7. PRELIMINARY DEMAND FORECAST

7.1 Projection of Cargo Traffic

7.1.1 Introduction and Methodology

The scope of work for this study requires the Consultants “To roughly estimate the cargo handling volume and number of passengers by 2025”. This is related to all seven ports and is prepared at the stage of Interim Report 1. Detailed forecasts for the two selected ports are made at the stage of Interim Report 2 and are shown in sections 18 and 25 below.

In order to achieve that objective, various forecasting methodologies were considered for this study, based on the technical requirements, the port and cargo characteristics, regional aspects and the stage of the study. River ports have rather different characteristics than conventional sea-ports and so this is a two (forecasting) stage study. Hence, for the preliminary forecasts for seven ports, the consultants consider that trends provide a suitable basis for forecasts, supplemented by commodity based forecasts.

It should be emphasised that the study needs the most reliable forecasts <u>but that time and data limitations demand a simplified approach for all seven ports at this stage.</u>

The regional development context prepared in the Progress Report and further expanded in the Interim Report forms an essential plank of these forecasts.

The preliminary socio-economic background prepared in the Progress Report remains valid and will be updated in the next stage as a basis for forecasting the two priority ports.

However, at this stage the forecasts are not based on GDP or GRDP.

Forecasting at this stage is preliminary and will be used as a basis for:

a) Preliminary Port Planning at 7 Ports
b) Priority port selection
c) Indicative Planning Recommendations for 5 Ports
d) Preliminary environmental impacts
e) Other aspects such as likely feasibility and for private sector participation

The requirements are to prepare forecasts for all 7 ports and, at this stage, the forecasts are based on the following factors:

a) Trends in cargo flows
b) Trends in handling and especially container
c) Trends in public cargoes
d) Trends in non public cargo (khusus, rede, loading point)
e) Trends in the major commodities at each port
f) Target commodity volumes in each location
g) Existing port master plans

h) Regional development studies

i) National transport and port studies with up to date forecasts such as JICA Port Study (The Study on the Port Development Strategy in the Republic of Indonesia, 1999) and TSSS (2000/01)

7.1.2 Traffic Forecasts

Cargo forecasts are made for each target year: namely, short term (2007) and long term (2025).

Estimates of long term cargo traffic will reflect the fact that cargo is not likely to expand indefinitely and hence will provide indicative projections. For example, 7 % growth every year over 25 years means an increase of 5 times the base year volume.

The impact of any likely changes in the provision of port facilities, and their impact on port traffic will be taken into account. This will include proposals by the public or private sector, and proposals that may be anticipated as part of this project's recommendations.

For each target year, the forecasts will be prepared for:

1) Total cargo, in tonnes, through the channel by:
   International-by Imports and Exports
   Domestic-by Unload and Load
2) Total cargo, in tonnes, at the public port facilities by:
   Container
   Remaining General cargo
   Additional Cargoes
   Specific Bulk Cargoes
3) Other high volume cargoes requiring special handling e.g. Palm Oil

7.1.3 The Seven Ports

These are detailed below in section 7.1.6.

7.1.4 The Two Priority Ports

It should be noted that the preliminary forecasts for the two priority ports are included only for completeness and are now superseded by the detailed forecasts made in Sections 18 (Jambi) and 25 (Samarinda).

7.1.5 Assumptions Common to all of the Preliminary Forecasts

(1) All forecasts are related to the port development scenarios in this report. However, the forecasts are unconstrained (i.e., limitations of berths, channel or other constraints on achieving the forecast are not taken into account).

(2) No impact is assumed by attraction or diversion of cargoes to/from other ports

(3) For each port, trend-based statistical analysis was undertaken and where the statistical relationships for cargo were strong, they were used. However, if the relationships were weak, recent trend data, as well as master plans and other sources were used.

(4) These forecasts will constitute a middle or best estimate scenario. At a later stage, other scenarios may be envisaged for more optimistic and less optimistic total cargo scenarios, as well as varied sub-scenarios for specific commodities, containers and public cargoes.

(5) The forecasts, implicitly, assume continued macro economic recovery, as noted in the Progress Report, and no major economic or social dislocation. The forecasts are not based on national or regional economic development forecasts, with the exception of specific commodity forecasts. However, the forecasts assume average national GDP growth of about 4% between 2001 and 2003 moving up to 5 % by 2005 and perhaps reaching 7 % by 2009. On this basis, GDP and GRDP is expected to average 5 % per year between 2000 and 2010.

(6) The base year is 2000 with the first forecast year being 2001.

(7) The target forecast years are 2007 and 2025.

(8) Modification of the initial forecast is then made to calculate the following in addition:

Major Commodities
Containers
Cargoes through the public berths

(9) Commodities: At this stage we have assessed all the commodities handled in each port and reviewed only those commodities that either make up a significant proportion of total traffic (i.e. more than 20% currently), or those that will become significant in the future.

These commodities include logs and wood products, pulp, CPO, coal, fertiliser and fuel/oil. In the next stage, and mainly related to containerisability of cargo, a commodity based forecast will be made for the two selected ports to supplement the specific major commodity forecasts.

Containers: Container traffic has been expanding rapidly at most ports. At some ports it is handled only at public berths while at others it is handled at two types of locations (namely, public ports and dermaga khusus).

The future proportion of containers handled in the public/other terminals is described below but is assumed to depend on the current division of cargo and on the port development scenario recommended.

Data has been converted to TEUs by assuming 10 tonnes per TEU which is consistent with current port data.

(10) Public Berth Cargo Forecasts

Recent trends in public cargo movements are not consistent and often not well documented.

We have also considered that, if new port facilities are provided, and management, productivity and tariffs are appropriate, then some private/khusus wharf operators may find it cheaper and more convenient to ship cargoes via the public port. Therefore, some diversion of non-public berth traffic to the public port may be appropriate (this was the approach taken in the Jambi port Master Plan).

Therefore, we have assumed that a varying proportion (5 to10% depending on the port) of the forecast total cargoes will transfer to the public port. In order not to over emphasize these transferred cargoes without more study, the Consultants start introducing such cargoes from 2005, assuming new/upgraded facilities might be available from that date. They are also introduced at a reduced rate so that the maximum of 5% or 10% is only reached in 2010.

Distribution between international and domestic cargoes at public berths is sometimes known from port data. The GRT of calling vessels often does not reflect cargo handled, so it is difficult to make tentative estimates where port data is lacking.

A detailed review of international and domestic shipping might increase the proportion of international cargoes in response to the port's ability to handle larger ships and more direct movements of cargo. However, we have not increased further the proportion of international traffic, beyond the change in the proportions that result from forecasting each traffic type (imports, exports, load and unload).

(11)Comparison of Preliminary Forecasts

Where current forecasts are available from other sources, we have compared these and shown the results in the text.

7.1.6 Assumptions and Bases of the Preliminary Traffic Forecast for Each Port

It should be noted that the following specific assumptions of the preliminary forecasts are in addition to the general assumptions, described above, which are common to all ports.

(1) Jambi Port-Assumptions of the Preliminary Forecasts

1) The forecasts, shown in Table 7.1.1 relate to all Jambi Cargoes and the projected public cargoes are not allocated to Muara Sabak, Talang Duku or Muara Tungkal at this stage.

2) Reference is made in this forecast to the Muara Sabak Master Plan (MP) study.

3) Commodities: Two main commodities dominate cargoes handled at Jambi; logs and wood products and CPO. In the future coal is predicted to be a major cargo with coal handling facilities already under construction in 2001.

In terms of the forecasts, wood and logs are predicted at best to be static and may decline in the medium term. Therefore, logs and wood are not included as specific commodities in the forecast. However, they are already included in the overall traffic forecast.

CPO is expected to expand and based on the previous MP, we have assumed 500,000 tonnes by 2007; We have also considered that this might expand to 1.0 million tonnes by 2025, and this would be speculative, but possible.

Coal is not handled at present, but is forecast could reach 2 million tonnes in the future. We have followed the MP in the short term and estimated that by 2025 this volume would reach the mentioned 2 million tonnes.

4) Containers: Container traffic has been expanding rapidly. This is currently handled at two types of locations (i.e., public port and dermaga khusus). We have applied the data from the MP to our own total forecasts to predict total container traffic.

   Container traffic is split at present between two locations (30 % public and 70 % khusus) but based on the port planning scenarios, this is unlikely to be maintained in these proportions in the future. Therefore, at this stage we have assumed that the public facility would handle 50 % of all container cargoes by 2025.

   The MP forecasts that containers will amount to 37 % of total traffic by 2025. This would imply about 50 % containerisation of total, non-bulk, cargo. The percentage of public container to public traffic is about 76% at the original 30:70 split but increases to 84 % if the 50:50 % split is assumed. These assumptions seem reasonable in light of the existing and forecast commodities.

5) Public Berth data seems relatively clear for 2000 but its prediction into the future less clear for several reasons;

   Firstly, recent trends in public cargo movements are not consistent. We have therefore, assumed a modest increase of 5 % per year based on the current cargo level.

   Some diversion of non public traffic to the public port will be appropriate. Therefore, we have assumed that 10% of the forecast total cargoes will transfer to the public port from 2010 as explained in Section 3.1.5-10 above.

   The MP assumed that after 2007, Kuala Tungkal would not handle any public cargo and we have assumed the same. After 2007, we have assumed a split between Muara Sabak and Talang Duku of 65 %: 35 % respectively. This is similar to the MP but allows a somewhat larger role for Talang Duku in the future.

   Distribution between international and domestic cargoes at the public berth is not known from port data.

6) Comparison of our forecasts and the MP reveals some differences, but not many of significance. This is partly because of the more recent data used which shows more robust traffic growth and because of the assumptions on coal and CPO. Further, some assumptions are different. We are discounting the pessimistic scenario in the MP for comparison purposes because of this.

The MP assumed between 11.2 and 7.7m tonnes of total cargo by 2025 with between about 4.2 million and 2.9 million tonnes containerised (37 % by 2025 of the total in both cases).

Our estimates, amount to 11.8 million tonnes by 2025, including an additional 2 million tonnes of coal and CPO in total. Excluding these commodities would reduce our total to 9.8 million tonnes or mid way between the MP scenarios.

Our container estimates amount to 4.4 million tonnes containerised as we estimated a larger total volume of cargo.

The MP did not forecast total public port traffic, except only for Muara Sabak, at about 2.4 million tonnes (Moderate Forecast). If this location was assumed to handle 77 % of all traffic, the total public traffic would amount to 2.9 million tonnes by 2025. Our forecast for public cargoes is independent of, but similar to, the MP.

It should also be noted that the MP developed another scenario which assumed a very large transfer of khusus cargoes to the public port, but this may not be realistic for port planning purposes. However, the principle seems sound and we have used this in all the port forecasts as described above.

Table 7.1.1 Preliminary Jambi Port Traffic Forecast

(All in Unit = 1,000 Tonnes)

Year	INTERNATIONAL	DOMESTIC CARGO	TOTAL CARGO(1)	PUBLIC CARGO	CONTAINER CARGO(2)	TEUs (000s)
1988	688	853	1,541	187	15	2
2000	1,064	2,454	3,518	161	248	25
2007	1,396	3,498	5,894	418	983	98
2025	2,869	5,955	11,824	2,603	4,374	437
Annual Growth Rates						
1988-2000	3.7%	9.2%	7.1%	-1.2%	59.6%	
2000-2007	4.0%	5.2%	7.7%	14.6%	21.7%	
2007-2025	4.1%	3.0%	3.9%	10.7%	8.6%	
2000-2025	4.0%	3.6%	5.0%	11.8%	12.2%	

NOTES: Subject to the attached assumptions.
(1) Total cargo includes main bulk commodities of cpo and coal from 2007
(2) Container cargo is public and private container movements
Public cargo includes an allocation of container traffic from the total container tonnage, and therefore, experiences high growth rates NOTE: Superseded by detailed forecasts.

(2) Pontianak-Assumptions of the Forecasts

1) The cargo forecasts, shown in Table 7.1.2, are for Pontianak port only, and therefore, exclude any smaller ports under the branch such as Sintete, Ketapang and Telok Air.

2) Initially trend based forecasts were considered, but the statistical relationship were weak and therefore, discounted. The use of growth rates from recent trends and other sources were, therefore, applied.

3) No impact is assumed by attraction or diversion to/from other Indonesian ports, although an appropriate new coastal or offshore island location would no doubt lead to increased cargo attraction.

4) Reference is made in the forecasts to the Updated Master Plan study for Pontianak (UMP) which was prepared in 1998 (1997 data).

5) Commodities:
Three main commodities dominate those handled at Pontianak; logs and wood products, fuel and CPO. In the future coal/other minerals and other agricultural products may be significant, although at this stage these are not predicted.

   In terms of the forecasts, wood and logs are predicted at best to be static and may decline in the medium term. Therefore, logs and wood are not included as specific commodities in the forecast. However, they are included in the main forecast.

   Fuel is also not specifically included in the forecast as the volume is already significant and will likely expand slowly based on regional development needs and will be handled at specialist berths (Pertamina).

   CPO is expected to expand and based on the previous UMP, we have assumed 305,000 tonnes by 2007 and 2.0 million tonnes from 2018 based on the JICA Western Kalimantan study. These data include the upstream bulking station at Sanggau;

6) Containers

   Container traffic has been expanding rapidly. It is currently handled in one location (i.e., the public port). We have considered the data from the UMP but believe that these seem a little pessimistic given the trends in the last three years, and especially the national surge in domestic container movements. For example, based on the UMP, the proportion of containerised traffic to public port traffic is forecast to remain the same between 2000 and 2025 at about 65%.

   We have therefore, assumed that the proportion of containerised traffic would rise from 65% in 2000 to about 80 % containerisation of public cargoes by 2025. This results in about 34 % of all cargoes being containerised by 2025.

These assumptions seem reasonable in light of the existing commodity mix but should be reviewed again at a later stage.

As the container traffic is only handled in the public port, container traffic is forecast separately but also included within the public port cargo forecast. The two sources are then cross-checked to ensure consistency (e.g. the container cargo cannot exceed a certain proportion of the total public cargo).

7) Public berth cargo data seems relatively clear for 2000 and the forecasts have the following main aspects.

   Firstly, Recent trends in public cargo movements are reasonably consistent. We have therefore, assumed an increase of 8 % per year to 2007 based on the current cargo trends. After 2007, we forecast that the rate of increase will slow to about 5 % per year.

   Some diversion of non-public traffic to the public port may be appropriate. Therefore, we have assumed that between cargoes will transfer after 2010, at a maximum of 5 %, of the forecast total cargoes to the public port.

   Distribution between international and domestic cargoes at the public berth is not known from port data.

   Given that recent data shows no clear trend in the proportion of international to domestic cargo, we have made no explicit change to this proportion.

8) Comparison of our forecasts and the UMP reveals some differences. This is mainly due to some assumptions being different. (The UMP forecast to 2018 so this is the year of comparison).

9) UMP assumed about 10.7 million tonnes of total cargo by 2018 with 2.5 million tonnes containerised. (23 % of total cargo by 2018).

10) Our estimates, amount to a total of 11.3 million tonnes by 2018 with 3.6 million tons of containerised cargo. The total includes our forecast of a slightly higher CPO volume of 2.0 million tonnes by 2018, and is comparable to the UMP figures.

    The UMP forecast total public port traffic at about 3.6 million tonnes by 2018. Based on more recent data which shows a higher volume of public cargo, we are forecasting some 4.1 million tonnes of public cargo by 2018, excluding transfer from khusus.

    Our container estimates amount to a much more significant additional 1.1 million tonnes containerised as we assumed a higher public cargo volume and a larger percentage being containerised. As mentioned above, it seems unrealistic to maintain the 2000 percentage of 65 % of public cargoes containerised and we have increased this over the period to 75 % by 2018.

Table 7.1.2 Preliminary Pontianak Port Cargo Forecast

(In Unit =1, 000 Tonnes)

Year	INTERNATIONAL CARGO	DOMESTIC CARGO	TOTAL CARGO(1)	PUBLIC CARGO	CONTAINER CARGO	TEUs (000s)
1988/89	918	648	1,566	803	267	26.7
2000	961	2,520	3,481	1,400	903	90.3
2007	1,366	3,995	5,813	2,470	1,996	199.6
2025	3,579	10,017	15,458	6,547	5,233	523.3
Annual Growth Rates						
1988/9-2000	0.4%	12.0%	6.9%	4.7%	27.6%	
2000-2007	5.2%	6.8%	7.6%	8.4%	12.0%	
2007-2025	5.5%	5.2%	5.6%	5.6%	5.5%	
2000-2025	5.4%	5.7%	6.1%	6.4%	7.3%	

NOTES: Subject to the attached assumptions.
(1) Total cargo includes main bulk commodities of cpo and coal from 2007
Container cargo is total container movements
Public cargo includes an allocation of container traffic from the total container tonnage

(3) Samarinda Port - Assumptions of the Preliminary Forecasts

1) Location of Port Development

The proposed location of the new port development at Samarinda will depend on further studies and these are described elsewhere. The traffic forecasts will certainly be different for a coastal location as it will almost certainly develop an important international cargo role for Samarinda, handling both container and bulk traffic as well as other important domestic cargoes. All cargoes would probably increase at a faster rate at a coastal location than at a river-side location due to attracted cargoes and generated traffic from new and relocated industrial and processing developments.

Such coastal development would also need to take account of Balikpapan both from a view of losing traffic to Balikpapan and perhaps, conversely, gaining traffic by providing a more localised regional facility.

Consequently, at this stage, the forecasts relate only to a river-side location and should a coastal location be selected, further analyses of the port development scenario and traffic hinterlands will be needed

Note: These preliminary forecasts are included for completeness and are now superseded by the detailed forecasts below.

2) Commodities:

There are two main commodities handled at Samarinda; coal (50 % of total cargo) and logs and wood products (30%).

In terms of the forecasts, wood and logs are predicted at best to be static and may decline in the medium term. Therefore, logs and wood are not included as specific commodities in the forecast. However, they are implicitly included in the main forecast.

Coal traffic has been expanding consistently in East Kalimantan (and Indonesia) but in recent years has increased very little through Samarinda. Coal shipments are, however, expected to increase though no targets were obtained from sources in Kalimantan. At this stage therefore, the volume of coal is not separated from the total port cargoes.

3) Containers

Container traffic has been expanding rapidly. It is currently handled in one location (i.e. the public port).

We have assumed that the proportion of containerised traffic would rise from 55 % in 2000 to about 77 % containerisation of public cargoes by 2025. We understand that a few Samarinda sourced containers already use Balikpapan port. From our own information, and from container shipping companies in Samarinda, it seems likely that if Balikpapan/Kariangau is developed, that the outflow to Balikpapan would increase.

4) Public Berth Data

Public berth cargo data seems relatively clear for 2000 and the forecasts have the following main aspects.

Firstly, Recent trends in public cargo movements are reasonably consistent. We have therefore, assumed an increase of 7 % per year to 2007 based on the current cargo trends. After 2007, we forecast that the rate of increase will slow, and have assumed some 4 % growth per year thereafter.

Some diversion of non-public traffic to the public port may be appropriate. Therefore, we have assumed that a maximum of 5 % of the forecast total cargoes will transfer to the public port by 2010.

As the container traffic is only handled in the public port, container traffic is forecast separately but also included within the public port cargo forecast. The two sources are then cross-checked to ensure consistency (e.g. the container cargo cannot exceed a certain proportion of the total public cargo).

Distribution between international and domestic cargoes at the public berth has been provided from port data and analysis shows that nearly all public traffic is domestic.

5) We have not been provided with any forecasts but our forecasts appear reasonable, at this stage, based on recent trends at Samarinda and other similar ports.

Table 7.1.3 Samarinda Port Preliminary Traffic Forecast

(in Unit = 1, 000 Tonnes)

	INTERN-ATIONAL	DOMESTIC CARGO	TOTAL CARGO	PUBLIC CARGO	CONTAINER CARGO	TEUs (000s)
1988	2,303	1,820	4,123	495	196	20
2000	5,245	3,143	8,388	1,237	687	69
2007	8,432	3,571	12,003	2,010	1,518	152
2025	13,948	5,238	19,186	4,727	3,654	365
Annual Growth Rates						
1988-2000	7.1%	4.7%	6.1%	7.9%	36.8%	
2000-07	7.0%	1.8%	5.3%	7.2%	12.0%	
2007-2025	2.8%	2.2%	2.6%	4.9%	5.0%	
2000-2025	4.0%	2.1%	3.4%	5.5%	6.9%	

NOTES: Subject to the attached assumptions.
NB Total cargo includes main commodities of cpo and coal from 2007
Container cargo is total container movements
Public cargo includes an allocation of container traffic from the total container tonnage

(4) Palembang - Assumptions of the Forecasts

1) These forecasts relate to existing Palembang port facilities at Boom Baru and Sungai Lais, but also assume Tj. Api Api (multi-purpose terminal) will be built in the longer term. It is therefore, important that in any future studies for Tj. Api Api, the traffic forecasts include the impact on Boom Baru and Sungai Lais.

2) Reference is made in this forecast to the various studies such as:
   a. Development of Tj. Api Api port, S. Sumatra Province (Sumsel), 2000.
   b. Study of Access to Tj. Api Api, Sumsel, 2000
   c. Proposal for Port and Coal terminal at Tj. Api Api, Private Sector, 1997
   d. Data prepared by Sumsel on Tj. Api Api,2001

3) Commodities: There are several significant commodities that dominate cargoes handled at Palembang; In order of importance these are; Oil and BBM (refined Products), fertiliser, coal, CPO and logs/wood products. In the future coal is predicted to be a more significant cargo, and possibly a very significant cargo if Tj Api Ai proceeds.

   In terms of the forecasts, wood and logs are difficult to predict and may decline in the medium term if supplies are restricted. Therefore, logs and wood are not included as specific commodities in the forecast but are included in the overall forecast. Similarly, oil/ BBM is already a significant cargo and is also already included in the main forecast. According to previous studies, oil and BBM are, in any case, predicted to be static or experience marginal increases.

Only the net increase in coal, fertiliser and CPO is specifically added to the total port cargoes.

CPO is expected to expand and based on the previous reports, the study team have assumed 367,000 tonnes by 2007. The study team has also considered that this might expand to 1.0 million tonnes by 2025.

Some 1 million tonnes of coal is handled at present, and is predicted to reach 2 million tonnes by 2010. The study team has estimated that by 2025 this volume would reach the 4 million tonnes, without Tj Api Api.

Fertiliser is expected to increase substantially to 3.6 million tonnes by 2015 at about 4 % per year.

4) Containers: Container traffic is currently handled at the public port and has not been expanding significantly. Indeed, the current, relatively high, level of container movements was already reached in 1996.

   The study team have assumed that Palembang port will experience renewed growth in container traffic as general/public cargoes continue to increase and its container characteristics will be similar to other river ports under study. Review of the commodity based traffic shows considerable scope for containerisation.

   Currently, container traffic comprises about 36% of public traffic (and in 1997, when container traffic was higher and public traffic lower, this percentage reached 66 %). The study team has therefore assumed by 2025 this percentage will reach 75 % and review of commodity mix shows this is possible but should be reviewed again later.

5) Public Berth data seems relatively clear for 2000 but its prediction into the future less clear. This is for two main reasons as follows.

   Firstly, recent trends in public cargo movements are not consistent. The study team have therefore, assumed a modest increase of 5 % per year based on the current cargo.

   The study team has assumed that the maximum of 5 % of the forecast total cargoes will transfer to the public port by 2010.

   Distribution between international and domestic cargoes at the public berth is known from port data and this shows that about 35 % is international and 65 % is domestic.

6) Although much has been written about Tanjung Api Api there is little good data on the remaining cargo flows in the existing port area including Sungai Lais.

Table 7.1.4 Palembang Port Preliminary Traffic Forecast

(In 000 Tonnes)

	INTERNATIONAL	DOMESTIC CARGO	TOTAL CARGO	PUBLIC CARGO	CONTAINER CARGO	TEUs (000s)
1988	1,125	6,497	7,622	915	2	0
2000	1,524	9,400	10,924	1,422	493	49
2007	1,832	12,024	13,856	2,044	1,090	109
2025	3,416	23,099	26,515	4,511	3,386	339
Annual Growth Rates						
1988-2000	2.6%	3.1%	3.0%	3.7%	>50% pa	
2000-2007	2.7%	3.6%	3.5%	5.3%	12.0%	
2007-1025	3.5%	3.7%	3.7%	4.5%	6.5%	
2000-2025	3.3%	3.7%	3.6%	4.7%	8.0%	

NOTES: Subject to the attached assumptions.
NB Total cargo includes main commodities of cpo and coal from 2007
Container cargo is total container movements

(5) Pekanbaru Port

1) In this report, forecasts are related to the port planning scenario for Pekanbaru.

2) Reference is made in this forecast to various other forecasts including the port 2005 and the Master Plan (1995 data), although this is now somewhat out of date.

3) Commodities: There are a few significant commodities that dominate cargoes handled at Pekanbaru; In order of importance these are: pulp, logs, plywood and CPO. In the future coal is predicted to be a more significant cargo, but no target forecasts are available.

In terms of the forecasts, no commodity is separated for forecasting or to be added to the main forecast as explained above. Forecasts have been made for major Pekanbaru commodities but these are already implicitly contained within the main forecast.

Pulp is an important commodity that has increased rapidly in recent years and the team has used the IPC1 forecast to 2005 and extended that at a moderate rate. This approach is also applied to the other commodities mentioned above. Coal shipments, based on the regional development analysis, are assumed to reach about 900,000 tonnes by 2025. CPO is forecast to increase by about 10% per year from 2000 reflecting existing and planned investment in palm oil plantations.

Logs are difficult to predict and may as easily decline as increase in the medium term if supplies are restricted, but a very modest annual increase is assumed.

4) Containers: Container traffic is currently handled at the four locations in Pekanbaru (i.e., Public, PT Siak Haska, and by two private paper making companies). Those handled at the public wharf may be low volume, although the exact number is not

clear from the data. This is because the PT Siak Haska and the public containers appear in some data as both being classified as public cargoes at Perawang.

The total container volume handled at Perawang is still low but growing strongly. The study team has assumed that Pekanbaru port will experience growth in container traffic as general/public cargoes continue to increase and that its container characteristics will be similar to other river ports under study. Review of the commodity based traffic shows scope for increased containerisation, which when combined with higher traffic would result in substantial growth rates in container volumes.

Currently, container traffic comprises about 16% of total traffic. The assumptions of the study team has led to this percentage increasing to 23 % by 2025, with 73 % of all public cargoes containerised. Review of the commodity mix shows this is possible but should be reviewed again later.

Currently, the public port container volume is about 20% of total containers and we have increased that percentage to 30% by 2025 based on the port planning scenario.

5) Public Berth Traffic Forecast

It should be noted that public cargoes are very small and appear to be declining in some years but increasing in other years.

Therefore, recent trends in public cargo movements are not consistent. The study team have therefore, assumed an increase of 10 % per year to 2007 and 5 % thereafter. The reason for this is that in 2000 cargo was relatively low. Even in absolute terms, public cargo is still predicted to be quite small in 2007 at 490,000 tonnes (including transferred cargo).

Some diversion of non-public traffic to the public port may be appropriate and the study team has assumed that 5 % of the forecast total cargoes will transfer to the public port from 2010.

Distribution between international and domestic cargoes at the public berth is known from port data and this shows that about 28 % is international and 72 % is domestic.

6) As mentioned above, there are two possible sources for comparison with the team's forecasts. The IPC1/Cabang forecasts are for 2001 to 2005 and we have reviewed these for container traffic and commodities as they seem quite reasonable.

The second source is the Master Plan which was prepared in the mid 1990's with 1995 data. Hence, the team can compare their forecasts for 2000 with actual data. Unfortunately, by the year 2000, their total forecasts were too low by 2.3 million tonnes or some 70 % less than actual and their 2015 forecasts are equivalent to the actual 2000 data. This makes use of their data generally inappropriate.

Table 7.1.5 Pekanbaru Port Preliminary Traffic Forecast

(In Unit = 1,000 Tonnes)

	INTERN-ATIONAL	DOMESTIC CARGO	TOTAL CARGO	PUBLIC CARGO	CONTAINER CARGO	TEUs (000S)
1991	1,008	557	1,565	190	276	28
2000	2,091	3,502	5,593	260	892	89
2007	3,133	6,825	9,958	490	2,099	210
2025	7,769	12,677	20,446	1,901	4,635	464
Annual Growth Rates						
1991-200	8%	23%	15%	4%	34%	
2000-200	6%	10%	9%	9%	13%	
2007-202	5%	3%	4%	8%	4%	
2000-202	5%	5%	5%	8%	7%	

NOTES: Subject to the attached assumptions.
Container cargo is total container movements
Public cargo includes an allocation of container traffic from the total container tonnage, and therefore, experiences high growth rates

(6) Kumai Port

1) The forecasts are made first for all Kumai Cargoes which are shown in Table 7.1.6 below. They are then allocated to Kumai (i.e., Bumiharjo port) which is shown in the summary tables for all ports in Table 7.1.8.

2) The forecasts were initially trend based, but the statistical relationships were weak and recent trends and Kumai Bumiharjo Master Plan (KBMP) data were, therefore, used.

3) Given the recent (nearby) troubles in the region, and the loss of some population, either temporarily or permanently, the team has tended to be a little less optimistic about cargo growth, especially in the short term, than for the other river ports with the exception of Sampit.

4) Reference is made in this forecast to the KBMP and where it provides useful data, we have used it. We have also referred to the Regional Plan for Western Kalimantan (RPWK), funded by JICA, 1999.

5) Commodities: Two main commodities dominate cargoes handled at Kumai: logs/wood products and CPO. In the future CPO volume is expected to become much larger, hence the new facilities at Bumiharjo.

   In terms of the forecasts, wood and log cargoes are predicted at best to be static and may decline in the medium and long terms according to the RPWK. Therefore, logs and wood are not included as specific commodities in the forecast. However, they are included in the main forecast. No specific mention is made of wood products in the KBMP forecasts.

CPO is expected to expand and based on the previous KBMP, we have followed their targets of 1.2 million tonnes by 2013 and thereafter.

Fertiliser is also expected to become a major commodity by 2025.

6) Containers: No containers are presently handled at Kumai and it is not expected to become a major container handling port. The KBMP plan forecasts an extremely low volume of containers in the future and we have modified this slightly. The KBMP predicted 5,000 TEUs by 2010. We have also estimated about 6,800 TEUs by 2007 but increasing thereafter at a similar growth rate to the KBMP to 2025 resulting in about 79,000 TEUs by that date. This target still remains modest.

7) Public Berth data seems relatively clear for 2000. Recent trends in public cargo movements are fairly consistent with a solid year on year increase of over 6 % since 1993 (data before 1993 seems inconsistent). We have therefore, assumed an increase of 5 % per year based on current cargoes.

   Some diversion of non-public traffic to the public port appears appropriate. Therefore, we have assumed that 5 % of the forecast total cargoes will transfer to the public port from 2010.

   Distribution between international and domestic cargoes at the public berth is known from existing port data and, therefore, the current 10 % international and 90 % domestic cargo through the public berths has been used in the forecasts

8) The forecasts of the KBMP are only related to Kumai port and reveal some differences but not many of significance, between their forecasts and the team’s. We note that the use of tonnes/M3/litres makes comparisons further difficult.

9) The KBMP forecasts for Kumai in 2025 show approximately 1.2 million tons excluding CPO. If Kumai makes up about 57 % of total traffic, hence their forecast would be about 2 million tonnes by 2025 in total plus CPO. Our forecast is about 2.3 million tonnes by 2025, plus CPO, which would be reasonably consistent with the KBMP.

10) In order to allocate cargo to Bumiharjo, we have assume that it would handle all international traffic, all containers, a proportion of the domestic cargo and all CPO cargo amounting to a maximum of 80 % of the total Cabang cargo (shown in Table 7.1.6) for the above mentioned ports.

Table 7.1.6 Preliminary Kumai Port Traffic Forecast

(In 000 Tonnes)

	INTERN-ATIONAL	DOMESTIC CARGO	TOTAL CARGO (inc. CPO)	PUBLIC (Ex. CPO)	CONTAINER CARGO	TEUs (000s)
1988	241	385	626	436		
2000	252	710	962	677		
2007	275	1,061	1,637	882	68	6.8
2025	360	2,056	3,516	1,642	789	78.9
Annual Growth Rates						
1988-2000	0.4%	5.2%	3.6%	6.5%		
2000-2007	1.3%	5.9%	7.9%	3.9%		
2007-2025	1.5%	3.7%	4.3%	3.5%	14.6%	
2000-2025	1.1%	2.7%	3.1%	2.5%	10.3%	

NOTES: Subject to the attached assumptions.
Container cargo is total container movements
Public cargo includes an allocation of container traffic from the total container tonnage, and therefore, experiences high growth rates

(7) Sampit Port

1) These forecasts relate to all Sampit Cargoes including Mendawai, Samuda and Kuala Pembuang as shown in Table 7.1.7. Cargo is allocated only later in the summary tables 7.1.8 to Sampit (i.e. Bagendang port).

2) Given the recent troubles in Sampit, and the loss of population, either temporarily or permanently, the team has tended to be somewhat pessimistic about cargo growth, especially in the short term. However, we note the important provincial role of this port and have therefore confirmed this, in terms of cargo growth, within the forecasts.

3) Reference is made in this forecast to the Sampit/Bagendang Master Plan (SBMP) study. However, this study is already somewhat out of date and, in places, lacks key data. Where it provides useful data however, we have used it.

4) Commodities: Two main commodities dominate cargoes handled at Sampit; logs/wood products and CPO. In the future CPO volume is expected to become much larger, hence the new facilities at Bagendang.

   In terms of the forecasts, wood and logs are predicted at best to be static and may decline in the medium term. Therefore, logs and wood are not included as specific commodities in the forecast. However, they are included in the main forecast. No mention is made of wood products in the SBMP.

   CPO is expected to expand and based on the previous SBMP, we have followed their targets of 500,000 tonnes by 2007 and 1.0 million tonnes by 2010 and thereafter.

   Fertiliser is expected to increase in volume to 500,000 tonnes by 2025.

5) Containers: Container traffic has been expanding fairly rapidly but from a low base, and this traffic is currently handled at the public port. The forecast from the SBMP has already been surpassed and we have used our own assumptions to predict container traffic.

   The team estimates that containers will amount to 26 % of total traffic by 2025. This would imply about 64 % containerisation of public cargoes, excluding CPO. These assumptions seem reasonable in light of the existing and forecast commodity mix but should be reviewed again.

6) Public Berth data seems relatively clear for 2000 but its prediction into the future may be less clear. This is for two main reasons as follows.

   Firstly, recent trends in public cargo movements are not consistent. We have therefore, assumed a modest increase of 5 % per year based on the current cargo.

   Some diversion of non public traffic to the public port may be appropriate and we have assumed that 5 % of the forecast total cargoes will transfer to the public port from 2010.

7) Comparison of our forecasts and the SBMP reveals some differences but not many of significance, although the use of tonnes/M3/litres makes comparisons further difficult. The SBMP forecasts for Sampit in 2025 show approximately 2 million tons excluding CPO of about 1 million tonnes. Hence their forecast is for about 3 million tonnes by 2025. Our forecast is just over 2.6 million tonnes by 2025 but reaching that target at a lower growth rate than SBMP in the short term.

   The SBMP forecast only about 30,000 TEUs by 2025, a very conservative position considering that 12,000 TEUs were already handled in 2000. As mentioned by IPC 3 staff, the recent troubles have led to an even faster growth in containers and we see no reason why this will not continue as far as the commodity mix will allow (i.e., to the point of maximum containerisation). Our estimated rate of growth at 9.1 % per year is itself somewhat modest, because it is from a low base and leads to only 105,000 TEUs by 2025.

Table 7.1.7 Preliminary Sampit Port Traffic Forecast

(In 000 Tonnes)

	INTERN-ATIONAL	DOMESTIC CARGO	TOTAL CARGO (Inc. CPO)	PUBLIC (Ex. CPO)	CONTAINER	TEUs (000s)
1988	130	286	416	207	40	
2000	80	1,380	1,460	335	119	12
2007	108	1,690	2,200	531	262	26
2025	191	2,877	3,968	1,636	1,048	105
Annual Growth Rates						
1988-2000	-4.0%	14.0%	11.0%	7.1%		
2000-2007	4.4%	2.9%	6.0%	6.8%	11.9%	
2007-2025	3.2%	3.0%	3.3%	6.5%	8.0%	
2000-2025	3.5%	3.0%	4.1%	6.5%	9.1%	

NOTES: Subject to the attached assumptions. All Ports in Sampit Cabang.
Container cargo is total container movements
Public cargo includes an allocation of container traffic from the total container tonnage, and therefore, experiences high growth rates

7.1.7 Summary of the Preliminary Forecasts

Table 7.1.8, and the attached graphs in Figures 7.1.1-7.1.3, show the summary forecast for each port divided into the following categories.

1) Total cargo (All cargoes recorded by the port including public and non-public, including special berths and ports, mid stream loading and loading at sea)
2) Public cargo
3) Container cargo

It should be noted that only a relatively small proportion of total cargo uses the public port facilities in most cases.

It should also be noted that while we distinguish between public and private port facilities this is based on the current organisation of ports. It does not mean that the public ports will necessarily remain 100 percent publicly owned or managed in future.

It is also worth remembering that 7 % growth over 25 years means total growth amounting to over 5 times the base year.

The following key points may be summarised from these data;

(1) Up to 2000, **total cargo** has been increasing by between 11 % per year at Pekanbaru and Sampit, by about 6% to 7% at Jambi, Pontianak and Samarinda and by 3-4 % at Kumai and Palembang

(2) Currently, Palembang and Samarinda are the largest ports with 10.9 million and 8.4 million tonnes respectively. Pekanbaru has 5.6 million tonnes and Jambi and Pontianak have 3.5 million Kumai and Sampit are the smallest averaging 0.5 million tonnes each.

(3) The forecasts made by the team are divided into short term 2001-2007 and long term 2001-2025.

(4) In the short term, total cargo is estimated to grow by between 3.5 % (Palembang) and 8.6 % (Pekanbaru)

(5) In the long term, total cargo is estimated to grow by between 2.6 %(Samarinda) and 5.8 % (Pontianak)

(6) It should be noted that, excluding Kumai and Sampit, the ports with the lower volumes have been growing faster, unless specific commodity growth influences port traffic. We have continued those two characteristics in the forecasts.

(7) Consequently, by 2025, Samarinda, Palembang and Pekanbaru might record about 20 million tonnes or more, Jambi and Pontianak between 12 and 15 million tonnes and Kumai and Sampit approaching 4 million tonnes.

(8) On average, total cargo is estimated to grow by 4.4 % per year between 2000 and 2025 at the subject ports.

(9) Up to 2000, cargoes handled at the **public ports** had been increasing by variable amounts ranging from 3 % at Pekanbaru to 9 % at Pontianak.

(10) Public cargoes are relatively low and in 2000 ranged from 161,000 tonnes at Jambi to 1.4 million tonnes at Palembang and Pontianak.

(11) Our short term forecasts indicate that public cargoes could grow by between 4 % at Sampit and 14 % at Jambi. It should be noted that where public container cargoes grow faster than those at private berths based on the port planning scenario, as at Jambi, this causes the public cargo to increase significantly more than the average.

(12) Our long term forecasts of public cargoes indicate growth rates of between 4% at Kumai and 10% at Jambi. Again cargoes grow more quickly where the port planning scenarios assume faster public container and other public cargo growth than private.

(13) On average, public cargo is estimated to grow by 6 % per year to 2025.

(14) Container growth has generally been very rapid with growth rates at many ports over 50% per year, albeit from very low or zero volumes. Most of the subject ports only started handling containers in any volumes after 1994.

(15) The currently recorded average weight of cargo per TEU (including empty and loaded) is 10 tonnes, although there is some variation especially at smaller ports.

(16) Currently, the volume of containers handled varies from about 90,000 TEUs at Pekanbaru and Pontianak, 12,000 TEUs at Sampit with no containers handled at Kumai.

(17) Our container forecasts show solid and consistent growth over the planning periods and especially if considered over the whole period.

(18) Short term container growth rates have been assessed at between 21% per year at Jambi and 12% at Palembang, Sampit, Samarinda and Pontianak.

(19) Longer term rates are between 15% at Kumai and 5 % at Pekanbaru and Samarinda. It should be noted that higher long term growth rates were constrained by the assumed maximum percent of containerisation which for most ports was about 80%. In the next stage this will be reviewed again.

(20) Container volumes were estimated to reach, in 2025, 523,000 TEUs at Pontianak, about 450,000 TEUs at Jambi and Pekanbaru and about 350,000 TEUs at Samarinda and Palembang. Container volumes at Sampit and Kumai were estimated at between 100,000 and 79,000 TEUs respectively by 2025.

(21) On average, container movements are estimated to grow by about 8 % per year between 2000 and 2025.

Table 7.1.8 Summary of All Ports' Traffic Forecasts

	Actual Data			Forecast Years				Growth Rates % pa			
Port	1988	1994	2000	2007	2015	2020	2025	1998-2000 (4)	2000-2007	2007-2025	2000-2025
	In 000 Tonnes							Actual	**Forecast**		
JAMBI											
Total Cargo	1,541	2,328	3,518	5,894	8,031	9,745	11,824	7.1%	7.7%	3.9%	5.0%
Public Cargo (1994)	-	187	161	418	942	1,566	2,603		14.6%	10.7%	11.8%
Container Cargo(1)	0	15	248	943	1,865	2,856	4,374	59.6%	21.0%	8.9%	12.2%
PONTIANAK											
Total Cargo	1,566	2,335	3,481	5,613	8,805	11,667	15,458	6.9%	7.1%	5.8%	6.1%
Public Cargo	431	786	1,400	2,470	3,809	4,994	6,547	10.3%	8.4%	5.6%	6.4%
Container Cargo	0	267	903	1,996	3,063	4,004	5,233	22.5%	12.0%	5.5%	7.3%
SAMARINDA											
Total Cargo	4,123	5,881	8,388	12,003	14,785	16,842	19,186	6.1%	5.3%	2.6%	3.4%
Public Cargo	495	783	1,237	2,010	2,939	3,728	4,727	7.9%	7.2%	4.9%	5.5%
Container Cargo	0	196	687	1,518	2,243	2,863	3,654	23.2%	12.0%	5.0%	6.9%
PALEMBANG											
Total Cargo	7,622	9,125	10,924	13,856	18,489	22,141	26,515	3.0%	3.5%	3.7%	3.6%
Public Cargo	915	1,141	1,422	2,044	2,906	3,621	4,511	3.7%	5.3%	4.5%	4.7%
Container Cargo	2	248	493	1,090	1,804	2,471	3,386	12.2%	12.0%	6.5%	8.0%
PEKANBARU											
Total Cargo	1,565	2,959	5,593	9,958	13,710	16,743	20,446	11.2%	8.6%	4.1%	5.3%
Public Cargo	190	222	260	490	895	1,304	1,901	2.6%	9.5%	7.8%	8.3%
Container Cargo(1)	0	276	892	2,099	2,985	3,719	4,635	21.6%	13.0%	4.5%	6.8%
KUMAI (All Branch Ports)											
Total Cargo	-	600	962	1,637	2,299	2,843	3,516	-	7.9%	4.3%	5.3%
Public Cargo(2)	-	470	677	882	1,163	1,382	1,642	-	3.9%	3.5%	3.6%
Container Cargo(3)	0	-	0	68	202	399	789	-	n/a	14.6%	
SAMPIT (All Branch Ports)											
Total Cargo	416	779	1,460	2,200	2,859	3,368	3,968	11.0%	6.0%	3.3%	4.1%
Public Cargo(2)	-	207	335	531	876	1,197	1,636	-	6.8%	6.5%	6.5%
Container Cargo	0	40	119	262	485	713	1,048	19.9%	11.9%	8.0%	9.1%
ALL PORTS	1988	1994	2000	2007	2015	2020	2025	1998-2000 (4)	2000-2007	2007-2025	2000-2025
Total Cargo	16,833	24,007	34,326	51,161	68,979	83,349	100,913	6.1%	5.9%	3.8%	4.4%
Public Cargo	2,031	3,795	5,492	8,845	13,530	17,791	23,567	8.6%	7.0%	5.6%	6.0%
Container Cargo	2	1,042	3,342	7,976	12,647	17,026	23,119	21.4%	13.2%	6.1%	8.0%

Total Cargo 7 River Ports in 2000 and 2025 in tonnes	34,326,000		50,456,500

NOTES:

(1) Containers also handled in private berths

(2) Excludes CPO volumes of t (4) Growth rates vary according to base and end year, so this is indicative only

(3) No containers until 2005

(4) Growth rates vary according to base and end year, so this is indicative only

Figure 7.1.1 Preliminary Traffic Forecast-Total Cargo

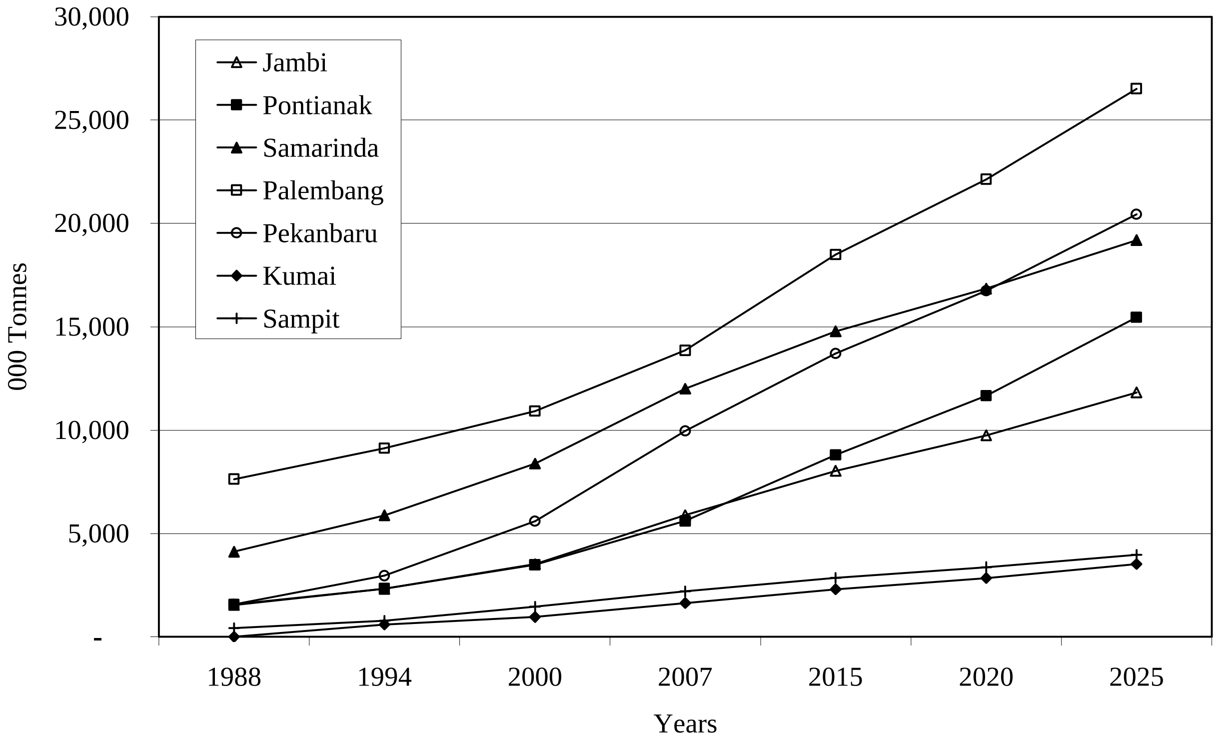


Figure 7.1.2 Prliminary Public Cargo Forecast-All Ports

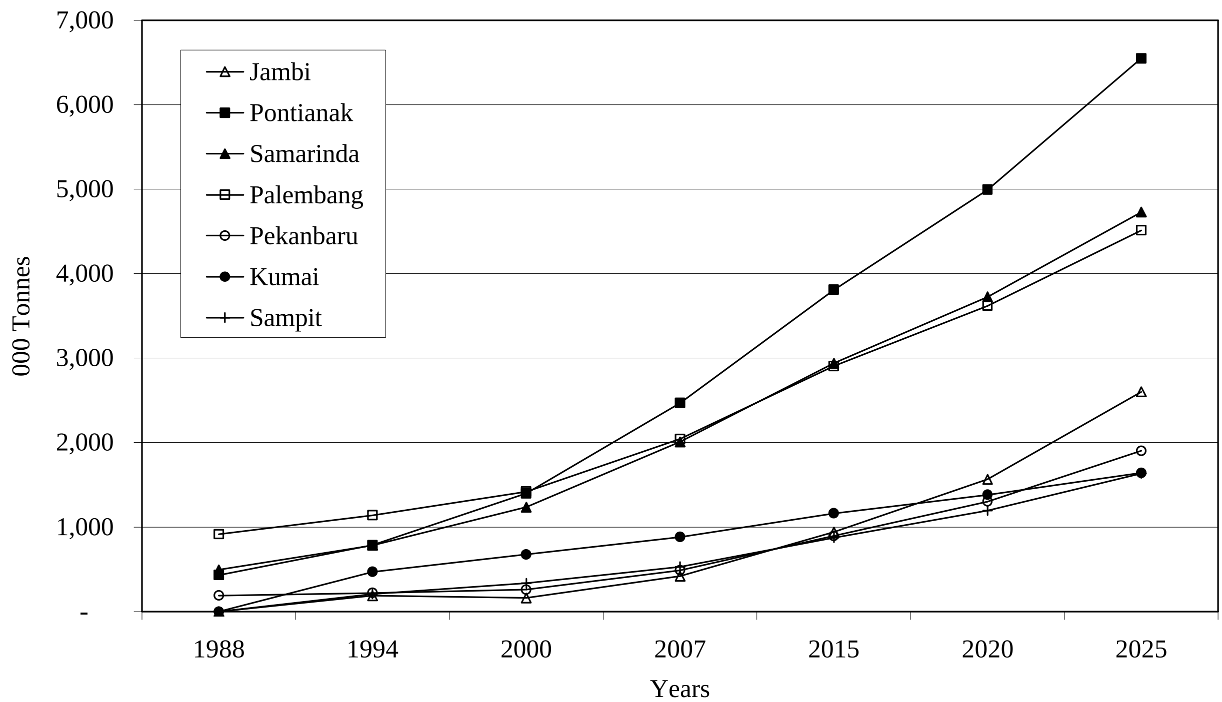
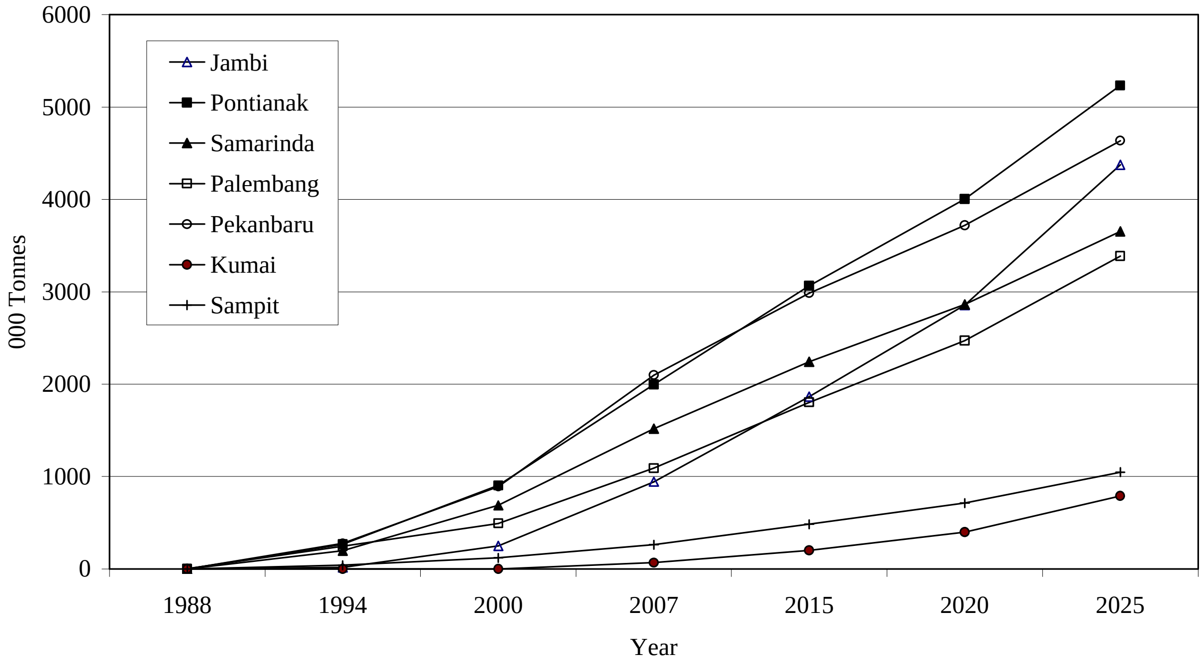


Figure 7.1.3 Prliminary Cargo Forecast-Containerised Cargo



7.2 Passenger Forecast

7.2.1 Introduction

Sea passenger traffic in Indonesia has been increasing very rapidly over a number of years and this is also true for most of the subject ports.

The Consultants are aware of these long term high growth rates in passenger sea travel, whether by ferry under DGLC/ASDP and private companies and by DGSC/Pelni and private companies.

Such long-term trends provide an implicit basis for the forecasts, along with more recent trends.

It is assumed that there are several driving forces behind these trends, including movement for economic and social purposes between islands and especially between Java and Sumarta/Kalimantan, population movements (transmigration) and general economic development. The reduction in air capacity and the high cost of air travel has also impacted on sea transport demand in the initial years of the crisis.

Further, in recent years, the GOI has purchased a fleet of modern large passenger vessels and this has no doubt encouraged or allowed rapid increases in passenger flows. In the current economic circumstances, slow expansion of the fleet may conversely curtail expected expansion of passenger volumes.

The existing and forecast passenger movements have implications for port planning in two ways. Firstly, there is the need to cater for these passengers and ships. Secondly, as the Pelni and private vessels generally use cargo port berths, there is the need to coordinate and organise facilities in a manner that is safe and efficient for both passengers and cargo.

Given the likely continued expansion of passenger volumes to the levels expected, this would probably mean the development of separate passenger facilities at all ports as soon as possible and as soon as passenger volumes justify it.

7.2.2 The Passenger Forecast Methodology

Given recent high demand and likely constraints on continued growth rates at this level, the Consultants have followed a middle course between these two conflicting influences.

Passenger forecasts have been made on the basis of trend analysis followed by a review of the results of this statistical analysis to take into account likely passenger developments. This should make the forecasts as realistic as possible.

For example, Sampit has experienced serious problems in 2001 and although the problems themselves are likely to be resolved, the loss of population may be a longer term problem which will impact passenger growth.

Further, the recent very rapid passenger growth rates at most ports may be related to the economic crisis and may not continue at such high rates.

At Pekanbaru, passenger growth has been minimal in recent years and this needs further explanation as to whether decline in demand is due to other modes (e.g. competition with express buses to Java), or other ferries providing services or general decline.

All river ports to some extent, suffer from quite long and slow journeys on the river part of the trip. At Samarinda port, for example, one could imagine increasing competition over 25 years from Balikpapan port (and airport) in the future due to the time savings by travelling via Balikpapan.

Very few port studies include passenger forecasts and where there are forecasts, they are usually underestimated. Therefore, although our forecasts may appear low by historical trends, they may represent a fairly reasonable level of demand, especially in the longer term by 2025. However, such long term forecasts are more indicative than for immediate planning purposes.

7.2.3 Passenger Ship Calls

Passenger ship calls are based upon the above passenger forecasts. The data on passenger ship size by GRT are very weak since these vessels are generally included in the domestic ship calls and are not disaggregated.

Nevertheless, ship calls are disaggregated by size in some ports and in others the number of calls is known. Further, the Pelni fleet, which transports a large proportion of passengers, is known in some detail.

Therefore, in some ways similar to the methodology for projecting cargo ship calls, the projected future passenger volume is divided by the expected passenger interchange per call. The interchange per call is based upon actual current data and supplemented by data on the existing Pelni vessel fleet. As passenger volumes increase, it is assumed that larger vessels will be placed on these routes up to the existing maximum vessel capacity. If this does not occur, there will be a larger number of smaller vessels or demand will be suppressed or both of these could occur together.

Overloading of passenger vessels is a problem and while the vessels are able to carry additional loads, safety is compromised in case of accidents at sea. While we have not assumed vessel interchange greater than capacity, use of maximum ship capacity does probably mean that at peak times vessels will still be overloaded.

7.2.4 The Forecasts

Table 7.2.1 below summarises the projected passenger traffic at each port, together with the forecast ship calls. The tables also show the number of projected ship calls per day and this shows, in many cases, the likely large impact passenger forecasts have upon the need for port facilities.

The results of the forecasts show that projected short term growth rates i.e. 2000-2007 vary between 12 % and 7.5 % per year, except for Pekanbaru which has a variable recent trend.

Longer term (i.e. 2007 to 2025), projected growth rates range between 8 % and 5 % (also except for Pekanbaru).

Vessel calls vary between 3 per day in Pontianak to 0.2 (just over 1 per week) at Pekanbaru by 2025.

All very long-term forecasts are likely to be affected by competing modes to varying extents.

Table 7.2.1 PASSENGER FORECAST SUMMARIES

(INCLUDING PASSENGER SHIP CALLS)

All Passenger Volumes in 000's Per Year

JAMBI

	Year	Passengers (In 000s/Year)	Pass/ Call	Calls	Short and Long term growth rates	Vessel Calls per Day: 2000, 2007, 2025
	1995	21.0	250	84		Calls Per day
	2000	134.0	1000	134		0.4
	2007	261.1	2000	131	10.0%	0.4
	2025	1,043.5	3000	348	8.0%	1.0
Annual Growth Rates						
1995-2000		44.9%	32.0%	9.8%		
2000-2007		10.0%	10.4%	-0.4%		
2007-2025		8.0%	2.3%	5.6%		
2000-2025		8.6%	4.5%	3.9%		

PONTIANAK

	Year	Passengers	Pass/ Call	Calls	Short and Long term growth rates	Vessel Calls per Day: 2000, 2007, 2025
	1988	71.0	500	142		Per day
	2000	586.0	1000	586		1.6
	2007	1,141.9	2000	571	10.0%	1.6
	2025	4,563.2	4000	1,141	8.0%	3.1
Annual Growth Rates						
1988-2000		19.2%	5.9%	12.5%		
2000-2007		10.0%	10.4%	-0.4%		
2007-2025		8.0%	3.9%	3.9%		
2000-2025		8.6%	5.7%	2.7%		

SAMARINDA

	Year	Passengers	Pass/ Call	Calls	Short and Long term growth rates	Vessel Calls per Day: 2000, 2007, 2025
	1988	58.3	500	117		Per day
	2000	197.2	2000	99		0.3
	2007	327.2	3000	109	7.5%	0.3
	2025	787.4	4000	197	5.0%	0.5
Annual Growth Rates						
1988-2000		10.7%	12.2%	-1.4%		
2000-2007		7.5%	6.0%	1.5%		
2007-2025		5.0%	1.6%	3.3%		
2000-2025		5.7%	2.8%	2.8%		

NOTES for ALL PORTS and See Text:
For all ports forecast growth rates based on past trends and best estimates of consultants
Ship passenger capacity based on existing data and PELNI fleet sizes ie where
passenger demand justifies, we move up to larger capacity vessel. At present,
largest vessel is 2,000 capacity, thus embark and disembark = 4,000 not allowing for current
gross overloading on some routes and at peak times. Assumed no larger vessels used than at present

PALEMBANG

	Year	Passengers	Pass/ Call	Calls	Short and Long term growth rates	Vessel Calls per Day: 2000, 2007, 2025
	1988	6.0	250	24		Per day
	2000	518.0	2000	259		0.7
	2007	1,145.1	3000	382	12.0%	1.0
	2025	3,870.5	4000	968	7.0%	2.7
Annual Growth Rates						
1999-2000*		16.0%				
2000-2007		12.0%	6.0%	5.7%		
2007-2025		7.0%	1.6%	5.3%		
2000-2025		8.4%	2.8%	5.4%		

* Passneger growth very large each year but 1999 to 2000 16%

PEKANBARU

	Year	Passengers	Pass/ Call	Calls	Short and Long term growth rates	Vessel Calls per Day: 2000, 2007, 2025
	1988	38.1	250	152		Per day
	2000	7.4	250	30		0.1
	2007	10.4	500	21	5.0%	0.1
	2025	57.9	1000	58	10.0%	0.2
Annual Growth Rates						
1988-2000		-12.8%	0.0%	-12.8%		
2000-2007		5.0%	10.4%	-4.9%		
2007-2025		10.0%	3.9%	5.8%		
2007-2025		8.6%	5.7%	2.7%		

KUMAI

	Year	Passengers	Pass/ Call	Calls	Short and Long term growth rates	Vessel Calls per Day: 2000, 2007, 2025
	1988	5.0	250	20		Per day
	2000	245.0	2000	123		0.3
	2007	541.6	3000	181	12.0%	0.5
	2025	2,164.3	4000	541	8.0%	1.5
Annual Growth Rates						
1988-2000		38.3%	18.9%	16.3%		
2000-2007		12.0%	6.0%	5.7%		
2007-2025		8.0%	1.6%	6.3%		
2007-2025		9.1%	2.8%	6.1%		

Sampit

	Year	Passengers	Pass/ Call	Calls	Short and Long term growth rates	Vessel Calls per Day: 2000, 2007, 2025
	1988	12.3	250	49		Per day
	2000	483.0	2000	242		0.7
	2007	801.3	3000	267	7.5%	0.7
	2025	3,202.1	4000	801	8.0%	2.2
Annual Growth Rates						
1988-2000		35.8%	18.9%	14.2%		
2000-2007		7.5%	6.0%	1.5%		
2007-2025		8.0%	1.6%	6.3%		
2007-2025		7.9%	2.8%	4.9%		

7.3 Projection of Calling Vessels

7.3.1 Introduction

These forecasts have been based on the base data, the forecast cargo, and the forecast maximum ship size for each port provided to the economist. The ship calls are total ship calls (public and non-public) and are disaggregated into international and domestic.

7.3.2 The Methodology for Estimating Ship Calls

(1) Analyse the last 5 years ship call data by international and domestic to provide base year data on calls, average GRT, tonnes per interchange and load factors. Cargo data either actual to 2000 (or after 2000 from the forecasts) is related to total international cargo and total domestic cargo.

(2) Estimate DWT from GRT by dividing by 0.7 (generally accepted ratio and confirmed by analysis of Indonesian ship data).

(3) Show the average GRT, cargo tonnes per call (interchange), vessel load factors for 1995-1999; (load factor is calculated by dividing the cargo tonnes handled by the total DWT capacity)

(4) Estimate the maximum GRT for each port-either from navigation rules which are available for some ports or from the consultants estimates for the remainder. Estimate the average GRT for 2007 and 2025 (based on maximum and trends)

(5) Estimate the future load factors for 2007 and 2025 by consultants estimates. For example if load factors are already high, no change; if low, some change based on trend.

(6) Growth of the cargo tonnes per call is based on the forecast GRT and load factor growth

(7) Divide the cargo forecast by the forecast cargo tonnes per call to obtain ship calls per year

7.3.3 Limitations of the Forecasts

(1) The ship call baseline data is not very reliable for ship call projection and is often only sufficiently disaggregated for very broad estimates of total international and domestic ship calls

(2) 1995 to 1999 data includes the economic crisis in Indonesia (although 1995 and 1996 were normal years). While we see some variation in cargo volumes over that period, ship calls and ship sizes may have been more erratic.

(3) Maximum GRT is based on:

a. existing navigation rules
b. the consultants estimates based on ship sizes and channel characteristics
c. adjustment where current average GRT is already very high, relative to that provided

or derived, maximum GRT in a. or b. above.

In some ports, the current, average GRT (especially for international ships) is greater than the stated or estimated maximum GRT. One reason is that ship calls at ‘loading point at sea’ or ‘rede/channel loading’ are included in total calls which would lead to over-estimating ship size.

In Kumai and Sampit ports, the latter is the problem and we have assumed a future mix of larger ships which anchor only and an increasing proportion of smaller vessels(up to maximum size) which berth at the new facilities.

Another reason may be that load factors for international ships appear quite low possibly suggesting larger vessels are part loaded when calling at smaller ports or inaccurate data. We have reviewed the load factors for the period 1995 to 1999 and assessed any trend.

In ports other than Sampit and Kumai, it would not make sense to reduce the average GRT into the future to meet the estimated maximum GRT and we have tended to use the maximum recent average GRT in each port, rounded up to the nearest thousand GRT.

7.3.4 Other Factors

Whether or not ship calls increase, depends on the relative size of cargo growth relative to the increase in ship size or change in load factors. Therefore, the ship call forecast depends on both the growth in cargo and its absolute amount.

7.3.5 Passenger Ship Calls

In addition to the forecast of cargo ships, the passenger ship forecast, estimated in Section 3.2 above, is added.

7.3.6 Improvements to the Forecasts

The two selected ports have been subject to further data collection and analysis to provide more accurate (i.e., more disaggregated) data. Ship call data and forecasts are described in the sections for Jambi (Section 18) and Samarinda (Section 25).

7.3.7 The Ship Call Projections

The following tables show the estimated ship call and average GRT data with the relevant assumptions attached to each table.

Table 7.3.1 SUMMARY OF FORECAST SHIP CALLS

1. PORT OF JAMBI-ALL SHIP CALLS

SHIP CALLS PER YEAR

	International	Domestic	Total	Passenger Ships
1995	1,230	3,723	4,953	84
1999	1,463	3,582	5,045	134
2007	1,268	3,273	4,541	131
2025	1,505	1,853	3,358	348
Growth Rates per Year				
1988/9-2000	4.4%	-1.0%	0.5%	12.4%
1999-2007	-1.8%	-1.1%	-1.3%	-0.3%
2007-2025	1.0%	-3.1%	-1.7%	5.6%
1999-2025	0.1%	-2.5%	-1.6%	3.7%

AVERAGE GRT

	International	Domestic	All Vessels
1995	2,365	400	888
1999	2,268	575	1,066
2007	3,500	1,000	1,582
2025	4,500	3,000	3,649
Growth Rates per Year			
1988/9-2000	-1.0%	9.5%	4.7%
1999-2007	5.6%	7.2%	5.1%
2007-2025	1.4%	6.3%	4.8%
1999-2025	2.7%	6.6%	4.8%

NOTES:

Assumes maximum GRT at Talang Duku is 1200 GRT

Assumes maximum GRT at Muara Sabak is 4500 GRT

Assumes increase in International Load factor from 19% in 1999 to 30% in 2025

Assumes domestic Load factor stays at 75%

NOTE: Base year for passenger vessels is 1988 except for Jambi which is 1995

2. PONTIANAK-ALL SHIP CALLS

SHIP CALLS PER YEAR

	International	Domestic	Total	Passenger Ships*
1995	885	6,948	7,833	142
1999	953	5,137	6,090	586
2007	1,082	4,607	5,689	571
2025	1,924	2,735	4,659	1,141
Growth Rates per Year				
1995-2000	1.9%	-7.3%	-6.1%	12.5%
1999-2007	1.6%	-1.4%	-0.8%	-0.3%
2007-2025	3.2%	-2.9%	-1.1%	3.9%
1999-2025	2.7%	-2.4%	-1.0%	2.6%

*From 1988

AVERAGE GRT

	International	Domestic	All Vessels
1995	5,177	564	1,085
1999	5,612	861	1,604
2007	6,000	1,500	2,232
2025	6,500	3,800	5,698
Growth Rates per Year			
1995-2000	2.0%	11.2%	10.3%
1999-2007	0.8%	7.2%	4.2%
2007-2025	0.4%	5.3%	5.3%
1999-2025	0.6%	5.9%	5.0%

NOTES:

Estimated maximum ship size is 3,800 GRT but current size is greater. See text.

About 6,000 GRT was reached before 1999 for international shipping, hence assumption of small increase

Load factor international increases from 13% 1999 to estimated 20% by 2025

Load factor domestic increases from 37 % 1999 to estimated 50% by 2025

3. SAMARINDA-ALL SHIP CALLS

SHIP CALLS PER YEAR				
	International	Domestic	Total	Passenger Ships*
1995	850	8,678	9,528	117
1999	947	11,997	12,944	99
2007	1,276	11,186	12,462	109
2025	1,973	8,773	10,746	197
Growth Rates per Year				
1995-1999	2.7%	8.4%	8.0%	-1.4%
1999-2007	3.8%	-0.9%	-0.5%	1.3%
2007-2025	2.5%	-1.3%	-0.8%	3.3%
1999-2025	2.9%	-1.2%	-0.7%	2.7%

* From 1988

AVERAGE GRT			
	International	Domestic	All Vessels
1995	9,609	658	1,457
1999	9,598	695	1,346
2007	10,600	850	2,059
2025	11,000	1,400	3,980
Growth Rates per Year			
1995-1999	0.0%	1.4%	-2.0%
1999-2007	1.2%	2.5%	5.5%
2007-2025	0.2%	2.8%	3.7%
1999-2025	0.5%	2.7%	4.3%

Notes: By navigation rules maximum GRT=10,000 but already over that before 1999 in some years

Load factor international increases from 43% 1999 to estimated 45 % by 2025

Load factor domestic increases from 25 % 1999 to estimated 30% by 2025

4. PALEMBANG-ALL SHIP CALLS

SHIP CALLS PER YEAR

	International	Domestic	Total	Passenger Ships*
1995	705	2,851	3,556	24
1999	865	2,887	3,752	259
2007	792	3,452	4,244	382
2025	889	4,312	5,201	968
Growth Rates per Year				
1995-1999	5.2%	0.3%	1.4%	21.9%
1999-2007	-1.1%	2.3%	1.6%	5.0%
2007-2025	0.6%	1.2%	1.1%	5.3%
1999-2025	0.1%	1.6%	1.3%	5.2%

*From 1988

AVERAGE GRT

	International	Domestic	All Vessels
1995	3,232	2,715	2,818
1999	2,839	2,592	2,649
2007	4,000	3,250	3,388
2025	6,000	5,000	5,167
Growth Rates per Year			
1995-1999	-3.2%	-1.2%	-1.5%
1999-2007	4.4%	2.9%	3.1%
2007-2025	2.3%	2.4%	2.4%
1999-2025	2.9%	2.6%	2.6%

NOTE: Subject to attached notes and tables

By navigation rules, maximum GRT is about 9,000 tonnes

Load factor international increases from 39% 1999 to estimated 45 % by 2025

Load factor domestic increases from about 75 % 1999 to estimated 75% by 2025

5. PEKANBARU-ALL SHIP CALLS

SHIP CALLS PER YEAR

	International	Domestic	Total	Passenger Ships*
1995	1,138	3,510	4,648	152
1999	1,658	5,494	7,152	30
2007	2,169	9,871	12,040	21
2025	4,354	10,983	15,337	58
Growth Rates per Year				
1995-1999	9.9%	11.9%	11.4%	-12.8%
1999-2007	3.4%	7.6%	6.7%	-4.3%
2007-2025	3.9%	0.6%	1.4%	5.8%
1999-2025	3.8%	2.7%	3.0%	2.6%

*From 1988

AVERAGE GRT

	International	Domestic	All Vessels
1995	4,026	1,436	2,070
1999	4,605	1,546	2,255
2007	4,800	2,000	2,482
2025	5,000	2,900	3,485
Growth Rates per Year			
1995-1999	3.4%	1.9%	2.2%
1999-2007	0.5%	3.3%	1.2%
2007-2025	0.2%	2.1%	1.9%
1999-2025	0.3%	2.4%	1.7%

Notes: By navigation rules, maximum GRT at Pekanbaru=1,000 tonnes

Maximum at Perawang is 2,900 tonnes

Load factor international increases from 20 % 1999 to estimated 25 % by 2025

Load factor domestic increases from 23 % 1999 to estimated 28 % by 2025

6. KUMAI -ALL SHIP CALLS

SHIP CALLS PER YEAR

	International	Domestic	Total	Passenger Ships*
1995	87	1,947	2,034	20
1999	114	2,658	2,772	123
2007	266	4,045	4,311	181
2025	311	4,613	4,924	541
Growth Rates per Year				
1995-1999	7.0%	8.1%	8.0%	16.3%
1999-2007	11.2%	5.4%	5.7%	5.0%
2007-2025	0.9%	0.7%	0.7%	6.3%
1999-2025	3.9%	2.1%	2.2%	5.9%

*from 1988

AVERAGE GRT			
	International	Domestic	All Vessels
1995	10,029	488	896
1999	10,965	1,003	1,413
2007	5,375	1,200	1,458
2025	5,375	2,000	2,213
Growth Rates per Year			
1995-1999	2.3%	19.7%	12.1%
2000-2007	-9.7%	2.6%	0.4%
2007-2025	0.0%	2.9%	2.3%
2000-2025	-2.8%	2.8%	1.8%

Notes: Estimated amximum GRT=3,500 tonnes

Load factor international increases from 13 % 1999 to estimated 15 % by 2025

Load factor domestic increases from about 16 % 1999 to estimated 16 % by 2025

GRT 5,375 estimated from 75% of vessels in future 3,500 GRT and 25% 11,000 GRT

7. SAMPIT-ALL SHIP CALLS

SHIP CALLS PER YEAR

	International	Domestic	Total	Passenger Ships*
1995	38	4,866	4,904	49
1999	102	4,638	4,740	242
2007	134	4,204	4,338	267
2025	122	3,370	3,492	801
Growth Rates per Year				
1995-1999	28.0%	-1.2%	-0.8%	14.2%
1999-2007	3.5%	-1.2%	-1.1%	1.3%
2007-2025	-0.5%	-1.2%	-1.2%	6.3%
1999-2025	0.7%	-1.2%	-1.2%	4.7%

*From 1988

AVERAGE GRT			
	International	Domestic	All Vessels
1995	7,701	413	469
1999	3,803	637	705
2007	4,400	1,000	995
2025	4,400	2,000	1,923
Growth Rates per Year			
1995-1999	-16.2%	11.4%	10.7%
1999-2007	1.8%	5.8%	4.4%
2007-2025	0.0%	3.9%	3.7%
1999-2025	0.6%	4.5%	3.9%

Estimated maximum GRT is 3,200 tonnes

Load factor international increases from 14 % 1999 to estimated 18 % by 2025

Load factor domestic increases from about 27 % 1999 to estimated 30 % by 2025

GRT 4,400 estimated from 75% of vessels in future 3,200 GRT and 25% 8,000 GRT

8. PRELIMINARY EVALUATION OF RIVER ACCESS CHANNELS

8.1 Sedimentation in River Channels

8.1.1 Siltation

The volume of the maintenance dredging to remove siltation in the channels and harbour basin in the Study Areas reached the million cubic-meters mark. The sedimentation also known as “siltation” is where fine materials of clay and/or silt are agitated, drifted and deposited in the estuary and river channels.

It is characteristic of the siltation process that the flocculation of fine materials of clay and silt takes place in the estuary by mixing of river water and seawater as explained below.

Fine materials of clay and silt suspended in river water are negatively charged at their surface, and the flocculation does not take place because of the electrical repulsion among the grains. Thus the sedimentation of the fine materials is rather slow in river flow.

But once the suspended fine materials contact with seawater, the negative charge on the surface is neutralized with the positive ions of Na^{+}, K^{+}, Mg^{++}, etc. and the suspended materials change easy to flocculate.

The flocks (flocculated silt and clay) formed by the above-mentioned process will deposit in the estuary area and a layer of fluid mud will be formed at the bottom. The layer of the fluid mud occasionally reaches several meters in thickness and is the main factor of the sedimentation in shipping channels.

The layer of fluid mud contains a lot of pore water in the flocks and the substantial density is less than that of sand (specific gravity: 2.65). It is estimated that the density ranges between 1.05 and 1.3 g/cm^2 (corresponding water content is 1,200 % - 700 %).

It is assumed that the layer of fluid mud is formed and retained only in the 2 – 3 hours period when the tidal current is stagnant. Fluid mud is easy to be agitated by waves, washed away by current (tidal current and nearshore current) and dispersed, and to deposit and form the outer bar in an estuary area.

This section deals with the studies to understand the actual situation of siltation along the shipping channel in the river of the Study Areas.

Note: The definition of sediment by grain size in this section is as follows.
Sand: 71 – 2,000 μm; Silt: 5 – 74 μm; Clay: less than 5 μm.

8.1.2 Records of Pre-dredge Sounding

The sedimentation volume was studied based on the records of pre-dredge sounding in each river channel. Pre-dredge sounding was conducted prior to the dredging work of the shipping channel to determine the contract volume of the work. The record of Sedimentation Volume (refer to the illustration below) inside the Design Section is given at every 100-m interval along the shipping channel.

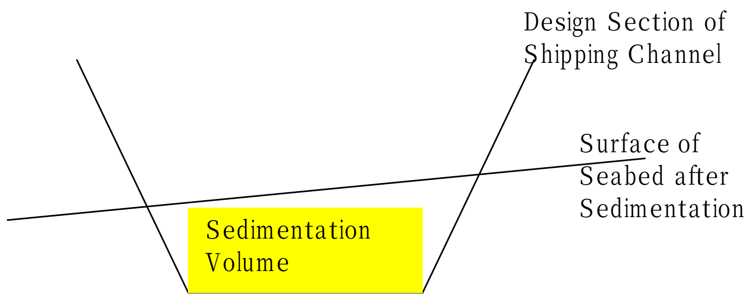


Table 8.1.1 shows the availability of the records of pre-dredge sounding in the ports of the Study Areas (except Pekanbaru where maintenance dredging is negligible). There are some cases where the records are not available or lost after dredging works were carried out.

Table 8.1.1 Availability of Records of Pre-dredge Sounding

(Source: DGSC; Unit of Sedimentation Volume: 1,000 m^3)

Port / Fiscal Year		1995	1996	1997	1998	1999	2000	Material
Jambi	Volume	326	357	356	-	-	-	Silt
	Record	n/a	n/a	ada	ada	-	-	
Palembang	Volume	2,302	2,500	2,329	2,174	2,363	2,211	Silt/Sand
	Record	n/a	n/a	ada	ada	ada	ada	
Pontianak	Volume	1,962	1,724	1,199	845	851	-	Silt/Sand
	Record	n/a	ada	ada	ada	ada	-	
Kumai	Volume	-	-	501	-	-	316	Silt
	Record	-	-	ada	-	-	ada	
Sampit	Volume	781	-	701	-	631	-	Silt/Sand
	Record	ada	-	ada	-	ada	-	
Samarinda	Volume	1,296	1,333	1,350	1,352	1,218	1,181	Silt/Sand
	Record	n/a	ada	ada	ada	ada	ada	

Note: n/a = Not available; ada = Available; " – ": No dredging work in the year.

The distribution of sedimentation volume along the river channel and its characteristics will be reviewed in the following sections.

8.1.3 Pekanbaru

No suitable data/records of sedimentation could be obtained for the river channel in Sungai Siak. Thus an estimation of the volume of the suspended sediment is set out using the average yearly discharge (river flow rate) and observed figures of suspended solid (SS).

Table 8.1.2 shows the results of the estimation for the seven rivers. The observed values of SS used in the estimation are shown in Table 8.1.3 (1) and (2).

Table 8.1.2 Estimation of Suspended Sediment Discharge from Rivers

Name of River	Catchment Area* (km^2)	Yearly Discharge* (10^6 m^3/year)	Observed Suspended Solid** (mg/L)	Estimated Suspended Sediment (ton/year)	Volume of Flocclulated Sediment (m^3/year)***	Average Volume of Maintenance Dredging (m^3/year)
S. Siak	12,474	15,744	80	1,259,520	970,000 ～ 1,200,000	Negligible
S. Batanghari	44,554	46,826	65	3,043,690	2,340,000 ～ 2,900,000	350,000
S. Musi	77,234	78,260	30	2,347,800	1,810,000 ～ 2,240,000	2,300,000
S. Kapuas	95,557	121,644	65	7,906,860	6,080,000 ～ 7,530,000	1,300,000
S. Kumai +	8,200	7,671	65	498,615	380,000 ～ 470,000	440,000
S. Mentaya +	16,200	16,200	65	1,053,000	810,000 ～ 1,000,000	720,000
S. Mahakam	92,641	82,400	100	8,240,000	6,340,000 ～ 7,850,000	1,450,000

Source: * Kantor Menteri Negara Pekerjaan Umum (2000)
** Pusat Litbang Pengairan, Badan Litbang PU, Departmen Pekerjaan Umum
*** Density of Flocculated Suspended Sediment: 1.05～1.3 g/cm^3.
+ No observed data of Concentration of SS. Assumed as 65 (mg/L) following S. Kapuas.

Explanation of the method for Sungai Siak is as follows.

(1) The yearly average value of SS (suspended solid) is given as 80 mg/L（80 x 10^{-6} ton/m^3） for Sungai Siak from Table 8.1.3 (1).
(2) Yearly discharge from the river basin of Sungai Siak is given as 15,744 x 10^6 m^3/s from the information by PU (2000).
(3) Suspended Sediment (assumed to include both bed-load and wash-load) is estimated using the yearly averaged values of SS and river discharge and is obtained as 1,259,520 ton/year.
(4) Suspended Sediment is converted to the volume of flocculated sediment using the substantial density of fluid mud (1.05 - 1.3 g/cm^2) and the value 970,000～1,200,000 m^3/year is obtained.

Actually, the sedimentation volume is considered very small at the lower reaches of Sungai Siak and maintenance dredging in navigation channel is negligible. There may be two reasons for this for Sungai Siak.

Firstly, most of the suspended solid is made up of very fine material called “wash-load”, which are agitated by waves and current and washed away offshore without causing sedimentation.

And secondly, the estuary of Sungai Siak is facing Bengkalis Strait. It is plausible that the sediment and fluid mud deposited at the estuary area are carried away by the tidal current in this narrow strait.

Table 8.1.3 (1) Observed Values of Suspended Solid (Sumatra)

Source: Departemen Pekerjaan Umum

Sungai Siak: Intake PDAM Pekanbaru

1997	Unit	14-Jan	21-Feb	25-Mar	14-Apr	30-May	13-Jun	23-Jul	23-Aug	Sep	Oct	Nov	12-Dec	Average
SS	(mg/L)	80	34	60	38	18	60	34	20				160	66

1998	Unit	12-Jan	Feb	11-Mar	Apr	22-May	Jun	Jul	18-Aug	Sep	Oct	Nov	18-Dec	Average
SS	(mg/L)	288		14		26			126				30	86

Sungai Siak: Perawang

1995	Unit	Jan	Feb	Mar	Apr	May	Jun	19-Jul	18-Aug	16-Sep	17-Oct	29-Nov	28-Dec	Average
SS	(mg/L)							92	62	28	61	50	140	82

Sungai Batanghari: Muara Tembesi

1995	Unit		16-Sep			26-Oct			13-Jun			17-Jun		Average
SS	(mg/L)		78			112			60			26		69

Sungai Batanghari: Pulau Pandan

1995	Unit		18-Sep			30-Oct			17-Jun			19-Jun		Average
SS	(mg/L)		44			46			83			64		59

Sungai Musi: Salah Nama

1997	Unit				8-Apr	25-May	10-Jun							Average
SS	(mg/L)				26	10	40							25

Sungai Musi: Salah Nama

1998	Unit			28-Mar		28-May			11-Aug				7-Dec	Average
SS	(mg/L)			12		29			30				45	32

Sungai Musi: Jambetan Ampera

1997	Unit				8-Apr	25-May	10-Jun							Average
SS	(mg/L)				29	11	48							29

Sungai Musi: Jambetan Ampera

1998	Unit			28-Mar		28-May			11-Aug				7-Dec	Average
SS	(mg/L)			21		31			32				48	36

Table 8.1.3 (2) Observed Values of Suspended Solid (Kalimantan)

Source: Departemen Pekerjaan Umum

Sungai Kapuas: Pontianak

1997	Unit	28-Jan	25-Feb			28-May	28-Jun	30-Jul				29-Nov	30-Dec	Average
SS	(mg/L)	24	18			26	16	20				54	20	25

1998	Unit						10-Jun		28-Aug				10-Dec	Average
SS	(mg/L)						149		36				111	102

Sungai Kapuas: Jeruju

Item	Unit	29-Jan	29-Feb	29-Mar					29-Aug					Average
SS	(mg/L)	25	20	30					7					21

Sungai Kapuas: Jeruju

Item	Unit					29-May	29-Jun	29-Jul	28-Aug	29-Sep	29-Oct	29-Nov	29-Dec	Average
SS	(mg/L)					38	55	57	14	98	30	68	36	48

Sungai Mahakam: Intake PDAM Samarinda

1996	Unit	10-Jan	8-Feb	11-Mar	29-Apr	22-May	19-Jun	22-Jul	11-Sep	30-Sep	7-Oct	18-Nov	20-Dec	Average
SS	(mg/L)	68	118	76	68	53	104	68	72	142	80	106	120	92

1997	Unit	21-Jan	25-Feb			29-May	11-Jun							Average
SS	(mg/L)	50	40			68	60							55

Sungai Mahakam: Hilir Industri Batubara 1995

1995	Unit					17-May	15-Jun	19-Jul	14-Aug	13-Sep	16-Oct	9-Nov	14-Dec	Average
SS	(mg/L)						190	78	80	46	106	138		106

8.1.4 Jambi

(1) Navigation channel maintained by dredging

A large sandbar (Outer Bar) with a width of over ten kilometers alongshore and 7 – 10 km on-offshore is located in the estuary area of Sungai Batanghari. The navigation channel to Port of Jambi cuts through the sandbar and is maintained by dredging (see Figure 3.11.2).

The design section of the navigation channel has the following dimensions: bottom width: 70 m, depth: LWS-4.5 m and side slope: 1:8.0.

The average yearly volume of the dredging in the Jambi Port navigation channel is about 350,000 m^3 (see Table 3.11.1) and most of the volume comes from the dredging in the channel on the Outer Bar area. The dredging work is carried out by hopper dredger and the dredged material, mainly silt, is disposed of at a dumping site located 12 km offshore north of the river mouth.

(2) Record of pre-dredge sounding

The distribution of sedimentation volume (refer to the illustration in Section 8.1.2) along the channel from the records of pre-dredge sounding of the years 1997 and 1998 are shown in Figure 8.1.1. The left side of the graph is the Outer Bar side and the right side is the inner side of the river mouth.

The sedimentation volume along the channel is sub-divided as shown in the table below. The common tendency of sedimentation is seen for the two years.

Year	Division (1 – 5 km)	Division（6 – 11 km）	Total
1997	123.5 (38 %)	199.8 (62 %)	323.3 (100 %)
1998	96.0 (9.1 %)	135.1 (58 %)	231.1 (100 %)

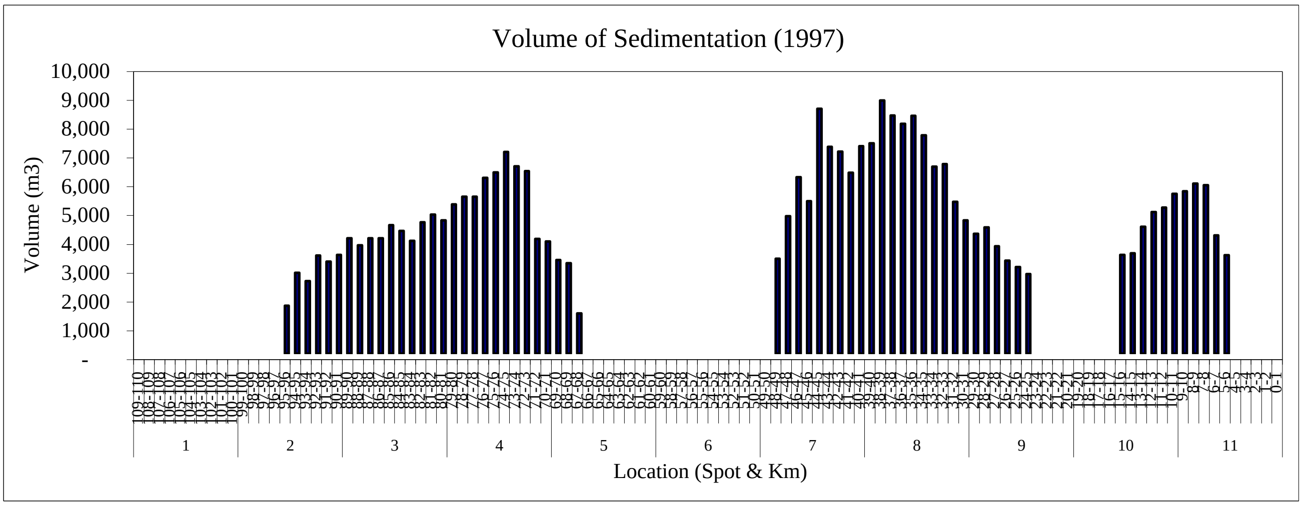
(Unit of sedimentation volume: 1,000 m^3)

The depth of sedimentation in the channel is estimated as 0.3 – 0.5 m from the bottom of design section; it is understood that sand and/or consolidated silt is deposited.

(3) Estimated volume of suspended sediment discharge

The discharge of suspended sediment from Sungai Batanghari is estimated as 2,300 – 2,900 x 10^3 m^3/year (volume of flocculated sediment) as shown in Table 8.1.2, and the dredging volume in the channel is about 350,000 m^3/year in average.

The big difference between the estimate and the dredging volume is explained by the fact that the layer of fluid mud of the surface of deposition drifts easily and is dispersed by the current on the Outer Bar (tidal current and/or nearshore current) and washed away. Some portion of the sediment does deposit and form the Outer Bar.



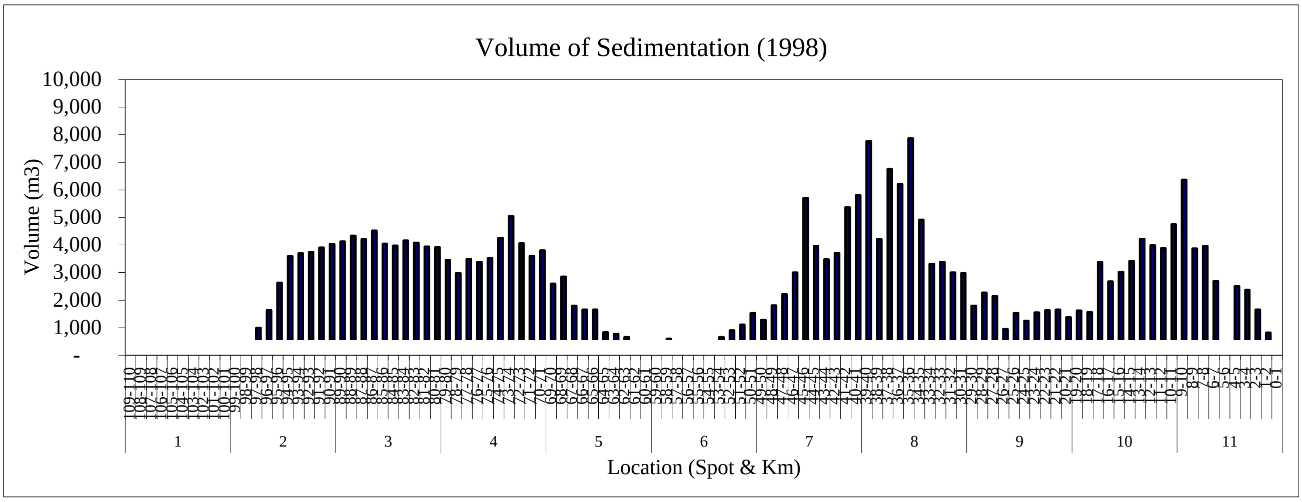


Figure 8.1.1 Distribution of Sedimentation Volume along Navigation Channel (Jambi)

8.1.5 Palembang

(1) Navigation channel maintained by dredging

Boom Baru, the existing Palembang port, is located 110 km upstream from the Outer Bar. There are 15 dredging sub-divisions along the river channel between the river mouth and Boom Baru and each sub-division has its own name (see Figure 3.11.3).

The design section of the navigation channel has the following dimensions: bottom width: 100 m, depth: LWS-6.5 m and side slope: 1:4.0.

The extension of the channel maintained by dredging has rather a grand scale so that the dumping sites of the dredged sediment are established at three points (i.e., one is offshore of the Outer Bar and two others are along the river channel). It is said that deep water is used as the dumping site along the channel. The dredging work is carried out by hopper dredger and the dredged material is silt.

(2) Record of pre-dredge sounding

The distribution of sedimentation volume along the channel from the records of pre-dredge sounding of the 4 years from 1997 to 2000 are shown in Figure 8.1.2 (1) and (2). The left side of the graph is the Outer Bar side and the right side is the inner side of the river.

The distribution of sedimentation in each sub-division of the channel is shown in Table 8.1.4. The over two million m^3 sedimentation has been taking place along the river channel every year.

According to the table, it is understood that most of the sedimentation volume is intensively taking place at the 30 km division of the downstream channel and Outer Bar (C1, C2, Tanjung Carat - Payung Selatan; about 90 % of the total volume).

The sedimentation volume at the channel divisions on Outer Bar (C1, C2 and Tanjung Carat) accounts for 70 % of the total volume in the four-year average.

The sedimentation volume at the divisions along the inner river channel has rather a smaller ratio to the total volume compared with the river mouth area. It is plausible to assume that the riverbed along the river channel is dynamically stable against river flow. The shares of sedimentation volume at Muara Selat Jaran and /or Sungai Lais reach 5 – 7 % and are not negligible.

The reason the sedimentation volume at Sungai Lais is a relatively large figure can be understood because Sungai Lais is located at the confluence of smaller canals to the main stream of Musi River.

In Muara Selat Jaran, it is reported that a new sandbar has emerged in the river channel in recent years. One of the dumping areas of dredged sand is located in the neighboring upstream of Muara Selat Jaran, and the disposed sand may have been treated improperly.

The depth of sedimentation in the navigation channels C1 and C2, on Outer Bar, reached 2.5 – 3 m and it is estimated that the layer of fluid mud accounted for the top 1-2 m portion of the thickness from the surface.

The depth of sedimentation in the sub-divisions upstream from Payung Utara ranged from 1.0 to 1.5 m. The depth of sedimentation at Muara Selat Jaran is read as 1.5 – 2 m.

Table 8.1.4 Sedimentation Volume by Division of Channel

Division of Channel	1997	1998	1999	2000
C1 and C2	1,061,426 49%	1,111,030 60%	1,428,397 68%	1,730,220 80%
Tanjung Carat	291,698 13%	308,716 17%	0%	58,200 3%
Tanjung Buyut	0%	36,270 2%	0%	0%
Payung Utara	254,094 12%	22,680 1%	122,257 6%	221,230 10%
Payung Barat	200,416 9%	68,660 4%	191,513 9%	0%
Payung Selatan	307,351 14%	39,460 2%	159,176 8%	0%
Keramat Utara	0%	0%	0%	0%
Parit XII	0%	0%	0%	0%
Penyebrangan Upang	19,968 1%	56,140 3%	9,765 0%	0%
Selat Jaran	0%	0%	0%	0%
Muara Selat Jaran	38,427 2%	136,880 7%	100,576 5%	143,300 7%
Sungai Lais	0%	84,450 5%	85,328 4%	0%
Summation	2,173,380	1,864,286	2,097,012	2,152,950

(Unit of Sedimentation Volume: m^3)

(3) Estimated volume of suspended sediment discharge

The discharge of flocculated sediment from Musi River is estimated as 1,800 – 2,200 x 10^3 m^3/year (see Table 8.1.2). And the average volume of dredging works is reported as about 2,300 x 10^3 m^3/year. Both the results of estimating and actual work coincide well, this denoting that fluid mud with high water content accounts for the most of the dredging volume in the navigation channels of Musi River.

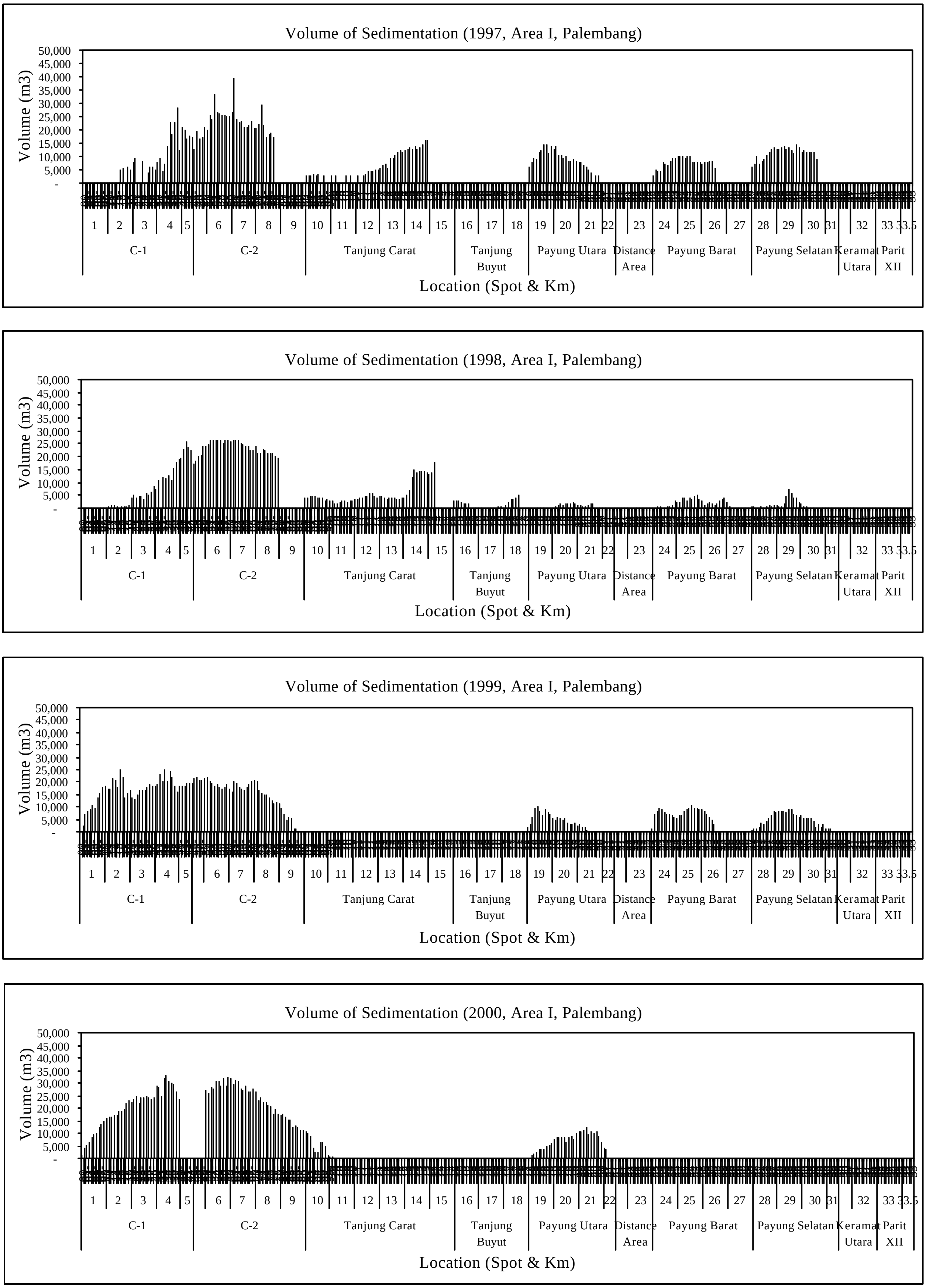
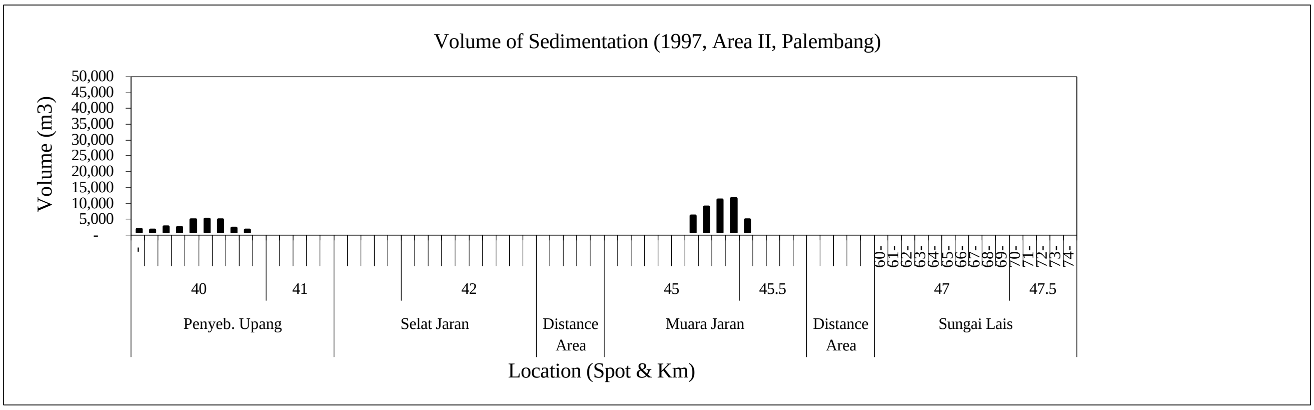
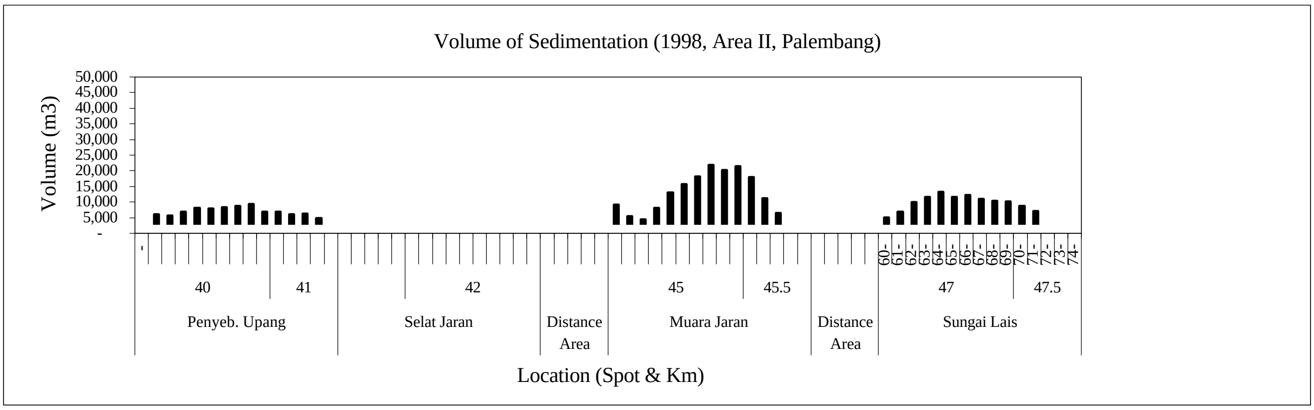
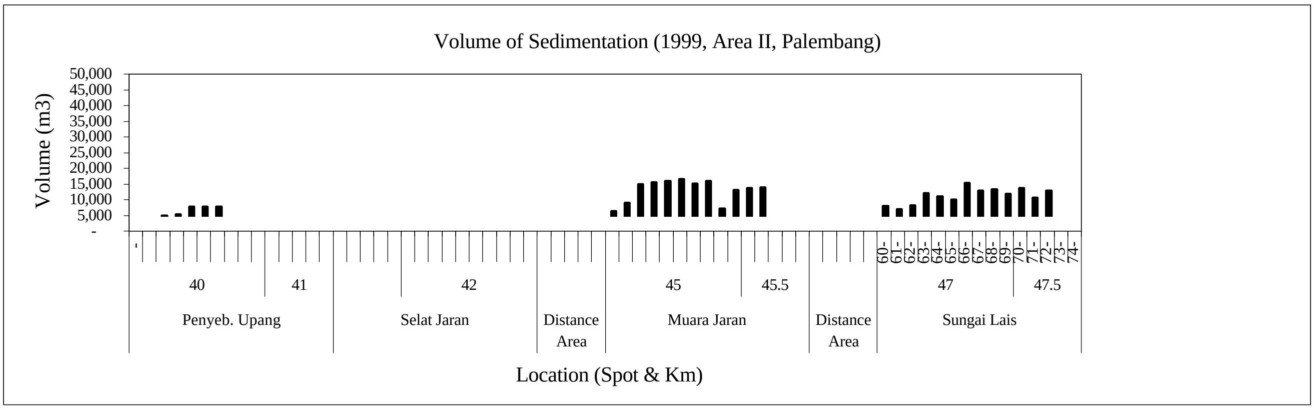


Figure 8.1.2 (1) Distribution of Sedimentation Volume along Channel (Palembang, Area I)







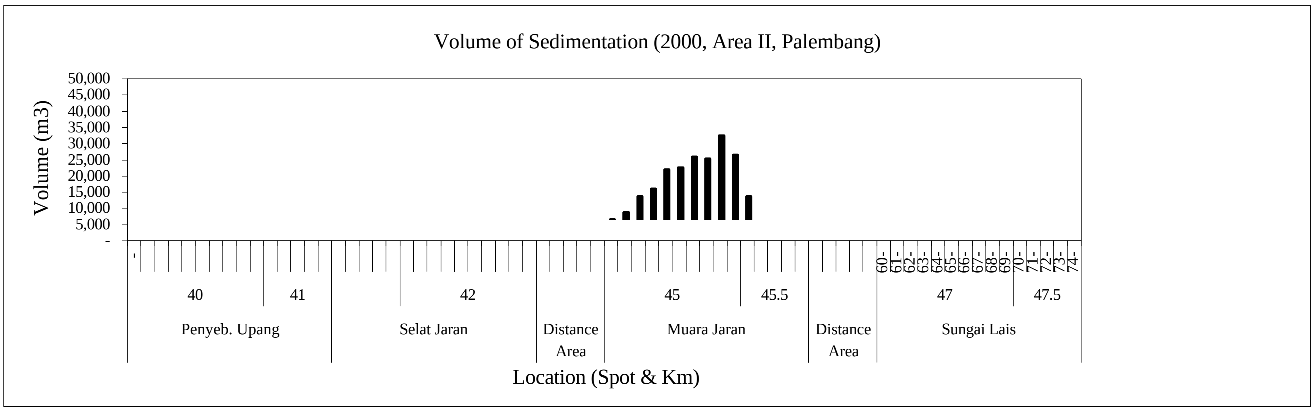


Figure 8.1.2 (2) Distribution of Sedimentation Volume along Channel (Palembang, Area II)

8.1.6 Pontianak

(1) Navigation channel maintained by dredging

The Outer Bar and the shallow water area (LWS-0.5 – 5 m) continue for about 10 km from the river mouth in the estuary of Kapuas Kecil River. A navigation channel of 15 km length runs through the Outer Bar and is maintained by dredging (see Figure 4.11.1).

The design section of the navigation channel has the following dimensions: bottom width: 80 m, depth: LWS-5.5 m and side slope: 1:4.0.

The average yearly volume of the dredging in the Pontianak Port navigation channel is about 1,300,000 m^3. The dredging work is carried out by hopper dredger and the dredged material, mainly silt, is disposed of at a dumping site located 15 km offshore west of the river mouth.

(2) Record of pre-dredge sounding

The distribution of sedimentation volume along the channel from the records of pre-dredge sounding of the years 1996 - 1999 are shown in Figure 8.1.3.

The sedimentation volume along the channel in the 15 km extension in the estuary is sub-divided as shown in the table below. The common tendency of sedimentation is seen among four years and the ratio of sedimentation between the outer side and the inner side is 50 % - 50 %.

Year	Division (1 – 8 km) Outer side	Division（9 – 15 km）Inner side	Total
1996/97	469.3 (64 %)	263.6 (36 %)	732.9 (100 %)
1997/98	316.7 (48 %)	343.1 (52 %)	659.8 (100 %)
1998/99	431.8 (54 %)	371.4 (46 %)	803.2 (100 %)
1999/2000	293.2 (47 %)	335.7 (53 %)	628.9 (100 %)

(Unit of sedimentation volume: 1,000 m^3)

The sedimentation volume calculated from the record of pre-dredge sounding shows only half of the yearly average volume of dredging of 1,300,000 m^3/year. This is because the record of pre-dredge sounding does not cover the whole area of maintenance dredging and there is inconsistency among the sources of information.

The depth of sedimentation in the channel is estimated as 0.5 – 0.6 m from the bottom of design section; it is understood that sand and/or consolidated silt is deposited and the depth of the fluid mud layer is smaller.

(3) Estimated volume of suspended sediment discharge

The discharge of flocculated sediment is estimated as 6,000 – 7.500 x 10^3 m^3/year from the whole catchment area of Kapuas River (see Table 8.1.2). Since Pontianak Port is located at the confluence of Sungai Kapuas Kecil and Sungai Landak, the above-mentioned sedimentation volume is understood to be part of it.

According to the records of pre-dredge sounding, the sedimentation volume to be dredged in the maintenance dredging of the channel is evaluated as 700,000 - 800,000 m^3/year. Fluid mud with high water content could account for the inconsistency with the yearly average volume of 1,300,000 m^3/year.

8.1.7 Kumai

(1) Navigation channel maintained by dredging

A shallow water area (LWS-0.5 – 5 m) with the width of 10 km spreads inside and outside of Teluk Kumai (Kumai Bay). And a navigation channel of 18.5 km in length runs through the shallow water and is maintained by dredging (see Figure 4.11.2).

The design section of the navigation channel the following dimension: bottom width: 50 m, depth: LWS-5.0 m and side slope: 1:4.0.

The average yearly volume of the dredging in the Port of Kumai navigation channel is about 440,000 m^3. The dredging work is carried out by hopper dredger and the dredged material, mainly silt, is disposed of at a dumping area located at 20 km offshore south of the river mouth (03°05'00"S, 114°40'40"E；water depth: 8 - 9 m).

(2) Record of pre-dredge sounding

The distribution of sedimentation volume along the channel from the records of pre-dredge sounding of the years 1997 and 2000 are shown in Figure 8.1.4. The sedimentation volume along the channel in the 18.5 km extension in the estuary is sub-divided as follows.

Year	Sub-division (1 – 8 km)	Sub-division (9 – 14 km)	Sub-division (15–18.5 km)	Total
1997/98	221.4 (49 %)	- (0 %)	233.9 (51 %)	455.3 (100 %)
2000	11.9 (4 %)	- (0 %)	254.6 (96 %)	266.5 (100 %)

(Unit of sedimentation volume: 1,000 m^3)

There are only two cases where available records and the situations are quite different between (i.e., the first case shows the 50 % of whole sedimentation volume in the 8-km division outside Kumai Bay (① and ② in Figure 4.11.2) and the other shows only 4 %).

The depth of sedimentation in the channel is estimated as 0.8 m from the bottom of design section; it is understood that sand and/or consolidated silt is deposited. The fluid mud at the surface layer must have been washed away by the current (tidal current and nearshore current).

There is no significant sedimentation seen in the mid sub-division (③ and ④ in Figure 4.11.2) for this portion of the navigation channel along the sand-spit at the bay mouth.

A 250,000m^3 of sedimentation is located in the portion of the navigation channel inside Kumai Bay (④ and ⑤ in Figure 4.11.2). The depth of sedimentation in this portion is estimated as 1.2 - 2 m from the bottom of design section; it is understood that the layer of fluid mud cover the surface of the consolidated layer of sand and silt.

(3) Estimated volume of suspended sediment discharge

The discharge of flocculated sediment from Kumai River is estimated as 380 – 470 x 10^3 m^3/year (see Table 8.1.2). The average volume of dredging works is reported as about 440 x 10^3 m^3/year. Both the results of estimating and actual work coincide well.

Sungai Kumai flows into Kumai Bay and the major portion of the sediment discharge from Kumai River is deposited in the navigation channel and in the shallow water area of Kumai Bay. The sediment drifts by tidal current and nearshore current forms a large scale Outer Bar and shallow water area inside and outside of Kumai Bay.

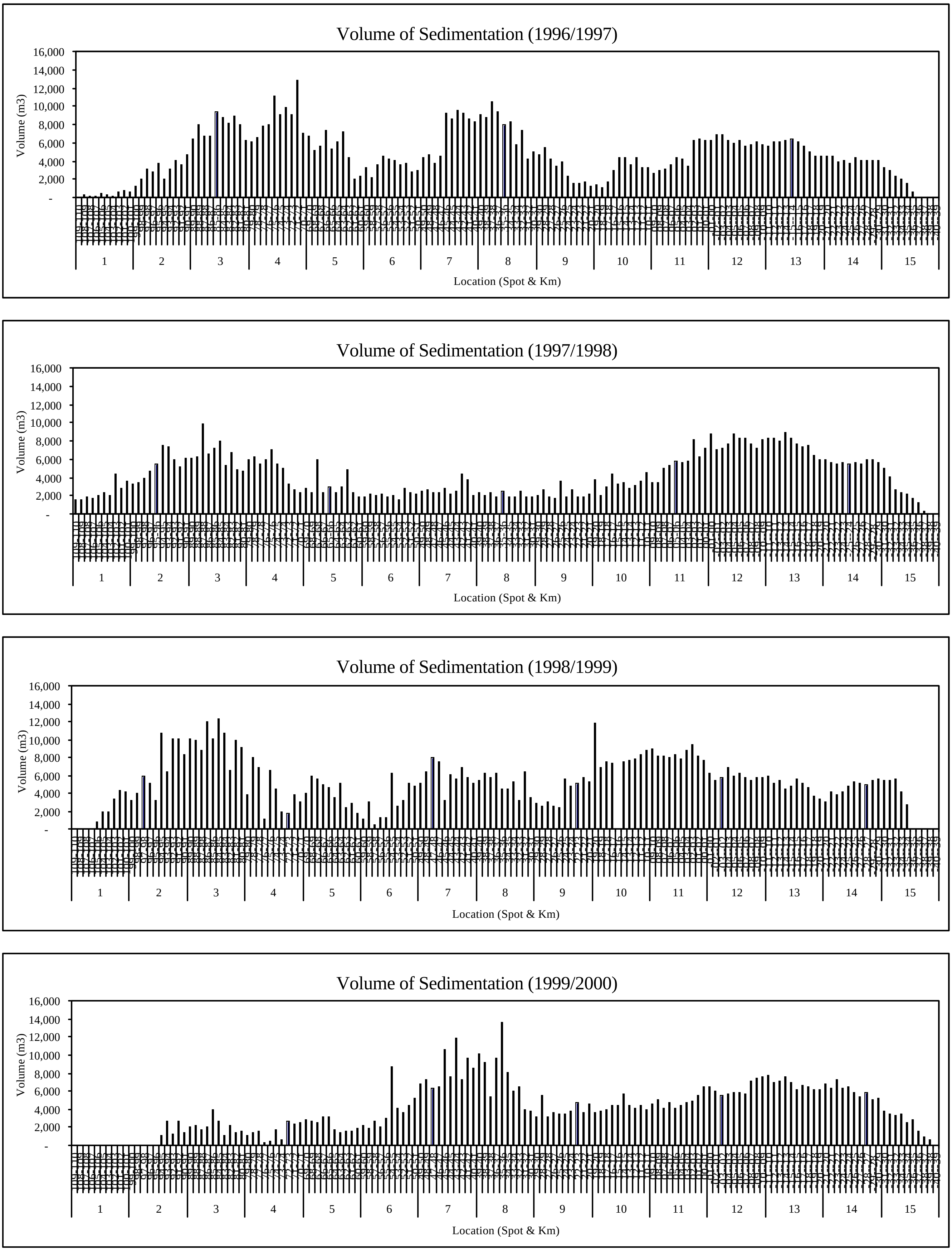
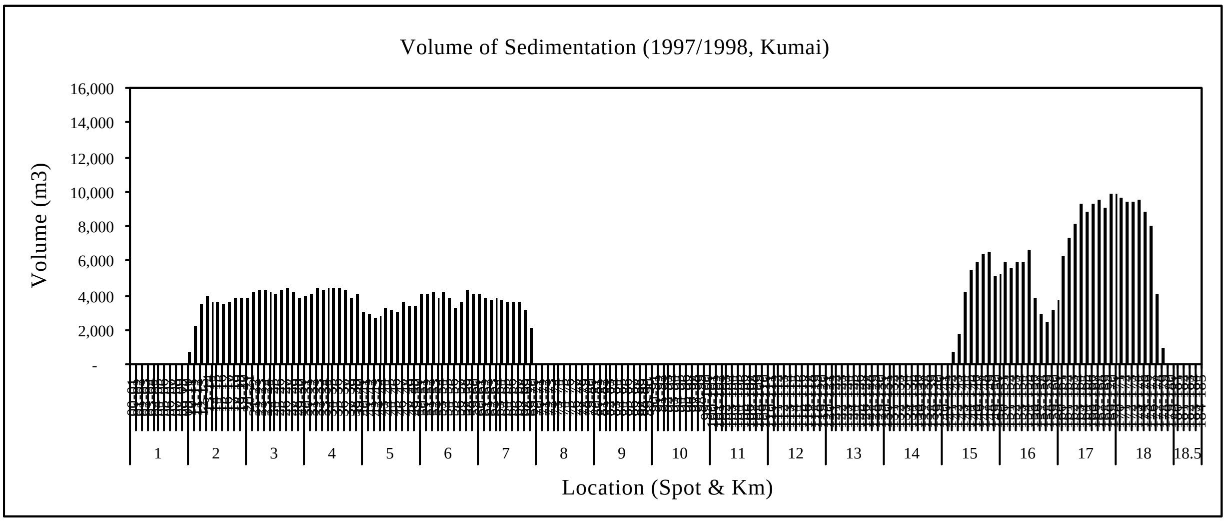


Figure 8.1.3 Distribution of Sedimentation Volume along Navigation Channel (Pontianak)



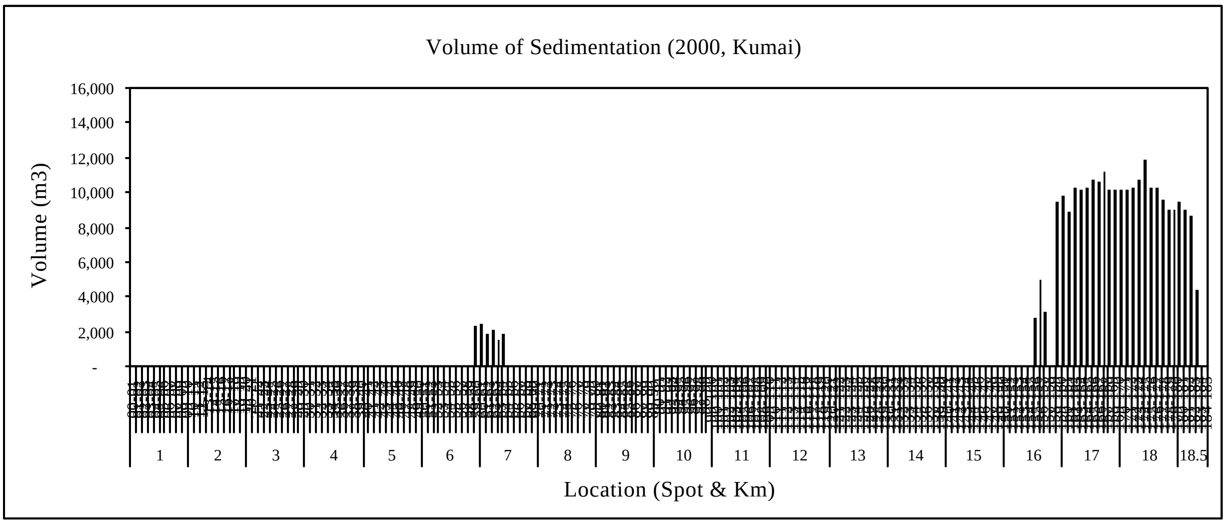


Figure 8.1.4 Distribution of Sedimentation Volume along Navigation Channel (Kumai)

8.1.8 Sampit

(1) Navigation channel maintained by dredging

In contrast to Kumai Bay, the contour lines of –5 m and –10 m cut deep into Sampit Bay and the water depth at the bay mouth reaches 10 – 15 m. A navigation channel with the extension of about 10 km runs through the shallow water area and is maintained by dredging (see Figure 4.11.3, Area A).

There is also a group of navigation channels maintained by dredging at the Samuda district 15 km upstream from the river mouth (see Figure 4.11.3, Area B).

The design section of the navigation channel has the following dimension: bottom width: 50 m, depth: LWS-4.5 m and side slope: 1:4.0.

The average yearly volume of the dredging in the Port of Sampit navigation channel is about 720,000 m^3. The dredging work is carried out by hopper dredger and the dredged material, mainly sand and silt, is disposed of at a dumping area located at the bay mouth (03°07'52"S, 113°05'35"E; water depth: 18 - 20 m).

(2) Record of pre-dredge sounding

The distribution of sedimentation volume along the channel from the records of pre-dredge sounding of the years 1995, 1997 and 1999 is shown in Figure 8.1.10.

The sedimentation volume along the channels is sub-divided by the Areas A and B as follows.

Year	Area A (1 – 7 km)	Area A (7 – 10 km)	Area B (15–19.5 km)	Total
1995/96	540.3 (78 %)	49.1 (6 %)	106.5 (16 %)	691.0 (100 %)
1997/98	601.7 (93 %)	5.5 (1 %)	9.1.5 (6 %)	649.7 (100 %)
99/2000	387.6 (80 %)	29.7 (6 %)	64.3 (14 %)	481.6 (100 %)

(Unit of sedimentation volume: 1,000 m^3)

Records show that 80 – 90 % of total sedimentation volume comes from the 7 km division of Area A.

The depth of sedimentation in the channel is estimated as 1.5 m from the bottom of design section; it is understood that sand and/or consolidated silt is deposited and that some layer of fluid mud coveres it.

The sedimentation volume at Area B along the navigation channel is about 15 % of the total volume.

(3) Estimated volume of suspended sediment discharge

The discharge of flocculated sediment from Mentaya River was estimated as 810 – 1,000 x 10^3 m^3/year (see Table 8.1.2). The average volume of dredging works is reported as about 720 x 10^3 m^3/year. Both the results of estimating and actual work coincide well here, too.

Sungai Mentaya flows into Sampit Bay and the major portion of the sediment discharge from Mentaya River is deposited in the navigation channel and in the shallow water area of Sampit Bay.

8.1.9 Samarinda

(1) Navigation channel maintained by dredging

A very large-scale delta of 40 km in longitude and 60 km in latitude is formed at the river mouth of Sungai Mahakam. The main navigation channel to Samarinda has 65 km extension from the south entrance of the delta (see Figure 4.11.4 (1)), where a 29 km portion of the navigation channel is maintained by dredging (see Figure 4.11.4 (2)).

The design section of the navigation channel has the folowing dimensuions: bottom width: 80 m, depth: LWS-6.0 m and side slope: 1:6.0.

The average yearly volume of the dredging in the Port of Samarinda navigation channel is about 1,450,000 m^3. The dredging work is carried out by hopper dredger and the dredged material, mainly sand and silt, is disposed of at two dumping areas located at 25 km offshore south of the delta and also along the river at the center of the delta (refer to Figure 4.11.4 (1)).

(2) Record of pre-dredge sounding

The distributions of sedimentation volume along the channel from the records of pre-dredge sounding of the 5 years from 1996 to 2000 is shown in Figure 8.1.6. The distribution of sedimentation in each sub-division of the channel is shown in Table 8.1.5.

The sedimentation volume in Area I-B South and North are both large. The volume of two divisions accounts for about 60 % of the total volume of the sedimentation in the channel every year. The second largest is Area I-A (the south end of the channel) and which accounts for about 16 % of the total.

At the upper stream of the delta, Area V South accounts for 10 % of the total sedimentation volume. The single trunk channel of Mahakam River breaks up into three branches and the river flow reduces its speed there (at Tanjung Sanga-sanga). This is the reason because sediment transported by the river flow tends to cause sedimentation at that area of the channel.

The sedimentation volume calculated from the record pre-dredge sounding is about 1,000,000 m^3/year and differs from the reported yearly average volume of dredging:

1,450,000 m^3/year. This is because the record of pre-dredge sounding does not cover the whole area of maintenance dredging and there is inconsistency among the sources of information.

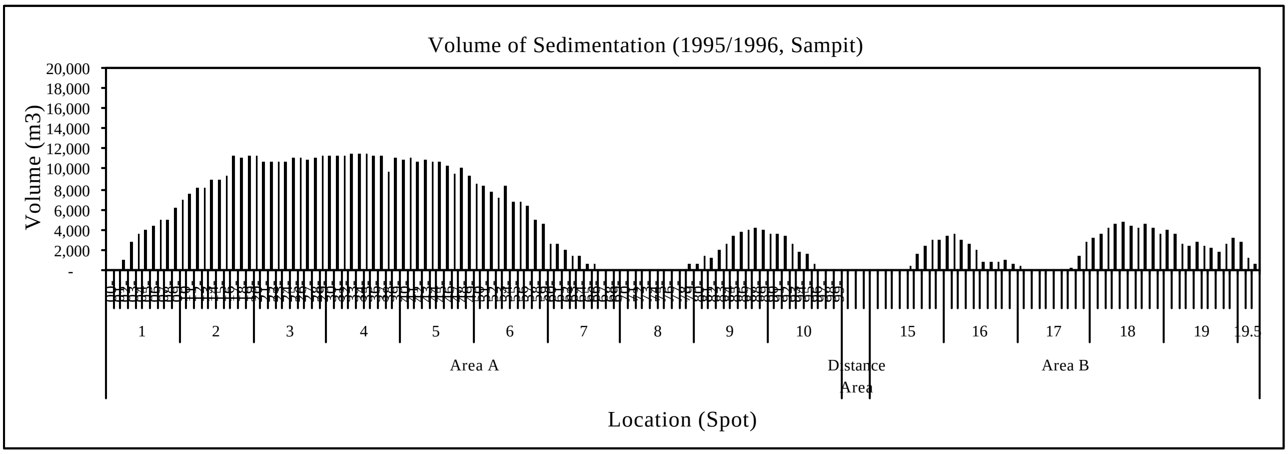
The depth of sedimentation in the channel is estimated as 1.0 - 1.5 m from the bottom of design section; it is understood that sand and/or consolidated silt is deposited and a layer of fluid mud covers it.

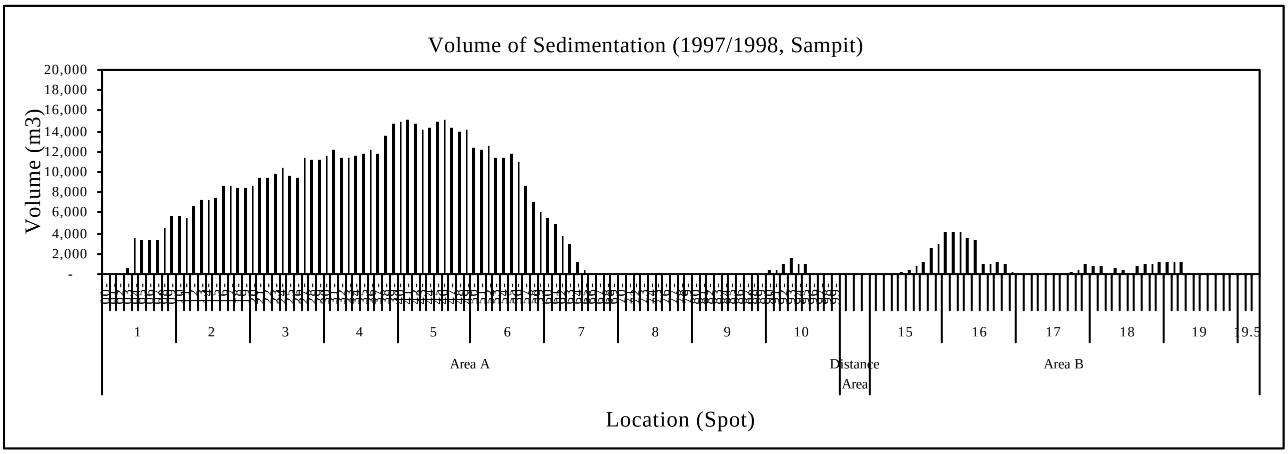
(3) Estimated volume of suspended sediment discharge

The discharge of flocculated sediment from Mahakam River is estimated as 6,340 – 7,850 x 10^3 m^3/year (see Table 8.1.2) to nourishe and form the large-scale delta at the estuary. The dredging volume in the Samarinda Port navigation channel is part of it.

Table 8.1.5 Sedimentation Volume by Division of Channel

Division of Channel	1996	1997	1998	1999	2000
Area I-A	109,255 10%	197,757 17%	255,306 25%	58,610 6%	166,561 20%
Area I-B South	235,795 22%	125,741 11%	68,062 7%	130,860 14%	197,712 24%
Area I-B North	488,960 45%	538,900 46%	367,631 36%	419,605 44%	337,693 41%
Area II Muara Pegah	81,376 7%	124,086 10%	102,274 10%	143,210 15%	60,668 7%
Area III South East			17,876 2%	640 0%	1,995 0%
Area III East			17,876 2%	640 0%	30,535 4%
Area IV Pendingin	17,905 2%	21,224 2%	18,489 2%	2,165 0%	10,225 1%
Area V South	102,075 9%	122,584 10%	151,156 15%	123,620 13%	14,716 2%
Area V North	56,255 5%	51,929 4%	31,293 3%	70,930 7%	
Summation	1,091,621	1,182,221	1,029,963	950,280	820,105





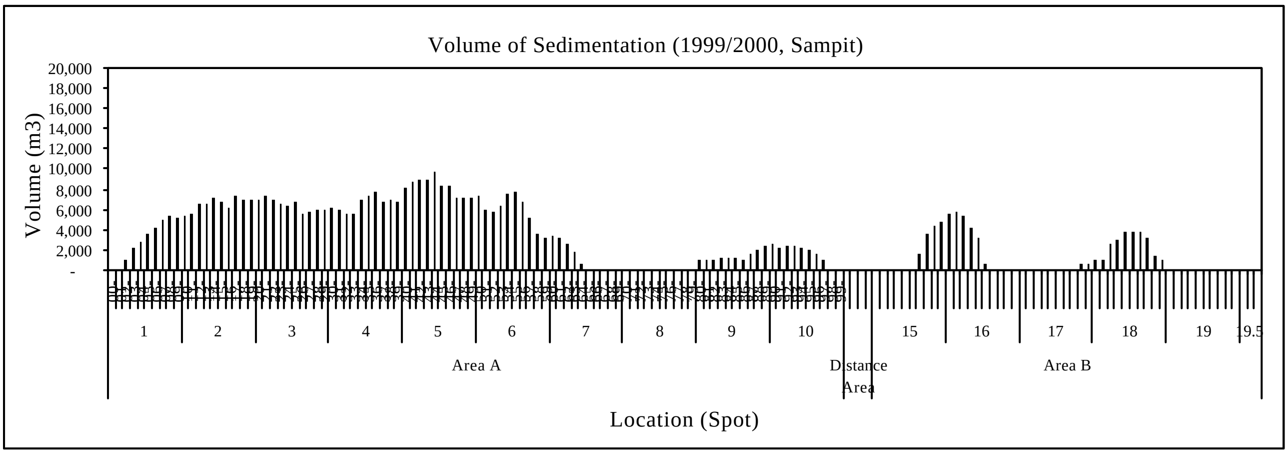


Figure 8.1.5 Distribution of Sedimentation Volume along Navigation Channel (Sampit)

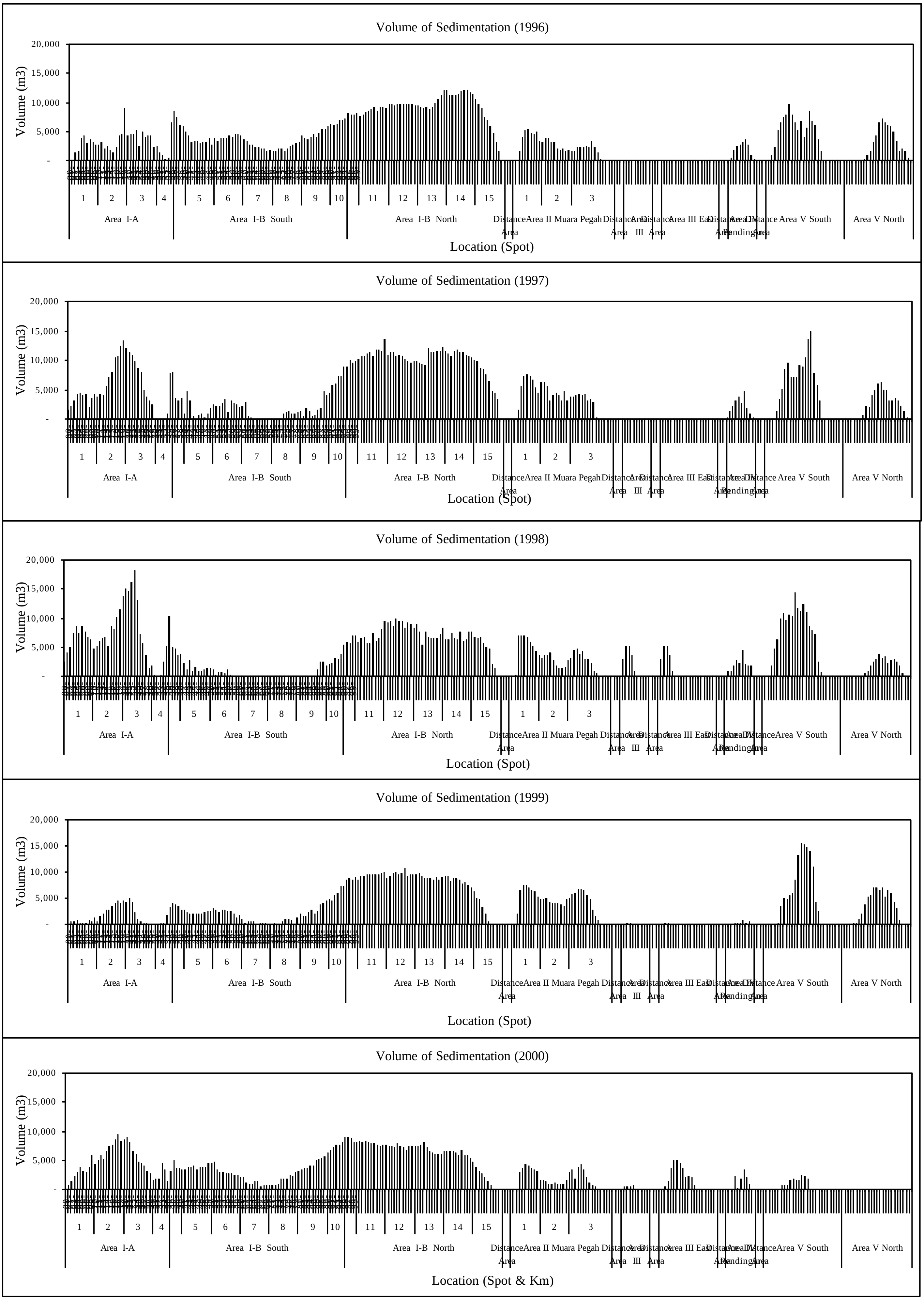


Figure 8.1.6 Distribution of Sedimentation Volume along Navigation Channel (Samarinda)

8.2 Channel Management and Maintenance Dredging

8.2.1 Pekanbaru (Siak River)

The main problems of the Siak River navigation channel are its narrowness (it is less than 100 m wide) and its extreme meandering. The maintenance dredging of the channel is not a serious problem because there is a sediment flushing effect by the river flow due to its narrowness. Moreover, as the river flows into Selat Bengkalis, the sediment at the river mouth is washed away and entrained by the tidal current in the narrow strait without causing sedimentation.

A longitudinal profile of the riverbed of Sunagi Siak is shown in Figure 8.2.1.

The river channel of Siak River has sufficient depth of LWS -15 - 20 m, except for parts of the confluence to Selat Bengkalis and Pekanbaru area. The channel from Buatan (110 km from the river mouth) to Perawang (135 km) has a depth of LWS -8 - 10 m and becomes shallower to LWS -6 m in the vicinity of Pekanbaru.

Frequent ship collision accidents are reported in Siak River and so the navigation at night time is restricted. The installation and maintenance of navigation aids and signs are a main issue in Siak River in order to secure the safety of the navigation channel.

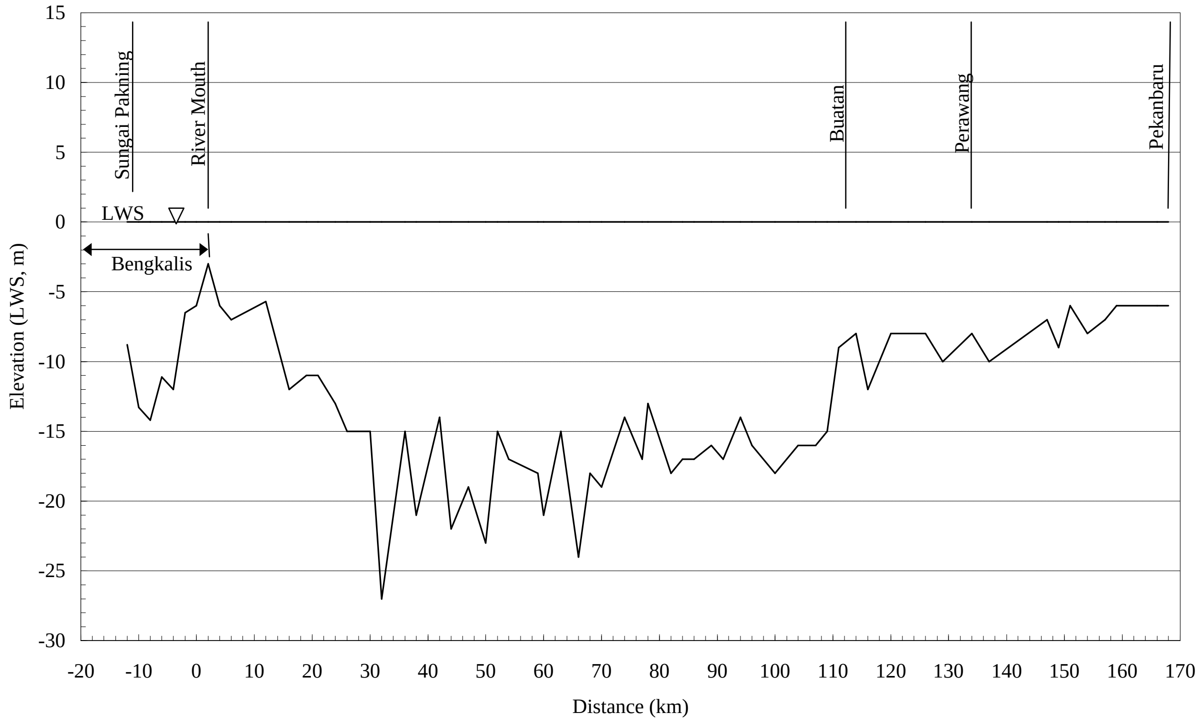


Figure 8.2.1 Longitudinal Profile of Sungai Siak (Pekanbaru)

Source: Dinas Hidro-Oseanografi Chart No.14 (1957, 1970, 1974)

8.2.2 Jambi (Batnghari River)

(1) Jambi Port (Talang Duku)

The access restrictions to Jambi Port (Talang Duku) are summarized as follows.

1) The port is located 155 km from the river mouth and vessels take 10 – 12 hours to reach to the port,
2) Since the river channel has many meanderings and sharp bendings, the navigable vessel size to the port is restricted to L_{OA} <75 m and Draught <5.0 m,
3) The water depth in the area of Sungai Kelemak (about 65 km from the river mouth) is very shallow with LWS -1 - 3 m and vessels are restricted to a small draught of 2.5 – 4.5 m in the dry season.
4) The seasonal fluctuation of the water level is large in Batanghari River (5 – 7 m between rainy season and dry season). To cope with this problem, the quay structures in Talang Duku are designed with pontoon type. This is one of the restrictions to the modernization of cargo handling in the port.

(2) Muara Sabak and the estuary area

Muara Sabak has a development plan designed by the provincial government and is located at 25 km from the river mouth. Since there are no sharp bends in the river channel to reach it, larger vessels up to L_{OA} <115 m and draught <6.5 m are navigable as compared with Talang Duku.

A longitudinal profile of the riverbed of Batanghari River is shown in Figure 8.2.2.

A vast Outer Bar is located in the estuary formed by river siltation. The water depth in the area within 11 km from the river mouth is shallower than LWS -1 m. A navigation channel（design depth: LWS-4.5 m）runs through Outer Bar and is maintained by dredging.

The depth of the navigation channel changes from LWS -5 to -7 m in the 15 km section from Tanjung Solok (river mouth) to Muara Sabak, and the water depth is barely secure for the shipping vessels.

According to the records of pre-dredge sounding, the major portion of the siltation is concentrated within the section 11 km from the Outer Bar. However, the sounding survey record is limited to this part of the channel and it appears that insufficient channel management has been carried out.

(3) Sedimentation in the river channel

The channel from Muara Sabak to Tanjung Solok is the portion where the river bed is dynamically maintained by the flushing effect of the river flow, (i.e., the water depth maintained by the river flow would be LWS -5 to -7 m).

If a pair of training dykes is constructed at the river mouth as the countermeasure of siltation, the water depth maintained with the effect of the dykes would be expected to be LWS -5 to -7 m at most.

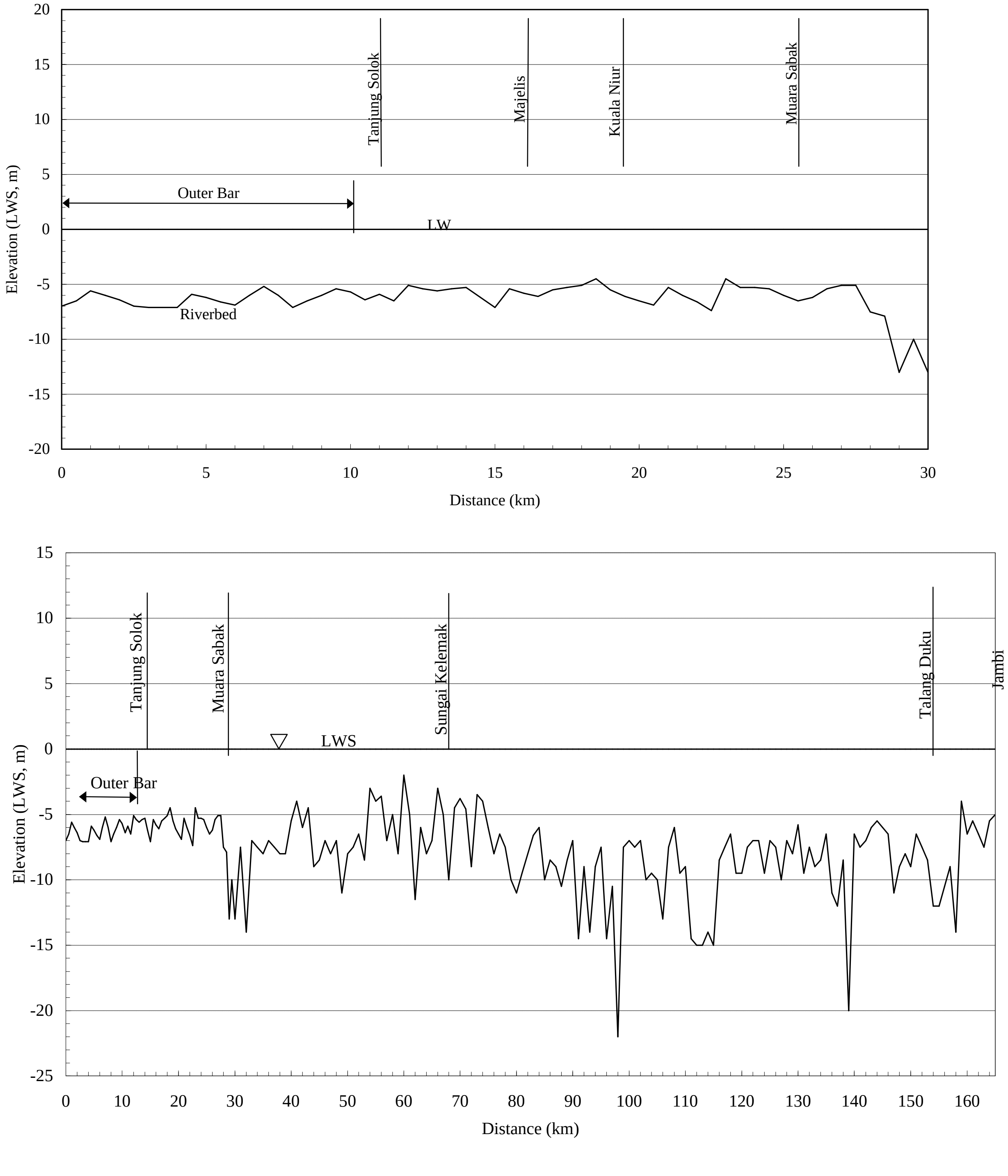


Figure 8.2.2 Longitudinal Profile of Sungai Batnghari (Jambi)

Source: Dinas Hidro-Oseanografi Chart No.48 (1974, 1981)

8.2.3 Palembang (Musi River)

(1) Characteristics of riverbed and channel

According to the records of pre-dredge sounding, 90 % of the volume of sedimentation on the navigation channel is concentrated within the 30 km section in the downstream most part of the river channel (Outer Bar, Tanjung Carat, …, Payung Selatan).

A longitudinal profile of the riverbed of Musi River is shown in Figure 8.2.3.The depth of the channel in this part shows shallow water less than LWS -5 – 6 m and it is maintained by infrequent dredging.

Water depth of LWS -7 to -10 m is generally secured in the upper stream sections from Pulau Payung. Since the sediments in the channel drift with the river flow, the riverbed is dynamically stable in those parts of the river.

If a pair of training dykes is constructed at the river mouth as a countermeasure of siltation, the water depth maintained with the effect of the dykes would be expected to be LWS -7 to -10 m at most.

The two locations of Pulau Kramat and Muara Selat Jaran have deep water as seen in the riverbed profile, and the dumping areas for dredged soil are set up at those points. Although the formation of a new sandbar in the river channel has been reported at Muara Selat Jaran, actually no sounding survey of the channel has been carried out in the vicinity of the dumping area.

(2) Maintenance dredging and disposal of sediment

The depth of sedimentation layer in the Outer Bar area reaches 2.5 – 3 m and over half of the depth is likely to be the fluid mud layer. It is said that this kind of fluid mud layer has no actual influence on shipping vessels such as bottom friction or damaging the ship body.

In the European ports, where siltation problems in the channel are abundant, the nautical depth of the channel is defined to exclude the density of sediment up to 1.2 g/cm^3 so that the fluid mud layer is not calculated in the depth of the navigation channel (PIANC, Bulletin No.9.2, 1983; Navigation in muddy areas).

The method to detect the fluid mud layer and the consolidated silt layer beneath is applicable using the dual frequency echo-sounder (210 kHz and 33 kHz). Concerning the large volume of the maintenance dredging in the estuary of Sungai Musi, the volume of sediment to be dredged should be studied and defined using these methods.

Concerning Muara Selat Jaran, the dredged sediment disposed of at the dumping area in the river channel is transported downstream by the river and is itself causing sedimentation. Hence, dredging work is ineffective in this area.

A dumping area along the river channel should be established onshore on the riverbank or the sandbar not in the water area. In order to improve the method of dredging and disposal of the dredged material, pump dredging system should be introduced with delivery pipes to the dumping area.

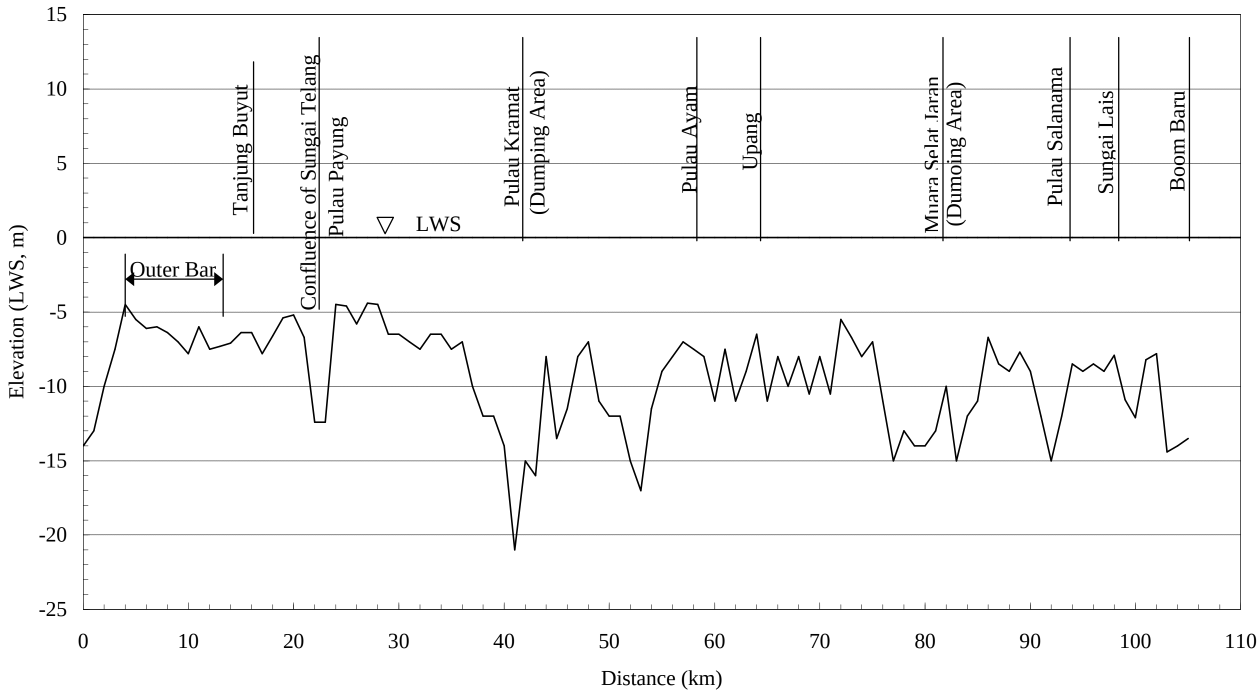


Figure 8.2.3 Longitudinal Profile of Sungai Musi (Palembang)

Source: Dinas Hidro-Oseanografi Chart No.3476 (1974, 1981)

8.2.4 Pontianak (Kapuas Kecil River)

The longitudinal profile of the riverbed of Kapuas Kecil River downstream of the Port of Pontianak is typical (refer to Figure 8.2.4). The navigation channel extending toward the river mouth downstream of the Jungkat runs through Outer Bar of the river and its depth of LWS -5 m is maintained by infrequent dredging.

On the other hand, the channel division from the confluence with Sungai Landak to Pulau Panjang through the Port of Pontianak has a depth of LWS -8 to -10 m, and yearly maintenance dredging is not carried out here. The water depth of the river channel is dynamically maintained by the river flow.

The sounding survey of the navigation channel for the planning of dredging program is limited only to the 15 km section from Outer Bar to Jungkat, and no information is available on the changes of riverbed forthe inner channels. To examine the inconsistency between the sources and to optimize the dredging program, a sounding survey should be conducted regularly for the purpose of proper management and maintenance of the river channel.

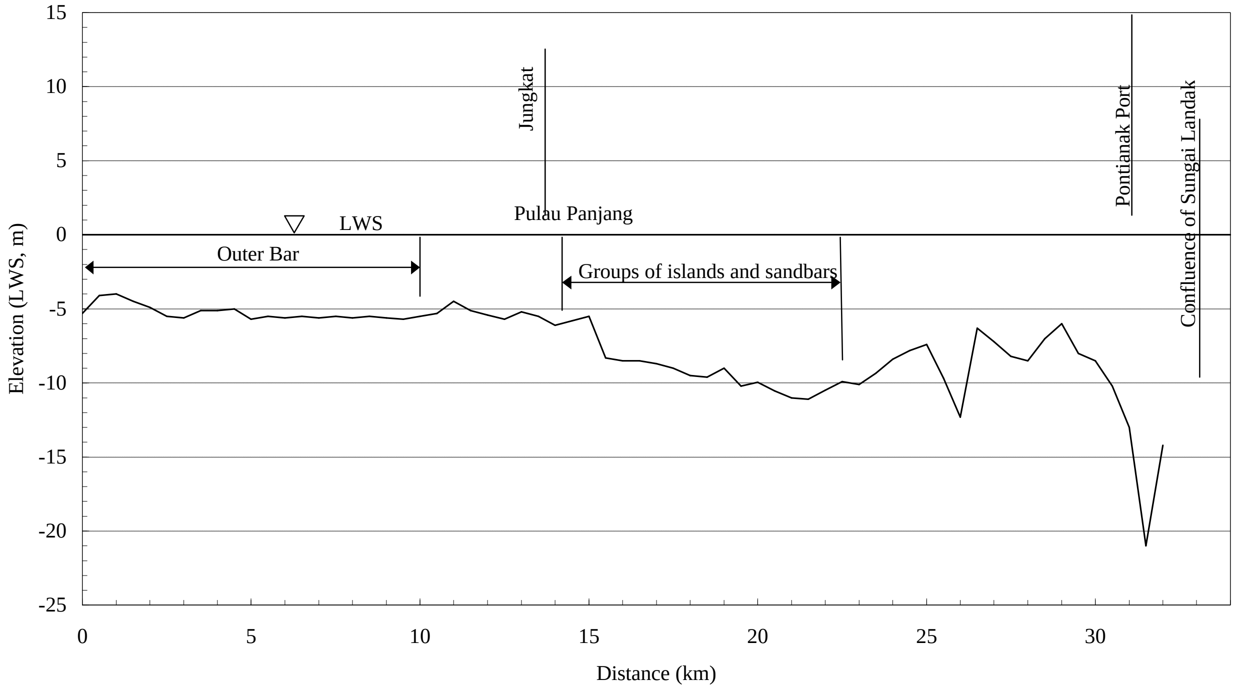


Figure 8.2.4 Longitudinal Profile of Sungai Kapuas Kecil (Pontianak)

Source: Dinas Hidro-Oseanografi Chart No.336 (1980)

8.2.5 Kumai and Sampit

Kumai River has a rather deep river channel compared to the Kalimantan rivers and the longitudinal profile of the riverbed (see Figure 8.2.5) shows the water depth as LWS -8 to –10 m excluding the estuary area. Bumiharjo, the upper stream site for the development of new CPO terminal, was selected because of this depth.

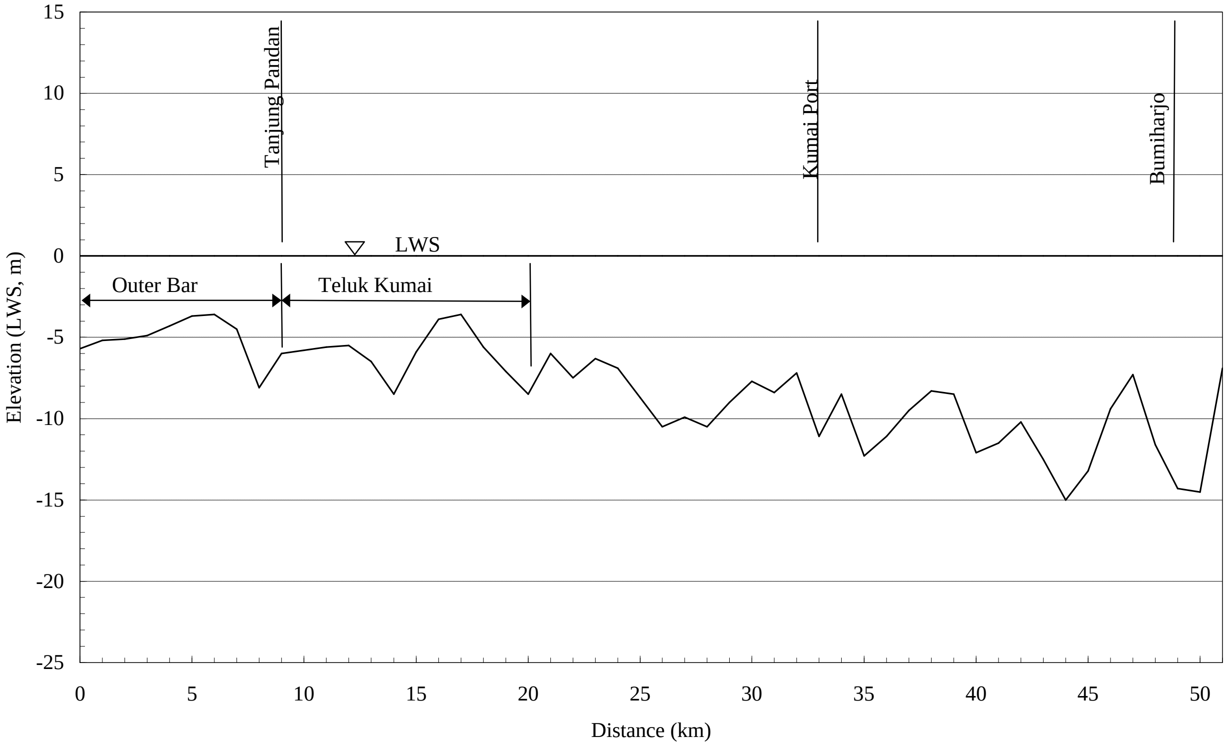


Figure 8.2.5 Longitudinal Profile of Sungai Kumai (Kumai)

Source: Dinas Hidro-Oseanografi Chart No.340 (2000)

The downstream section of Mentaya River, where Port of Sampit is located, has a rather shallow river channel and the longitudinal profile of the riverbed (see Figure 8.2.6) shows the water depth as LWS -6 to –8 m. The site for the development of the new CPO terminal, Bagendang, was selected at a downstream section of the river.

It is common for two rivers that the average sedimentation of 500 – 700 x 10^3 m^3/year takes place on the navigation channel at the estuary area. In order to continue to use the river ports and river channel, maintenance dredging is unavoidable in the channel of the estuary area. The optimization of the volume and work method of the maintenance dredging will be the main issues of channel management in the future.

It is projected that CPO, general cargoes and container cargoes will be handled mainly in the river ports along Mentaya River and Sampit River, this will encourage the introduction and utilization of the shallow draught vessel for the re-vitalization of the river transportation.

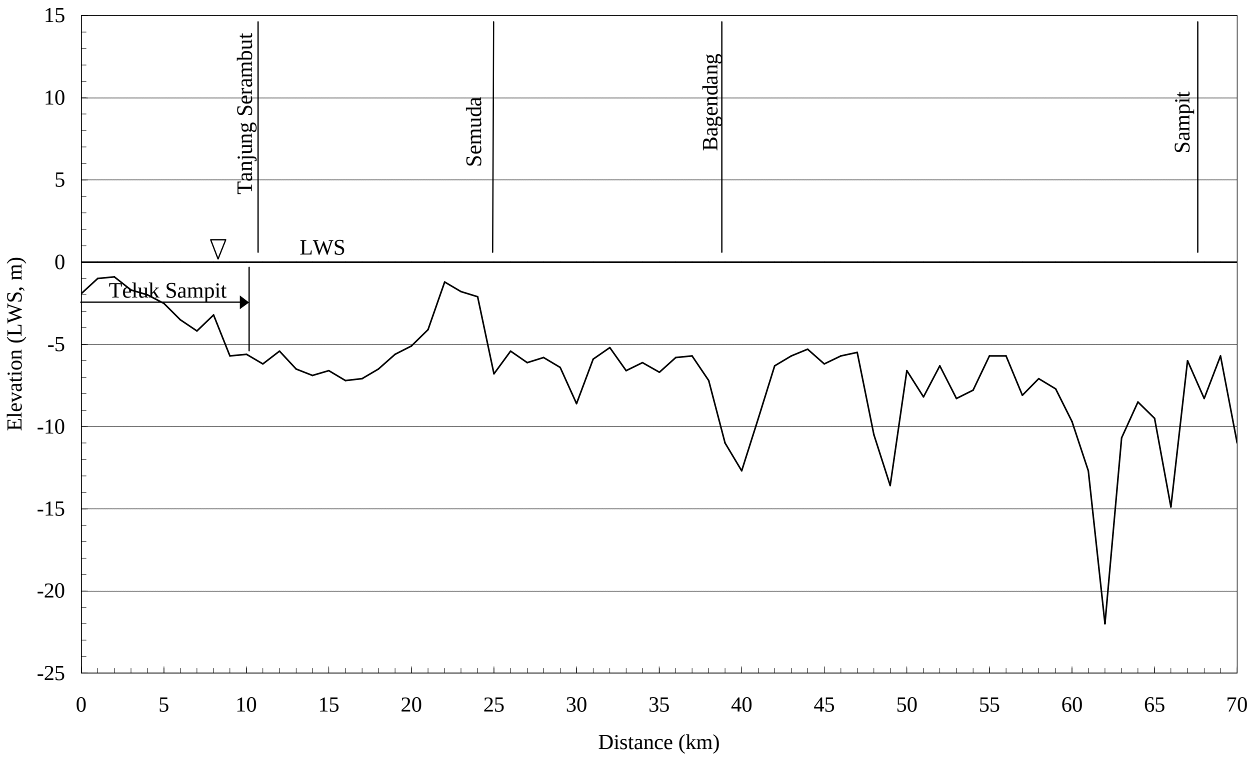


Figure 8.2.6 Longitudinal Profile of Sungai Mentaya (Sampit)

Source: Dinas Hidro-Oseanografi Chart No.156 (1998)

8.2.6 Samarinda (Mahakam River)

The navigation channel runs through the vast Mahakam delta. Tanjung Sanga-sanga is the beginning of the estuary delta, and the longitudinal profile of the riverbed (see Figure 8.2.7) shows that the river channel up to this point has deep water over LWS -10 m.

At Tanjung Sanga-sanga, the stream diverges from the trunk river to from many branches and the river flow rate drops in the delta. The channel division downstream of Tanjung Sanga-sanga becomes shallower to LWS-5 - 8 m, where the water depth of the navigation channel is maintained by dredging.

Figure 8.2.5shows that the water depth of the navigation channel maintained by the flush effect of the river flow is LWS -8 to -10 m at most. The following hydraulic measures would concentrate the river flow and to cause the flush effect to the navigation channels: namely,

(1) To close the divergence of the river channel by closing dyke,

(2) To construct training dyke along the navigation channel in the delta.

However, these measures cannot be justified easily for the following reasons:

(1) The construction cost would be gigantic due to the large scale of the estuary delta,
(2) The rise of water level during floods in Mahakam River and the effect of backwater to the upper stream,
(3) The presumed impact to the environment of the estuary delta.

Hence, there is no countermeasure to dramatically reduce the volume of maintenance dredging in the delta of Mahakam River. The yearly average volume of maintenance dredging in the Port of Samarinda navigation channel is 1,450,000 m^3/year, and it is still a big burden for port management.

Increasing the depth or the width of the navigation channel is not recommendable because that will only cause the volume of the maintenance dredging to increase. To cope with the growing traffic volume in the Samarinda navigation channels, the effect of countermeasures combined with hydraulic facilities and maintenance dredging should be examined.

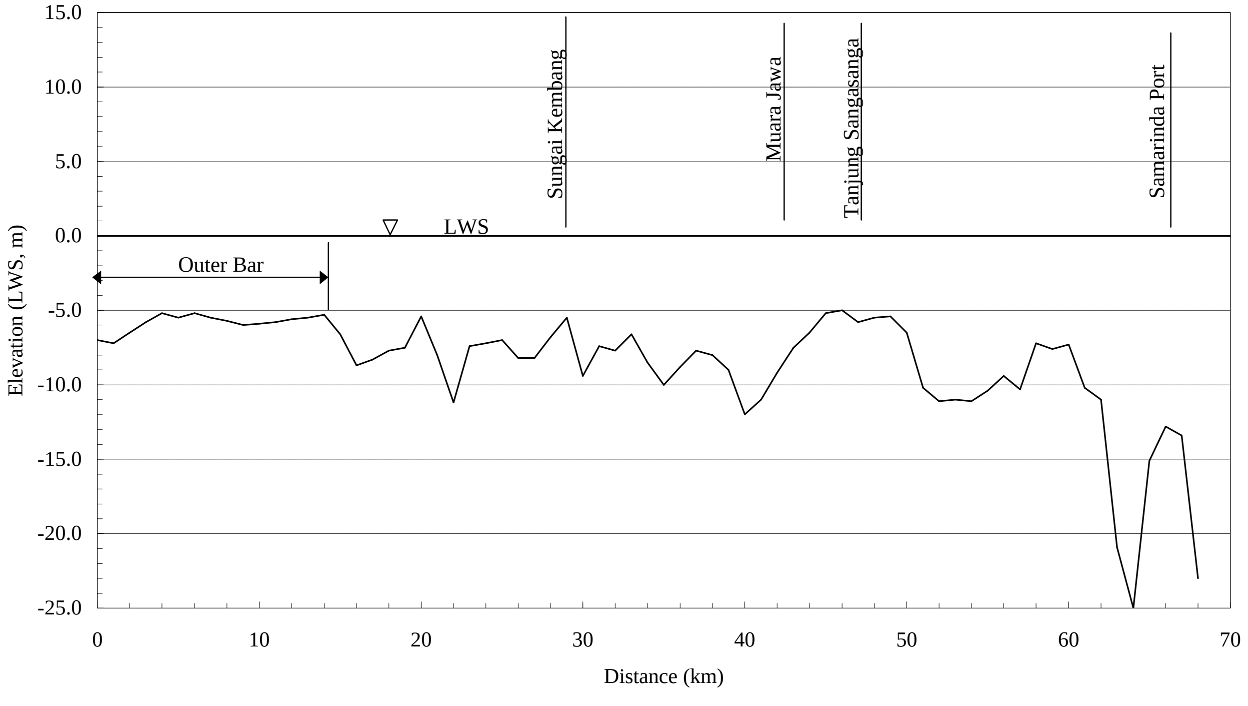


Figure 8.2.7 Longitudinal Profile of Sungai Mahakam (Samarinda)

Source: Dinas Hidro-Oseanografi Chart No.159, 395 (1989, 1994)

8.3 Appropriate Dimensions of Vessels

8.3.1 Characteristics of Each Port for Calling Vessel Size

Information on the annual total number of vessel calls and their total GRT (gross register tonnage) for each study port and for each service were collected from IPCs. The average vessel size of calling vessel (GRT) for each study port was calculated as follows.

Table 8.3.1 Average Size (GRT) of Calling Vessels at each port (1999)

		Pekan-baru	Jambi	Palem-bang	Ponti-anak	Kumai	Sampit	Sama-rinda
International	10^3 GRT	7,634	3,318	2,456	5,348	1,250	262	9,805
	Ship Call	1,658	1,463	865	953	114	69	816
	Average GRT	4,605	2,268	2,839	5,612	10,965	3,803	12,016
Domestic	10^3 GRT	8,494	2,061	7,482	4,424	2,665	2,957	8,338
	Ship Call	5,494	3,582	2,887	5,137	2,658	4,638	11,997
	Average GRT	1,546	575	2,592	861	1,003	637	695

The main observations from this table are as follows:

1) Vessel size of international service is greater than domestic service, but in the case of Palembang, nearly the same size vessels are used in the international and domestic services.
2) In international services, larger vessels over 10,000 GRT have been calling at Samarinda and Kumai ports than at other study ports.

In Samarinda, large vessels for international service load / unload their cargo at the anchor point at sea.

Although the available information was very limited, an analysis for the GRT distribution of calling vessels for several ports was carried out as shown in Figure 8.3.1.

The distribution shows that many smaller vessels (less than 1,000 - 1,500 GRT) are calling at these ports but typical pattern could not be discerned. However, the GRT distribution from these figures of calling vessels at Pertamina berth (Palembang) shows some interesting points as follows:

1) GRT distribution of tankers has two peaks at GRT 3,000 and GRT 13,000.
2) Size of oil barges is much smaller than that of tankers.

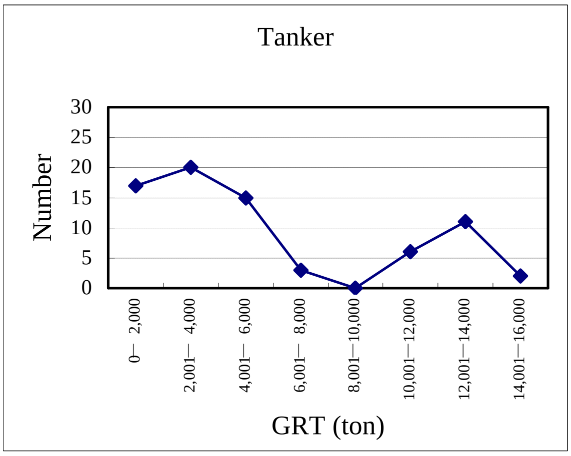
In river transport, the supplementary role of barges is very since the necessary number of oil barges is 10 times more than that of tankers.

In the GRT distribution of tankers, a product tanker (Loa: 158.0m, draught: 6.875m, 14,142 GRT) recently built in Japan (1998) and delivered to Pertamina is included. (see

Table 8.3.3 Type 2 ship)

This vessel can not call at Pertamina berth in full loaded condition but it can call in partial loaded condition at shallow draught (cargo weight 12,358 Lt, DWT:17,500 Lt).

Note: DWT=dead weight



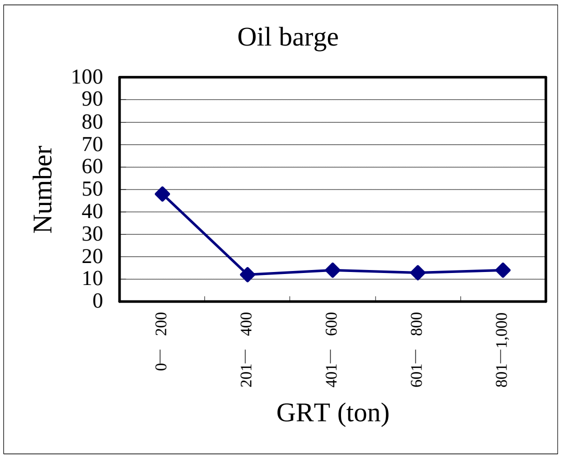


Figure 8.3.1 GRT distribution of calling vessels at Pertamina berth (Palembang)

8.3.2 Restrictions on the Size of Calling Vessels

(1) Overall length of vessel

Sumatra ports, Pekanbaru, Jambi and Palembang are located along the river over 100 km upstream from the river mouth. Siak river (Pekanbaru and Perawang) and Batanghari river (Jambi and Talang Duku) have many bends or sharp curvature of the channel, therefore those points must be taken into account in determining the overall length of calling vessels.

It is not possible to survey each bend or sharp curvature along the stream of each river. We assume that a vessel can navigate through each bend or sharp curvature subject to fully application of navigation rules. Whether the vessel can navigate through each bend and sharp curvature or not, can be explained in connection with the vessel's turning characteristics as follows:

Vessel transfer*(nearly equal to the radius of the turning circle) is assumed to be 2.5 times the overall length of the vessel (Loa). Therefore if the radius of curvature of the channel is less than 2.5 times of Loa of the vessel, the vessel may not navigate along the stream and will collide with the riverbank or cause grounding. (Figure 8.3.2)

* Note: transfer = transverse distance of deviation from the original course at that time a vessel turns to 90 degrees after the helm is ordered.

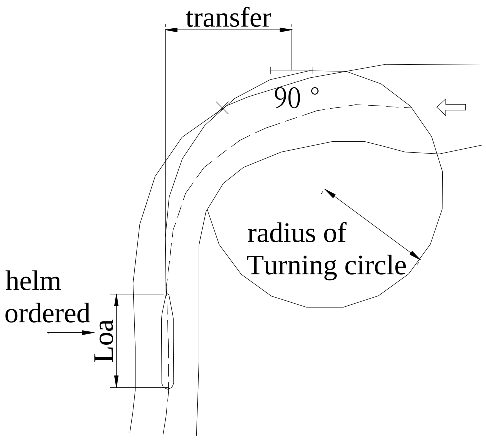


Figure 8.3.2 Collision with riverbank or grounding

(2) Restrictions from navigation rules

Each port has it's own navigation rules and it imposes some restrictions on the calling vessel size (dimensions)

Table 8.3.2 Restrictions on dimensions of calling vessel by navigation rules

	Max. Loa(m)	Max. Draught(m)
up to Perawang	90	6.0
up to Pekanbaru	50	5.0
up to Muara Sabak	115	6.5
up to Jambi	75	5.0
up to Palembang	185	n/a
up to Pontianak	n/a	n/a
up to Kumai	n/a	n/a
up to Sampit	n/a	n/a
up to Samarinda	153	6.8

In addition, since partial loading and "cargo topping" are ordinary procudures in Indonesia, these methods should be taken into account. "Topping" is the additional loading of cargo that is transported by barge near the river mouth and loaded to the mother vessel.

8.3.3 Shallow Draught Vessel

In the design of shallow draught vessels, draught(d) and length have restrictions for engineering and hydraulic conditions. Therefore, in order to increase the "carrying capacity" of the vessel, the breadth of the vessel (B) is usually increased to the technically possible maximum extent considering restrictions of the width of the channel.

The ratio *B*/*d* is one of the important indexes of shallow draught vessels (refer to Figure 8.3.3).

Figures 8.3.3 and 8.3.4 shows the relations between *B* and *d* of vessels and also DWT and *d* of vessels obtained from the information of calling vessels at the seven Study ports. Musi type vessel and Pertamina product tanker are used to satisfy the above mentioned shallow draft vessel requirements.

(1) Example of shallow draught vessels.

The above-mentioned Pertamina product tanker gains its large DWT from its shallow draught vessel design (refer to Figure 8.3.4). Its hull shape is developed by tank test experiments.

Musi type vessel is a urea carrying bulk carrier vessel of PT. Pusri and built in Japan (1976). It has many features for unloading of urea dry bulk. Its draught is restricted to about 6 m and maximum breadth of hold must be maintained as much aft as possible. Therefore the stern part vessel is very fat. To keep smooth stern water stream, the “cut-up stern” form is applied (refer to Figure 8.3.5 and top of Figure 8.3.6).

In the Musi type vessel, there is less loading capacity because the large spaces is used for installation of unloading facilities and equipment (bucket elevator, shuttle boom conveyer, etc.).

The particulars of shallow draught vessels operating in Indonesia are shown in Table 8.3.3

Table 8.3.3 Particulars of shallow draught vessels

	Type 1 Musi Type Vessel	Type 2 Pertamina Tanker
Vessel name	OTONG KOSASHI (Figure 8.3.6, top)	PEGADEN/ PERTAMINA1024 (Figure 8.3.6, bottom)
Delivered	‘76—11	‘98—8
Loa (m)	114.5	158
Lbp (m)	109.4	150.0
Breadth (m)	20.0	27.7
Depth (m)	10.0	12.0
Draught (m)	6.034	6.875
GRT	7,373.94	14,142
DWT (t)	7,606.2	17,500 Lt
Cargo capacity (m^3)	12,681.2	24,814
Main engine	medium speed diesel x 2, 2,500 HP x 600/180 rpm	low speed diesel x 1, 5,700 HP x 170 rpm
Service speed (knot)	12.0	13.25
Sister vessels	① IBRAHIM ZAHIER ② SOEMANTRI-BODJONEGORO ③ PUSRI INDONESIA	ENAM-ENAM KADEPE

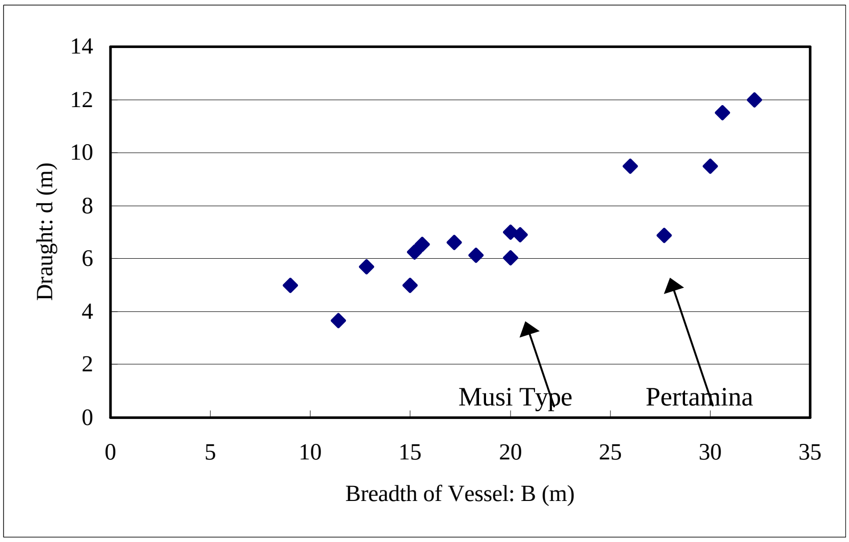


Figure 8.3.3 Relation between *B* and *d*

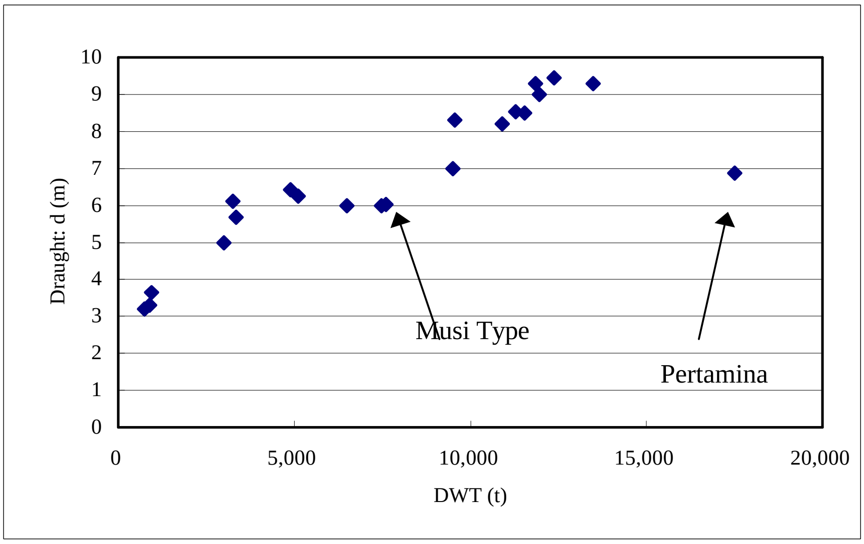


Figure 8.3.4 Relation between DWT and *d*

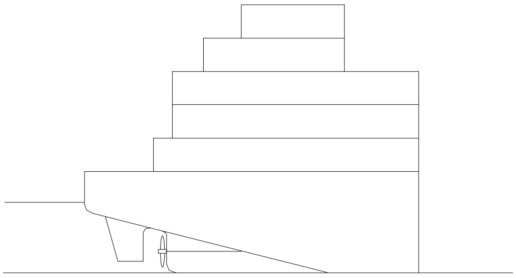
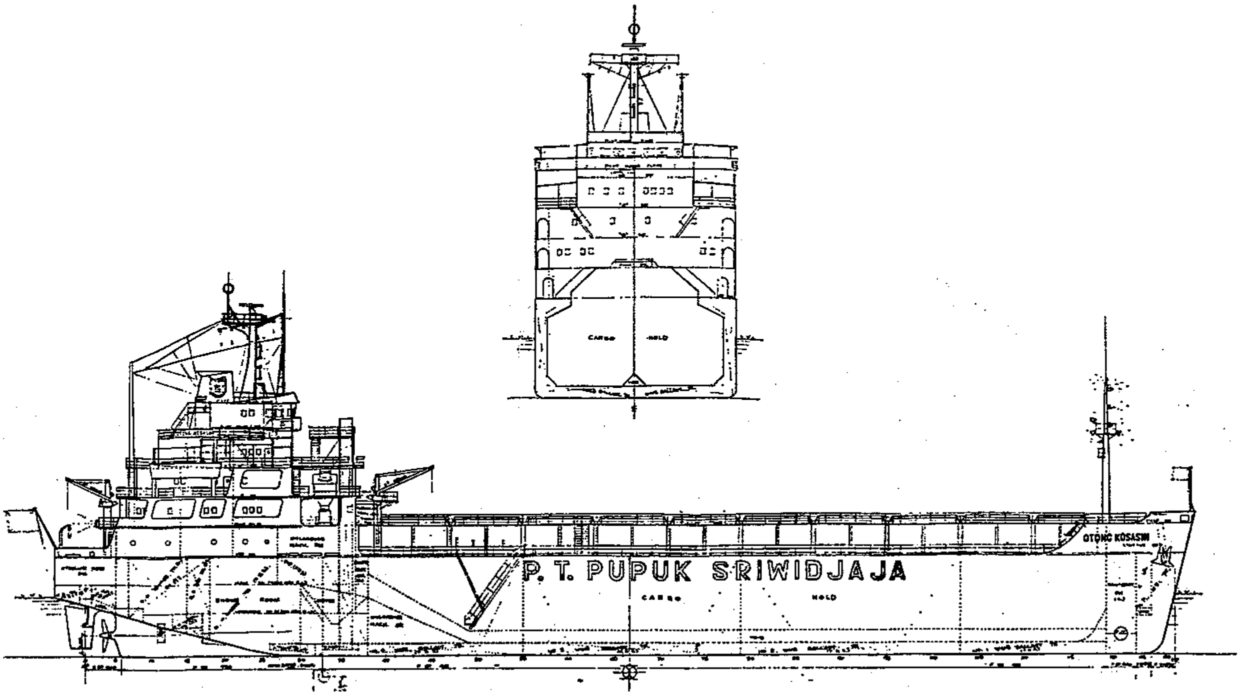
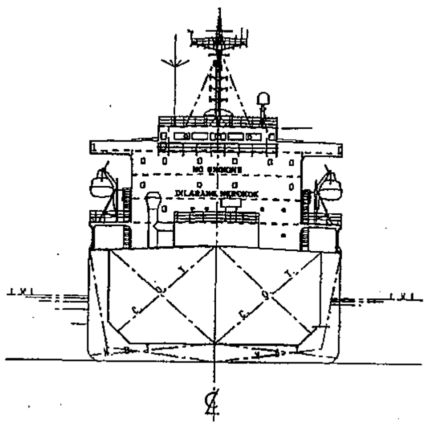


Figure 8.3.5 An Illustration of Cut-up stern form



Type 1: PT Pusri's "Musi Type" vessel

Bridge Front View & Midship Section



Type 2: Pertamina Product Tanker "Pegaden/ Pertamina 1024"

Figure 8.3.6 Shallow Draft Vessel in Musi River

(2) Two types of cargo vessels

There are two representative types of cargo vessels: namely,

Type 1: "Volume design vessel" such as bulk carrier, car carrier, etc., where specific gravity of cargo is relatively low. For this type of vessel, cargo hold/tank capacity (m^3) is essential and DWT (t) is of secondary importance.

Type 2: "Weight design vessel" such as crude oil tanker, ore carrier, etc., where specific gravity of cargo is relatively high. For this type of vessel DWT is essential and cargo hold/tank capacity is of secondary importance.

In fully loaded condition, it is very difficult to satisfy these two restrictions (volume and weight) simultaneously since one factor is essential and the other is only for adaptation for the fluctuation of the specific gravity of intended cargo.

Requirements to be applied in the design of shallow draught vessel are summarized as follows.

1) Enlarge cargo lot; partial loading or topping cargo should be limited. In the case of private berth such control may be easy, but not a public berth.

2) Shallow draught type vessel may be applicable to tanker or bulk carrier.

3) Shallow draught type vessel seems not to be applicable to general cargo vessel. General cargo ship is suitable for carrying wide range of cargo; on the other hand shallow draft vessel must be designed for specified cargo loading.

4) In general, Sumatra river ports are located farther from the river mouth than those of Kalimantan and Sumatra rivers have more bends or sharp curvature than thoset of Kalimantan.

   Thus it seems that the shallow draft vessel having low L/B is more applicable for Kalimantan than for Sumatra from the point of view of course keeping ability.

5) In a shallow draft vessel, the hull must be designed with very careful consideration for stream-lining along the hull surface to avoid vibration, noise and low maneuverability, etc.

In case of applying the shallow draught vessel design, a very large cargo hold/tank capacity will be necessary for Type 1 and a very large DWT for Type 2 (refer to Table 8.3.3).

9. PORT MANAGEMENT SYSTEM

9.1 Identification of Problem Areas

9.1.1 Responsible Organization

MOC is in charge of the administration of the transportation sector. The Ports and channels are managed by the DGSC, while the ferry ports are managed by the DGLC.

Figure 9.1.1 Relationship among the Authorities of Port Management.

DGSC is made up of five divisions under the Secretary of Directorate General and five directorates, Directorate of Sea Transport and Traffic, Directorate of Ports and Dredging, Directorate of Maritime Safety and Seamanship, Directorate of Navigation, and Directorate of Guard and Rescue.

The main function of Directorate of Port and Dredging is planning, construction, and management of ports and channels. Directorate of Navigation administrates the traffic in channels.

There are 2,293 ports in Indonesia subject to the Shipping Law (Law No.21/1992). They are separated into two groups, 656 public ports and 1,484 private ports and special wharves.

Table 9.1.1 Ports of Indonesia
Table 9.1.2 Special Ports and Special Wharves in Indonesia in 2001

These ports are managed based on the Ports Regulations (Government Regulation No.69/2001) and Keputusuan Menteri (Ministry Decree No.26/1996).

IPC (I-IV) manages 110 commercial ports among 656 public ports. KANPEL manages 546 non-commercial ports. Also, ADPEL and KANPEL take care of the safety in the ports and channels. Navigation Offices are established to take charge of navigational aids. KANPEL are going to be transferred to the local government in line with the decentralization process.

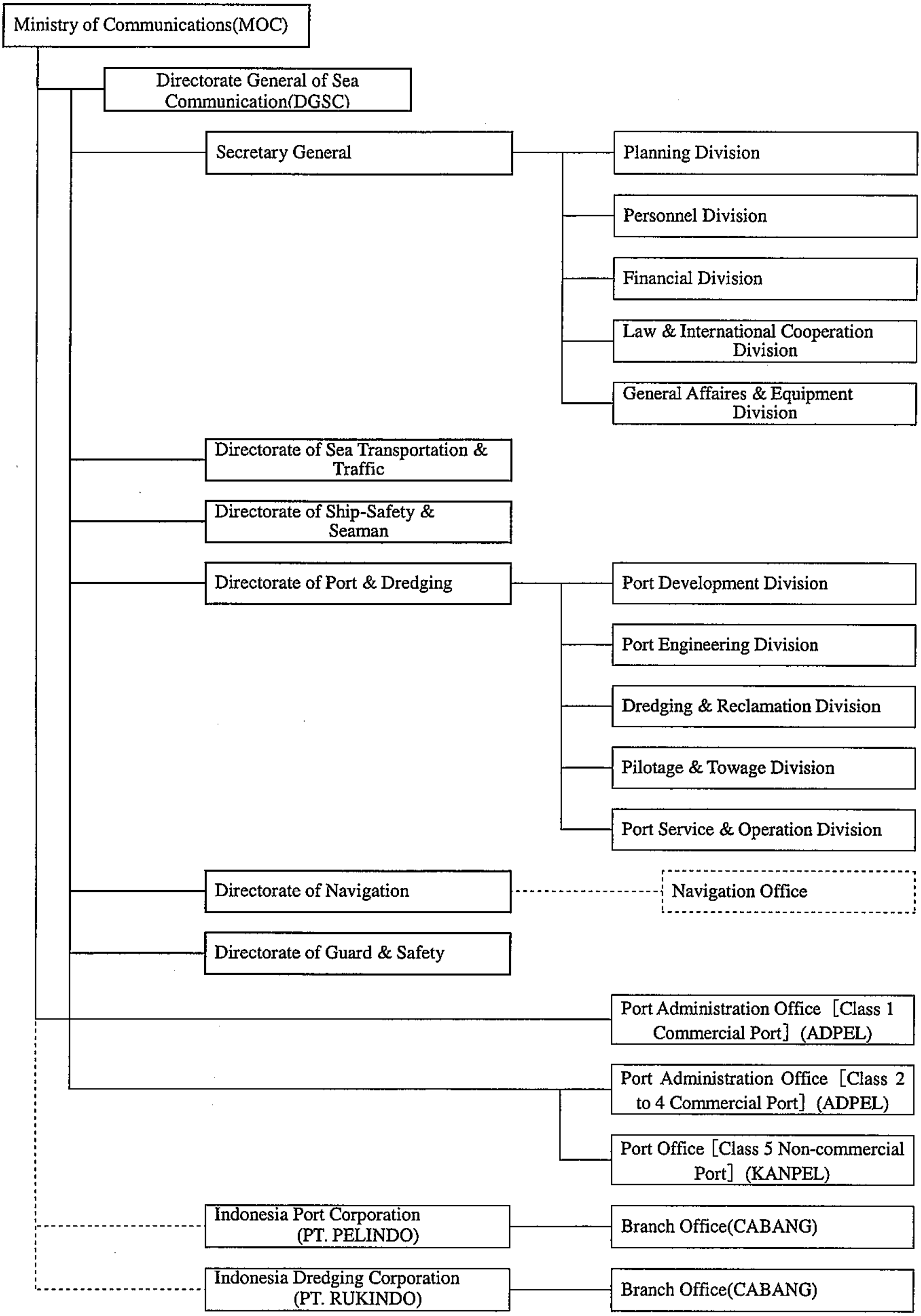


Figure 9.1.1 Relationship among the Authorities of Port Management

Table 9.1.1 Ports of Indonesia

May / 2001

District	Province	Public Port					Special Port (Including Special Wharf)	Ferry Port	Total
		Commercial Port			Non-Commercial Port				
		P.M	Port	Including River Port	Port	Including River Port			
Sumatra	DI.Aceh	I	6		10	(1)	34		
	North Sumatra	I	8	(4)	46	(2)	60		
	West Sumatra	II	3		6		13		
	Riau	I	10	(3)	43	(4)	168		
	Jambi	II	3	(1)	8	(2)	55		
	Bengkulu	II	1		3		3		
	South Sumatra	II	8	(1)	3	(1)	76		
	Lampung	II	1		11	(2)	13		
	Sub-Total		40	(9)	130	(12)	422	27	619
Jawa and Bali	DKI.Jakarta	II	3				26		
	West Java	II	3		13	(1)	59		
	Central Java	III	3		10	(1)	23		
	Yogyakarta	III					1		
	East Java	III	8		18		49		
	Bali	III	3		7		32		
	Sub-Total		20		48	(2)	190	19	277
Kalimantan	West Kalimantan	II	7	(1)	4	(2)	199		
	Central Kalimantan	III	8		3		131		
	South Kalimantan	III	2		4	(1)	115		
	East Kalimantan	IV	5	(3)	13	(2)	188		
	Sub-Total		22	(4)	24	(5)	633	26	705
Sulawesi	North Sulawesi	IV	3	(1)	36		39		
	Central Sulawesi	IV	3		32		54		
	South Sulawesi	IV	4		37		10		
	Southeast Sulawesi	IV	1	(1)	33		11		
	Sub-Total		11	(2)	138		114	19	282
	West Nusatenggara	III	3		12		25		
	East Nusatenggara	III	5		30		18		
	Maluku	IV	3		56		41		
	Irian Java	IV	6		108		41		
	Sub-Total		17		206		125	62	410
	Total		110	(15)	546	(19)	1484	153	2,293

Note:

Instruction of Director General of Sea Communication No. PP 72/2/10-99 on December 24,1999 Regarding

Table 9.1.2 Special Ports and Special Wharves in Indonesia

(MAY 2001)

No	Province	Special Port		Total Special Port	Special Wharf		Total Special Wharf	Total Operator
		With License	With out license		With License	With out License		
1	DI.Aceh	16	8	24	9	1	10	34
2	North Sumatra	28	8	36	12	12	24	60
3	West Sumatra	2	5	7	2	4	6	13
4	Riau	20	45	65	70	33	103	168
5	Jambi	1	3	4	29	22	51	55
6	Bengkulu	0	0	0	1	2	3	3
7	South Sumatra	12	43	55	12	9	21	76
8	Lampung	0	3	3	8	2	10	13
9	DKI.Jakarta	5	12	17	4	5	9	26
10	West Java	8	4	12	33	14	47	59
11	Central Java	1	4	5	9	9	18	23
12	Yogyakarta	0	1	1	0	0	0	1
13	East Java	7	16	23	11	15	26	49
14	Bali	4	11	15	6	11	17	32
15	West Nusateggara	2	12	14	3	8	11	25
16	East Nusatenggara	1	7	8	3	7	10	18
17	West Kalimantan	8	78	86	22	91	113	199
18	Central Kalimantan	0	19	19	34	78	112	131
19	South Kalimantan	6	5	11	32	72	104	115
20	East Kalimantan	24	10	34	62	92	154	188
21	North Sulawesi	3	21	24	12	3	15	39
22	Central Sulawesi	8	28	36	11	7	18	54
23	South Sulawesi	4	2	6	4	0	4	10
24	Southeast Sulawesi	1	4	5	5	1	6	11
25	Maluku	10	17	27	8	6	14	41
26	Irian Java	9	16	25	10	6	16	41
	Total	180	382	562	412	510	922	1484

Note: Instruction of Director General of Sea Communication No. PP 72/2/10-99 on December 24,1999

Regarding The Supervising and Controlling to Special Wharf, has been issued, for:

- All Heads of Regional Office of Communication Ministry;
- All Port Administrators;
- All Heads of Port Office.

9.1.2 Problems in the Principal River Ports

All the seven ports are located inland far away from the river mouth and are experiencing problems peculiar to river ports.
According to the site survey (except Kumai and Sampit Port), the following problems were identified.

(1) Problems in the Port Management

1) Pekanbaru Port

- Public piers with a depth of 6m are located in Pekanbaru and Perawang public wharves. It is difficult to gather detailed data of cargo traffic.
- Pekanbaru is surrounded by commercial and residential areas, and there is no more space for expansion. Therefore, redevelopment of the existing wharves has to be considered, including the relocation of port management offices to outside.
- Traffic jam around the port hampers efficiency.
- Perawang is currently used as a container yard but the access road needs to be improved.
- It is difficult to maintain navigation safely throughout the 165 km of the rounding channel from the estuary of the Siak River.
- Sufficient dredging budget needs to be secured to maintain the access channel.

2) Jambi Port

- Jambi port (located 167 km from the estuary of the Batanghari River), requires a serious attention to maintain navigational safety.
- It is difficult to gather detailed data of cargo traffic due to the predominance of private cargo.
- As for Muara Sabak, 50 km out of the 115 km access road from Jambi is not paved.
- Kuala Tungkal is a port for small ships (-2m to -3m) and cannot accommodate big ships.
- A large volume of dredging is carried out every year, and sufficient funds need to be constantly secured.

3) Palembang Port

- Boom Baru needs development so that yard efficiency is improved.
- Mobile and gantry cranes need to be repaired and properly maintained.
- Another port area, Sungai Lais (8 km downstream of Boom Baru), is not utilized. A master plan is needed.
- A large volume of dredging is carried out every year, and sufficient funds need to be constantly secured.

4) Pontianak Port

- The port of Pontianak can be separated into two areas, Pontianak and Nipah Kuning, (5km downstream of Pontianak). Only traditional ships use Nipah Kuning.
- Roads are poorly maintained, hampering the distribution of freights from the port.
- Vessels crossing the river around the Pontianak area occasionally collide with one another.
- Behind the wharves of Pontianak is water, and the yards are not used efficiently.
- There are many port offices in the port area requiring relocation.
- Water depth is sufficient, but a lot of funds are needed for dredging in the estuary, (up to about 15 km offshore). It is necessary to come up with a measure to secure the dredging budget.
- There is only one bridge crossing the river. For this reason, the bridge is heavily congested. There is an urgent need for an increase in ferry service or a new bridge.

5) Kumai Port

- The existing port of Kumai is surrounded by the residential area, and it cannot be expanded. Therefore, a new pier for CPO is being constructed in Bumiharjo. As for the existing port, warehouse and offices need to be re-arranged to increase efficiency.
- Dredging budget needs to be secured and navigational safety needs to be maintained.

6) Sampit Port

- The existing port of Sampit cannot respond to the present amount of cargo. Also, it is surrounded by the residential area and therefore expansion is not possible. For those reasons, a new pier is being constructed in Bagendang, which is 22 km downstream from Sampit. CPO will be the main cargo handled, but containers could be handled in future. It might be difficult to raise the funds.
- Dredging budget needs to be secured and navigational safety needs to be maintained.

7) Samarinda Port

- The existing port is extremely congested. There is not enough space for cargo handling and cargo storage. The port is surrounded by roads and residential areas, and there is no space for expansion.
- Therefore, the port offices need to be moved to outside the port.
- A part of the existing wharf needs fixing.
- Some parts of the pavements in the yards are also damaged. Restoration of the

entire area would email a huge cost, therefore a plan for a partial repair is needed.

- The passenger terminal is comparatively new, but it is used only twice a month.
- It rains a lot around the Mahakam River, and its water level is not much lower than that of the residential areas. An appropriate countermeasure against flooding in the event of heavy rain is required.
- For the safety of navigation, pilots board ships larger than 150 tons. There are few lighthouses in the Mahakam River.

(2) Common Problems of the Seven Ports

1) River Port Area

- In some ports, a long time has passed since port working area and port interest area were established. They need to be reviewed to respond to the current needs.

2) Utilization and Management

- Generally, land area is narrow in river ports. These river ports traditionally handled daily commodities in break-bulk form but the ports are now required to handle containers and a wide space is needed.
- In the land area, there are a lot of port-related offices aggravating the congestion. There is a need for the relocation of these buildings.
- Some ports do not have a good access road.

3) Administrative Services

- In order to improve the port administrative services, it is necessary to expedite and simplify the procedures needed to get various permissions.
- Therefore it is necessary to simplify the formats or to introduce an EDI system and a manual system.

Figure 9.1.2 Port EDI System (Internet)

4) Navigational Safety

- Principal river ports in Sumatra are located far from the estuary, and maintaining safe navigation throughout the channel is a serious issue. Therefore, MOC has taken measures, such as a compulsory pilot system (over 105 GT in Jambi and over 150 GT in Pekambaru). However, Indonesia has not established navigation rules or regulations.

5) Budgets

- Maintenance dredging in Palembang and Samarinda was funded by the central government until recently. Due to the country’s financial problems, however IPC started to shoulder the dredging costs in the other ports in 2001. In Palembang, Samarinda, and Pontianak, it is necessary to determine who is responsible for the dredging expenses: central government, local government (province/municipality), or private sector (company/users of the port).

In the United States of America, the port management body is mainly responsible for these costs within ports area, and also the central government bears the dredging costs outside the port area. The federal government gives a subsidy for facilities, such as a breakwater. In some ports in France, the central government bears 20 percent of the costs and the rest is borne by port managing agencies. In Japan, the fund to construct a channel outside a port is borne by the central government. The funding system for port development widely differs depending on the country. Therefore it is necessary to establish an appropriate system suitable for Indonesia.

- The revenue and expenditure of the river ports are shown below. Most of the revenues are from the rental/concession fee. How to secure the funds for dredging is a serious issue.

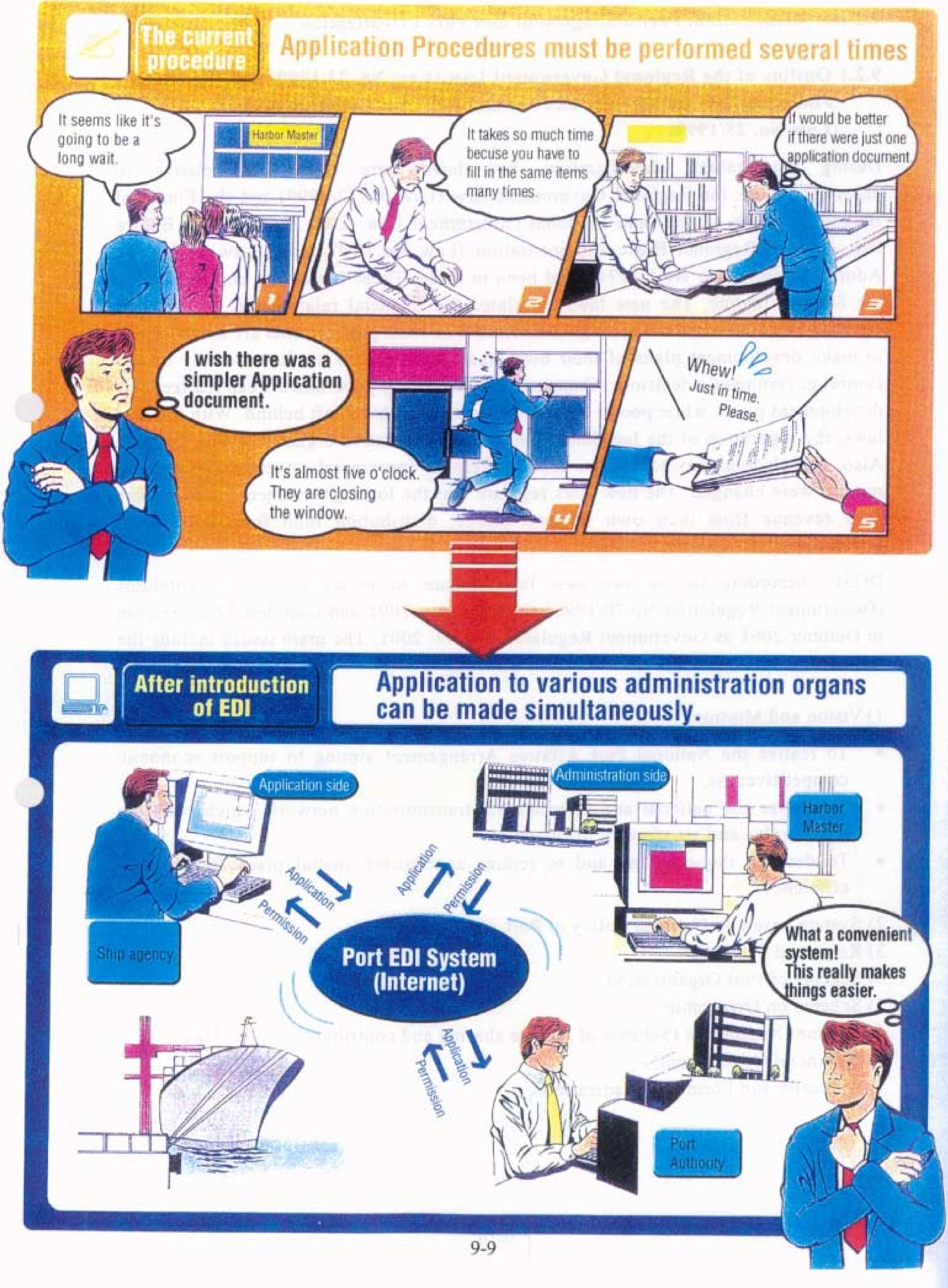
Table 9.1.3 Revenue and Expenditure of the Seven River Ports (2000), Assumed Dredging Cost (2001)

(Unit: Rp. million)

	Pekanbaru	Jambi	Palembang	Pontianak	Kumai	Sampit	Samarinda
Revenue 2000 (Result)	8,832	7,166	34,360	24,063	1,864	2,899	13,336
Expenditure 2000 (Result)	4,935	6,130	21,957	17,792	1,757	3,167	4,227
Dredging Cost 2001 (Plan)	Not big Amount	N.A.	8,750	3,298	N.A.	2,450	4,725

Source: IPC Local Office

Figure 9.1.2 Port EDI System



9.2 Decentralization, Port Management and Port Privatization

9.2.1 Outline of the Regional Government Law (Law No. 22/1999) and the Financial Balance between Central and Regional Government Law (Law No. 25/1999)

During the Habibi administration, two laws were established relative to decentralization: the Regional Government Law (Law No.22/1999) and the Financial Balance between Central and Regional Government Law (Law No.25/1999). Before that, Law of Regional Basic Administration (Law No.5/1974) and Law of Village Administration (Law No.5/1974), had been in force. These laws were enacted during the Suharto regime. The new laws stipulated the financial relationship between the central government and the local governments. The local governments are now allowed to make development plans of their own areas, and they do not have to rely on the central government's decisions. Comparatively rich local governments can realize their development plans, while poorer local governments might be left behind. With the new laws, the separation of the legislative and the administrative organ is clearly defined. Also, the election procedures for local governors (provincial governor, regent and mayor) were changed. The new laws regulate that the local governments should raise their revenue from their own revenue source, distribution fund from the central government, loans and the others.

DGSC, according to the two new laws, began to revise its Port Regulations (Government Regulation No.70/1996) since January 2001 and completed the revision in October 2001 as Government Regulation No.69/ 2001. The main issues include the following;

1) Vision and Mission

- To realize the National Port Affaires Arrangement aiming to support economic competitiveness.
- To realize the national and international transportation network which can give added value and satisfaction to customers.
- To develop the economy and to realize appropriate spatial plans for national efficiency.

2) System based on National Policy of Port Affairs
3) Roles and Function
4) Scheme of Port Organization
5) Scheme on Ownership
6) Income Distribution (Scheme of income sharing and contribution of PEMDA / Provincial Government)
7) Authority and Form of Organization

9.2.2 Management of Ports

(1) Port Management in Indonesia

The Indonesian government has established the Regional Government Law (Law No.22/1999) and the Financial Balance between Central and Regional Government Law (Law No.25/1999). With the Law of Autonomy (Law No.22/1999) and the Law of Fiscal Balance (Law No.25/1999), Indonesia has taken a step forward towards decentralization and deregulation in 2001. MOC is following this change and decided to transfer some of its authority on the port sector to local governments.

(2) Port Management in Other Countries

1) History

Ports are very important for facilitating international trade. Therefore, great attention has been paid to port management throughout the world. In Europe, ports were first created as free ports, and later the central government or the local government took them over. Nowadays, the ports in UK, Sweden, and Italy are generally managed by the port authorities of the countries.

In the USA, ports development was carried on by private companies or states. Some ports started their operation as a private port and then changed to a public port as is the case with New York Port.

In developing countries, the central government or public corporations generally manage public ports, but local governments (province or municipality) and local port authorities are beginning to take part in the port management.

There are five types of port management:

- National Government,
- Regional Government,
- Independent Port Committee,
- Public Corporation,
- Private Corporations.

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2) Recent Trends

Many countries have begun to introduce a privatization policy, and the port management system are changing accordingly. The Overseas Coastal Development Institute of Japan (OCDI) has surveyed the port management system in leading nations since 1996.
The main findings are as follows:

Classification according to the Administrative Body.

Ports can be classified according to the administration system and ownership.

Administering bodies can be separated into two types: Public Sector or Private Sector. In this section, an analogy with home ownership is drawn to facilitate understanding.

a. House with Furniture and Meals

Everything from owning, construction and management is done by public sectors.
Example: Bangkok port in Thailand, Sihanoukville port in Cambodia, Mumbai port in India.

b. House

The degree of owning and running of ports by private sector gradually increases in this style. 'Owner' type could be classified into two types according to whether they have the facilities or not.

b-1. House with Furniture

The degree of owning and running of ports by private sector gradually increases in this style, and except for the terminals, infrastructures and superstructures are run by the private sectors.
Example: Yokohama port in Japan, Kaohsiung port in Taiwan, Pusan port in South Korea, Manila port in Philippines.

b-2. House without Furniture

The degree of owning and running of ports by the private sectors gradually increase in this style. The private sector takes care of the infrastructure only, and the rest is the responsibility of the public sectors.
Example: Hamburg port and Bremen port in Germany, Rotterdam port in Netherlands, Antwerp port in Belgium, Los Angels port in USA.

c. House owned within a Period

Conditions of reservation are imposed on the possessive rights, and the owners leave the management of infrastructures and terminals to the private sectors.
Example: Balboa port and Cristobal port in Panama, Santos in Brazil.

d. House owned by One

The private sector owns, constructs and manages the ports.
Example: Southampton port in UK, Tauranga port in New Zealand.

9.2.3 Port Management in Japan

Since 1868 until the end of the World War II, ports in Japan were considered as state-owned facilities. The central government was responsible for maintenance and management of the ports. At that time, all the port facilities belonged to the government in principle.

Private enterprises needed special permission to run a port. The ports were administrated by the local governors. Even though cities, towns and villages were requested to share the financial burden of the port development, they could not own and manage the ports. As for the foreign trade facilities, the Customs office managed their piers and wharves.

Before the end of the World War II, there were only two rules regarding the management of the ports: rule regarding the opening of a port and another rule regarding quarantine. The rest were carried out according to the customs and the orders.

After the World War II, with the new constitution in effect, democracy became the rule in Japan's politics and economy. Accordingly, a new rule regarding the port management, Port and Harbor Law in Japan, was established in May 1950.

With the establishment of the Port and Harbor Law, local public bodies became responsible for ports. Therefore, the principal responsibility for port management was transferred from the central government to the local governments.

The Port and Harbor Law is the basic law that regulates the management, development, and use of the ports. It requires that the management of ports should be done by to the local government. On the other hand, the central government is expected to assist the ports financially and to coordinate important matters from the national viewpoint.

Decentralization and deregulation are in progress in Japan as well. The Port and Harbor Law was modified in April 2000 accordingly.

9.3 Port Privatization and Its Impact

9.3.1 Port Privatization in Indonesia

(1) History and Laws

There are 656 public ports and 1,484 private ports which were stipulated based on the Shipping Law. 110 large-scale ports out of 656 public ports are called commercial ports, and four IPCs manage them. The other small-scale ports in isolated islands and borderlands are managed directly by the MOC. IPC (old) existed as a local sub-organization of DGSC until 1982, but with the suggestion from the World Bank, it became a State Enterprise in order to increase efficiency. In 1992, it became a joint-stock company with its stocks 100 percent owned by the government.

Indonesia has been executing a development project based on the sixth 5-year (REPLITA VI) since 1994, and is taking a positive attitude towards introducing public money into ports. This is based on the fact that the Indonesian government does not have enough funds of its own and does not want to increase the amount of its foreign loans.

In August 1994, the Indonesian government distributed a small booklet called 'Investment Opportunities in Indonesian Public Ports' to private enterprises and called in for investments. In this booklet, the laws associated with the ports and rough schemes are introduced. It is stated in the booklet that when a foreign company wants to invest, it needs to make a joint venture with a local enterprise, and to make a contract with IPC.

Most facilities of ports are the objects to the introduction of the private money, for example, container terminals, conventional terminals, supply of water and electricity, treatment of the wastes, and except for the safety of the ships and the ownership of the water and land, the rest is all targeted to the private money. Especially for profitable container terminals, specific proposal was made.

The purpose of privatization in Indonesia is to attract private capital and improve the quality of services for customers. Therefore, the private sector is being encouraged to take part in the port business.

Especially with the relaxation of rules by the Shipping Law and the Government Regulation, it has become possible for the private sector including foreign investors to participate in the construction and management of port.

Based on these conditions, the private enterprises are increasingly joining the IPC.
In 1994, IPC II concluded the contract of joint operation with a private enterprise regarding the construction and management of the container terminal III of the port of Tg.Priok. In 1997, IPC III concluded the contract of joint operation with a private enterprise regarding the construction and management of the port of Tg.Priok.

However, with the financial and economic crisis which began in late 1997, the foreign capitals withdrew from Indonesia, and the Indonesian government had to reconsider, postpone or cancel many of the privatization projects. In January 1998, the government established Presidential Decree No.7, which stipulated the regulations regarding the relationship between the government and the private sectors, procedures to execute projects, the tendering system when choosing a private enterprise, and attempted to improve the whole system and to increase the transparency of the selection process. Indonesia has established the Law of Autonomy and the Law of Fiscal Balance, and has taken a step forward towards a new direction.

Indonesia's financial situation is still severe, and the privatization of port development and management are expected to reduce the burdens of the government and to promote the improvement in many of the infrastructures.

(2) Frameworks regarding Privatization and Foreign Investment

In Indonesia, there are no rules that directly regulate the introduction of private money to the port developments. However, there are basic rules that regulate privatization and foreign investment associated with the port development as follows.

Name of Laws/Regulations	Summary
1) Law No.1/1967 on Foreign Investment	General regulation for foreign investment
2) Government Regulation No.56, 57, 58 & 59/1991	Establishment of IPC (I to IV), Transfer of competence for Management on some Public Ports from Government to IPC
3) Shipping Law No.21/1992	Cooperation between IPC and Private Sector on Business of all Port Activities
4) Government Regulation No.20/1994 on Foreign Investment	New and Supplementary Regulation on/for Foreign Investment
5) Government Regulation No.69/2001	Regulation toward Local Government and Private Sector to manage Public Ports
6) Presidential Decree No.7/1998	New and General Regulation for Private Sector to participate in Infrastructure Projects

Source: DGSC&BKPM

A brief explanation for main/important points of each law and regulation are as follows.

1) Law No.1/1967 on Foreign Investment

The principle of foreign investment is stipulated in this law. Up to the present point, this law is still considered to be compatible with the current need of Indonesia for foreign investment. This law established the general rules for foreign investment such as legal form, domicile and area, field of activity, manpower, concession, taxation and other levies, duration, right of transfer and repatriation.

2) Government Regulation No.56, 57, 58 & 59/1991

This regulation stipulates the establishment of IPC (I, II, III & IV) and management system of some public ports that is delegated by the government to IPC. IPC, whose assets are owned entirely by the government, was transformed into public corporation where the majority of the shares are owned by the government.

3) Shipping Law No.21/1992

The Clause 26.2 ensures that the private sectors are allowed to cooperate with IPC in of all port business activities with the exception of port basin and property of land and water areas.

4) Government Regulation No.20/1994 on Foreign Investment

This regulation applies to companies established by foreign investment. Important points of this regulation are summarized as follows.

a. Clause 1, Approval of Foreign Investment

An approval on foreign investment is granted to Foreign Investment (FDI) company that is established in the form of "Limited Liability Company" subject to the Indonesia Law and domiciled in Indonesia.

b. Clause 2/Article 1, Two forms of FDI

The FDI company may be established in the form of:

① Joint Venture Company

Joint venture between foreign capital and domestic capital owned by Indonesian capital and domestic capital owned by Indonesian citizens, and/or Indonesian legal entities

or

② Straight Investment Company

Straight investment, in which the foreign citizens and/or foreign legal entities own the entire capital.

c. Clause 2/Article 2, Determination by Investors

The amount of investment shall be determined by the investor in accordance with the economic feasibility of the business activities concerned.

d. Clause 3, Duration of Business License

① Business license is granted to the FDI company for a period of 30 years from the commencement of a commercial operation.

② The business license may be renewed by the Minister of Investment/Chairman of the Investment Coordinating Board, if the company carries out its business for the benefit of the national economy and development.

e. Clause 5, Scope of Works carried out by FDI Company

"A straight investment company" is not permitted to carry out business activities in the business sectors referred to above (see paragraph 1).

f. Clause 6, Partners' shares in the Joint Venture Company

The Indonesia partners' shares in the joint venture company shall be at least 5 % of the total paid-up capital of the company upon its establishment.

5) Presidential Decree No.7/1998

In January of 1998, the government had developed a new cross-sector legal and regulatory framework for structuring and negotiating agreements for private sector participation. The Decree is composed of 15 clauses and a more detailed appendix made of 8 chapters. It mainly regulates the relationship between privatization-related government organization and the private sector, the procedure of project implementation, the bidding system. The Decree is evaluated as being highly effective for upgrading the quality of the whole system and enhancing the transparency of the selecting procedure.

(3) Case Study

The history of privatization of port management in Indonesia can be summarizes as follows.
In 1993, in the port of Tg.Priok, an attempt was made that the private cargo loading/unloading companies to do all the operations in certain areas of the bulk cargo section in the port.
The division of the jobs/roles between the central government, I PC and the private sectors are summarized in the table as follows.

Function		Port of Tg.Priok	Port of Tg.Emas
Regulation/ Administration	Navigation	Central Government	Central Government
	Immigration Control	Central Government	Central Government
	Custom	Central Government	Central Government
	Quarantine	Central Government	Central Government
	Safety/ Security	Central Government	Central Government
Port Planning		Central Government/IPC	Central Government/IPC
Management/ Administration	Administrator	IPC	IPC
	Utility/Service	IPC	IPC
	Pilot	IPC	IPC
	Tug Boat	IPC/Private Sector	IPC
Yard/Quaywall Operation	Container Handling	IPC	Private Sector (Contract Base)
	Conventional Cargo Handling	IPC/Private Sector	IPC/Private Sector
	General Cargo Handling	IPC/Private Sector	IPC/Private Sector
	Warehouse/Storage Shed	IPC/Private Sector	IPC/Private Sector
	CFS	IPC	IPC
	Truck Transportation	IPC (Quaywall to Warehouse) Private Sector (Warehouse to Factory)	IPC (Quaywall to Warehouse) Private Sector (Warehouse to Factory)

Source: IPC II & IPC III

(4) Conditions of the Privatization Project

Generally in Indonesia, there are two kinds of the privatized construction projects (construction of container terminals in public ports, and construction of bulk terminals in special ports). Also, there are various projects that are going on in the public ports (development of facilities for cement and coal, reclamation, setting up of computer systems such as EDI). In the main public ports, the privatization projects which were approved by MOF are as follows.

No	Name of the project (Contract Date)	IPC	Type	Total Amount of Investment (Billion Rp.)	Situation/Condition
1.	Development/Management of CT III in Tg.Priok Port (16, Aug.,1994)	II	JO	997	Partly opened in Jul. 1996. Fully opened in Feb. 1998.
2.	Reclamation (500ha) of East Ancol in Tg.Priok Port (20, Mar.,1995)	II	BT	2,233	The reclamation project is going on. Scheduled to be completed in the beginning of the 21^{st} century.
3.	Establishment of a JV Company in EDI Project (29, May, 1995)	II	JV	100	It is being run already.
4.	Setting up and Management of Water Supply in Tg.Priok Port (18, Nov., 1996)	II	BOT	17	Progressing.
5.	Development and Management of Port Bojonegara in Banten Bay (24, Apr., 1997)	II	BOT	1,439	Land leveling work would reach 395 ha.
6.	Development and Management of CTIII in Tg.Perak (22, Apr., 1997)	III	JO	241	Scheduled to open fully in late 1998
7.	Setting up and Management of Conveyer Facilities for Dry Bulk Cargo in Port Tanjung Perak (14, Jul., 1995)	III	-	48	Preparation
8.	Development and Management of Coal Wharf in Pulau Laut (10, Nov., 1994)	III	-	226	Preparation
9.	Development and Management of Loading/Unloading Facilities in Port Gresik (14, Aug., 1997)	III	BOT	46	Halfway the Construction

Source: DGSC&IPC, as of Jan. 1998

(5) Future Problems with Privatization

Sustaining privatization projects has been difficult since the economic and political crises emerged in 1997, but once the problems are solved, sustainable development in Indonesia is quite possible things to her rich natural resources and plentiful human resources.

The development of ports in Indonesia is directly associated with the development of Indonesia itself since Indonesia is surrounded by the ocean, and with the new policy of decentralization, development of ports including privatization is one of the most important issues.

However, the development of ports cannot be realized with privatization alone, and considering the financial and international problems, the country and the private enterprises should unite to solve the problems.

Therefore, it is important to make use of all the advantages of privatization, and to consider and clarify the roles that the country should play in management of the ports. Also, to make valid and effective investments, it is important to develop the whole area around ports.

9.3.2 Privatization of Port Management, Its Significance and Its Methods in Various Countries

(1) The Significance of Privatization

Privatization is a growing trend in many parts of the world, including the developed nations. There are basically three reasons why privatization is introduced:

- to improve the services in the ports,
- to reduce the government's financial burdens,
- to gain the marketing share.

1) To improve the Services in the Ports

The ports form a great part of a country's infrastructures. If the port services cost a lot of money, it weakens the country's competence for export and makes import prices more expensive. Therefore, it is very important to improve port services. Also, it is important to improve port services and reduce costs in order to improve the living standards of citizens.

2) To reduce the Government's Financial Burdens

Within the restrictions of the national budget, privatization provides a new source of finance, and it is one of the important means to make the most use of private know-how and human resources.

3) To gain Marketing Share

By leaving the activities in the ports to the marketing mechanism, rational and efficient re-distribution of resources can be possible.

(2) Methods of Privatization

1) Outline

The styles of privatization differ according to a country's history or economic situation. There are also various contract types: BOT system, BT system, administration contract method or administration permission method etc.
In the UK or New Zealand, port management is largely privatized: private companies manage and operate the ports. However, there are too many legal restrictions, and this system is not very suitable for a single port project.

2) Characteristics of Each Style

Below are the seven main styles of privatization of port development and management.

a. Management Contract

A public sector allows a private enterprise to manage its properties for a certain period of time. The aim is to introduce private sector know-how, and then improve the efficiency and productivity of the business.

b. Lease

A public sector leases its loading/unloading facilities to the private sector. Either a public sector pays the rent to the public or the public leases real estates from private sectors and accomplishes its jobs.

c. Concession

For 15 to 30 years, construction, management and responsibilities are transferred to the private sector. The ownership of the facilities is retained by the public sector, and the private enterprise manages the facilities and retains profits which it earns. On the other hand, the private enterprise is required to pay a concession charge to the public sector.
This style, which gives great authority and responsibility to the private sector, aims at increasing efficiency of larger businesses.

d. Joint Operation

Both the public and the private sector provide capital. For a certain period of time, they run the business together. The profits would be divided according to the percentage of their investment.
This style is quite popular all over the world, and is used for large-scale port development projects.

e. BOT (Built, Operate and Transfer)

Under this style, the public sector allows a private enterprise to build and manage certain port businesses. When the contract expired, all the properties must be returned to the public sector. The private enterprise pays a royalty to the public sector.

f. Joint Venture

This style is applied in case of indefinite period of time. The public and the private sectors cooperate with the local subsidiary, and below are two styles of cooperation:

- New and independent joint venture
- New company under state company

g. Public or Stock Flotation

Both mean the same thing - privatization of an organization itself. In this style, privatization has progressed the most out of all the other styles.
Public flotation means the disposition of an enterprise's properties. All the responsibilities of providing services would be transferred to the private sector.
Stock Flotation means disposition of all the properties to the private sector.

(3) The Roles that the Private and the Public Sectors have to play

1) The Basic Philosophy of the Roles of the Public and the Private Sectors

Privatization of both development and management are encouraged in many parts of the world. The speeds at which they progress differ from country to country, but certainly they are progressing. In some Asian countries, because of their financial problems, the progress is gradual, but privatization surely promotes port developments.
On the other hand, the increase in privatization does not alter the roles of the public/political section from the national/neutral point of view. The most important thing is to clarify the roles to be played by the public and private sectors.
Their roles can be sorted out as follows:

a. The Roles of the Public Sector

The public sector functions as 'the planner of regulation', 'the administration authority', 'the planner', and 'the authority of safety 'and' developer. In some countries, the public sectors take part as 'the administrator' or 'daily controller' in management of ports.

b. The Roles of the Private Sector

The private sector, with a few exceptions, basically takes part in all the roles to reduce the burden of the government as to bring more efficiency to the port management and development.

(4) Trends of the privatization in the main port of the world

Privatization, in fields such as electricity, water, airports, railways, roads or ports, is containing in both developed and developing countries.

In 'Developing best practices for promoting private sector investment in infrastructure' which was published by the Asian Development Bank in 2000, the problems of privatization with finance in equipping infrastructures to application of private properties in South-East Asia are being reported. For the privatization, in the field of ports, the following trends are reported from a survey.

- The direction in which the privatization of ports was progressing, when the movement first began, was quite vague, but as it progressed, the roles that the private and the public sectors have to play are being examined, sorted and became clearer.
- The core of the privatization of ports is the cargo operation field, and mainly the public port administrator manages the port planning and management field.
- In many of the developed nations, the public organizations own the ports, lease
- The real estates, and leave the management of terminals to the private sector.
- In many of the developing nations, BOT is the most popular privatization scheme, although there are many different variations of it according to the countries' conditions of the contracts.
- Therefore, in applying privatization, it is necessary to examine and clarify the roles of the private and the public sectors so that they could both be effective to each other.

9.3.3 Private Enterprise Business of Ports in Japan

The private enterprise business of ports in Japan began based on the 'Ports for 21 Century' project which was meant to be a long-term project, proposed in May 1985.

To create a high-quality waterfront space with sophisticated and varied facilities, approximately 163 private sector projects were being developed until 2001 based on the related laws.

Hereafter, more positive steps would be taken towards creating more high-quality and safe waterfronts by improving private enterprise and making the most use of the abilities of the private sectors.