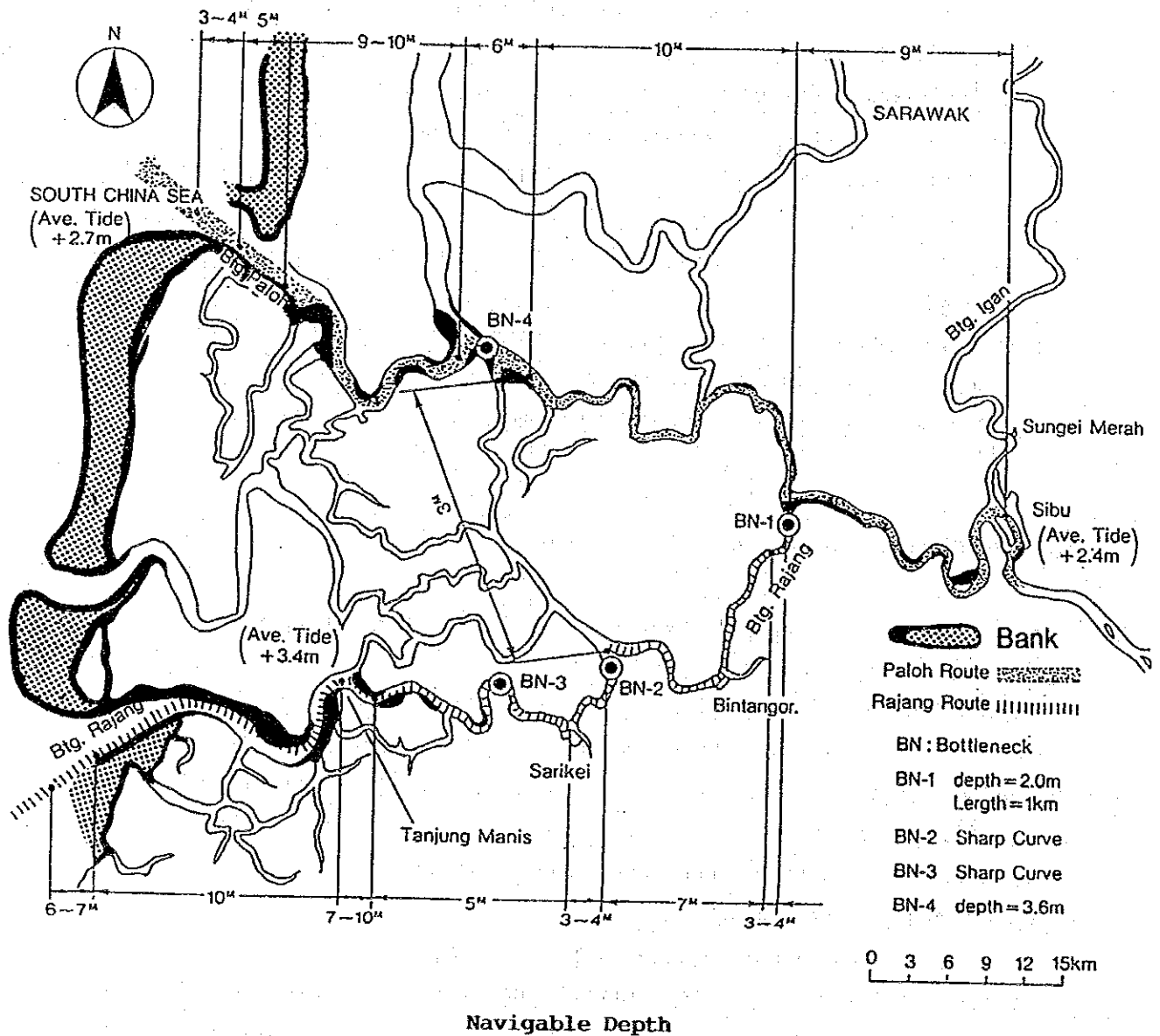


Consequently, the development of Rajang Port should have the following constraints:

- the maximum ship size is determined by the current depth of the estuaries
- the development must not include large-scale dredging and reclamation
- the port facilities should not significantly disturb river current



2.3 Development Policy for Rajang Port

On the basis of the federal port policy, in the relationship between Rajang Port and other major ports in Sarawak, that is Kuching, Bintulu and Miri Ports, and development mentioned above, the following roles are ascribed to Rajang Port.

2.3.1 Federal port policy

Malaysia buys and sells commodities and manufactured products in markets throughout the world. The vast majority of this trade is seaborne. Domestically, prior to the development of inland roads and a rail system, water transport was also crucial for communication in the country. Therefore, in Malaysia, ports form the foundation for the economic and social development of the nation.

The Sixth Malaysia Plan (1991 - 1995) states that an increase in cargo volume handled at ports in Malaysia is expected from 80 million tons in 1990 to 130 million tons in 1995 and that a sufficient handling capacity will be required to meet the expected increase in throughput. The Plan also states that greater containerization is expected and that development of intermodal services, ports and inland services associated with containerization, will be required, including the upgrading of organizational facilities to meet the demands of intermodalism.

The "National Port Plan", formulated by the Economic Planning Unit with the participation of the Ministry of Transport, Malaysia, gives us the long term perspective for the roles of ports in Malaysia; namely, to sustain national economic growth by providing rational, economic and reliable water transportation services. Malaysia's major ports can combine a number of multi-purpose functions; for example, they should play the roles of gateway for regional seaborne transportation and for industrial development, as well as other specialized roles. "National Port Plan" recommends the following roles for the major ports of Malaysia:

Multi-purpose and concentration center

Port Klang containers

Johore Port dry and liquid bulk

Kuantan Port timber from Sabah/Sarawak to Peninsular

Multi-purpose and Regional gateway

Penang Port

Kuching Port

Rajang Port

Kota Kinabalu Port

Multi-purpose and Industrial Port and Regional Gateway

Bintulu

2.3.2 Port development policy of Sarawak State

Sarawak State is moving vigorously toward economic growth mainly as a result of industrial development in five industries, that is, the timber processing industry, petrochemical industry, agriculture, tourism industry and electronic industry. These industries require mass transportation modes to supply materials, export finished products and transport tourists; in other words, the development depends upon transportation to a great extent.

In Sarawak, the absence of significant inland road or rail links, represent formidable barriers to any long distance overland consolidation/movement of cargoes. Lack of bridges and weight limitations on existing roadways are the current obstacles. Although an improvement plan for the existing arterial road from Kuching to Bintulu and a construction plan for bridges on the road are proposed, it is not economical or appropriate to concentrate seaborne cargo to and from Sarawak at a single port because the state spreads widely from east to west and because each region can be directly connected with the Peninsular and foreign countries through its port. Therefore, the state's seaborne cargo should be mainly handled at Kuching, Rajang and Bintulu ports.

Kuching Port should become the gateway port for the Sarawak River basin, Rajang Port for the Rajang River Basin and Bintulu for the eastern Sarawak, respectively. Bintulu Port also plays a role as the gateway port for the offshore oil and gas industry and for onshore industrial development. The timber industry is one of leading industries in Sarawak and STIDC (Sarawak Timber Industry Development Corporation) has timber processing zone development plans at the three ports. Therefore, Kuching, Rajang and Bintulu Ports should have a role as the gateway for timber product exports from Sarawak. Miri Port, a principal minor port, plays the role of gateway for those areas which Rajang and Bintulu Ports do not cover.

Roles of these ports area as follows:

Rajang Port:

- Regional gateway port for Rajang River basin
- Multi-purpose port to handle full range of cargo classifications
- Container handling port for geared vessels, most transshipped via Port Klang
- Gateway for timber product exports

Kuching Port:

- Regional gateway port for Sarawak River basin
- Multi-purpose port to handle full range of cargo classifications
- Container handling port for geared vessels, most transshipped via Port Klang
- Gateway for timber product exports

Bintulu Port:

- Regional gateway port for eastern Sarawak
- Multi-purpose port to handle full range of cargo classifications
- Gateway for offshore oil and gas industry
- Gateway for onshore industrial development
- Container handling port for geared vessels, most transshipped via Port Klang
- Gateway for timber product exports

Miri Port:

- Gateway for the areas which Rajang and Bintulu Ports do not cover

Rajang Port should play a role as a gateway for general cargo imports, agricultural product exports, timber product exports and coal exports; the following is required if Rajang Port is to play its role efficiently:

- full utilization of the existing facilities
- renovation and expansion of the existing facilities
- new wharf development on the current water depth conditions (no large-scale dredging)
- rational allocation of roles among wharves
- rational container handling
- safety of ship maneuvering and port operation

2.4 Port Development

2.4.1 Main demand relating to Rajang Port

According to the demand forecast, the following trade flow is to be expected:

- exports of timber products processed at the STIDC's TPZ at Tg. Sebulal and private sawmills located in the Rajang Delta
- import of manufactured goods which would be consumed in Sibu town and the vicinity
- exports of agricultural products from the vicinity of Sarikei
- exports of coal

2.4.2 Evaluation of the existing wharves

The existing facilities are evaluated in the light of the port demand as follows:

- The future cargo volume is expected to exceed the handling capacity at Sibu Center wharf even if the ongoing renovation is taken into consideration. A supplementary terminal is required.

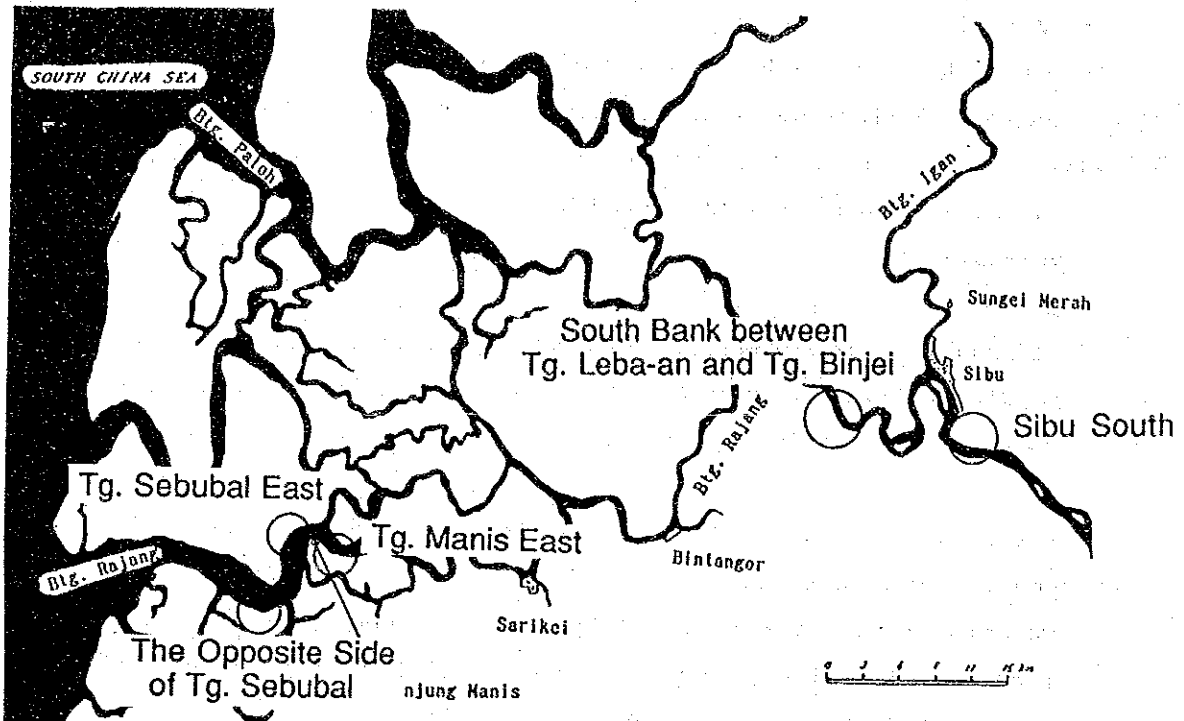
- Even after the ongoing renovation is completed, the future cargo volume is expected to exceed the handling capacity at Sarikei. However, Sarikei has room for one more berth expansion.
- The existing facility at Bintangor is capable of handling the future demand.
- Although the existing oil jetty at Sungei Merah has the capacity to handle the future demand, oil tankers are at risk in case of fast current.
- Although at Tg. Manis anchorage, cargoes (logs, timber products, coal, etc.) are currently transferred from barge to ocean-going vessels without a port facility, future mooring facilities will be required to handle timber products rapidly, safely and economically, and handled coal rapidly and economically.

2.4.3 Possible sites for new port development

The south side of Rajang River from the estuary to Sibu is preferable for Port Development from the socioeconomic point of view, that is, urban development (accessibility to consumption and production area), utility such as water and electricity supply and labour procurement.

Taking into consideration natural and socioeconomic conditions, possible sites for new port development and their respective navigable depth from the estuaries of Rajang and Paloh Rivers to the site are as follows:

- a) Tg. Manis East (-7.5m)
- b) Tg. Seubal East (-10m)
- c) the opposite side of Tg. Seubal (-10m)
- d) Sibu South (Tg. Kuple East) (-6m)
- e) South bank between Tg. Leba-an and Tg. Binjei (-7.5m)



The possible sites for new development are evaluated as follows:

- A new terminal for timber product exports requires a site with deep water because the trade needs large vessel to reduce freight costs. Tg. Sehubal has a sheltered and wide waterway with sufficient depth for the safe maneuvering of ships though there is currently no port facility.
- A new terminal for coal exports requires a site with deep water because the trade needs large vessels to reduce freight costs. Tg. Sehubal has a sheltered and wide waterway with sufficient depth for the safe maneuvering of ships though there is currently no port facility.
- Sibu South is located near Sibu town and connected by a paved road with a sufficient width for truck traffic. Sibu South is the proper site for a supplementary terminal.

2.4.4. Conclusion

Consequently, the expansion of the existing facilities and new port development is proposed as follows:

(expansion)

- Sarikei expansion of handling capacity
- Sg. Merah enhancement of safety

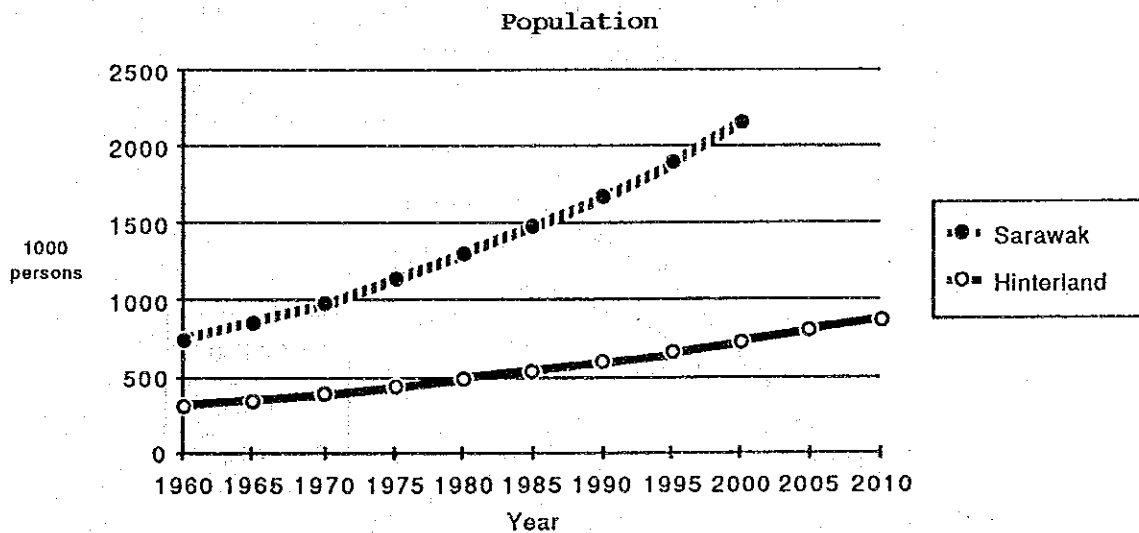
(new development)

- Tg. Sebulal East ... timber products terminal
- Tg. Sebulal East ... coal terminal
- Sibul South supplementary terminal for Sibul Center

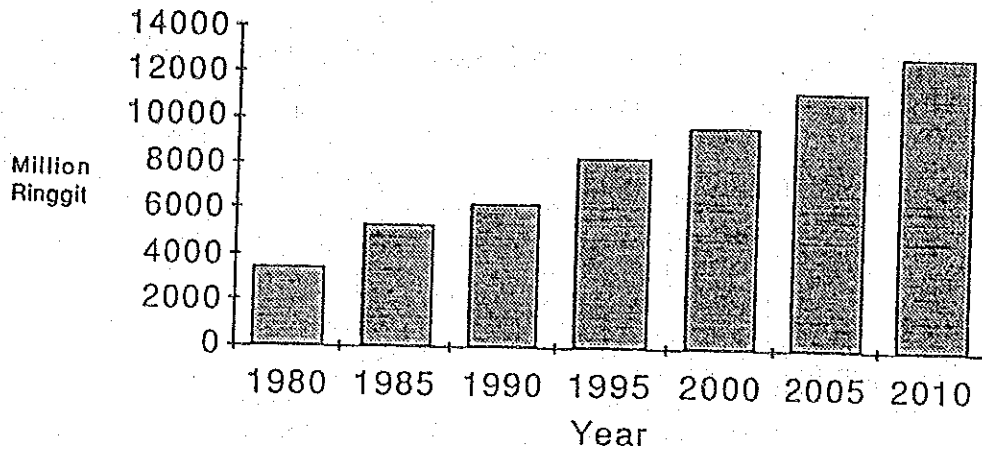
2.5 Future Cargo and Passenger Volume

2.5.1 Population and GDP

Population of the Rajang Port hinterland and GDP in Sarawak were forecast as follows:



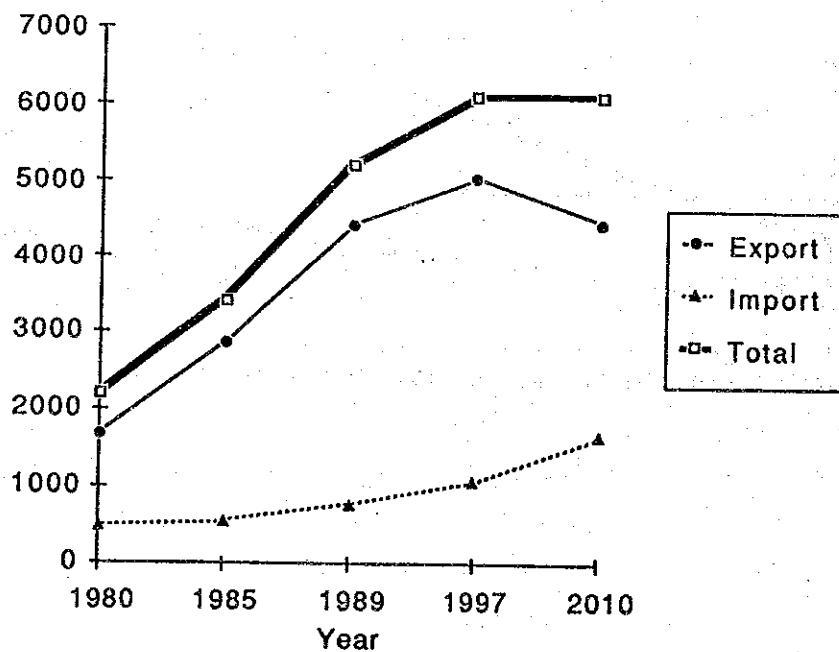
GDP in Sarawak



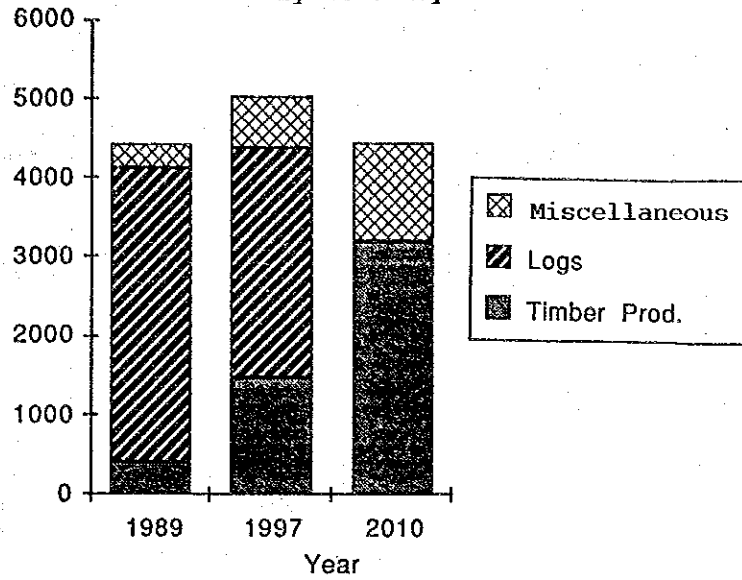
2.5.2 Cargo volume

Based on future population in the hinterland, GDP and other economic indices, future cargo handling volumes have been forecast as follows. Cargo volumes of all commodities, except timber logs, will grow as the state economy grows. The export volume of logs is expected to decline to zero due to the reduction of log production in Sarawak and the shift to down-stream timber industries, that is, timber processing industries. By contrast, export volume of timber products is expected to increase.

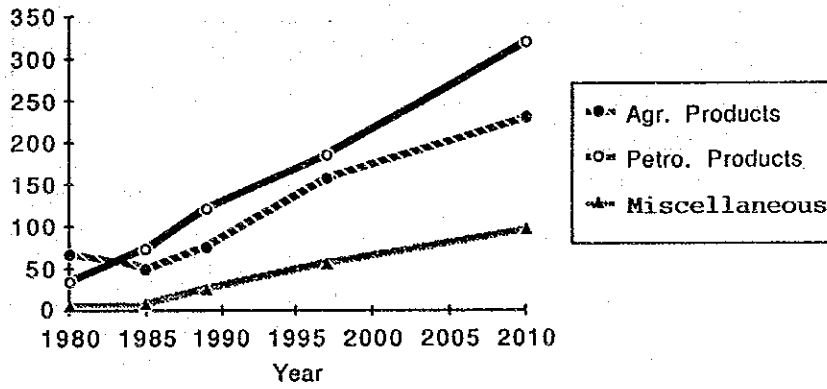
Cargo Volume at Rajang Port
(1,000tons)



Export Volume
by Comodity

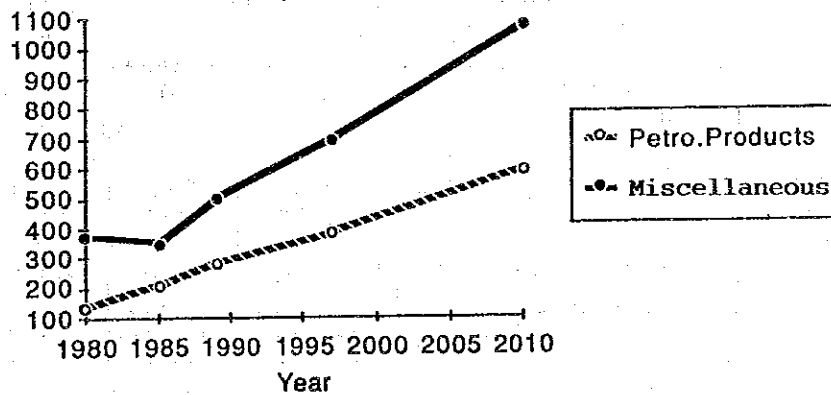


Export Volume at Rajang Port (details of "miscellaneous")
(1000tons)



Import Volume at Rajang Port

(1000tons)



International Trade
(1,000 freight tons per annum)

COMMODITY \ YEAR	1989	1997	2010
Export			
Timber Products	422	1481	3205
Logs	3715	2917	0
Coal	79	250	600
Agricultural Products	76	158	232
Petroleum Products	122	187	322
Others	25	56	96
Import			
Motor Vehicles	24	47	59
Food	71	91	137
Feed/Fertilizer	55	101	159
Petroleum Products	285	384	595
Others	350	458	726
TOTAL	5224	6130	6131

Coastal and Riverine Cargo Transportation
(1,000 tons, per annum)

WHARF \ YEAR	1988	1997	2010
Coastal Transportation			
Sibu (Govn.)	102	188	257
Sibu (Priv.)	40	52	65
Sarikei	21	25	31
Bintangor	9	10	13
Tg. Seubal	0	6	7
Riverine Transportation			
Sibu (Govn.)	29	34	44
TOTAL	200	315	417

Passenger Transportation
(2 ways daily)

WHARF \ YEAR	1990	1997	2010
Sibu	3403	3850	4839
Sarikei	1852	2085	2548
Bintangor	504	565	705
Tg. Seubal	0	70	123
TOTAL	5759	6567	8215

2.6 Master Plan

According to the results of the demand forecast, the study on handling capacity of the existing facilities and possible sites for new port development at Rajang Port, the Master Plan (2010) is formulated as follows:

2.6.1 Roles of each wharf

- Sibu Center/Sibu South:
trade center for consumption goods and some agricultural products in the region, especially, Sibu and Kapit Districts
- Sarikei:
export center of agricultural products as well as import terminal of consumption goods for Sarikei town and vicinity
- Bintangor:
import terminal of consumption goods for Bintangor town and vicinity
- Tg. Minis area (Tg. Seubal East, new development):
timber product export center and coal terminal

2.6.2 Cargo volume at each wharf

Wharf	1989	1997	2010
Sibu	495	711	1097
Sarikei	56	147	223
Bintangor	12	24	38
S. Merah	340	536	856
Tg. Seubal	0	1388	3917
Tg. Manis Anchorage	4185	3324	0
TOTAL	5088	6130	6131
EXPORT	4378	5049	4455
IMPORT	710	1081	1676

unit: 1,000 tons, container cargo included

2.6.3 Containers

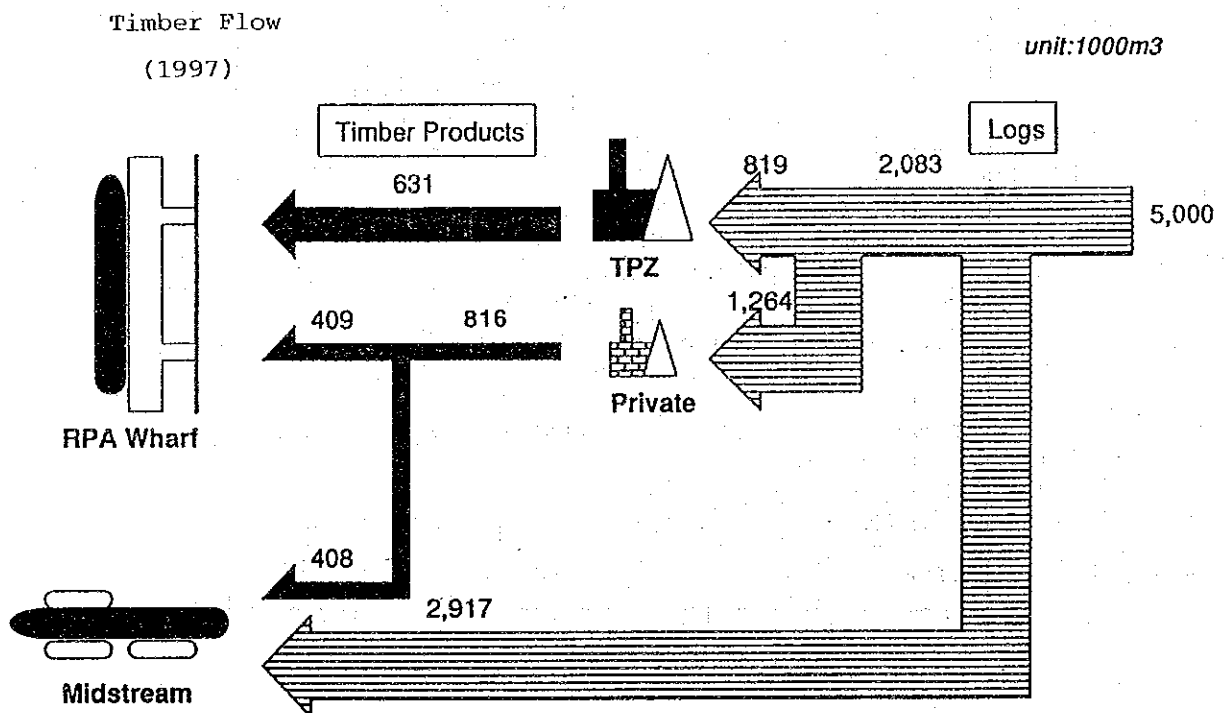
Wharf	1989	1997	2010
Sibu	12125	22400	61200
Sarikei	0	3600	9600
Bintangor	0	200	600
Tg. Seubal	0	21200	114600
TOTAL	12125	47400	186000
LADEN	7597	26800	101300
EMPTY	4531	20600	84700

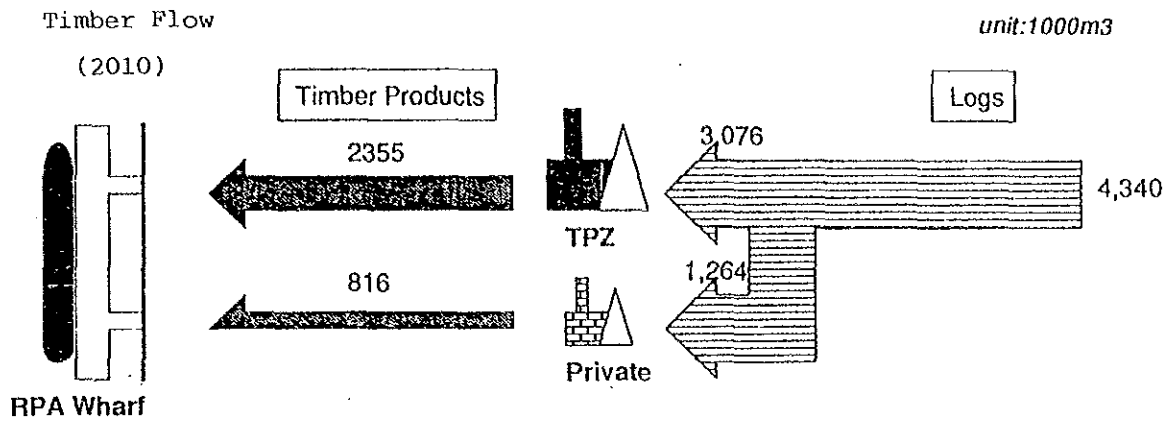
unit: TEU

2.6.4 Flow of timber and coal at Rajang Port

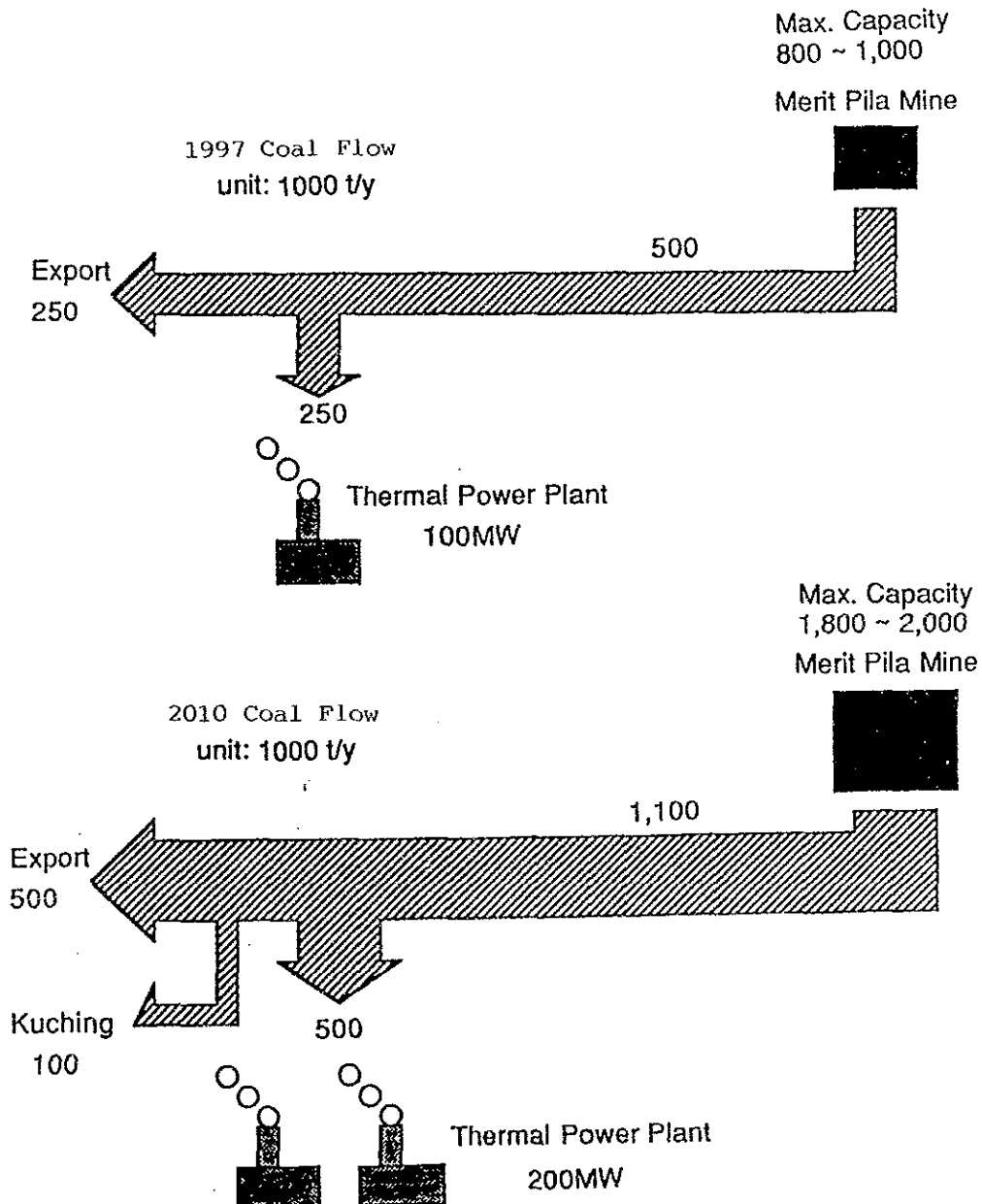
Timber and coal are expected to flow at Rajang Port in future as follows:

(1) Timber logs and products





(2) Coal



2.6.5 Ship size

Following ships are expected to call at Rajang Port in future.

timber products carriers: 5,000-10,000DWT

(RO/RO ships: max. 20,000GT)



General Cargo Ship
10,000DWT, length: 137m, draught: 8.5m



RO/RO Ship
15,000GT, length: 200m, draught: 8.8m

coal carriers: 10,000-30,000DWT



Dry Bulk Carrier
20,000DWT, length: 165m, draught: 10.0m

general/container cargo ships: 3,000-5,000DWT



General Cargo Ship
5,000DWT, length: 109m, draught: 6.8m



Container Ship
5,000DWT(200TEU),
length: 120m, draught: 6.7m

others (oil tanker, barge)



Oil Tanker
1,000DWT, length: 60m, draught: 4.0m



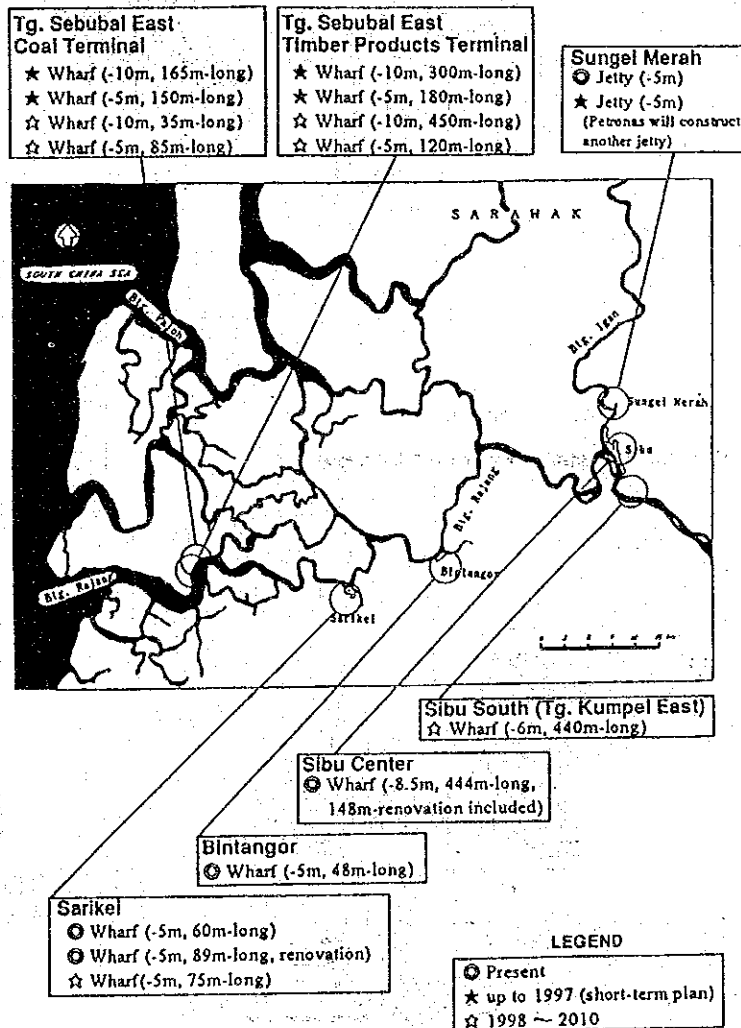
50m-barge and 3,000HP-tugboat

2.6.6 Facility plan






(1) International trade

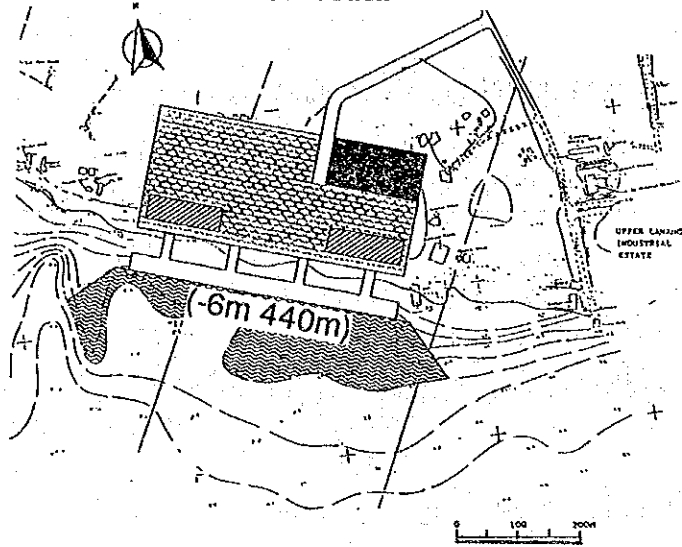
Mooring Facility

Wharf	Depth	Length	Remarks
Sibu South	-6m	440m	
Sarikel	-5m	75m	
S. Merah	-5m	1 Jetty	
Tg. Sebal	-10m	750m	Timber Products Terminal
	-5m	300m	Timber Products Terminal
	-10m	200m	Coal Terminal
	-5m	235m	Coal Terminal
TOTAL		2,010m (plus 1 Jetty)	

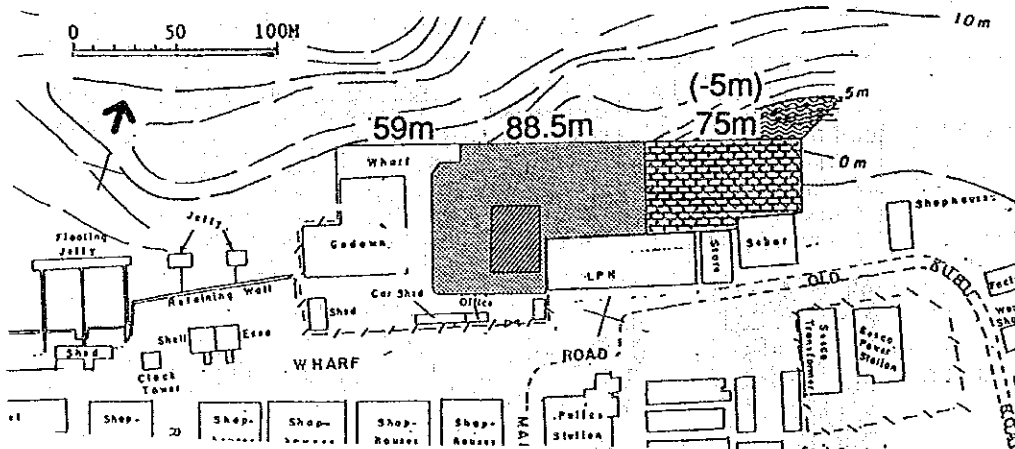


Sibu South





	mooring facility (-6m 440m)
	shed (8,600m ²)
	open storage area (37,300m ²)
	administration area
	basin (dredging) (-6m 56,000m ²)

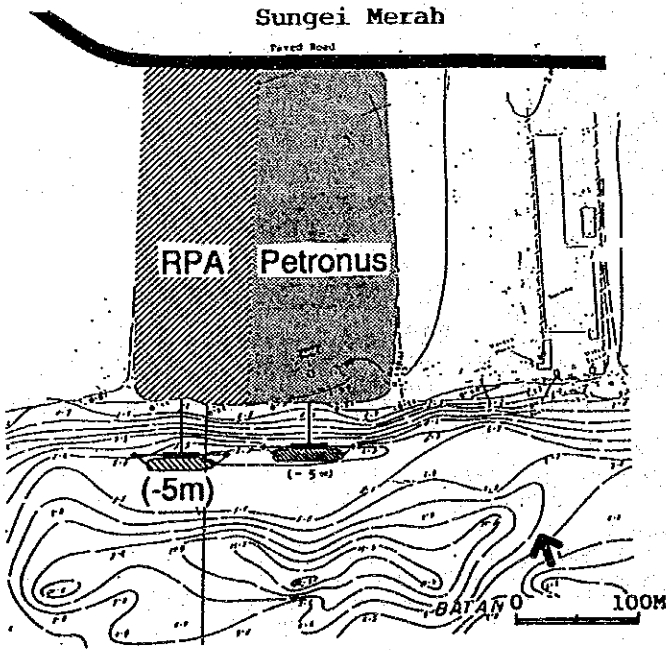


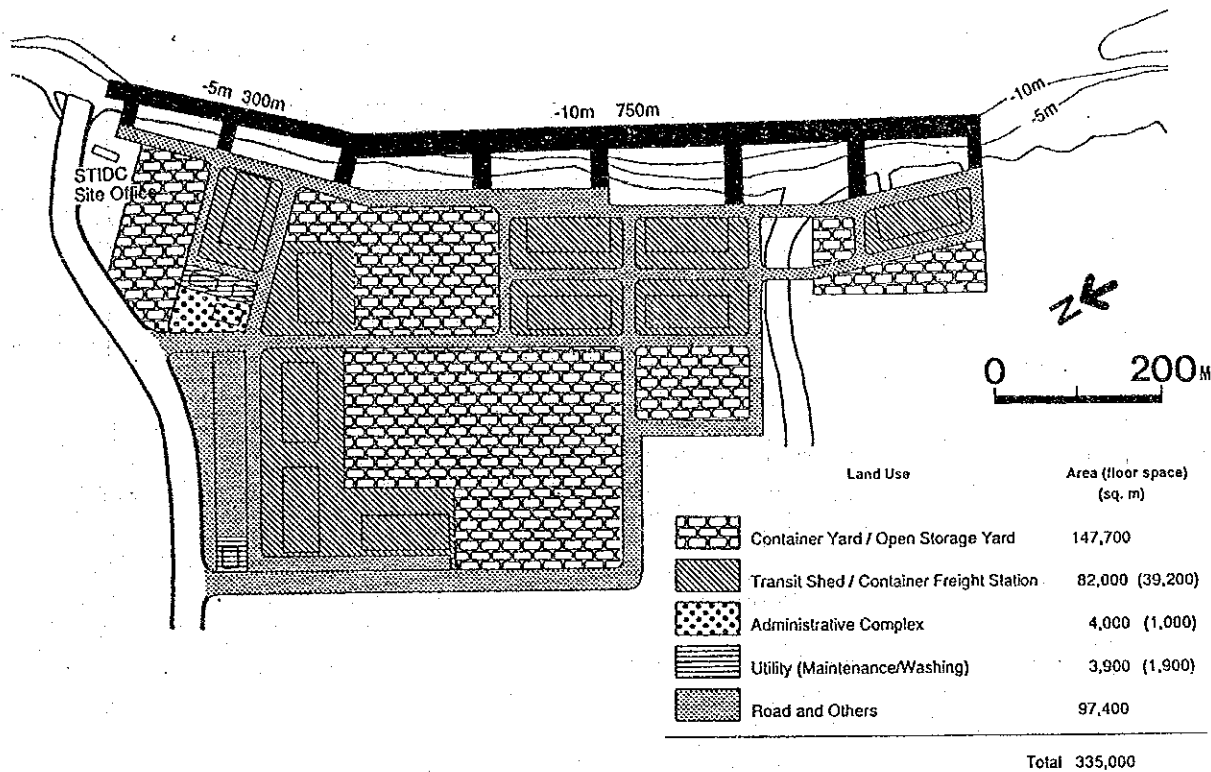
Sarikei



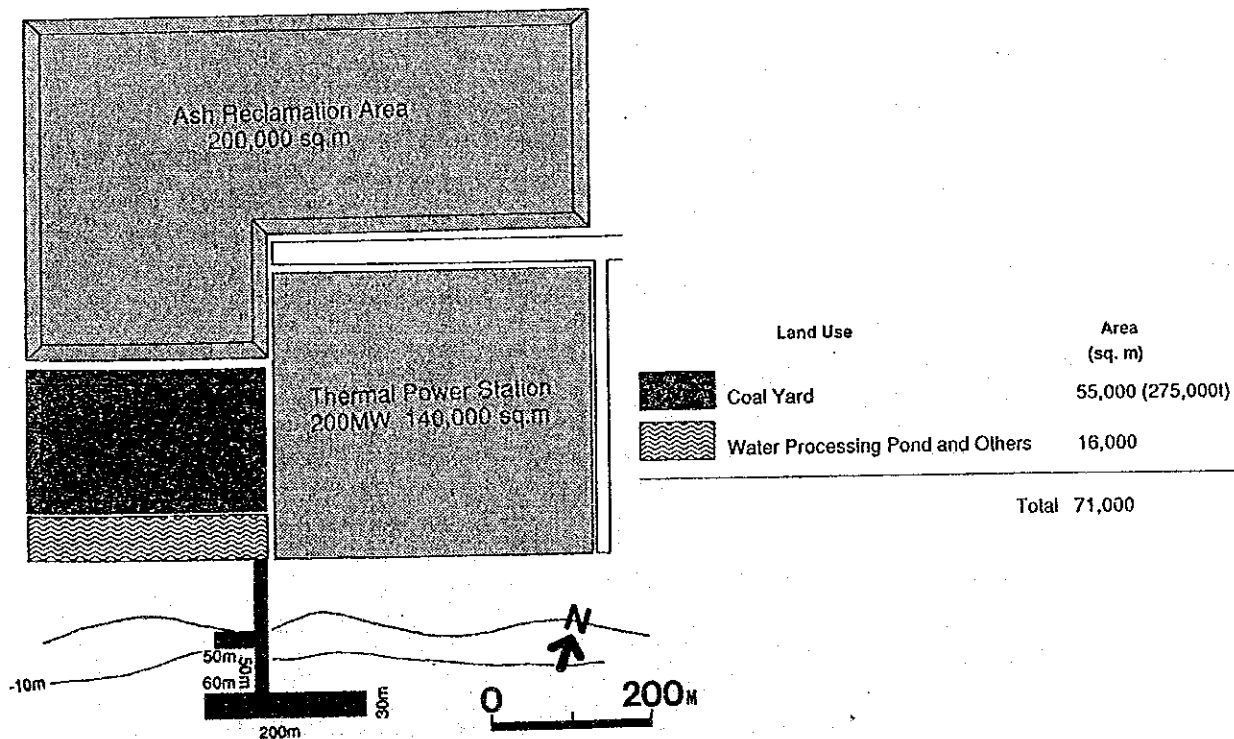
Sungei Merah

	open storage area (on-going plan)
	shed (on-going plan)
	open storage area (Master plan)
	basin (dredging) (Master plan)





Timber Products Terminal
MASTER PLAN Terminal Layout
(Tg. Sebulal)



Coal Terminal
MASTER PLAN Terminal Layout
(Tg. Sebulal)

Storage/Sorting Facility (m²)

Wharf	Shed	Open Yard	Remarks
Sibu South	9,600	36,700	Timber Products Terminal Coal Terminal
Sarikei	-	2,800	
Tg. Sebulal	39,200	147,700	
	-	55,000	
TOTAL	48,800	242,200	

Cargo Handling Equipment and Crafts

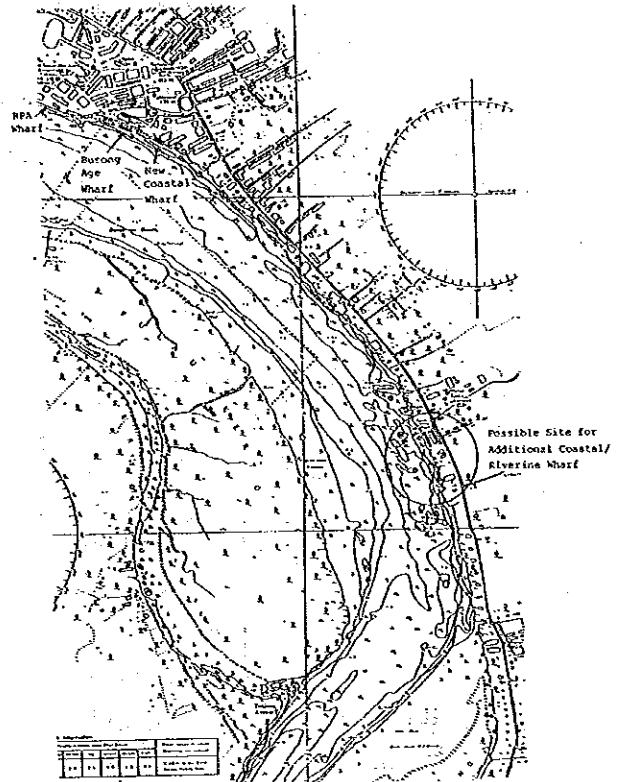
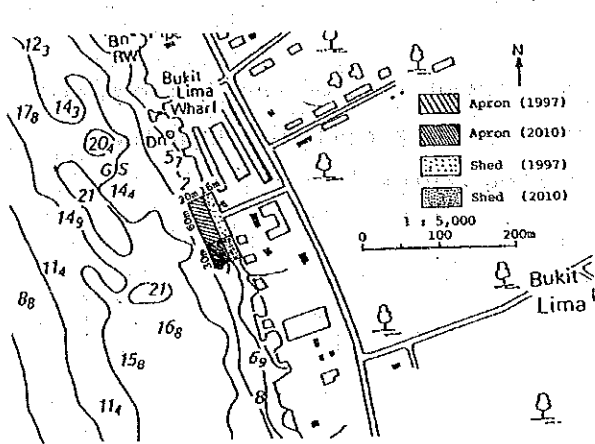
Equipment	Nos
Mobile Crane (150t)	1
Tractor Head + Chassis	8
Forklift (25/42t)	6
Forklift (3t)	71
Truck (5t)	6
Dump Truck (10t)	9
Shovel Loader (3m ³)	2
Shovel Loader (1m ³)	2
Shiploader (250t/h)	1
Tugboat (2000ps)	2
Tugboat (1000ps)	1

(2) Coastal and riverine cargo transportation

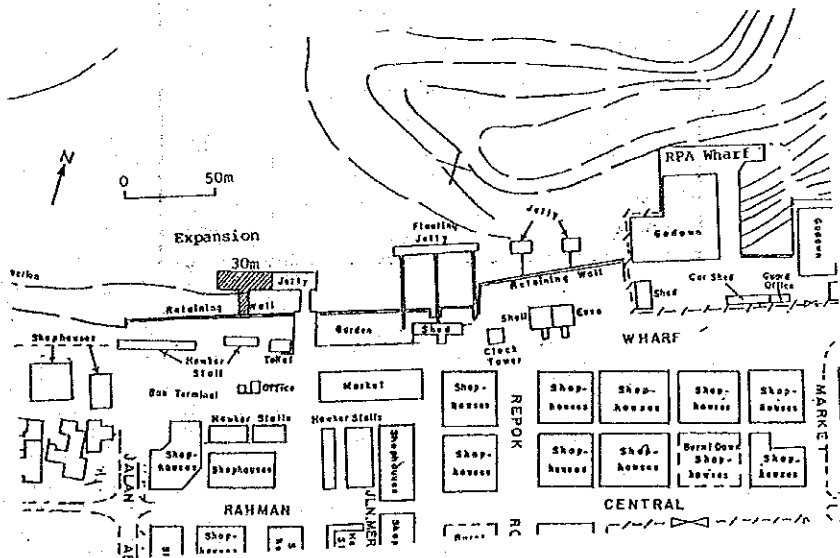
Wharf	Depth	Length	Remarks
Sibu	-5m	90m	jetty
Sarikei	-5m	30m	jetty (expansion)
Tg. Sebulal	-5m	30m	jetty
TOTAL		150m	

(3) Passenger boat service

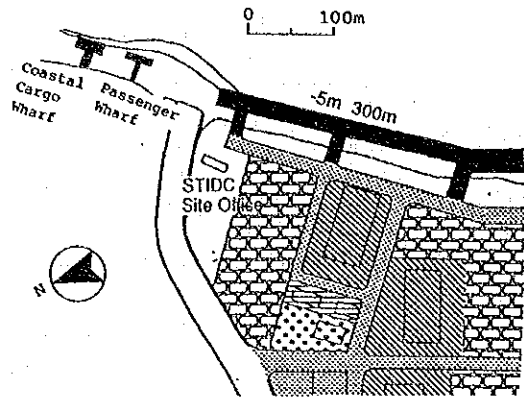
Wharf	Description	Remarks
Sibu	15m x 15m x 6units	pontoon additional to the Upstream and Downstream Express Boat Wharves
Tg. Sebulal	30m x 10m x 1unit	pontoon



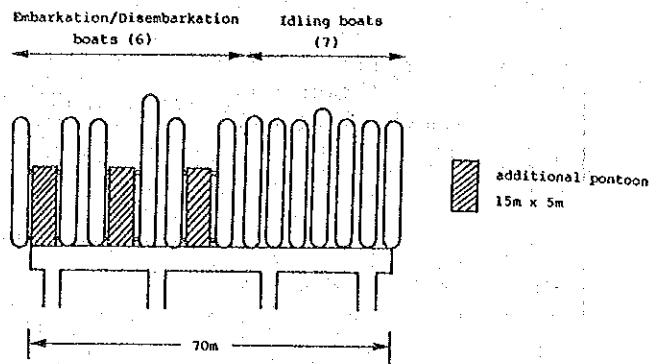
Plan for Additional Coastal and Riverine Wharf at Sibu



Expansion Plan of Existing Coastal Cargo Wharf at Sarikei



Plan for Coastal Cargo Wharf and Passenger Wharf at Tg. Sebulal



Improvement Plan of the Upstream and Downstream Express Boat Wharves at Sibu Center

2.6.7 Costs

(1) International Trade

(million Ringgit)

Wharf/etc.	Cost
Sibu South	58
Sarikei	7
S. Merah	3
Timber Terminal	181
Coal Terminal	31
Navigation Aids	33
Cargo Handling Equipment	25
Others	17
TOTAL	355

(2) Coastal and riverine cargo transportation

(1,000 Ringgit)

Wharf	Cost
Sibu	3,100
Sarikei	800
Tg. Sebulal	810
TOTAL	4,710

(3) Passenger boat service

(1,000 Ringgit)

Wharf	Cost
Sibu	690
Tg. Sebulal	460
TOTAL	1,150

3. SHORT-TERM FACILITY PLAN

On the basis of the Master Plan, a short-term plan for the target year 1997 was formulated as follows.

3.1 Facility Plan

(1) International Trade

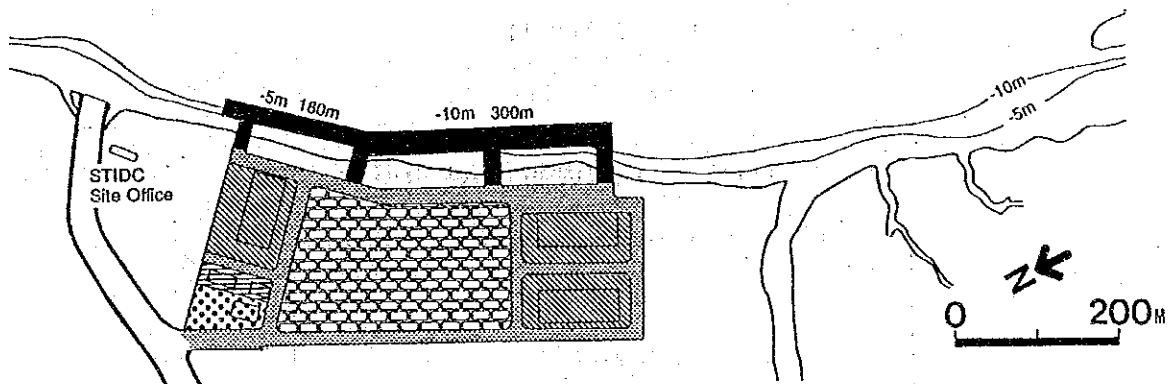
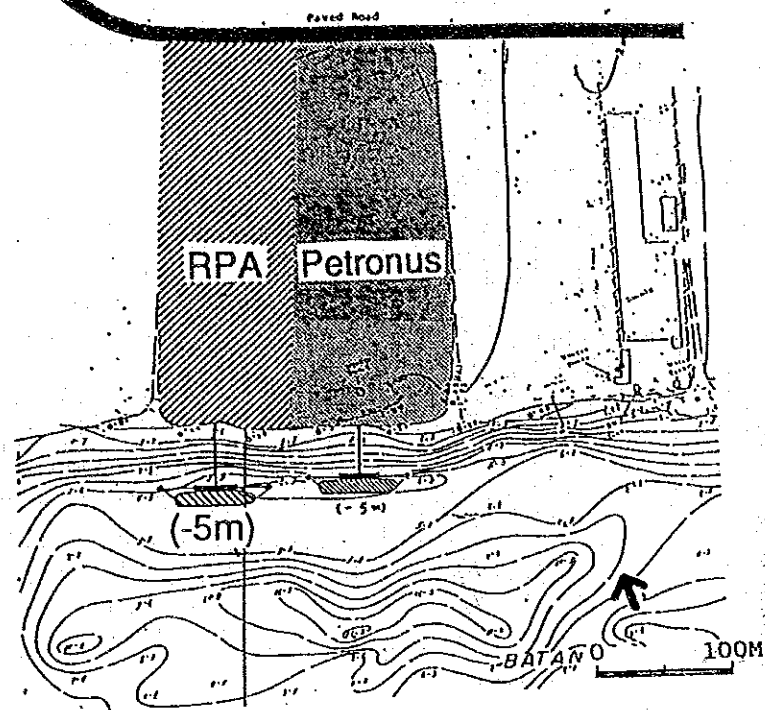
Mooring Facility

Wharf	Depth	Length	Remarks
S. Merah	-5m	1 Jetty	
Tg. Seubal	-10m	300m	Timber Products Terminal
	-5m	180m	Timber Products Terminal
	-10m	165m	Coal Terminal
	-5m	150m	Coal Terminal
TOTAL		795m (plus 1 Jetty)	

Storage/Sorting Facility (m²)






Wharf	Shed	Open Yard	Remarks
Tg. Seubal	12,800	31,600	Timber Products Terminal
	-	25,000	Coal Terminal
TOTAL	12,800	56,600	

Short-term Plan for Sungei Merah



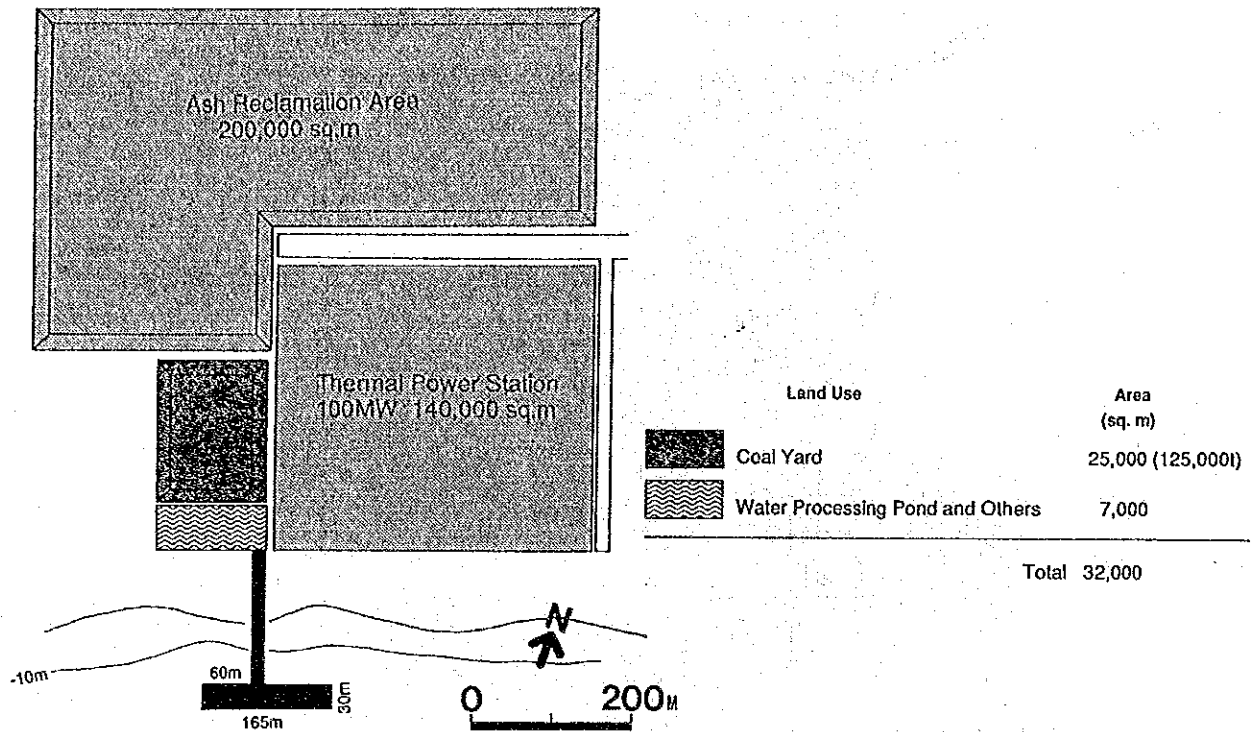
Land Use

Area (floor space)
(sq. m)

	Container Yard / Open Storage Yard	31,600
	Transit Shed / Container Freight Station	32,000 (12,800)
	Administrative Complex	4,000 (1,000)
	Utility (Maintenance/Washing)	2,500 (1,100)
	Road and Others	29,900

Total 100,000

Timber Products Terminal
SHORT-TERM PLAN Terminal Layout
(Tg. Seubal)



Coal Terminal
SHORT-TERM PLAN Terminal Layout
(Tg. Seubal)

Cargo Handling Equipment and Crafts

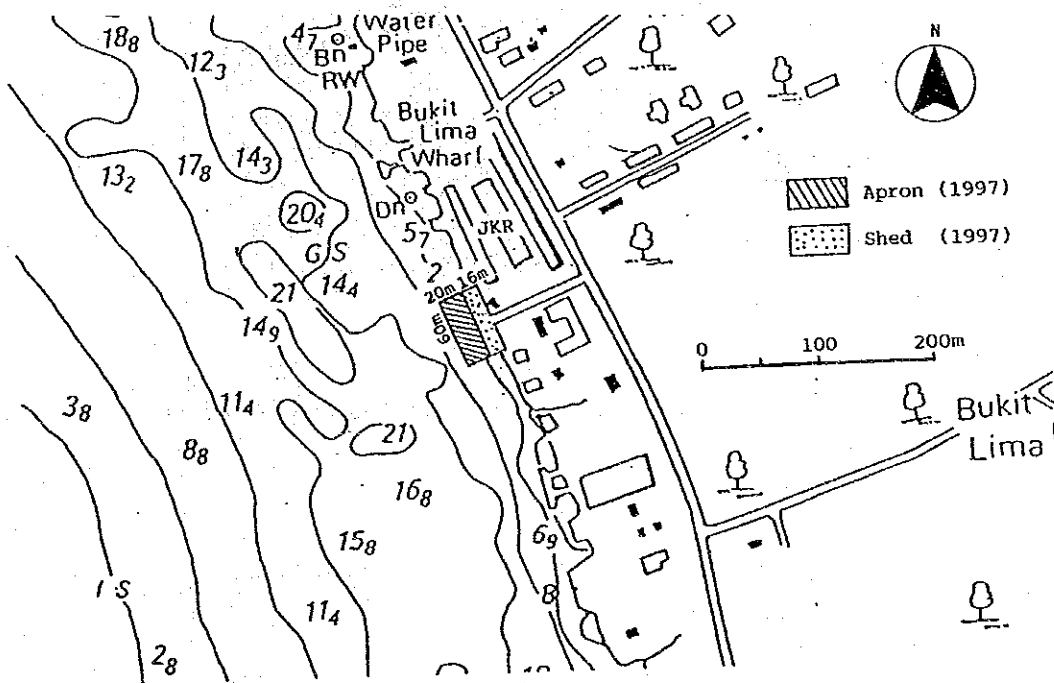
Equipment	Nos
Tractor Head + Chassis	5
Forklift (25/42t)	4
Forklift (3t)	6
Dump Truck (10t)	4
Shovel Loader (3m ³)	2
Shovel Loader (1m ³)	2
Shiploader (250t/h)	1
Tugboat (2000ps)	1
Tugboat (1000ps)	1

(2) Coastal and riverine cargo transportation

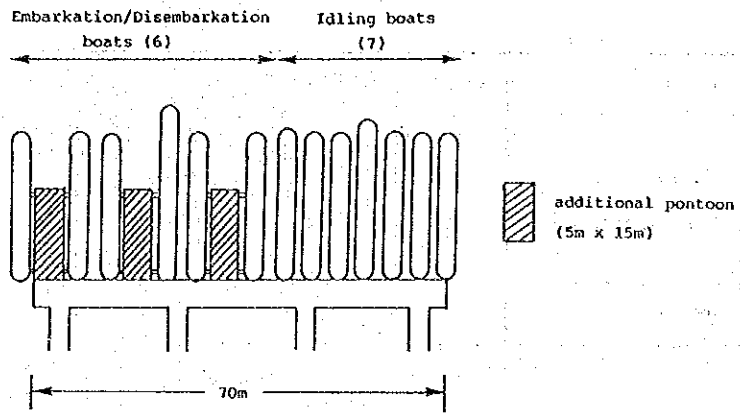
Wharf	Depth	Length	Remarks
Sibu	-5m	60m	jetty
Tg. Sebubal	-5m	30m	jetty
TOTAL		90m	

(3) Passenger boat service

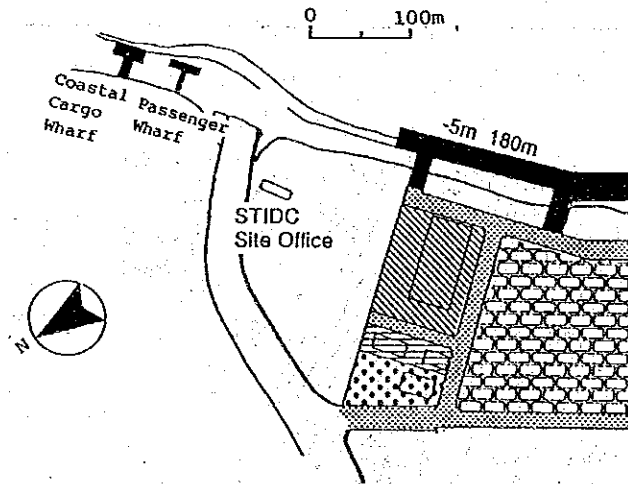
Wharf	Description	Remarks
Sibu	15m x 15m x 6units	pontoon additional to the Upstream and Downstream Express Boat Wharves
Tg. Sebubal	30m x 10m x 1unit	pontoon



Plan for Additional Coastal and Riverine Wharf at Sibu



Improvement Plan of the Upstream and Downstream Express Boat Wharves at Sibu Center



Plan for Coastal Cargo Wharf and Passenger Wharf at Tg. Sebulal

3.2 Costs

(1) International trade

(million Ringgit)

Wharf/etc.	Cost
S. Merah	3
Oil Jetty	3
Timber Terminal	78
Mooring Facility	49
Storage Facility	14
Other Facilities	8
Reclamation	3
Handling Equipment	4
Coal Terminal	26
Mooring Facility	21
Other Facilities	1
Reclamation	1
Handling Equipment	3
Navigation Aids	18
Tugboats	12
Buoys/etc.	6
Others	20
TOTAL	145

(2) Coastal and riverine cargo transportation

(1,000 Ringgit)

Wharf	Cost
Sibu	2,100
Tg. Sebulal	810
TOTAL	2,910

(3) Passenger boat service

(1,000 Ringgit)

Wharf	Cost
Sibu	690
Tg. Seubal	460
TOTAL	1,150

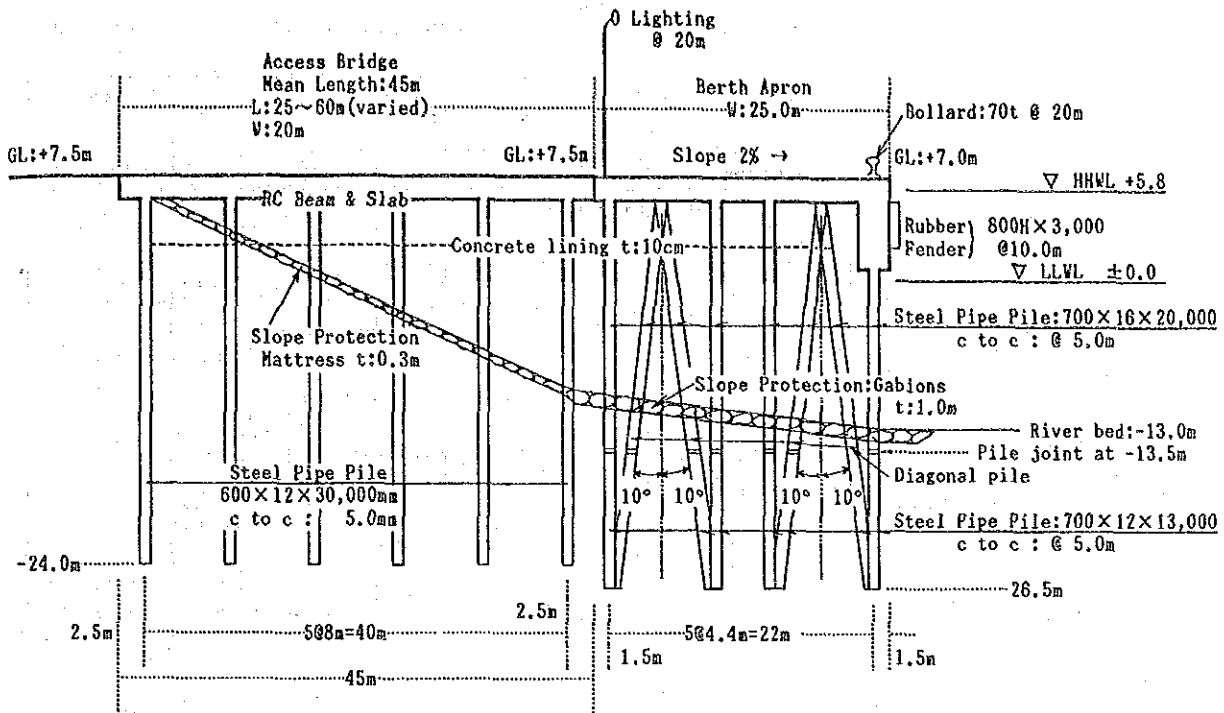
3.3 Preliminary Design

The preliminary design of the main facilities is conducted based on the Short-term Plan. The purpose of the preliminary design is to estimate an approximate cost of the development plan and to evaluate the economic and financial analysis.

The new facilities are designed to accommodate ships of 1,000 to 15,000 DWT referring to the following standards.

- 1) Technical standards for port and harbour facilities in Japan (Japan port and harbour association, 1989)
- 2) British Standards
- 3) Standard design criteria for ports in Indonesia (Maritime Sector Development Programme, Secretariate General of Sea Communication)

It is proposed in designing that local construction materials and machinery/equipment will be used as much as possible. The proposed wharf is to be built at the river shore. Therefore, the detached pier type of wharf structure with a foundation of diagonal piles is recommended in consideration of river flow disturbance, cost and environmental impact. As the representative sample of the facility designing, a typical cross-section of -10.0 m Timber Wharf at Tg. Seubal East is shown below.



Typical Cross-Section of -10.0 m Timber Wharf
with diagonal piles at Tg. Sebulal

3.4 Construction Program for the Short-term Plan

The development schedule is projected as follow:

Completion of Feasibility Study by JICA	-----	Feb. 1992
Period of Detailed Design	-----	12 months
Tender Call, Evaluation of Tender & Signing of Contract	-----	6 months
Construction Period	-----	30 months

The working schedule of various projects in the Short-term Plan is shown below.

Construction Program (Short-Term Plan)

Description	Year		1991	1992	1993	1994	1995	1996
	Q'ty	Month	6	6	6	6	6	6
1. F/S by JICA	L.S.							
2. E/S (O/D & Survey)	L.S.							
3. Tender for Construction	L.S.							
4. Sungai Merah Oil Jetty	L.S.							
5. Timber Products Terminal								
1) Deep Wharf (-10m)	300 m							
2) Shallow Wharf (-5m)	180 m							
3) Container Stock Yard	23,300 m ²							
4) Transit Shed /C.F.S.	12,800 m ²							
5) Adnl. Building	1,000 m ²							
6) Maintenance Shop	700 m ²							
7) Washing Facilities	400 m ²							
8) Open Storage Yard	8,300 m ²							
9) Port Road	26,900 m ²							
10) Parking & Paved Area	23,600 m ²							
11) Green Area	3,000 m ²							
12) Reclamation	100,000 m ²							
13) Utilities	L.S.							
6. Coal Terminal								
1) Deep Wharf (-10m)	165 m							
2) Shallow Wharf (-5m)	150 m							
3) Coal Stock Yard	25,000 m ²							
4) Port Road	2,000 m ²							
5) Reclamation	32,000 m ²							
6) Utilities	L.S.							
7. Cargo Handling Equipment	L.S.							
8. Coal Handling Equipment	L.S.							
9. Navigation Aids	L.S.							
10. Miscellaneous Works	L.S.							
11. Mobilization	L.S.							

3.5 Cost Estimates

3.5.1 Cost for international trade

(1) Cost Estimate Factors

- 1) Prices are shown in Malaysian Ringgit, based on February, 1991 prices.
- 2) The exchange rate is one year average of year 1990.
 - 1 US Dollar = 2.8 Malaysian Ringgit
 - 2 Malaysian Ringgit = 53 Japanese Yen
- 3) Customs duties on imported materials and equipment are not included.
- 4) No import duty for the floating equipment is included.
- 5) Sales tax in local materials is assumed.
- 6) Consulting services is assumed.
- 7) A physical contingency of 6% is assumed.

(2) Project Cost Estimate in Short-term Plan up to 1997

The total project cost of the short-term plan up to 1997 is estimated as Malaysian Ringgit 144,962,000 as shown below of which the local and foreign portions are:

Local portion M\$96,915,000 (67%)
 Foreign portion M\$48,347,000 (33%)

COST ESTIMATE FOR THE SHORT-TERM PLAN

No.	Description	Quantity	Amount (1,000 Ringgit)		
			L/C	F/C	Total
1	Sungai Merah Oil Jetty	L.S.	3,192	265	3,475
2	Timber products Terminal	L.S.	60,490	17,075	77,565
3	Coal Terminal	L.S.	17,913	8,274	26,187
4	Navigation Aids	L.S.	2,061	15,531	17,592
5	Land Acquisition Cost	132,000 m ²	4,224	-	4,224
6	Miscellaneous Works	L.S.	600	600	1,200
7	Mobilization	L.S.	-	1,200	1,200
	Sub Total :		88,480	42,945	131,425
8	Consulting Services	L.S.	2,826	2,825	5,651
9	Physical Contingencies	6%	5,309	2,577	7,866
	Total :		96,615	48,347	144,982

L/C: local currency F/C: foreign currency

3.5.2 Rough cost for coastal and riverine cargo transportation

(1,000 Ringgit)

Wharf	Cost
Sibu	2,100
Tg. Sebal	810
TOTAL	2,910

3.5.3 Rough cost for passenger boat service facility

(1,000 Ringgit)

Wharf	Cost
Sibu	690
Tg. Sebulal	460
TOTAL	1,150

4. RECOMMENDATION ON PORT MANAGEMENT AND OPERATION

4.1 Present Management and Operating Systems at Rajang Port

4.1.1 Outline of systems of port management and operation in Malaysia

There are nine port authorities in Malaysia, of which four are in the Peninsula, four in Sarawak and one is Sabah. The four port authorities located in the Peninsula (Klang, Penang, Johor and Kuantan) and Bintulu Port Authority are federal ports responsible to the Ministry of Transport. Sabah Port Authority and the three port authorities (Kuching, Rajang and Miri) located in Sarawak are under state ministry supervision. These authorities are statutory organizations, each functioning independently of the other and operated as semiautonomous port authorities. Each port authority is expected to be financially self-sufficient and operate without subsidy.

4.1.2 Outline of systems of port management and operation at Rajang Port

There are two types of cargo handled in the Rajang Port. One is foreign cargo, that is, cargo moving to/from Sarawak. The other is domestic cargo moving inside Sarawak. Basically, foreign cargo is handled by the RPA, and domestic cargo is handled at State Government and private facilities.

The navigation of vessels is under the control of the Marine Department. Though pilotage is not compulsory for the Paloh and Rajang channels, it is strongly recommended that larger vessels use a pilot on all occasions.

4.1.3 Productivity while staying at port

The following table shows the productivity of an average vessel visiting the Sibul Wharf, which is the main wharf of the Rajang Port and neighbouring Kuching Port. Total productivity of Sibul is higher than at Kuching, but it still is not at a satisfactory level because the non-working hours of the vessels are long.

Productivity of Vessel in 1989

	Sibu	Kuching
Cargo Volume/Vessel(A)	1,578.7t	1,166.8t
Staying Hours at Port(B)	44.2h	42.2h
Berthing Hours(C)	34.3h	32.7h
Working Hours of Vessel(D)	18.0h	17.3h
Non-working Hours of Vessel (C-D)	16.3h	15.4h
Gang Hours Worked(E)	10.0h	10.4h
Handling Volume/Staying at Port(A/B)	35.7t/h	27.6t/h
Handling Volume/Berthing Hours(A/C)	46.0t/h	35.7t/h
Handling Volume/Working Hours of Vessel(A/D)	87.7t/h	67.4t/h
Handling Volume/Gang Hours Worked(A/E)	157.9t/h	112.2t/h

(Source: RPA & KPA)

4.1.4 Financial situations of the RPA

The Income and Expenditure Accounts of the RPA between 1986 and 1990 are shown in the following table. The finances before taxation registered a surplus in 1986 and 1987, but they showed a deficit from 1988 to 1990. This is mainly because of port dues which were accrued to the State Government from 1988. These port dues from part of the State Consolidated Fund (State Port Development Fund). The RPA can withdraw a grant from this fund in the range of the amount of its port dues to finance the Authority's capital expenditure.

Income and Expenditure Account

(Unit: 1000 Ringgit)

	1986	1987	1988	1989	1990
Operating Revenue	8,419	10,255	10,846	11,510	12,647
Operating Expenditure	9,027	10,440	11,408	11,842	12,943
Operating Income	-608	-185	-562	-332	-296
Non-operating Revenue	8,012	8,664	1,051	491	418
Non-operating Expenditure	1,345	711	624	403	350
Surplus Before Taxation	6,059	7,768	-135	-244	-228

4.2 Recommendations on Port Management and Operations

4.2.1 Efficient operation at wharves

The RPA is attempting to raise handling efficiency, but it seems to attach a great importance to improving productivity (efficiency) per gang hours worked. It is recommended that the RPA should make a further effort not only to improve productivity per gang hours worked but also to shorten the staying period of vessels at port from the viewpoint of service for users.

4.2.2 Raising the port tariff

The present tariff at the Rajang Port is at least 20% less than that of Kuching, a neighbouring port. The RPA can make the short-term plan project feasible by raising its tariff by 20% without losing its competitiveness.

4.2.3 Restructuring the tariff system

There will be a trend towards containerization and larger vessels in the Rajang Port. Port charges will need to reflect these trends.

(1) Introduction of storage charges for empty containers

It is necessary to introduce this charge to cover the cost of storage, to avoid accumulating of containers and to promote efficient use of the container yard.

(2) Introduction of dockage charges

It is necessary to introduce dockage charges based on a vessel's size and berthing hours to cover the cost of the various services and to promote efficient use of the wharves.

4.2.4 Reinforcement of the organization of the RPA

Since the Rajang Port will be more competitive with other ports in the near future, it is necessary that the RPA should pay more attention to port

users.

Therefore, the RPA should establish a marketing department. The department can collect information on port users' requirements, advertise the advantages of the port and attract customers.

4.2.5 Reinforcement of management of port limits

The Land & Survey Department, Ministry of Resource Planning, Sarawak is mainly responsible for use of the port limits.

However, the port management body should take part in control of the water area needed for the port. It is necessary for the port management body to have collective responsibility for all management within the port limits. The port management body should have authority in granting permission for construction or improvement of facilities, permission for exclusive occupation of a water area and permission for mining sand within the port limit.

4.2.6 Management and operation plans for new terminals

(1) Timber products terminal in Tanjung Manis area

1) Organization

The timber products terminal in Tanjung Manis area is expected to be one of the core components of the Rajang Port. The RPA should establish an administration center in Tanjung Manis area to manage the terminal. The center should have administration, operation, civil engineering, mechanical engineering and security & fire fighting sections.

2) Establishment of branch offices of port-related authorities

The timber products terminal will become a large port with more than one million tons of foreign trade cargo and more than 150 calling vessels in 1997, the target year in the Short-term Plan.

For the convenience of port users, it is desirable that port-related authorities' branch offices such as Marine Department, customs office, quarantine office, etc. be concentrated in one building, called a joint administration office.

3) Introduction of tugboats

As over 10,000 GRT vessels will berth the terminal, the RPA should introduce tugboats to secure safe berthing of large vessels.

4) Operation system

As a lot of cargo including containers is handled at the terminal, it is desirable to prepare a third shift (night operation) when it is required by users to promote quick dispatch of vessels.

(2) Coal terminal in Tanjung Manis are

As actual users of the coal terminal will be private companies with coal mining and export rights, while SESCO will manage the thermal power plant, the private sector should construct and manage the terminal.

(3) New oil terminal at Sungei Merah

The new oil terminal will be built to overcome problems associated with the old oil terminal. In future, the old and new oil terminal will complement each other, and therefore, it is desirable that the current method of management by the RPA will be adopted for the new terminal.

5. NAVIGATIONAL AIDS

5.1 Present Situation of the Waterways within Rajang Port

The Rajang port, where the waterways are long, narrow, shallow and winding, have inherent characteristics of a complex and problematic nature, making the port a difficult area to navigate for seagoing vessels.

Furthermore, the existing safety measures such as weather/tidal information service, arrangement of the navigation marks and provision for the traffic regulations are insufficient to cope with the present situation.

Investigating the waterways situation precisely, and minding the promotion of safety of the promising port, the study team recommends an expansion of navigational aids and strengthening the safety control system as follows.

5.2 Planning of Navigational Aids

5.2.1 Facilities

(1) Installing "RACON": To facilitate position finding of the vessels approaching off the Rajang and/or Paloh estuaries, a "RACON" annexed to both Tg. Jerijeh Light House and Tg. Sedi Light House should be highly effective.

(2) Replacing/Increasing navigation Marks: To indicate the safe area in the fairly narrow and shallow Rajang waterway, the study team has proposed the placement of 51 essential light buoys, leading and/or heading marks and other necessary navigation marks in the following figure.

(3) Keeping a reliable maintenance service for the Navigation Marks

(4) Installing nine unmanned Weather/Tidal Stations on important points of the Rajang waterways and connecting each station by "THE METEO BURST SYSTEM".

(5) Providing capable tug boats at the Tg. Seubal new wharf to assist the berthing maneuver of seagoing vessels.

(6) Removing two wrecks which interfere with vessels attempting to navigate the Rajang estuary waterway.

(7) Sweeping the waterways off Tg. Binjai/off Tg. Manis, and removing the dangerous sunken rock.

5.2.2 Traffic control system

(1) Revising the existing riverine traffic regulations: Considering the future state of the Rajang port, in which the vessel's size will become larger and the number of calling vessels will increase, the revision should set new standards of traffic safety, such as restrictions on night navigation, maximum proceeding speed and anchoring/overtaking in the specified waterways, the proceeding priority of large vessel in the waterways and so on.

(2) Introducing Vessel Traffic Service: The service known as VTS should be introduced from TG.Mains through the entrance of fairway, in particular, where the natural and navigational conditions are severe and problematic for seagoing vessels, to control the vessel movements and maintain the traffic safety of this area.

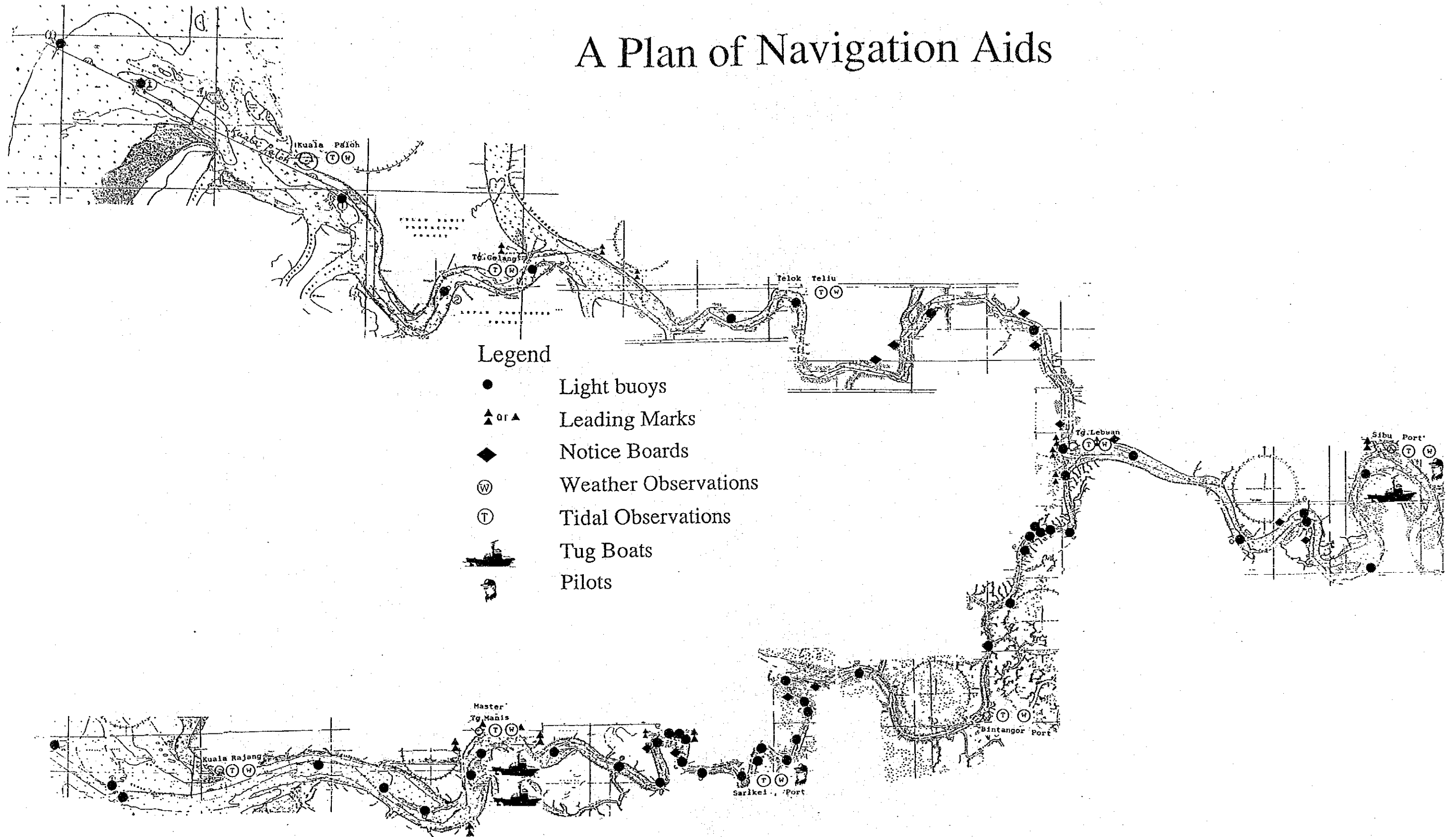
(3) Introducing a compulsory pilot system: The Rajang Port has sufficient means to implement the compulsory pilot system, which entrusts manoeuvring of the specified vessel to a licenced pilot who has enough knowledge and experience of the Rajang Port waterways. Also, double pilots manning on a single vessel between Sibuloh and K1.Paloh is necessary, as is improving the piloting service condition by providing a certain number of standby pilots and relief pilots.

As a result, the number of pilots should be increased from 3 to 11 at the Paloh waterway, and from 6 to 15 at the Rajang waterway.

5.2.3 Conclusion

Summing up, a navigational aids plan is shown in the following figure. In this figure, the area between Rajang estuary and Tg.Manis is considered as the target area of the Short-term Plan, therefore the implementation body should realize the plan until 1997.

A Plan of Navigation Aids



6. PROJECT FEASIBILITY

A feasibility study of the short-term plan was conducted to calculate the EIRR (Economic Internal Rate of Return) and the FIRR (Financial Internal Rate of Return) and to check the financial health of the port management body (RPA).

6.1 Economic Analysis

6.1.1 Purpose and methodology of economic analysis

- (1) Purpose : To appraise the economic feasibility of the Short-term Plan from the view point of the national economy.
- (2) Methodology: Evaluation of the economic internal rate of return (EIRR) based upon the "Discount Cash Flow Method" employing the "With and Without" Method.
- (3) Conversion into economic price: Market prices are converted into border prices.

6.1.2 Prerequisites

- (1) Project life: 30 years
- (2) Base year : 1990
- (3) "With" case : Oil Jetty, timber products terminal and coal terminal will be constructed.
- (4) "Without" case: The above mentioned facilities will not be constructed.
- (5) Cargo handling volume: It is assumed that cargo handling capacity will not increase after 1999.

6.1.3 Benefits

- (1) Savings in the staying cost of vessels
- (2) Savings in tugboat and barge costs
- (3) Savings in interest payments
- (4) Savings in stevedore costs
- (5) Construction cost of "Without" case
- (6) Other benefits

6.1.4 Costs

- (1) Initial investment
- (2) Administration costs
- (3) Operating and maintenance costs
- (4) Renewal investment costs

6.1.5 Results (EIRR)

Results of the EIRR calculation are shown in the following table including the sensitive analysis:

Case A: The costs increase by 10%

Case B: The benefits decrease by 10%

Case C: The costs increase by 10% and the benefits decrease by 10%.

Results of EIRR Calculation

	Base Case	Case A	Case B	Case C
Total Project(Timber, Oil and Coal Terminal)	22.2%	19.6%	19.3%	16.9%
Timber Products Terminal	25.1%	22.1%	22.0%	19.3%
Coal Terminal	10.6%	9.0%	8.8%	7.4%

6.2 Financial Analysis

6.2.1 Purpose and methodology of financial analysis

- (1) Purpose: to appraise the viability of the Short-term Plan and the financial soundness of the RPA
- (2) Methodology: evaluation of the financial internal rate of return (FIRR) based upon the "Discount Cash Flow Method" employing the "With and Without Method" and of the financial soundness of the RPA based upon its projected financial statements

6.2.2 General prerequisites

- (1) Project life: 30 years
- (2) Base Year: 1990
- (3) "With case": Oil jetty and Timber products terminal will be constructed.
- (4) "Without case": The above mentioned facilities will not be constructed.
- (5) Cargo handling volume: It is assumed that cargo handling capacity will not increase after 1999.

6.2.3 Revenue

- (1) Wharfage charge
- (2) Stevedorage charge
- (3) Receiving, sorting & delivery charge
- (4) Other revenues

6.2.4 Costs

- (1) Initial investment
- (2) Administration costs: personnel costs, maintenance, repair costs, etc.
- (3) Renewal investment costs

6.2.5 Conditions

- (1) Tariff increase by 20% from 1996
- (2) Fund raising plan
 - Loans from abroad: 31% of the project cost
 - Loans from federal/state government: 34% of the project cost
 - Loans from banks in Malaysia: 35% of the project cost
 - Weighted average interest rate of fund: 8.0%

6.2.6 FIRR

- (1) Results of calculation

The results of the FIRR are shown in the following table including the sensitivity analysis:

Case A: The costs increase by 10%

Case B: The revenues decrease by 10%

Case C: The costs increase by 10% and the revenues decrease by 10%

Results of FIRR Calculation

	Base case	Case A	Case B	Case C
Total Project(Timber Terminal+Oil Terminal)	10.6%	8.5%	8.3%	6.2%
Timber Products Terminal	11.1%	9.0%	8.8%	6.7%
Coal Terminal	8.9%	7.3%	7.1%	5.6%

(2) Appraisal

1) Total Project

The total project can be judged feasible because the FIRR of the total project exceeds the weighted average interest rate of fund (8%) including the first two cases of the sensitivity analysis.

2) Timber products terminal

The timber products terminal can be judged feasible as an individual project for the same reason as above.

3) Coal terminal

The FIRR of the coal terminal of the base case exceeds the weighted average interest rate of fund, but fails to do so in the cases of the sensitivity analysis. The coal terminal can be judged almost feasible as an individual project.

6.2.7 Financial soundness of the organization

The financial soundness of the port management body is appraised based on its projected financial statements.

(1) Profitability

The rate of return on net fixed assets, which shows the profitability of the investment, is expected to maintain favorable levels after 1998.

(2) Loan repayment capacity

The debt service coverage ratio, which shows whether the operating income can cover the repayment and interest of the long-term loans, is expected to maintain good levels throughout the project life, there will be no problem with the repayments of the long-term loans using the annual operating revenues.

(3) Operational efficiency

The operating ratio shows the operational efficiency of the organization as an enterprise, and the working ratio shows the efficiency of the routine operations of the port. Both the operating ratio and the working ratio will maintain favorable levels.

7. PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT

7.1 Introduction

7.1.1 Environmental policies in Malaysia

Malaysia began introducing five-year plans for socio-economic development in 1955. Statements on environmental preservation first appeared in the Third Malaysia Plan(1976-1980). In the Fourth Malaysia Plan, it was stated that an environmental preservation policy was necessary to ensure the continuous and healthy growth of the economy and safe environment for present and future generations.

7.1.2 The environment impact assessment

Procedures and guidelines of EIA were made according to the policy stated in the Third Malaysia Plan.

The objective of the EIA is to evaluate the total impact on the environment of a project proposed by public or private project initiator.

In this study, the PEIA was carried out for the short-term development plan and its construction phase and for the utilization of the port.

7.2 Current Situation of the Environment

Rajang River is the longest in Malaysia: its total length is about 560km. The Coastal plain (mostly alluvial flats, mainly swampy) covers more than 5,500 square km and possesses the most fertile soil. Both sides of the river are covered with tropical forest such as mangrove and nippa palm trees.

As for the land, there are no unique of important landform features within the project are with the exception of the sandbars in the estuary.

It is reported that erosion of the river bank occurs continuously along the river.

Regarding the water quality, pH is between 6.5 and 8.0 and average Suspended Solid is 50ppm; satisfy the Standard.

With respect to the air quality and noise level, there are no dust &

noise sources around the project site.

Concerning flora, some protected plants can be found in and around the project site. However, these species are found not only in the project site but in other areas.

Rare and protected wild life was not found in the area. In the sand-bars, there are some bird communities and habitats.

7.3 Environmental Impact

7.3.1 Environmental impact related to the construction work

(1) Impact on Air Quality

The impact on air quality can be regarded as small because the emission volume of SO_x and NO_x generated by construction machines is small and the period of the construction work is limited(short).

(2) Impact on Noise Levels

Piling generates noise at 130dB(A) at close range and the sand discharge pipe sill have an impact on noise levels. However, the noise will be reduced by forestation; also there is no private housing around the project site. Therefore, the impact on noise levels can be regarded as small.

(3) Impact on Water Quality

The diffusion of Suspended Solids from a suction dredger and waste way of reclaimed land will have an impact on water quality. However, the volume of soil to be dredged is small, so the impact on water quality can be regarded as small.

(4) Impact on Terrestrial Vegetation

The impact on terrestrial vegetation caused by the removal of Mangrove trees amounts to the loss of Mangrove trees themselves, the removal of plants and trees around the Mangrove trees, and a change in conditions such as sun levels and the water content of the soils around the removal area.

However, because the removal area is small, the impact on those conditions and others can be regarded as small.

(5) Terrestrial Wildlife

The site clearing will have some impact such as loss of territory. However, the width of the removal area is small and rare and protected animals have not been found in and around the project site. Therefore, the impact can be regarded as small.

7.3.2 Environmental impact related to the utilization of the port.

(1) Impact on Air Quality

The causal factors affecting Air Quality are SO_x and NO_x emitted by vessels staying at berths, and that of cargo handling equipment. However, the emission volume of SO_x and NO_x is small.

The dust from coal piles will also have an impact on the air quality. However, sprinkling is recommended to avoid fires and heavy dust. Therefore, the impact on air quality can be regarded as small.

(2) Impact on Noise Levels

The extent of noise levels made by the cargo handling equipment can be considered to be lower than that of the construction machines. Therefore, the impact on noise levels can be regarded as small.

(3) Impact on Water Quality

The volume of gray water discharged from administration buildings will be very small and the effluent should be treated like that of other industries in the near future. The rain water on the coal yard containing acid water will have an impact on water quality. However, the water will be treated in a sedimentation pond proposed in this study; if necessary, some precipitant may be useful for the reduction of the acid rate. Therefore, the impact on water quality can be regarded as small.

(4) Impact on Terrestrial Wildlife and Fauna

The impact on terrestrial wildlife and fauna can be considered small because the impact on above factors can be regarded as small.

7.4 Recommendation

7.4.1 Countermeasures for environmental conservation

When the implementation of the project commences, the project initiator should consider the basic matters listed below. These recommendations are offered from environmental point of view.

(1) Construction Phase

To reduce the impact on the environment, the mitigating and abatement measures listed below should be under taken in the construction phase.

The establishment of a sedimentation pond is an effective means of reducing the Suspended Solid from the reclaimed area. Additionally, some precipitant will be useful for reducing the concentration, if necessary.

It is necessary to protect the river bank and structures facing the Rajang River against erosion. Therefore, the stone gabions and sand bags type with chemical fiber sheet are recommended from the comprehensive view point of construction, maintenance cost and protection effect.

To preserve the natural forest and to protect the terrestrial vegetation and wild life, the working area(including a storage area for machines and material) should be made as small as possible.

(2) Operation Phase

1) Timber Port

Although the team has taken the impact of the wharves ;on the water current into account and has designed the wharves to prevent water disturbance as much as possible, it is necessary to monitor further erosion and accumulation of the river bank.

2) Coal Port

-to sprinkle water to prevent natural ignition and dispersion of coal dust from the piling area

-to set up a sufficiently large buffer zone to reduce the dispersion of coal dust

-to install covers over the conveyers to prevent the dispersion of coal dust in coal handling

-to set up a sedimentation pond for the treatment of water from the coal piling year. This facility has been taken into account in the report.

7.4.2 Further Study to be conducted

Although the impact of the project can be regarded as small, further study for some factors should be undertaken by the project initiator or constructor.

(1) Port Project

-To determine the impact on water quality, the concentration of suspended solid should be observed in construction phase

-To monitor further erosion and accumulation of the river bank, periodical observation of the shoreline is recommended

-To grasp the populations of flora and fauna, further observation is recommended

(2) Other Project

Timber related industries, and the Coal Thermal Power Plant may have a consequential impact on environment. Therefore, a thorough EIA will be required especially as concerns the atmosphere, water quality, flora and fauna, reclamation by ash and waste disposal.

8. CONCLUSION

8.1 Compliance of the Development Plan

The proposed development plan for Rajang Port was formulated in the light of the projected future population, economic activities in the Rajang Port Hinterland or Sarawak State and cargo throughput at Rajang Port. The projection was conducted based on the Sixth Malaysia Plan, the National Port Plan, the ongoing development relating to Rajang Port Hinterland and the present tendency of economic activity. Consequently, we believe that the development plan complies with the Port Development Policies of the Federal Government and the Sarawak State Government and will contribute significantly to the socioeconomic development of both the Rajang River Region and Sarawak State.

8.2 Project Feasibility

The development plan is proposed as the Master Plan for the year of 2010 and the Short-term Plan for the year of 1997. The Short-term Plan was appraised from viewpoints of national economy, RPA financial status and impact on the surrounding environment. As we stated in Chapters 6 and 7, the plan was evaluated as follows:

Project	Economic Evaluation	Financial Evaluation	Environment Impact Assessment
Entire Project Package	feasible	feasible	small impact feasible
(as an individual project)			
Timber Products Terminal	feasible	feasible	
Coal Terminal	almost feasible	almost feasible	

Therefore, the Short-term Plan is evaluated to be feasible.

8.3 Recommendation on Implementation of the Project

When the project reaches the implementation stage, the following points should be considered.

8.3.1 Timber products terminal

The timber products terminal has a top priority. The terminal would provide export service by large ocean-going ships and deposit service for timber products which are processed at private sawmills located in the Rajang River region. A terminal facility is essential for export-oriented industry. The provision of the economic transportation service will also attract other private sawmills and related industries to the TPZ area.

Two and five deep wharves are proposed in this study for the short-term plan (1997) and master plan (2010), respectively, according to the demand forecast based on the STIDC production plan. Therefore, the construction of the terminal, especially beyond the short-term plan, should be carried out one berth at a time checking the progress of the STIDC production plan and the situation of the private sawmills.

In addition, the implementation of the terminal development should be kept in harmony with the material transportation plan of STIDC for TPZ development (the shallow wharves will be used to bring in construction materials for TPZ in the first stage).

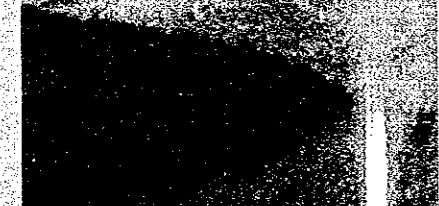
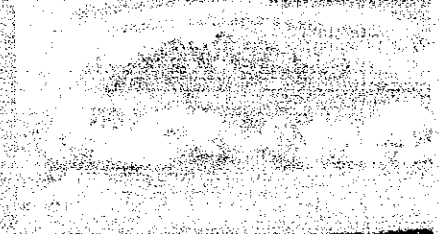
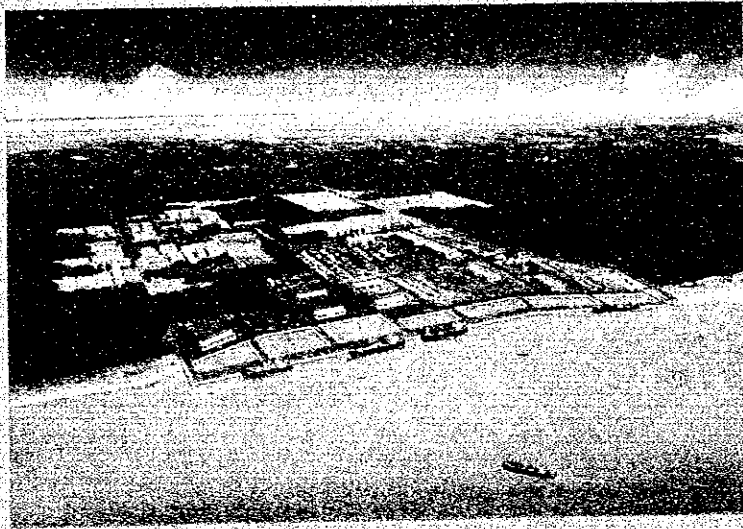
8.3.2 Coal terminal

The coal terminal is planned to supply coal to the thermal power plant proposed by the SESCO and to export coal by large bulk carriers. The installation of a thermal power plant in Tg. Manis area is the first prerequisite. Second, since the present mining capacity of Merit Pila coal mine is not large, an increase in coal production capacity is another prerequisite. Therefore, the coal terminal development should be carried out only after these prerequisites are satisfied.

In addition, only one private company has a license for coal transportation, which means that only two bodies, SESCO and a private license holder, would be involved in the coal terminal project. Therefore, construction and management/operation of the coal terminal could be conducted by the private sector.

8.3.3 New oil jetty

The new oil terminal is not planned to meet the demand but to enhance the safety of oil carriers. The existing oil jetty is capable of handling the demand but the safety of each ship is at risk. Therefore, the restricted use of the terminal, such as the prohibition of small barge berthing during fast currents (consequently, handling capacity at the jetty would decline), should be a consideration. Then, if the demand exceeds the handling capacity under the restriction, a new oil jetty should be constructed.



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