan has increased after the recession, whereas that of Central Kalimantan is sluggish. Main industries in Kalimantan are logging, wood processing, CPO processing, coal mining, and oil / gas industry. Wood and CPO processing can be seen in all provinces, but mineral resource industry has been established only in East kalimantan.

East Kalimantan is rich in oil and gas. Annual crude oil production in East Kalimantan accounts for some 70,205 MMSTB in 1999. Crude oil is transported to Balikpapan Port or refinery of Pertamina through pipeline, processed to be finalized, and exported using private loading facilities. Annual natural gas production accounts for some 1,562 million MSCF, 53 % of the nation total, in 1999. Natural gas is mainly transported to Bontang Port, and exported using private loading facilities.

East Kalimantan also has one of the largest coal mine in Indonesia, which is currently producing some 34 million tons per annum, 52 % of the nation total.

4.1.4 Prospects for Industrial Development

Industrial development of three provinces will capitalize on their rich natural resources and large arable land. Further plantation will be developed with CPO, taking a leading role. CPO production will increase, especially in West and Central Kalimantan, in accordance with provincial development policy for CPO plantation.

Forestry utilization is likely to continue as it is, keeping cutting volume within allowance trying to maintain forest resources.

Productions of oil and gas are likely to be maintained as it is, because more oil / gas deposits have been found. Development and expansion of coal mining is expected, especially in East Kalimantan.

All the provinces in Kalimantan have their own plan of industrial development, meanwhile it is taking more time to make it remarkably progressed.

4.2 Existing Port Facilities

4.2.1 Pontianak

(1) Public wharves

Public wharves are located in two areas, Pontianak, and Nipah Kuning, about 5 km distant from the Port of Pontianak down the stream. 710 m wharves (4-5 m deep) in front of the city center consist of 7 berths from NO.1 berth to NO.7 berth. Among 7 berths, NO.4, NO.6 and NO.7 berth handle container cargo. NO.3 and NO.5 berth handle both general and bulk cargo to be loaded into/unloaded from conventional vessels. NO.2 berth handles general cargo to be loaded into/unloaded from Indonesian traditional wooden vessels. Finally, NO.1 berth with passenger terminal is used for PELNI's high-speed passenger ship to/from Jakarta and other inter-island passenger boats. Meanwhile, 100 m Nipah Kuning wharves (4 m deep) handle general cargo to be loaded into/unloaded from Indonesian traditional wooden vessels only.

(2) Private wharves

Numerous private wharves are opened on both banks along the Kapuas River to support the local industries. Those private wharves handle CPO, plywood, rubber, and mostly smaller than public wharves in size. Most of bulk cargo like CPO and plywood, is transported by barge to load/unload a mother vessel in anchorage areas in the estuary.

4.2.2 Kumai

(1) Public wharves

Public wharves are located in two areas, Kumai and Bumiharjo, 11 km up the stream of the Kumai River. 322m wharves (4-5 m deep, 10 m in breadth) in front of the Kumai city center, handle general cargo, bulk cargo, in addition to passenger. General cargo to be loaded into/unloaded from Indonesian traditional wooden vessels, is also handled at wharves at Kumai. Meanwhile, a 60 m jetty, now under construction, will handle CPO liquid cargo in July 2001.

(2) Private wharves

Numerous private wharves are opened on both banks along the Kumai River to support the local industries. Those private wharves handle CPO, plywood, rattan, and mostly smaller than public wharves in size. Most of bulk cargo like CPO and plywood, is transported by barge to load/unload a mother vessel in anchorage areas in the estuary.

4.2.3 Sampit

(1) Public wharves

Public wharves are located in two areas, Sampit and Bagendang, 22 km down the stream of the Mentaya River. 316 m wharves (5.5 m deep, 10 m in breadth) in front of the Sampit city center,

handle container cargo, general cargo, bulk cargo, in addition to passenger. General cargo to be loaded into/unloaded from Indonesian traditional wooden vessels, is also handled at wharves at Sampit. Meanwhile a 150 m jetty, now under construction, will handle CPO liquid cargo in December 2001.

(2) Private wharves

Numerous private wharves are opened on both banks along the Mentaya River to support the local industries. Those private wharves handle CPO, plywood, rattan, and mostly smaller than public wharves in size. Most of bulk cargo like CPO and plywood, is transported by barge to load/unload a mother vessel in anchorage areas in the estuary.

4.2.4 Samarinda

(1) Public wharves

Public port facilities are located in two areas, that is, Samarinda and Mangku Palas, located on the opposite bank of the Mahakam River. Wharves (937 m long, 5-7 m deep) in front of the Samarinda city center, handle container cargo, general cargo, bulk cargo, in addition to passenger. Among 937 m wharves, a wharf in the middle is specified for accommodating Indonesian traditional wooden vessels, and 100m wharf next to the traditional vessel wharf, is remaining useless due to structural failure at this moment. On the other hand, there is 7 ha open storage yard in Mangku Palas across the river. IPC 4 is planning to accomplish port extension at Mangku Palas to cope with rapidly increasing port cargo.

(2) Private wharves

Numerous private wharves are opened on both banks along the Mahakam River to support the local industries. Those private wharves handle, plywood, coal, rattan, and mostly smaller than public wharves in size. Most of bulk cargo like coal and plywood, is transported by barge to load/unload a mother vessel in anchorage areas in the estuary.

4.3 Access Channels

4.3.1 Pontianak

(1) General

The access channel is composed of 15 km estuary channel and 16 km river channel. Total length of the access channel is 31 km. The width and depth of the channel are 80 m and 5.5 m, respectively. Tidal range is 1.3 m at Pontianak Port.

(2) Navigation rules

IPC 2 has the right and responsibility for the administration of the total length of access channel. Pilotage is required for vessels over 150 GRT. Night navigation is allowed, and vessel traffic is two ways throughout the channel.

4.3.2 Kumai

The access cannel is composed of the estuary channel and the river channel. The total length of the access channel is 20 nautical miles. The width and depth of the channel are 50 m and 5 m, respectively. Tidal range is 2.0 m at Kumai Port.

4.3.3 Sampit

The access cannel is composed of the estuary channel (10.2 km) and the river channel. The total length of the access channel is 34 nautical miles. The width and depth of the channel are 50 m and 4.5 m, respectively. Tidal range is 2.0 m at Sampit Port.

4.3.4 Samarinda

(1) General

The access cannel is composed of the estuary channel and the river channel. The total length of the access channel is 37 nautical miles. The width and depth of the channel are 70 m and 6 m, respectively. Tidal range is 1.5 m at the Port of Samarinda , and almost the same as at the estuary of the river.

(1) Navigation rules

IPC 4 has the right and responsibility for the administration of the access channel from the Samarinda Port to the river mouth. The Central Government has the right and responsibility for the administration of the access channel further ahead beyond the river mouth. Pilotage is required for vessels over 150 GRT. Vessels of less than 153 m length(LOA) and 6.8 m draft are allowed to enter the channel by taking advantage of high tide.

4.4 Existing Port Development Plans

4.4.1 Pontianak

(1) Port Extension Program at Pontianak

To cope with rapidly increasing demand of port cargo, in particular containerized cargo to/from the broad port hinterland in West Kalimantan, IPC 2 formed the container terminal extension program . The port extension program consists of the following three stages, (i) Urgent Port Improvement (Target Year 2003), (ii) Medium Term Port Extension (Target Year 2008), and (iii) Long Term Port Extension (Target Year 2018).

(2) New Deep Sea Port Development Plan at Temaju

In accordance with agronomical growth and concentrated investment, especially in CPO plantation development in West Kalimantan, Local Government is planning to frame a new port development project for large-scale CPO process and distribution terminal in the Temaju Island, about 80 km distant from Pontianak to the north. The proposed conceptual port development plan is to construct one concrete jetty (100 m long, 10 m deep, 25 m in breadth) with 2 mooring dolphins for 40,000 DWT CPO tanker ship, 8 CPO storage tanks, 8 CPO supply tanks and supporting facilities. The new port plan also includes an oil tanker terminal, a container terminal equipped with 4 container berths.

4.4.2 Kumai

In order to cope with growing demand of CPO-related cargo in particular, IPC 4 launched the new port development project for CPO process and distribution terminal and container/general cargo terminal in Bumiharjo, 11 km up the stream of the Kumai River. The long term port development project based on future CPO cargo demand is to construct 3 jetties (60 m long), 30 CPO tanks, other CPO-related tanks and pipeline, roads, and supporting facilities by the end of the year 2010. The construction work was initiated in February 2001.

4.4.3 Sampit

In order to cope with growing demand of CPO-related cargo in particular, IPC 4 launched the new port development project for CPO process and distribution terminal in Bagendang, 22 km down the stream of the Mentaya River. The long term port development project based on future CPO cargo demand at port is to construct 3 jetties (150 m long, 6 m deep), 32 CPO tanks, other CPO-related tanks and pipeline, roads and supporting facilities, which require 13 ha land, by the end of the year 2010. 90 % of jetty construction at the first phase project was fulfilled in February 2001.

4.4.4 Samarinda

(1) Short Term Port Improvement Program

To cope with rapidly increasing demand of port cargo, especially containerized cargo at Samarinda Port, IPC 4 formed the short term port improvement program. The program consists of the following three stages and is planed to be executed by the year 2005..

(i) The First Stage : Pavement with concrete over the traditional vessel wharves, and land acquisition at Mangku Palas.

(ii)The Second Stage : The demolishment of labor pool building, harbor master office and coastguard office.

(iii) The Third Stage : The construction of a new 170 m concrete wharf at the middle of the port.

(2) New Deep Sea Port Development Plan at Marang Kayu

IPC 4 is planning to launch a new deep sea port development project free from high dredging cost caused by maintenance of long and shallow access channel. The project is to construct a deep sea container terminal at the neighboring area of the Cape Marang Kayu, which accommodates oceangoing full-container vessels loaded with export/import container cargo.

(3) Port Improvement and Development at Balikpapan

The port improvement and development at Balikpapan, 110 km away from the City of Samarinda, will exert significant influence on the direction of Samarinda's port development. In this sense, the following two projects should be mentioned.

(i) Long Term Development Plan at Kariangau

The project was to construct a deep sea reclaimed port at Kariangau, which consists of 2 container berths (10 m deep) accompanied by 3 ha container yard, 3 conventional berths (450 m long, 10 m deep), reinforced port roads and supporting facilities.

(ii) Port Extension Plan at Semayang

The port extension plan at Semayang is to construct one jetty-type container wharf (200 m long, 20 m deep, 20 m in breadth), and 3.4 ha container yard which will be developed by means of reclamation in front of the waterfront highway.

4.5 Inland Transportation Network

Road network in Kalimantan is not sufficient, because large area of the territory is swampy, or mountainous. The road density is less than Indonesian average. Regional road length in Kalimantan is shown in Table 4.5.1.

Meanwhile, the air-transport network is efficiently linked by modern airport facilities, which are deployed in strategic locations in the whole Kalimantan Island. The airport location list is shown in Table 4.5.2.

Table 4.5.1 Regional Road Length in Kalimantan

(Unit : Km in 1998)

Province	State Road Length	Provincial Road Length	Regency/Municipality Road Length	Total	Area (km)	Road Density (km/km2)
Kalimanta Barat	805	1,598	9,510	11,913	146,807	0.081147
Kalimantan Tengah	1,708	523	7,049	9,280	153,564	0.060431
Kalimantan Timur	1,641	1,543	4,802	7,986	210,985	0.037851
Indonesia	27,977	47,863	279,523	355,363	1,922,570	0.184837

Table 4.5.2 Airport Location in Kalimantan

Province	Airport Name	City Name	Runway
West Kalimantan	Supadio	Pontianak	1,850 m * 30m
Central Kalimantan	T. Jilik Riwut	Palangkaraya	1,850 m
	Iskandar	Pankalanbun	1,650 m
East Kalimantan	Sepinggan	Balikpapan	2,500 m * 30 m
	Temindung	Samarinda	1,850 m * 30 m
	Juwata	Tarakan	1,650 m * 30 m

4.6 - 4.8 Port Cargo and Vessel Calls in Kalimantan River Ports

For Kalimantan, it is important to note that most of cargo coming under the 'jurisdiction' of the port office is handled at private wharves. Much of this cargo is the same at all ports comprising coal, palm oil, cut timber and processed wood, pulp and fuel.

Samarinda is the largest of all 4 ports in Kalimantan in terms of total cargo (almost 8.5 million tonnes) but its public berth cargo (1.2 million tonnes) was second behind Pontianak in 2000. Both traffic volumes have been growing rapidly annually by 6 and 8 percent respectively.

Pontianak handled about 3.5 million tonnes in total of which 1.4 million tonnes were public. Private traffic has been growing by nearly 7 % per year with public cargoes growing by over 9 percent.

Sampit and Kumai are ports serving Central Kalimantan which is the one of the poorest provinces in Kalimantan and Sumatra. They handled between 1.5 million and 1.0 million tonnes total respectively of which under 1.0 million tonnes passes through public port facilities. Total traffic has been growing at about 11 percent per year at Sampit, but public cargoes have stagnated, partly due to the lack of port facilities and the low water depth. Much of the cargo is palm oil.

In general, container traffic has rarely been handled at the river ports for more than 5 or 6 years because of lack of equipment and various other reasons. However, over the past 5 years container volumes have grown rapidly each year, even if still at low absolute volumes. Pontianak is handling over 90,000 TEUs, Samarinda about 70,000 and Sampit 10,000. Containers are not handled at Kumai yet.

Unlike Jambi and Pekanbaru ports, most containers are handled at the public wharves at the larger ports of Pontianak and Samarinda.

Passenger volumes have continued to grow over the last 10 years, and the economic crisis seems to have given it an added impetus with many ports throughout Indonesia registering 10-20 % growth per year over the last few years.

In line with increasing cargoes, the number of ship calls has grown. International bound traffic has often been in larger ships which have thus registered a lower growth in GRT. Domestic vessels, being small, have tended to increase in average size at a much faster rate. Coal barges at Samarinda are nearing the maximum the river can accommodate or about 10,000 DWT.

4.9 Port Management Systems

Kalimantan Island consists of 4 provinces. As for public ports, Kalimantan has 22 commercial ports (including 12 river ports) and 24 non-commercial ports (including 5 river ports). There are 633 special ports.

The Indonesia Port Corporation (IPC) II manages 7 commercial ports located in West Kalimantan. IPC III manages 8 commercial ports located in Central Kalimantan and 2 commercial ports in South Kalimantan. IPC IV manages 5 commercial ports located in East Kalimantan. The branch office of IPC in each port is in charge of the port's daily operation. Port Administration Offices (KANPEL) are responsible for the management of these ports. They are now under the control of DGSC.

4.10 Cargo Handling System and Productivity

4.10.1 Pontianak

(1) Cargo Handling System

To accelerate container handling efficiency, a gantry crane was introduced to NO.7 wharf of the port in February 2000. The crane is used for calling container vessels, on a first-come first-served basis. Yard operation of both general cargo and bulk cargo, is carried out by trucks and forklifts, but the efficiency of cargo movement on the yard is reduced by lack of cargo handling space at the busy port. Cargo handling equipment at Pontianak is shown in Table 4.10.1.

Table 4.10.1 Cargo Handling Equipment at Pontianak

Equipmemt	No. of Unit	Remarks
Container Crane	1	30.5 ton
Mobile Crane	2	50 ton
Forklift	10	2,3 and 5 ton
Head Truck	4	40 ton
Chassis	6	20 and 40 ton
Side Loader	2	15 ton
Top Loader	3	40 ton

(2) Efficiency

Cargo handling efficiency at Pontianak is shown in Table 4.10.2.

Table 4.10.2 Cargo Handling Efficiency at Pontianak

	1999 (A)	2000 (B)	B/A
International general cargo (t/gang/hour)	16.0	16.5	103.1
International bag cargo (t/gang/hour)	28.5	28.0	98.2
International container cargo (box/hour)	9	11	122.2

Source: IPC2 Pontianak Branch Office

4.10.2 Kumai

(1) Cargo Handling System

A mobile crane is playing the most important role to load/unload cargo vessels at the Port of Kumai. Yard operation of both general cargo and bulk cargo, is carried out by trucks and forklifts, but the

efficiency of cargo movement on the yard is reduced by lack of cargo handling space at the port.

(2) Efficiency

Cargo handling efficiency at Kumai is shown in Table 4.10.3.

Table 4.10.3 Productivity in Kumai

	1996	1997	1998	1999	2000
General cargo (t/gang/hour) Domestic shipping	160	180	200	210	215
Bag cargo (t/gang/hour) Domestic shipping	190	200	210	215	220

Source: IPC3 Kumai Branch Office

4.10.3 Sampit

(1) Cargo Handling System

A mobile crane is playing the most important role to load/unload cargo vessels at the Port of Sampit. Yard operation of container is carried out by forklift (1 unit) and trailer (1 unit). The efficiency of container handling operation is also reduced by lack of necessary space at the port. The loading/unloading operation of both general cargo and bulk cargo at conventional vessel wharves, are carried out by ship crane or mobile crane. And yard operation of both general cargo and bulk cargo, is carried out by trucks and forklifts, but the efficiency of cargo movement on the yard is reduced by lack of cargo handling space at the busy port. Cargo handling equipment at Sampit is shown in Table 4.10.4.

Table 4.10.4 Cargo Handling Equipment at Sampit

Equipment	No. of Unit	Remarks
Mobile Crane	1	40 ton
Forklift	1	5 ton
Trailer	1	

(2) Efficiency

Cargo handling efficiency at Sampit is shown in Table 4.10.5.

Table 4.10.5 Productivity in Sampit

Year / Indicators	2000
General cargo (t/gang/hour)	16.8
Bag cargo (t/gang/hour)	18.2
Container (box/gang/hour)	12

Source: IPC3 Sampit Branch Office

4.10.4 Samarinda

(1) Cargo Handling System

Mobile cranes are playing the most important role to load/unload cargo vessels at the Port of Samarinda. Yard operation of container cargo is carried out by forklifts (21 units), super stackers (2 units) and trailers (7 units). The efficiency of container's yard operation is reduced by lack of necessary space at the port, due to a number of damaged spots on container yards and roads. The loading/unloading operation of general cargo and bulk cargo at conventional vessel wharves, are carried out by ship crane or mobile crane. Yard operation of both general cargo and bulk cargo, is carried out by trucks and forklifts, but the efficiency of cargo movement on the yard is reduced by lack of cargo handling space at the busy port. Cargo handling equipment at Samarinda is shown in Table 4.10.6.

Table 4.10.6 Cargo Handling Equipment at Samarinda

Equipment	No. of Unit	Remarks
Mobile Crane	9	15 and 80 ton
Forklift	21	3 and 10 ton
Super Stacker	2	
Trailer	7	20 and 40 ton
Floating Crane	1	150 ton

(2) Efficiency

Cargo handling efficiency at Samarinda is shown in Table 4.10.7.

Table 4.10.7 Productivity at Samarinda

Year / Indicators	2000
General cargo (t/gang/hour)	16.0
Bag cargo (t/gang/hour)	18.0
Dry-bulk cargo (t/gang/hour)	18.0
Liquid cargo (t/gang/hour)	17.0
Container cargo (box/hour)	7.0

Source: IPC4 Samarinda Branch Office

4.11 Maintenance Dredging of Channels

(1) Pontianak (Sungai Kapuas Kecil)

A 15 km extension of the navigation channel for Port of Pontianak is maintained by dredging in the estuary of Sungai Kapuas Kecil. Port of Pontianak is located along the river about 30 km from the river mouth.

The annual average volume of the dredging is around 1.3 million m^3/year and the dredging work has been carried out almost every year in the recent eight years. The public expense for Pontianak channel accounts for about 9 % of the government annual budget for the dredging of commercial ports.

(2) Kumai (Sungai Kumai)

The navigation channel for Port of Kumai has a 18.5 km extension in the estuary of Kumai Bay and a 10 km portion of the channel is maintained by dredging. Port of Kumai is located along the river about 25 km from the river mouth. The annual average volume of the dredging is around 440,000 m^3/year and the dredging work was carried out three times in the recent eight years.

(3) Sampit (Sungai Mentaya)

The navigation channel for Port of Sampit has a 10.2 km extension in the Sampit Bay and a 15 km portion in the estuary area. Along the river, it is maintained by dredging. Port of Sampit is located along the river about 75 km from the bay mouth.

The annual average volume of the dredging is around 700,000 m^3/year and the dredging work was carried out for four times in the recent eight years. The public expense for Sampit channel accounts for about 7 % of the governmental annual budget for the dredging of commercial ports.

(4) Samarinda (Sungai Mahakam)

The navigation channel for Port of Samarinda has about 65 km extension from the river mouth and a 29 km portion of the channel is maintained by dredging.

The annual average volume of the dredging is around 1.5 million m^3/year and the dredging work was carried out every year. The public expense for Samarinda channel accounts for about 13 % of the government annual budget for the dredging of commercial ports.

Due to the constraint from the limited budget, the dredging works in the Samarinda channels have been only partially executed. In the case of year 2000, the dredging work was carried out with the bottom width 60 m and the water depth LWS -5.7 m (whereas the original standard section was: bottom width 80 m, depth LWS-6.0 m).

4.12 Structural Design

4.12.1 General

Table 4.12.1 shows the outline of existing port facilities of study ports and previously proposed relevant project plans for alternative sites. Similarly to Sumatra Ports, all candidate sites, except for Marangkayu (Samarinda), are located along a river.

Table 4.12.1 Outline of Port facilities

Location		**Kalimantan**							
		Pontianak		Kumai		Sampit		Samarinda	
Province		West Kalimantan		Central Kalimantan				East Kalimantan	
Port Office		IPC-II		IPC-III				IPC-IV	
Name of Port		**Pontianak**	**Jungkat**	**Kumai**	**Bumiharjo**	**Sampit**	**Bagen-dang**	**Samarinda**	**Marang kayu**
Situation		Existing	Plan	Existing	Under const.	Existing	Under const.	Existing	Plan
Name of River		Sg. Kapuas Kecil		Sungai Kumai		Sungai Mentaya (Sampit)		Sungai Mahakam	Facing outer sea
Dist. from river mouth		30.5 km	12.5 km	31 km	48 km	68 km	46 km	66 km	-
Navigation channel (dredged)	Length	15 km		11 km		16 km		24 km	
	Width	80 m		50 m		50 m(Outer channel) 90 m(Inner channel)		60 to 70 m	
	Depth(LWS)	-5.5 m		-5.5 m		-4.5 m		-6.0 m	
	Side slope	1:4		1:4		1:4		1:6	
	Volume (x1000)	1700 m3/year.		700 m3/2 years		700 m3/2 years		2200 m3/yr	
Port area		9.7 ha		1.11 ha	60 ha	1.47 ha	46 ha		N.A.
Berthing facility	Length	710 m	N.A.	190 m(RC)	60 m	316 m	101.5 m	937 m	
				132m(wood)					
	Depth (LWS)	-6 m		-5 m(RC)	-6 m	-7 m	-6 m	-5 m	
				4m(wood)					
	Width	12 to 35 m		10 m(RC)	6 m	15 m	6 m	15 m	
				6m(wood)					
	max. ship							153 m LOA	
	Structure	Concrete deck on Pile (P/C, Steel)		Conc.deck on pile, Wood deck on pile	Conc. Jetty with dolphins on PC piles	Conc. deck on pile	Conc. Jetty with dolphins on PC piles		

(Cont'd)

(Cont'd, Table 4.12.1)

Name of Port		Pontianak	Jungkat	Kumai	Bumiharjo	Sampit	Bagen-dang	Samarinda	Marang kayu
Port yard	Gen. Cargo	1.3 ha	N.A.	0.27 ha	(Future)		(Future)	0.25 ha	N.A.
	Container	1.9 ha		N.A.	(Future)	0.3 ha	(Future)	2.0 ha	
	CPO				26 ha				
CFS(unit/m2)		2/1750 m2		N.A.		N.A.			
Warehouse(unit/m2)		2/4450 m2		1/900 m2		1310 m2		3/4400 m2	
CPO tank					included		included		
Passenger terminal(person)		1/2000 m2		1/480 m2		1/780 m2		1/800 m2	
Power supply (KVA)		20							
Water supply	(m3/Reservoir)			200		100		380	
	m3/hour							70	
Road access		Applicable		Applicable	Applicable	Applicable	Applicable	Applicable	

4.12.2 Design Standard

In this report, technical overview was made on the basis of Indonesian and Japanese design standards.

4.12.3 Sub-soil Conditions

At a majority of the study ports, sub-soil consists of rather soft stratum with N value less than 10. At some ports such as Pontianak, a hard stratum exists deeper than –60 m below LWS (Low Water Spring)

4.12.4 Water Level

The approximate water level range at each river mouth and proposed port site is less than 2 m.

4.12.5 Design Criteria

(1) Live loads

The design load conditions for planned facilities are determined on the basis of present load conditions and future required load intensity.

(2) Seismic Load

A precise seismic load condition on the existing port facilities was not obtained from each Port except for Muara Sabak. The design seismic factor is, therefore, estimated by using the regional seismic coefficient for each port site which varies between 0 to 0.094.

(3) Ship berthing velocity

Considering the flow of river stream a higher design berthing velocity is recommendable. 15 to 20 cm/sec is preferable as a design berthing speed.

4.12.6 Dimension of Navigation Channel

According to the several design standards 85 to 131 m wide channel is required to allow two-way ship passage.

4.12.7 Structural Type of Port Facilities

Most of existing quay facilities are consisted of "Concrete deck on piles" type. Some use batter/raking piles to resist lateral force. Many variations of materials such as RC, PC and Steel pipe piles was observed.

4.12.8 Cargo Handling Equipment and Port Service Boats

Among the study ports, only Pontianak utilizes container gantry crane; all the other ports use mobile crane or top-loader/forklift for container handling. The future container cargo handling system for each port should be examined on the basis of future port development stages, which depend on the scale of container cargo volumes for each study port.

4.13 Conditions of Construction Procurement

4.13.1 General

For the purpose of estimation of construction cost, unit price of each element such as labour, major construction material and equipment are to be determined.

The costs of imported products are to be estimated using the average exchange rate of the currencies (Rupiah, Japanese Yen, US Dollar, etc.).

The basic costs of the construction works and unit prices are to be determined based on the availability of materials, labor, construction equipment and accessibility to the sites.

The capacity and capability of the local contractors are to be determined.

4.13.2 Findings in the Each Region

(1) Jakarta and Surabaya (Java)

Many construction companies exist which have experience in the construction of the port facilities. Almost all the construction materials are available in the Java region.

(2) East Coast of Sumatra, West, Central and East Kalimantan

Some branch offices of the construction companies in this region exist which have experience in port facilities construction.

4.13.3 Basic Cost of Construction Work

(1) Basic Cost of the Works

The breakdown of unit costs of the construction works are to be prepared by accumulating costs of labour, materials, equipment and also the indirect costs such as general temporary works, overheads, profit and so on.

(2) Depreciation Periods of Port Facilities

The depreciation periods of port facilities are to be assumed based on the report "Taksiran Umur Ekonomis Tetap" (source: IPC2, 1995).

4.14 Natural Conditions of Study Areas

4.14.1 Pontianak (Sungai Kapuas Kecil)

(1) Position

Port of Pontianak is located in West Kalimantan Province at the confluence of Sungai Kapuas Kecil (a branch of Sungai Kapuas) and Sungai Landak and is about 30 km upstream from the river mouth (00º01'00"S, 109º20'00"E).

The entrance and navigation channel to the port is via South China Sea and Sungai Kapuas Kecil. The river entrance is fronted by a bar of silt and sand which extends about 10 km offshore. A shipping channel is maintained through the bar by dredging. The minimum water depth is about 5 m in the Outer Bar area of the channel.

(2) River basin and discharge

Topography around Pontianak is flat lowland formed by alluvial soil with the altitude 0.5-2 m above mean sea level (MSL). The vegetation in this area is swamp forest and also mangrove and nipa are found along the river.

The water depth of the river channel along Sungai Kapuas Kecil is generally more than 5 m below LWS and the width of the river channel is 300 - 600 m.

Sungai Kapuas is the biggest river in Borneo Island; it has a catchment area of 95,557 km^2 and the total extension of the main stream (including the branch) is 869 km. The river basin accounts for 65 % of the area of West Kalimantan Province.

The average yearly discharge is given as 121,644 x 10^6 m^3/year (Source: Kantor Menteri Negara Pekerjaan Umum; 2000).

The merged catchment area of Sungai Landak and Kapuas Kecil is about 11,600 km^2.

(3) Climate

The whole area of the delta of Sungai Kapuas is subject to heavy rains, squalls. This area in West Kalimantan seldom experiences dry season. The strong rainfall occurs in August – February at 250-350 mm per month.

Off the west coast of Kalimantan the winds are variable and light in March and November.

(4) Tide and current

Average tidal range is 1.30 m at spring tide and 0.25 m at neap tide. The tidal form is diurnal. Amplitude (in cm) of tidal constituents at Sungai Kapuas Kecil is as follows (source: Tide Table; Dinas Hidro-Oseanografi, 2001).

M_2: 16, S_2: 9, N_2: , K_2: , K_1: 39, O_1: 32, P_1: 10,

Number of tidal type F = $(K_1 + O_1)/(M_2 + S_2)$ = 2.840 (Diurnal)

4.14.2 Kumai (Sungai Kumai)

(1) Position

Port of Kumai is located on Sungai Kumai (Central Kalimantan Province) about 25 km upstream from the river mouth (02º45'S, 111º43'E).

The entrance channel to the port is facing Teluk Kumai (Kumai Bay) from Java Sea. The river channel has around 690 m in width at Port of Kumai.

(2) Topography and river basin

The south coast of Kalimantan between Tanjung Puting and Tanjung Sambar is low and flat land and covered by dense, tall woods. The west shore of Teluk Kumai consists of a narrow sandy beach backed by high trees.

Sungai Kumai has a catchment area of 8,200 km^2 and the extension of the stream is 175 km.

There is no hydrographic or hydrological station along this river. The average yearly discharge is estimated as 7,671 x 10^6 m^3/year (Source: Kantor Menteri Negara Pekerjaan Umum; 2000).

(3) Climate

Climate data is given in Pangkalan Bun. The SE monsoon prevails from May to October and the NW monsoon from December to March. Squalls are most frequent in November and December. A moderate swell develops during the NW monsoon in January and February.

(4) Tide and current

The horizontal movement of water along the south coast of Kalimantan is a mixture of tidal streams and monsoon currents.

The tidal streams in Teluk Kumai are semi-diurnal and off the mouth of Sungai Kumai change fairly regularly every six hours. The maximum rate of the out-going stream observed was 3 knots and the in-coming stream 2 knots.

4.14.3 Sampit (Sungai Mentaya)

(1) Position

Port of Sampit is located on Sungai Mentaya (Central Kalimantan Province) about 35 miles (55 km) upstream from the river mouth (02º33'20"S, 112º58'16"E).

The entrance channel to the port is facing Teluk Sampit (Sampit Bay) from Java Sea.

Teluk Sampit is a bay occupied by shallow silty sand bar and the minimum water depth is about 2.5 m below LWS.

(2) Topography and river basin

Topography around Sampit is flat lowland with swamp forest.

Sungai Mentaya has a catchment area of about 16,200 km^2 and the extension of the stream is 400 km.

The average yearly discharge is estimated as 16,200 x 10^6 m^3/year (Source: Kantor Menteri Negara Pekerjaan Umum; 2000).

(3) Climate

Rainy season occurs in the season of west wind in this area, that is, from September to March. In the season of east wind (June – September) there is little rain. Average annual rainfall is about 2,000 – 2,500 mm.

(4) Tide

Average tidal range is 1.20 m at spring tide and 0.7 m at neap tide. The tidal form is diurnal. Amplitude (in cm) of tidal constituents at Teluk Sampit is as follows (source: Tide Table; Dinas Hidro-Oseanografi, 2001).

M_2: 49, S_2: 11, N_2: 14, K_2: , K_1: 60, O_1: 31, P_1: 20,
Number of tidal type $F = (K_1 + O_1)/(M_2 + S_2) = 1.517$ (Diurnal)

4.14.4 Samarinda (Sungai Mahakam)

(1) Position

Port of Samarinda is located on Sungai Mahakam (East Kalimantan Province) about 39-mile (75 km) upstream from the river mouth (00º32'00"N, 107º09'00"E). The entrance channel to the port faces Makassar Strait from Mahakam Delta.

(2) River basin and discharge

Sungai Mahakam is one of the most important rivers in the east coast of Borneo and forming a large Mahakam Delta with 30 km from east to west and 60 km from south to north in the river mouth area. Four trunk waterways and a large number of small waterways exist among the islands forming the delta. The small islands of the delta are swamp with mangrove vegetation.

Sungai Mahakam is the second biggest river in Borneo Island; it has a catchment area of 92,641 km^2. The river basin accounts for 44 % of the area of East Kalimantan Province.

The average yearly discharge is given as 82,400 x 10^6 m^3/year (Source: Kantor Menteri Negara Pekerjaan Umum; 2000).

(3) Climate

Average rainfall is about 140 mm per month all through the year. The months with rainfall more than 200 mm are February, April, May, September and July.

(4) Tide

Average tidal range at Samarinda is 1.80 m at spring tide and 0.5 m at neap tide. The tidal form is mixed semi-diurnal, and semi-diurnal is rather dominant. Amplitude (in cm) of tidal constituents at Samarinda is as follows (source: Tide Table; Dinas Hidro-Oseanografi, 2001).

M_2: 42, S_2: 26, N_2: , K_2: 10, K_1: 19, O_1: 24, P_1: ,
Number of tidal type $F = (K_1 + O_1)/(M_2 + S_2) = 0.632$ (Mixed semi-diurnal)

(5) Current

Strong offshore-ward current and/or onshore-ward current is found even in fairly distant water area from the delta. A steady southward current is found in Makassar Strait where the influence of the river flow and the delta have no affect.

Tidal current is experienced in the season from September to December with 2.5 knots at ebb tide and 2 knots at flood tide. Current by ebb tide is dominant in the rainy season and neap tide in the dry season.

4.15 The Environmental Outline of Kalimantan Study Areas

Large areas of Central, East and South Kalimantan are composed of sedimentary rocks such as sandstone and shale. Most sedimentary formations are relatively young. The southern part of Borneo consists mainly of loosely consolidated sand and gravel terraces, often the Quarterly by young, surface deposits of peat and alluvial fans deposited by flooding rivers.

The three longest Indonesian rivers are: Kapuas (1,143 km), Barito (900 km) and Mahakam (775 km). The study rivers include: 1) Kapuas Kecil River (Pontianak Port) flowing west from Mount Cemaru. 2) Kumai River (Kumai Port), 3) Mentaya River (Sampit Port) flowing south from the north mountainous range, and 4) Mahakam River (Samarinda Port) flowing east from the mountainous area.

Regarding the vegetation in Kalimantan, Mangroves occur along the coast, nipa communities along the brackish areas, and fresh water swamp forests in upper area of river basins. Apart from these forest communities, Depterocarpus dominated forests spread in the lowland areas.

Forest areas in Kalimantan have been developed from 1970's intensively. According to the World Bank's estimation of forest area reduction, forest area in Kalimantan was 50 million hectares in 1900, but it is estimated that it will be reduced to 25 million hectares by 2010.

Regarding the Fauna and Flora aspects, mountains and rivers block their movements; consequently Borneo Island is divided into 9 biological regions. Three study areas Pntianak, Sampit and Kumai basins belong to one biological region, which is enclosed by the Kapuas, the Barito and the northern mountains. Diverse Fauna in peat swamps and fresh water swamps are characteristic. The other study area Samarinda in the Mahakam basin belongs to the biological region, which is enclosed by Mahakam River, Barito River and the northern mountains. Many endemic plant species especially varieties of Orchid are characteristic in the area.

Environmental outlines in each study area is described as follows.

(1) Pontianak (the Kapuas Kecil)

Mangroves and nipa communities occur along the coast, estuary and brackish area effective by seawater in West Kalimantan. In its landward, peat swamps occupy most of the areas of the plains. The basis of the city of Pontianak is peat swamp. As Pontianak port is closer (30 km) to the river mouth compared with other study ports, Mangroves and Nipa palm communities occur along the area from river mouth up to the port.

Three areas are specified as the natural protected areas in the West Kalimantan, and peat swamp forests and fresh water forests are protected in these areas. Moreover, rubber

plantations are managed in the basin. The rivers are used for its transport.

(2) Kumai (the Kumai)

Since the Kumai port is the closest to the mouth of the river among the study ports, mangroves distribute in the estuary, nipa palm in brackish area near Kumai Port. Tanjung Puting is on the left bank at the estuary of Kumai River.

Three areas are specified as natural protected areas in Central Kalimantan province where peat swamp forest and freshwater swamp forest are conserved. Endangered species include: Orangutan, freshwater dolphin, dugong, turtles which are conserved in Tanjung Putting Natural Protected Area close to Kumai River with a long seashore. Precious bird (sea eagle) nesting are found around Kumai Port.

Rattan furniture, which is a noted product of this region, is transported from Kumai Port.

(3) Sampit (the Mentaya)

Mentaya River flows to Sampit Bay, and mangroves distribute along the bay coast. Depterocarpus forest distribute behind the mangrove forest. This formation, mangroves and Depterocarpus are remarkable and different from any other area's vegetation character.

Rattan products are loaded at Sampit Port as well as Kumai's.

(4) Samarinda (the Mahakam)

Mahakam River is the third longest river in Indonesia, and forms vast deltas at its estuary. The pioneer species Api-Api inhabits the estuary in which high salinity is caused by seawater. Nipa palm forest distribute along the riverbank in upper stream of Api-Api area. Fresh water plants distribute around Samarinda Port with its low salinity freshwater. Mahakam Lake is situated at the upper stream from Samarinda Port; it is specified as a natural protected area inhabited by endangered freshwater dolphins.

There are 4 natural protected areas in East Kalimantan province. Kutai Natural Protected Area is situated north of Samarinda, and it conserves precious species such as Orangutan.

Waterborne traffic, especially physical distribution in the Mahakam, is well developed in the past. Also wood processing is highly developed around Samarinda city: there are more than 50 wood processing or plywood factories along the Mahakam. Felled timber from the mountain area is transported in the Mahakam. Wood products are famous in this district.