30.10 Preliminary Engineering Studies

30.10.1 Preliminary Design of Port Facilities

(1) Design Vessel

The proposed container berth is designed to accommodate container ship with maximum capacity of about 5,000 DWT .The proposed design ship has the following dimensions.

Container Ship : 5,000 DWT, Overall Length : 110 m
Breadth: 15.7 m , Full loaded Draft: 5.5 m

An additional depth for the keel clearance is required for the wharf dimension. Assuming 10% of the full loaded draft is needed for the keel clearance, the depth is calculated by the following equation: 5.5 m x 0.1+5.5m = 6.2m. Here, the wharf depth is determined as 6.5m.

(2) Design Conditions and Design Criteria

1) Codes and Standard

The design criteria of marine and civil works conform to the following design standards and references:

- "Standard Design Criteria for Ports in Indonesia, 1984"
- "Technical Standards for Port and Harbor Facilities in Japan, 1999"

2) Design Criteria

The details of major design criteria for Master Plan are summarized in Table 30.10.1

Table 30.10.1 General Design Criteria

	Palaran	Samarinda	
		Existing Port	Passenger Berth
Seismic coefficient	0.05	0.05	0.05
Load on berth	3t/m^2	3t/m^2	2t/m^2
Load on yard	4t/m^2	4t/m^2	2t/m^2
Truck	T-20	T-20	T-20
RTG on yard	Max.32t/wheel	-	-
Gantry Crane on berth	Max 45t/wheel	Crane 25t	-
Berth top elevation	+3.5	+3.5	+3.5
Berthing velocity of ship	15cm/sec	15cm/sec	15cm/sec
Subsoil condition	-	Silty sand	-
Assuming depth of hard strata	-40m~-15m	-38m	-38m

3) Tide

The tidal fluctuation at the site is as follows:

Samarinda, Palaran : HWL = +2.65m , LWL = 0.0 m

(3) Layout

1) Palaran

The new container terminal development is planned at Palaran site, where a timber

factory is currently located. However, this study assumes that land acquisition of the site is possible. In this study, two alternatives for the construction of four or six berths were analyzed.

In the case of 4 berths development, container berths having 500 m total length with 22 m width and retaining wall for the yard behind the berths are planned in three construction phases. The southern area of the berths is allocated for the container yard with related facilities.

In the case of 6 berths development, three container berths having 375 m total length with retaining wall and container back yard with facilities are proposed in the first construction phase. Then, three container berths of 125 m length with retaining wall and container yard behind the berth are planned in phases II, III and IV. The major facilities and container handling equipment in the master plan for Palaran are summarized in Table 30.10.2. The general layouts are shown in Figures 30.10.1 and 30.10.2.

Table 30.10.2 Facilities and equipment for Palaran 6 berth case, (4 berth case)

Facility	Descriptions	Phase I	Phase II	Phase III	Phase IV
Container Berth	125m x 22m	3 unit (2)	1 unit (1)	1 unit (1)	1 unit
Retaining Wall	Sheet piles with Tie- rod	375m (250)	125m (125)	125m (125)	125m
Yard Pavement	T-20	79,400m^2 (68,500)	26,500 m^2 (24,000)	26,500 m^2 (24,000)	26,500 m^2
RTG Lane	1.5m width, RC beam	4,950 m^2 (4950)	1,650m^2 (2475)	1,650m^2 (2475)	1,650 m^2
Container sleeper	1.5m width, RC beam	6,425 m^2 (6425)	2,142m^2 (3213)	2,142m^2 (3213)	2,142 m^2
CFS	100m x 40m	4,160 m^2 (3,520)	4,160m^2(4800)	-	-
Workshop	R.C	1,200 m^2 (,,)	-	-	-
Terminal Office	R.C	800 m^2 (,,)	-	-	-
Access Road	Terminal Access	30,500 m^2(,,)	-	(368 m^2)	(368 m^2)
Utilities	Power, Water, Drainage, etc.	L.S (,,)	L.S (,,)	L.S (,,)	L.S (,,)
Equipment	Capacity	Phase I	Phase II	Phase III	Phase IV
Quay Gantry Crane	12m-span, 22m-reach, 17 m-height, 44-ton	3 units (2 units)	1unit (1unit)	1unit (1unit)	1unit
RTG	6-lanes, 1 over 4, 35-ton	6 units (4 units)	2unit (2unit)	2unit (2unit)	2 units
Yard Tractors	20" , 40"	12 units (8 units)	4unit (4unit)	4unit (4unit)	4 sets

2) Samarinda Existing Port

A new general cargo berth is proposed between the existing berths of Samarinda Port. The new berth is 175m in length and 15m in width. The retaining wall of steel sheet piles and anchor facilities for the yard behind the berth will be installed and

connected with the existing wall. The retaining wall is about 75m in length.

In addition to the berth construction, the existing buildings (such as three old warehouses, office buildings for related sectors and passenger terminal building) are to be demolished. Then, two new warehouses and a new combined office building for the port administration are planned in the port yard behind the berth.

The existing passenger terminal will be transferred to the southern area of the existing port, which requires 9,000 m^2 including car and bus parking. A new passenger terminal building having floor area of 3,200 m^2 is planned at this area. A new passenger berth with a platform 40 m long and two mooring dolphins are planned in front of the new terminal.

The major facilities and cargo handling equipment in the master plan for the existing Samarinda Port are summarized in Table 30.10.3.

Table 30.10.3 Facilities and equipment for Samarinda Port

Facility	Descriptions	Existing Port	Passenger Terminal
Cargo Berth	175m x 15m	1 unit	-
Retaining Wall	Sheet piles with Tie- rod	75m	100m
Yard Pavement	T-20	10,500m^2	-
Warehouse	130m x 26m	2 units	-
Office	R.C (3F)	1,200 m^2	
Passenger Berth	Platform 40m, Trestle 30m	-	1 unit
Mooring Dolphin	50 t (5m x 5m)	-	2 units
Passenger Building	20m x 80m (2F)	-	3,200 m^2
Parking Pavement	T-16		7,400 m^2
Utilities	Power, Water, Drainage, Sewerage	L.S	L.S
Equipment	Capacity	Existing Port	
		Phase I	Phase II
Mobile Crane	25 t	3 units	3unit
Forklift	7 t Diesel	10 units	10 units

The general layout for existing Samarinda Port and new passenger terminal are shown in Figures 30.10.3 and 30.10.4 respectively.

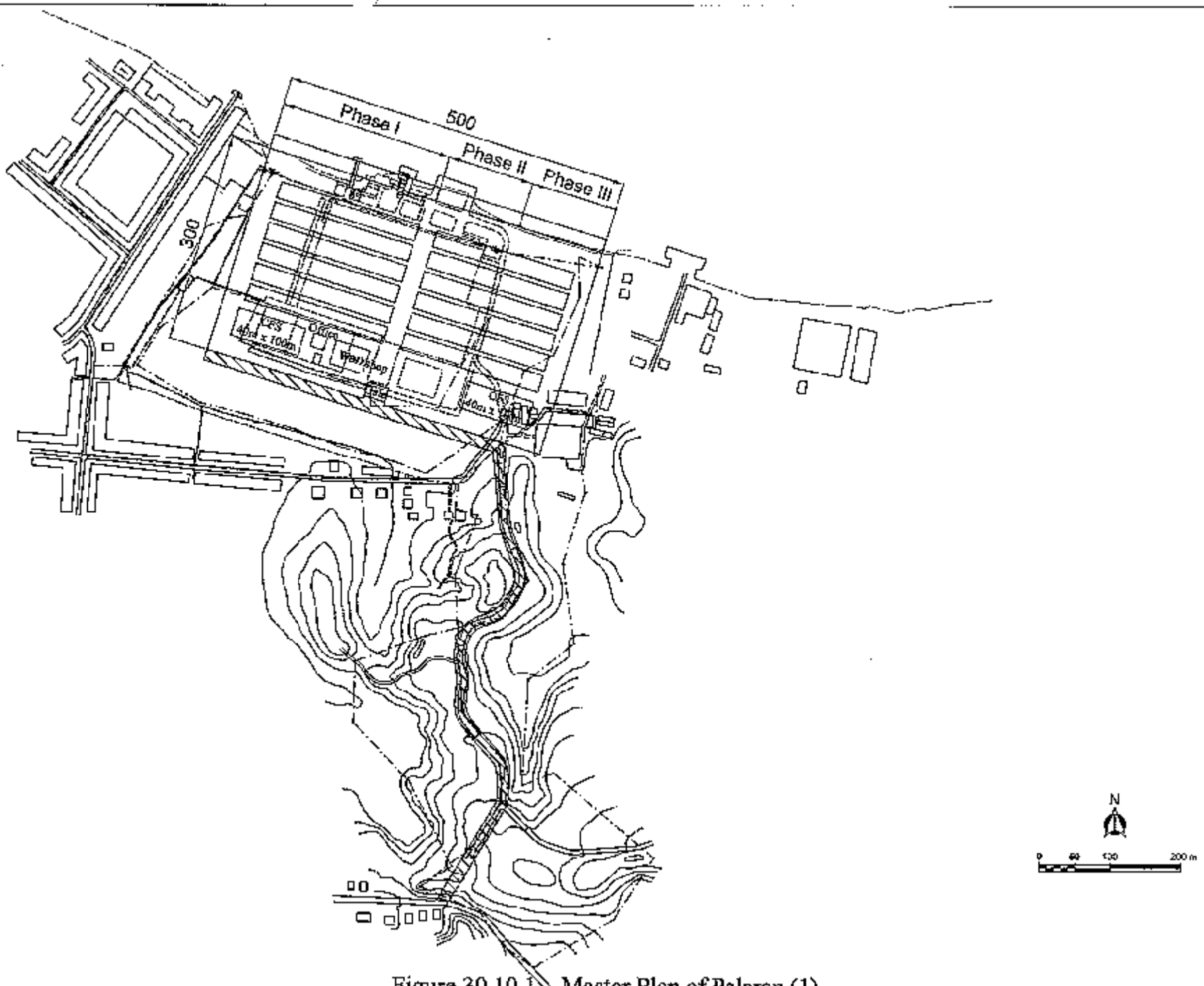


Figure 30.10.1 Master Plan of Palaran (1)

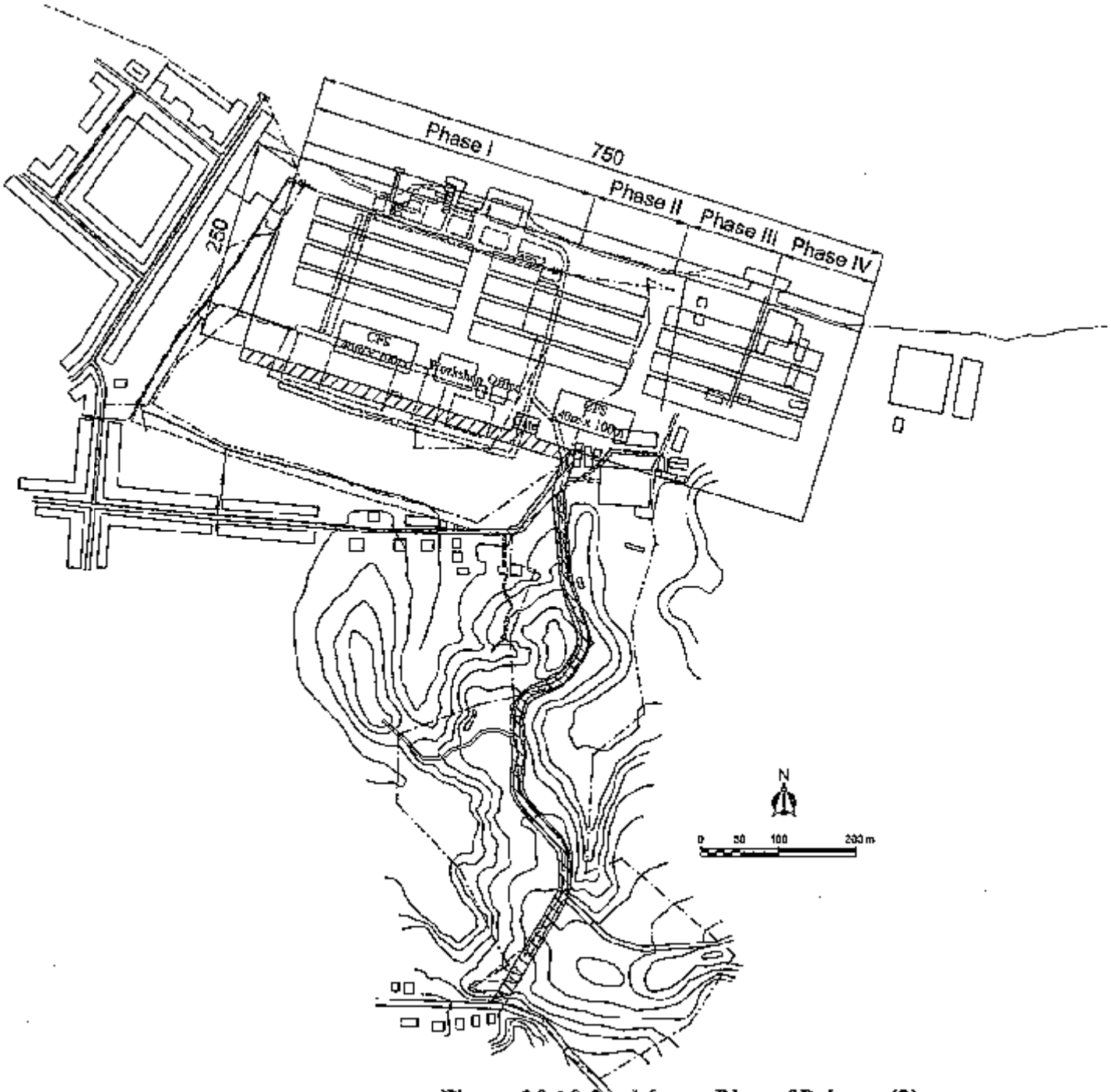


Figure 30.10.2 Master Plan of Palaran (2)

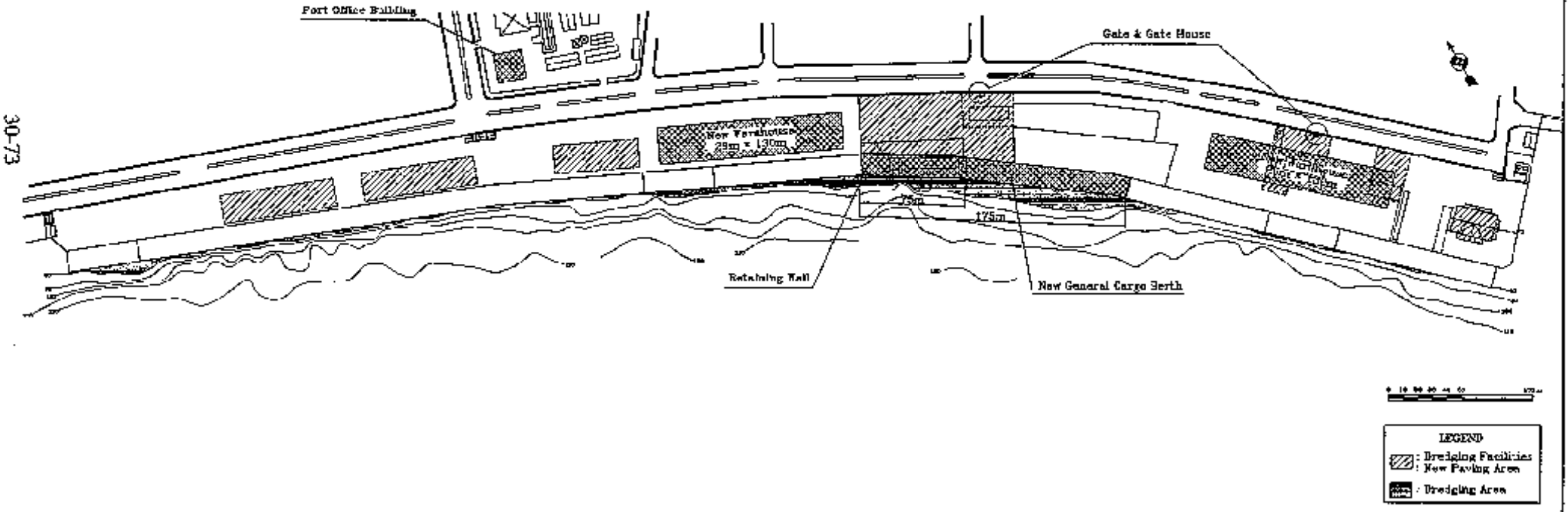


Figure 30.10.3 Master Plan of Samarinda

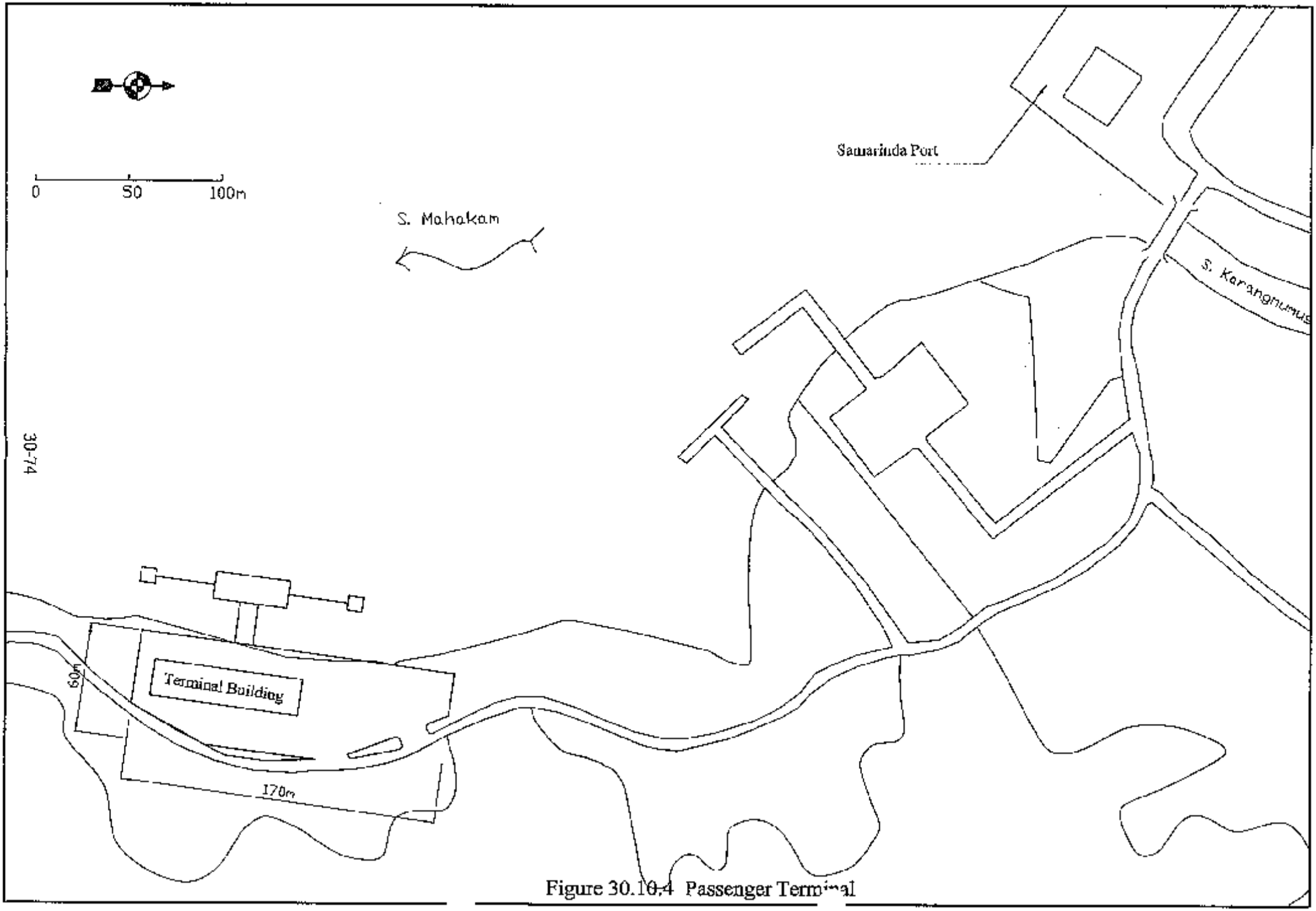


Figure 30.10.4 Passenger Terminal

(4) Design of Port Facilities

1) Container Berth for Palaran and General Cargo Berth for existing Port

The container berth for Plaran is designed as RC deck structure supported by steel pipe piles. Steel pipe piles are to be driven into the sand stone layer (N value > 50, assuming the depth of pile = -40m ~ -15m). The same diameter of vertical piles and coupled batter piles are used as a foundation of the deck structure. Crane rails will be installed just above the deck to withstand the weight of the gantry crane. In order to retain the reclamation fill for the terminal yard, a steel sheet pile wall will be installed behind the berth. The steel sheet pile wall will be supported by anchor wall and tie-rods.

The general cargo berth and retaining wall for the existing Samarinda Port will also be a similar structure as the container berth; however, the diameter of the piles and scale of the RC deck will be smaller. Considering the deep bearing soil stratum at existing port area, supportive foundation piles, which make use of the frictional subsoil resistance, will be more economical. The piles will be driven into –38m under LWL.

The typical section of the berth is shown in Figure 30.10.5

2) Pavement (Road, Container yard and General cargo open storage)

Roads and areas subject to paving works are listed as follows:

- Container storage areas and general cargo open storage
- RTG runway beam (RTG Lane)
- Container Sleeper
- Roads and Other area of Container Terminal

Depending on the facilities and their uses, different pavement types are applied to suit their function as described as follows:

- Container storage areas and general cargo open storage
  80 mm thick of rectangular interlocking blocks, 50 mm of sand, 200 mm of cement bound material, a crushed aggregate sub-base (300 mm) are layered on top of the compacted sub-grade.

- RTG runway beams
  Rubber Tired Gantry Crane (RTG) requires the long span passage with 1.5m width, in order to stand its loading weight of more than 38 tons per wheel. The lanes are generally required to make of the reinforcing concrete slab (RC slab) having 300 mm thickness with sub base (300mm min.) on top of the compacted sub grade. The joint of the spans will be provided upon the RC base in order to avoid unequal settlement, hence, to ensure the smooth operation of the RTG.

- Container Sleeper

Since containers will be generally stacked and arranged in fixed positions in the yard slots, a base named Container Sleeper to bear the containers' concentration load will be provided. The Container Sleeper is 1.5 m wide and of similar structure as RTG lane.

- Roads and other areas of Container Terminal

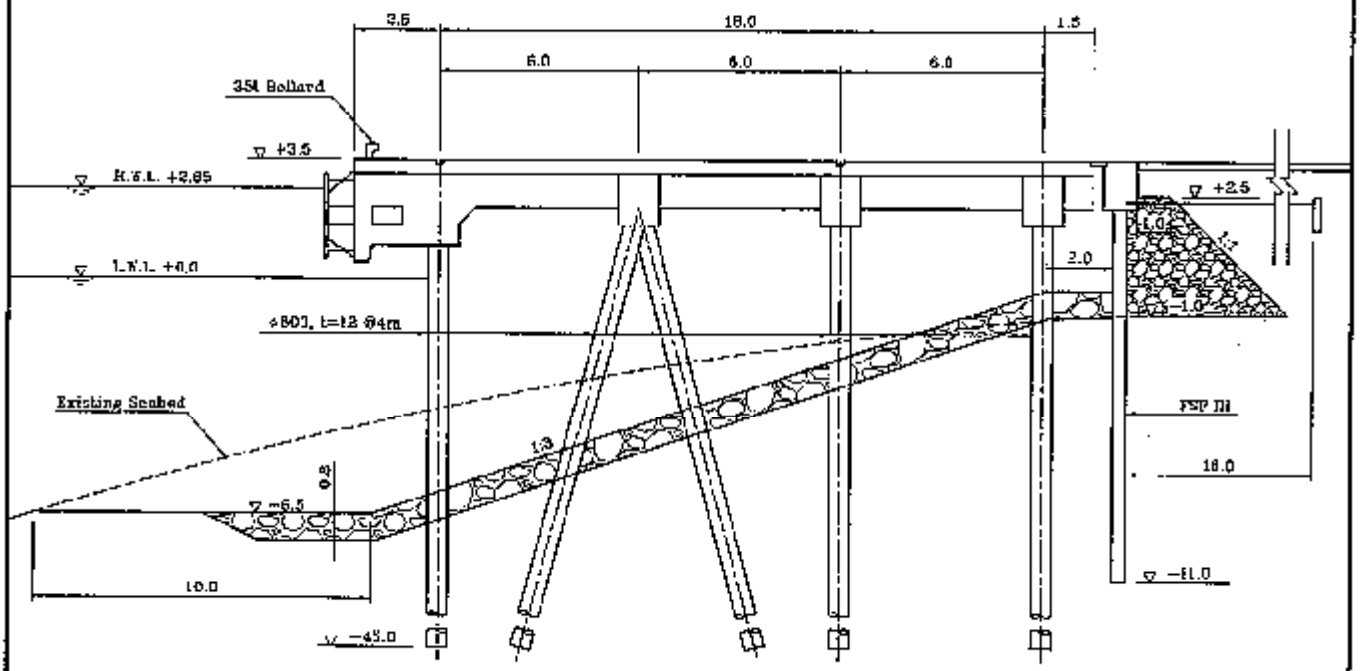
  The vehicle traffic lanes adjacent and parallel to the container stacking areas and access road to the terminal are planned to be pave with concrete. The pavement consists of concrete slab of 250 mm thick, on top of a crushed aggregate sub base (300 mm) over the compacted sub grade.

3) Buildings

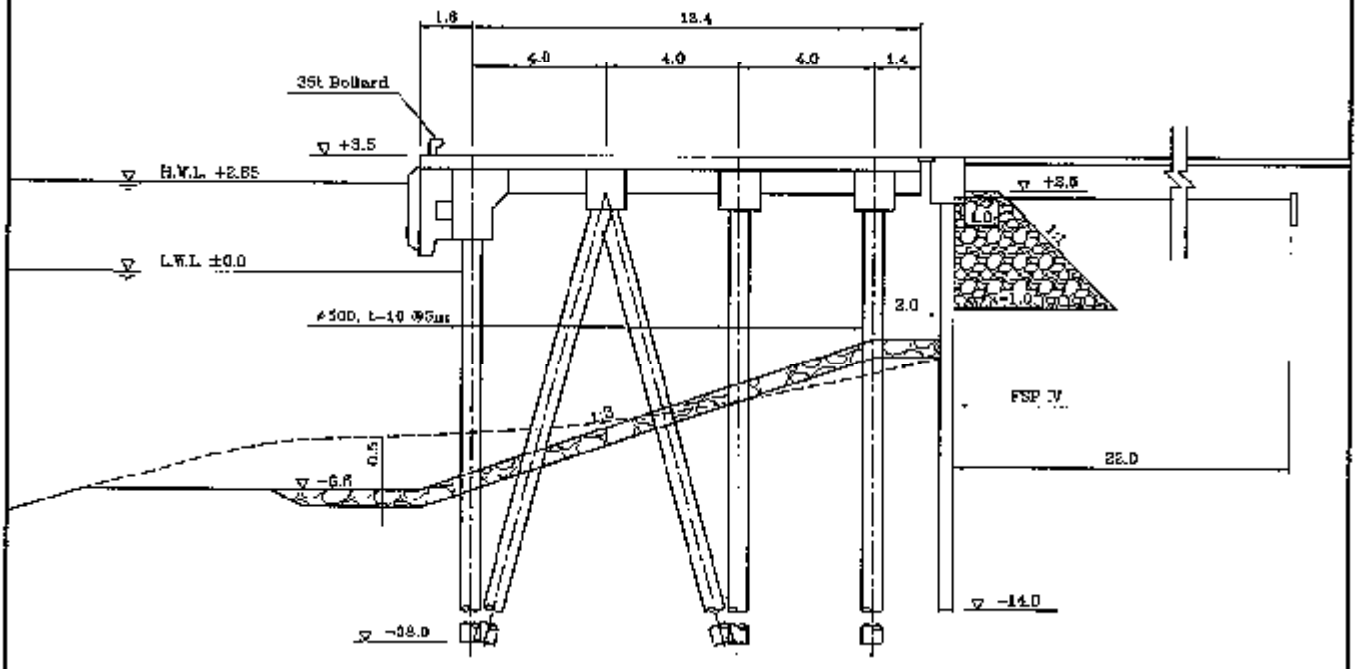
The Proposed port buildings are planned in accordance with the following principles.

- Rational and functional design for efficient port management and operation.
- Smooth flow line planning
- Flexibility on the future port expansion
- Utilization of the local construction methods and materials
- Economical design

The proposed buildings are basically planned as RC column structure.



Palaran Coctainer Terminal



Samarinda General Cargo Berth

Figure 30.10.5 Typical Section of Berth Facility

30.10.2 Cost Estimation

(1) Construction Procurement in Samarinda

1) Unit Cost of Labor and Materials in Samarinda

The unit costs of labor and materials in Samarinda basically refer to " HARUGA SATUAN BAHAN BUNGUNAN" issued by the province office, " JURNAL BAHAN BANGUNAN, KONSTRUKSI DAN INTERIOR 2001" and the survey made by the study team in the study area. For details see Table 30.10.4.

2) Unit Cost of Container Handling Equipment

The unit costs of the procurement of the handling equipment were calculated from the local prices of imported CIF plus installation fee. Indonesian import tax and duties are not included. For details see Table 30.10.5

Table 30.10.4 Unit Cost in Samarinda (unit :Rp)

Description	SAMARINDA (Rp/day)	Description	Unit	SAMARINDA
(Local)		Gasoline	Lit	1450
Superintendant	60,000	Diesel Fuel	Lit	900
Foreman	30,000	Cement	ton	470,000
Common Labour	15,000	Coarse Aggregate	m3	62,000
Skilled Labour	25,000	Fine Aggregate	m3	30,000
Welder	25,000	Sand for Filling	m3	26,000
Mechanician	25,000	Crushed Stone	m3	50,000
Electrician	25,000	Plywood 1cm	m2	30,000
Carpenter	20,000	Square Timber	m3	400,000
Painter	20,000	Asphalt	kg	3,800
Bar Bender	25,000	Reinforcing Bar		
Masonry	20,000	(D-10)	ton	5,000,000
Equip. Operator	30,000	(D-16)	ton	4,500,000
Plant Operator	30,000	(D-25)	ton	4,500,000
Diver	100,000	Structural Steel	ton	4,500,000
Ship Captain	100,000	Steel Pipe Pile		
Ship Crew	60,000	(D=600 x12)	ton	10,600,000
		(D=500 x10)	ton	10,600,000
(Foreign)		Steel Sheet Pile	ton	8,000,000
Expatriate	3,000,000	Concrete Block(pavement)	m2	195,000
Ship Captain	3,500,000			
Diver	3,500,000			

Table 30.10.5 Unit Cost of Equipment

Description	Cost (Million Rp)	Description	Cost (Million Rp)
Quay Gantry Crane Span 12m, Reach 22m	32,000	Mobile Crane (50t)	3,700
RTG 6Lane, 1 over 4	11,200	Mobile Crane (25t)	1,900
Tractor & Chassis	1,100	Forklift (7t)	650

3) Construction Firms in Samarinda

The construction firms in Samarinda basically are sub-contractors under foreign and major domestic contractors in Indonesia.

(2) Assumptions for Cost Estimation

1) Basic Price and Exchange Rate

The basic prices are as of 2001 and the foreign exchange rate of ;
1 US$ = 9,500 Rupiah (Rp) = 118 Yen

2) Currency Component

The each unit price was split into foreign currency and local currency portions, both indicated in Rupiah, estimated in the following classifications;

- The foreign currency component consists of :
  - -Imported construction materials
  - -Foreign components of depreciation and operation /maintenance cost for construction equipment and plant
  - -Foreign component of domestic materials
  - -Salaries and costs of foreign personnel
- The local currency component consists of :
  - -Local construction materials
  - -Local components of depreciation and operation /maintenance cost for construction equipment and plant
  - -Salaries and costs of local personnel
  - -Import duty on imported materials
  - -Indonesian taxes

3) Maintenance Cost (Facility, Equipment, Dredging)

The maintenance cost for facilities is set out as 2% of the facility construction cost based on the annual maintenance fee of the facilities. Also, 3% of the equipment cost is adopted as the maintenance cost for the equipment. The maintenance dredging cost is determined from the annual maintenance dredging cost of the river done by P.T PENGERUKAN INDONESIA (RUKINDO). The cost of maintenance dredging is calculated as Rp13,000/m^3 .

4) Land Acquisition

The land acquisition fee for Palaran site is set at about Rp 48,000/m^2 based on the results of the interview survey around the site.

(3) Basic Cost of Construction Works

The combined cost for major construction works is estimated from the costs of labor, required materials, required construction equipment, and the site expense of labor and equipment. The estimation was verified by referring to the data of local construction cost data collected in the survey. The combined cost of major works is shown in Table 30.10.6.

Table 30.10.6 Combined Cost for Major Works

Work Item	Unit	SAMARINDA	Currency(%)		Local Currency (%)		
			Foreign	Local	Goods	Skilled labour	Unskilied labour
Excavation	m3	2,635	61	39	12	68	20
Back Filling	m3	5,404	59	41	10	67	23
Soil Disposal	m3	3,564	62	38	9	69	22
Blinding Stone	m3	70,997	33	67	45	34	21
Base Course	m3	73,678	39	61	44	35	21
Sub- Base Course	m3	75,878	39	61	44	35	21
Con.Block Paving	m2	164,670	59	39	32	44	23
Concrete Form Work	m2	99,963	46	54	32	46	22
Re-Bar Work	ton	5,699,650	60	40	17	62	21
Mix- Concrete 270kg/cm2	m3	276,939	43	57	56	26	18
Mix- Concrete 210kg/cm2	m3	263,654	43	57	56	26	18
Mix- Concrete 150kg/cm2	m3	256,552	43	57	56	26	18
Concrete Placing(Included T ding Transportation)							
by Man Power	m3	112,108	39	61	6	64	30
by Truck Crane	m3	78,577	70	30	8	65	27
As-Con Hot-Mix	ton	415,006	76	24	17	56	27
As-Con Placing	ton	65,224	72	28	29	49	22
Steel Pile Driving							
D-500mm	m	1,198,657	94	6	2	70	28
D-600mm	m	1,899,192	94	6	2	70	28
Sheet Pile Driving	m	477,772	95	5	1	70	29
Dredging & Disposal by Cutter Suction	m3	35,000	78	22	6	76	18
Dredging & Disposal by Barge & Grab	m3	65,000	76	24	8	75	17
Paper Drain driving	m	18,698	94	6	9	60	31
Stone Placing	m2	270,408	58	42	44	37	19
Manufacturing Steel Structure							
Super Structure	ton	9,000,000	72	28	15	68	17
Supporting Structure	ton	6,000,000	74	26	11	72	17
Office Building	m2	2,250,000	62	38	32	55	13
Warehouse or Shed	m2	1,420,000	61	39	27	56	17

(4) Construction Cost and Procurement Cost

The construction cost is estimated based on the combined cost of the construction works. The utilities cost of such as water, electric power and drainage, refers to the other projects in the equivalent scale. In addition to the construction cost and procurement cost, the engineering fee for the detail design and supervision, physical contingency and VAT are estimated in this study. The engineering fee for construction is about 10% to 15% for the construction cost, 3% for the equipment cost. The physical contingency is 8% for the construction cost, VAT is 10% of the whole cost.

The equipment cost for Palaran is shown in Table 30.10.7 & Table 30.10.8.

The construction cost for Palaran is shown in Table 30.10.9 & Table 30.10.10.

The equipment cost for Samarinda is shown in Table 30.10.11.

The construction cost for Samarinda (Passenger Terminal) is shown in Table 30.10.12.

The construction cost for Samarinda (Existing Port) is shown in Table 30.10.13.

Table 30.10.7 Equipment Cost for Palaran (4 Berths Case)

Phase		Description	Quantity	Unit Price (Million Rp)	Amount (Million Rp)
I	1	Gantry Crane	2	32,000	64,000
	2	RTG	4	11,200	44,800
	3	Tractor & Trailer	8	1,100	8,800
		Engineering Fee	3%		3,528
		VAT	10%		12,113
			Total		**133,241**
II	1	Gantry Crane	1	32,000	32,000
	2	RTG	2	11,200	22,400
	3	Tractor & Trailer	4	1,100	4,400
		Engineering Fee	3%		1,764
		VAT	10%		6,056
			Total		**66,620**
III	1	Gantry Crane	1	32,000	32,000
	2	RTG	2	11,200	22,400
	3	Tractor & Trailer	4	1,100	4,400
		Engineering Fee	3%		1,764
		VAT	10%		6,056
			Total		**66,620**
Grand Total					**266,482**

Table 30.10.8 Equipment Cost for Palaran (6 Berths Case)

Phase		Description	Quantity	Unit Price (Million	Amount (Million Rp)
I	1	Gantry Crane	3	32,000	96,000
	2	RTG	6	11,200	67,200
	3	Tractor & Trailer	12	1,100	13,200
		Engineering Fee	3%		5,292
		VAT	10%		18,169
			Total		**199,861**
II	1	Gantry Crane	1	32,000	32,000
	2	RTG	2	11,200	22,400
	3	Tractor & Trailer	4	1,100	4,400
		Engineering Fee	3%		1,764
		VAT	10%		6,056
			Total		**66,620**
III	1	Gantry Crane	1	32,000	32,000
	2	RTG	2	11,200	22,400
	3	Tractor & Trailer	4	1,100	4,400
		Engineering Fee	3%		1,764
		VAT	10%		6,056
			Total		**66,620**
IV	1	Gantry Crane	1	32,000	32,000
	2	RTG	2	11,200	22,400
	3	Tractor & Trailer	4	1,100	4,400
		Engineering Fee	3%		1,764
		VAT	10%		6,056
			Total		**66,620**
Grand Total					**399,722**

Table 30.10.9 Construction Cost for Palaran (4 Berths Case)

	Description	Unit	Quantity	Unit Price(Rp)	Amount (Million Rp)	Phase I	Phase II	Phase III
1	Direct Construction Cost in PALARAN							
(1)	Mobilization and Demobilization	L.S	1	9,600,000,000	9,600	3,200	3,200	3,200
(2)	Dredging & Reclamation							
1)	Dredging	m3	22,500	65,000	1,463	764	559	139
2)	Reclamation	m3	14,000	30,404	426	139	145	142
(3)	Berth Construction							
1)	Steel Pipe Piling Work (D=600)	m	19,500	1,899,192	37,034	23,463	8,182	5,390
	Earth auger	point	40	47,500,000	1,900	0	0	1,900
2)	Concrete Deck							
	Concrete Placing	m3	8,251	662,120	5,463	2,731	1,366	1,366
	Re-bar Work	ton	908	5,699,650	5,175	2,588	1,294	1,294
3)	Retaining Wall							
	Sheet Piling Work	m	20,300	447,772	9,090	4,545	2,272	2,272
	Concrete Coping Work	m3	696	827,139	576	288	144	144
	Tie-rod & Anchor Block	No.	362	4,200,000	1,520	760	382	378
	Backfill Stone	m3	6,500	70,997	461	231	115	115
	Backfill	m3	9,000	5,404	49	24	12	12
4)	Slope Protection	m2	15,200	270,408	4,110	2,055	1,028	1,028
5)	Wharf Fittings							
	Fender & Bollard	set	35	124,000,000	4,340	2,170	1,085	1,085
	Crane Rail Fittings	m	1,000	1,315,000	1,315	658	329	329
6)	Yard Preparation	L.S	1	5,120,000,000	5,120	2,560	1,280	1,280
(4)	Yard Pavement							
1)	Block Paving	m2	55,000	164,670	9,057	4,528	2,264	2,264
2)	RTG Lane	m2	9,900	468,355	4,637	2,318	1,159	1,159
3)	Container Sleeper	m2	12,850	411,358	5,286	2,643	1,321	1,321
4)	Concrete Paving	m2	61,500	183,373	11,277	7,518	1,880	1,880
(5)	Access Road							
1)	Cutting & Filling & Grading	L.S	1	491,000,000	491	491	0	0
2)	Concrete Paving	m2	30,500	183,373	5,593	5,593	0	0
3)	Utilities	L.S	1	550,000,000	550	550	0	0
(6)	Buildings							
1)	Demolishing Existing Facilities	L.S	1	1,000,000,000	1,000	1,000		
2)	CFS (2 Units)	m2	8,320	1,420,000	11,814	4,998	6,816	0
3)	Gate	m2	500	2,250,000	1,125	1,125	0	0
4)	Terminal Office Building	m2	800	2,250,000	1,800	1,800	0	0
5)	Work Shop	m2	1,750	1,420,000	2,485	2,485	0	0
6)	Canteen	m2	150	1,420,000	213	213	0	0
(7)	Yard Fence	m	1,100	456,000	502	502	0	0
(8)	Drainage System	L.S	1	2,266,000,000	2,266	1,511	378	378
(9)	Power Supply & Yard Lighting	L.S	1	6,500,000,000	6,500	4,333	1,083	1,083
(10)	Water Supply System	L.S	1	2,850,000,000	2,850	1,900	475	475
(11)	Sewerage System	L.S	1	1,300,000,000	1,300	975	163	163
(12)	Other Utilities	L.S	1	500,000,000	500	250	125	125
Total Direct Cost					**156,888**	**90,909**	**37,057**	**28,922**
3	Indirect Construction Cost							
(1)	Common Temporary Work	%	6 to 8	D.C		5,455	2,965	2,314
(2)	Site Expenses	%	13 to 15	D.C		11,818	5,559	4,338
(3)	Overhead	%	8	D.C		7,273	2,965	2,314
Total Indirect Cost						24,545	11,488	8,966
Total Construction Cost						**115,455**	**48,545**	**37,887**
	Physical Contingency	%	10	T.C		**11,545**	**4,854**	**3,789**
	Engineering Fee	%	12	T.C		**13,855**	**5,825**	**4,546**
	VAT	%	10	T.C,P.C,E.F		**14,085**	**5,922**	**4,622**
Total Project Cost						**154,940**	**65,147**	**50,845**
Land Acquisition Fee		m2	**275,000**	**48,000**	**13,200**	**13,200**	**0**	**0**
Compensation for existing fascility		m2	**15,000**	**1,000,000**	**15,000**	**15,000**	**0**	**0**
Grand Total (Phase I +II+III)								**299,132**

Table 30.10.10 Construction Cost for Palaran (6 Berths Case)

	Description	Unit	Quantity	Unit Price(Rp)	Amount (Million Rp)	Phase I	Phase II	Phase III	Phase IV
1	Direct Construction Cost in PALARAN								
(1)	Mobilization and Demobilization	L.S	1	13,800,000,000	13,800	4200	3200	3200	3200
(2)	Dredging & Reclamation								
1)	Dredging	m3	32,000	65,000	2,080	1365	78	234	403
2)	Reclamation	m3	25,000	30,404	760	283	137	152	189
(3)	Berth Construction								
1)	Steel Pipe Piling Work (D=600)	m	28,613	1,899,192	54,342	30792	5318	12915	5318
	Earth auger	Point	80	47,500,000	3,800		1900		1900
2)	Concrete Deck								
	Concrete Placing	m3	12,000	662,120	7,945	3973	1324	1324	1324
	Re-bar Work	ton	1,320	5,699,650	7,524	3762	1254	1254	1254
3)	Retaining Wall								
	Sheet Piling Work	m	30,890	447,772	13,832	6916	2305	2305	2305
	Concrete Coping Work	m3	980	827,139	811	405	135	135	135
	Tie-rod & Anchor Block	No.	543	4,200,000	2,281	1140	380	380	380
	Backfill Stone	m3	9,800	70,997	696	348	116	116	116
	Backfill	m3	13,000	5,404	70	35	12	12	12
4)	Slope Protection	m2	22,800	270,408	6,165	3083	1028	1028	1028
5)	Wharf Fittings								
	Fender & Bollard	set	64	124,000,000	7,936	3968	1323	1323	1323
	Crane Rail Fittings	m	1,500	1,315,000	1,973	986	329	329	329
6)	Yard Preparation	L.S	1	5,120,000,000	5,120	2560	853	853	853
(4)	Yard Pavement								
1)	Block Paving	m2	55,000	164,670	9,057	4528	1509	1509	1509
2)	RTG Lane	m2	9,900	468,355	4,637	2318	773	773	773
3)	Container Sleeper	m2	12,850	411,358	5,286	2643	881	881	881
4)	Concrete Paving	m2	103,900	183,373	19,052	9526	3175	3175	3175
(5)	Access Road								
1)	Cutting & Filling & Grading	L.S	1	491,000,000	491	491	0	0	0
2)	Concrete Paving	m2	34,500	183,373	6,326	5,590	0	368	368
3)	Utilities	L.S	1	550,000,000	550	450	0	50	50
(6)	Buildings								
1)	Demolishing Existing Facilities	L.S	1	1,000,000,000	1,000	1,000			
2)	CFS (2 Units)	m2	8,320	1,420,000	11,814	5907	5907	0	0
3)	Gate	m2	500	2,250,000	1,125	1,125	0	0	0
4)	Terminal Office Building	m2	800	2,250,000	1,800	1,800	0	0	0
5)	Work Shop	m2	1,750	1,420,000	2,485	2,485	0	0	0
6)	Canteen	m2	150	1,420,000	213	213	0	0	0
(7)	Yard Fence	m	1,750	456,000	798	456	0	171	171
(8)	Drainage System	L.S	1	2,566,000,000	2,566	1,283	428	428	428
(9)	Power Supply & Yard Lighting	L.S	1	6,800,000,000	6,800	4,533	378	1,511	378
(10	Water Supply System	L.S	1	2,850,000,000	2,850	1,425	475	475	475
(11	Sewerage System	L.S	1	1,300,000,000	1,300	975	125	100	100
(12	Other Utilities	L.S	1	500,000,000	500	250	90	80	80
	Total Direct Cost				**207,784**	**110,815**	**33,433**	**35,080**	**28,456**
3	Indirect Construction Cost								
(1)	Common Temporary Work	%	6 to 8	D.C		6,649	2,675	2,806	2,276
(2)	Site Expenses	%	13 to 15	D.C		14,406	5,015	5,262	4,268
(3)	Overhead	%	8	D.C		8,865	2,675	2,806	2,276
	Total Indirect Cost					29,920	10,364	10,875	8,821
Total Construction Cost						**140,735**	**43,797**	**45,955**	**37,278**
	Physical Contingency	%	10	T.C		**14,073**	**4,380**	**4,596**	**3,728**
	Engineering Fee	%	12	T.C		**16,888**	**5,256**	**5,515**	**4,473**
	VAT	%	10	T.C,P.C,E.F		**17,170**	**5,343**	**5,607**	**4,548**
Total Project Cost						**188,866**	**58,775**	**61,672**	**50,027**
Land Acquisition Fee		m2	355,000	48,000	17,040	**13,200**	**0**	**1920**	**1920**
Compensation for existing fascility		m2	15,000	1,000,000	15,000	**15,000**			
Grand Total (Phase I +II +III +IV)									**391,380**

Table 30.10.11 Equipment Cost for Samarinda (Existing Port)

Phase		Description	Quantity	Unit Price (Million Rp)	Amount (Million Rp)
I	1	Mobile Crane (25t)	3	1,900	5,700
	2	Forklift (7T)	10	650	6,500
		Engineer Fee			366
		VAT			1,257
			Total		**13,823**
II	1	Mobile Crane (25t)	3	1,900	5,700
	2	Forklift (7T)	10	650	6,500
		Engineer Fee			366
		VAT			1,257
			Total		**13,823**
Grand Total					**27,645**

Table 30.10.12 Construction Cost for Samarinda (Passenger Terminal)

	Description	Unit	Quantity	Unit Price(Rp)	Total Amount (Million Rp)
1	Direct Construction Cost				
(1)	Mobilization and Demobilization	L.S	1	3,000	3,000
(2)	Berth Construction				
1)	Passenger Berth, Dolphin, Trestle	L.S	1	9,000	9,500
2)	Retaining Wall	L.S	1		2,763
(3)	Yard Pavement				
1)	Paving for Passenger Terminal	m2	7,400	164,670	1,219
(4)	Buildings				
6)	Passenger Terminal Bulding	9,500	3,200	2,250,000	7,200
(5)	Drainage System	L.S	1	1,000	1,000
(6)	Power Supply & Yard Lighting	L.S	1	2,500	2,500
(7)	Water Supply System	L.S	1	1,200	1,200
(8)	Other Utilities	L.S	1	300	300
Total Direct Cost					**28,682**
3	Indirect Construction Cost				
(1)	Common Temporary Work	%	8	D.C	2,295
(2)	Site Expenses	%	15	D.C	4,302
(3)	Overhead	%	8	D.C	2,295
Total Indirect Cost					8,891
Total Construction Cost					**37,573**
	Physical Contingency	%	8	T.C	**3,006**
	Engineering Fee	%	12	T.C	**4,509**
	VAT	%	10	T.C,P.C,E.F	**4,509**
Total Project Cost					**49,596**

Table 30.10.13 Construction Cost for Samarinda (Existing Port)

				Description	Unit	Quantity	Unit Price(Rp)	Amount (Million Rp)
1	Direct Construction Cost in Existing Port							
	(1)			Mobilization and Demobilization	L.S	1	2,000,000,000	2,000
	(2)			Dredging & Reclamation				
		1)		Dredging	m3	7,600	65,000	494
		2)		Reclamation	m3	2,100	30,404	64
	(3)			Berth Construction				
		1)		Steel Pipe Piling Work (D=500)	m	7,380	1,198,657	8,846
		2)		Concrete Deck				
				Concrete Placing	m3	2,000	662,120	1,324
				Re-bar Work	ton	209	5,699,650	1,191
		3)		Retaining Wall				
				Sheet Piling Work	m	3,060	619,590	1,896
				Concrete Coping Work	m3	60	827,139	50
				Tie-rod & Anchor Block	No.	46	4,800,000	221
				Backfill Stone	m3	820	70,997	58
				Backfill	m3	1,000	5,404	5
		4)		Slope Protection	m2	1,440	270,408	389
		5)		Wharf Fittings				
				Fender & Bollard	set	22	32,000,000	704
		6)		Yard Preparation	L.S	1		1,178
	(4)			Yard Pavement				
		1)		Block Paving	m2	10,500	164,670	1,729
	(5)			Buildings				
		1)		Demolishing Existing Facilities	L.S	1	500,000,000	500
		2)		Warehouse (1units)	m2	6,800	1,420,000	9,656
		3)		Port Office Building	m2	1,200	2,250,000	2,700
		4)		Gate(2units)	m2	120	2,250,000	270
		5)		Gate House (2 units)	m2	200	2,250,000	450
	(6)			Drainage System	L.S	1	350,000,000	350
	(7)			Power Supply & Yard Lighting	L.S	1	700,000,000	700
	(8)			Water Supply System	L.S	1	250,000,000	250
	(9)			Other Utilities	L.S	1	250,000,000	250
	Total Direct Cost							**35,276**
3	Indirect Construction Cost							
	(1)			Common Temporary Work	%	8	D.C	2,822
	(2)			Site Expenses	%	15	D.C	5,291
	(3)			Overhead	%	8	D.C	2,822
	Total Indirect Cost							10,936
Total Construction Cost								**46,211**
				Physical Contingency	%	8	T.C	**3,697**
				Engineering Fee	%	15	T.C	**6,932**
				VAT	%	10	T.C,P.C,E.F	**5,684**
Total Project Cost								**62,524**

(5) Project Cost

The total project cost for Palaran is Rp 565,613 million for the 4-berths case and Rp 791,103 million for the 6-berths case. Total project cost for existing Samarinda Port is **Rp 139,767 million**.

The Project cost is summarized in Table 30.10.14 and Table 30.10.15

For the economic analysis, the depreciation period of the constructed facilities and the procured equipment are determined as shown in Table 30.10.16.

Table 30.10.16 Depreciation Period of the Facilities and Equipment

Facility	Depreciation Period	Remarks
Berth , Retaining Wall	50 years	
Warehouse, CFS	50 years	
Pontoon , Movable Bridge	40 years	In River
Yard Pavement	30 years	
Road Pavement	30 years	
Buildings	40 years	
Equipment	Depreciation Period	Remarks
Quay gantry Crane	25 years	
RTG	20 years	
Mobile Crane	15 years	
Tractor & Chassis	10 years	
Forklift	10 years	

Table 30.10.14 Summary of Project Cost for Samarinda (Unit in Million Rp.)

Description		Container Terminal (4-Berth Case)												Container Terminal (6-Berth Case)												
1. Palaran		Phase I			Phase II			Phase III			**Total**			Phase I			Phase II			Phase III			Phase IV			**Total**		
		Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
1.1	Civil Works																										
1.1.1	Construction Cost	82,992	32,463	115,455	36,233	12,312	48,545	26,428	11,460	37,888	145,653	56,235	201,888	102,868	37,867	140,735	30,638	13,159	43,797	34,797	11,159	45,956	25,386	11,892	37,278	193,689	74,077	267,766
1.1.2	Physical Contingency	8,299	3,246	11,545	3,623	1,231	4,854	2,643	1,146	3,789	14,565	5,623	20,188	10,287	3,787	14,074	3,064	1,316	4,380	3,480	1,116	4,596	2,539	1,189	3,728	19,370	7,408	26,778
1.1.3	Enginering Fee	9,005	4,849	13,854	3,787	2,039	5,826	2,955	1,591	4,546	15,747	8,479	24,226	10,977	5,911	16,888	3,416	1,839	5,255	3,585	1,930	5,515	2,908	1,566	4,474	20,886	11,246	32,132
1.1.4	VAT	0	14,085	14,085	0	5,922	5,922	0	4,622	4,622	0	24,629	24,629	0	17,170	17,170	0	5,343	5,343	0	5,607	5,607	0	4,548	4,548	0	32,668	32,668
	Sub-total (1.1)	100,296	54,643	154,939	43,643	21,504	65,147	32,026	18,819	50,845	175,965	94,966	270,931	124,132	64,735	188,867	37,118	21,657	58,775	41,862	19,812	61,674	30,833	19,195	50,028	233,945	125,399	359,344
1.2	Equipment																										
1.2.1	Equipment	115,336	2,264	117,600	57,668	1,132	58,800	57,668	1,132	58,800	230,672	4,528	235,200	173,004	3,396	176,400	57,668	1,132	58,800	57,668	1,132	58,800	57,668	1,132	58,800	346,008	6,792	352,800
1.2.2	Enginering Fee	2,822	706	3,528	1,411	353	1,764	1,411	353	1,764	5,644	1,412	7,056	4,234	1,058	5,292	1,411	353	1,764	1,411	353	1,764	1,411	353	1,764	8,467	2,117	10,584
1.2.3	VAT	0	12,113	12,113	0	6,056	6,056	0	6,056	6,056	0	24,225	24,225	0	18,169	18,169	0	6,056	6,056	0	6,056	6,056	0	6,056	6,056	0	36,337	36,337
	Sub-total (1.2)	118,158	15,083	133,241	59,079	7,541	66,620	59,079	7,541	66,620	236,316	30,165	266,481	177,238	22,623	199,861	59,079	7,541	66,620	59,079	7,541	66,620	59,079	7,541	66,620	354,475	45,246	399,721
1.3	Land Acquisition																										
1.3.1	Land Acquisition		13,200	13,200								13,200	13,200		13,200	13,200					1,920			1,920			17,040	17,040
1.3.2	Compensation		15,000	15,000								15,000	15,000		15,000	15,000											15,000	15,000
	Sub-total (1.3)		28,200	28,200								28,200	28,200		28,200	28,200											32,040	32,040
	Total (1.1 + 1.2 + 1.3)	218,454	97,926	**316,380**	102,722	29,045	**131,767**	91,105	26,360	**117,465**	412,281	153,331	**565,612**	301,370	115,558	**416,928**	96,197	29,198	**125,395**	100,941	27,353	**128,294**	89,912	26,736	**116,648**	588,420	202,685	**791,105**

Description		**Existing Port (General Cargo Terminal)**						**Passenger Terminal**			**Total**		
2. Samarinda Port		Phase I			Phase II								
		Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total	Foreign	Local	Total
2.1	Civil Works												
2.1.1	Construction Cost	34,708	11,503	46,211				26,636	10,937	37,573	61,344	22,440	83,784
2.1.2	Physical Contingency	2,777	920	3,697				2,131	875	3,006	4,908	1,795	6,703
2.1.3	Enginering Fee	4,506	2,426	6,932				2,931	1,578	4,509	7,437	4,004	11,441
2.1.4	VAT	0	5,684	5,684				0	4,509	4,509	0	10,193	10,193
	Sub-total (2.1)	41,991	20,533	62,524				31,698	17,899	49,597	73,689	38,432	112,121
2.2	Equipment												
2.2.1	Equipment	12,078	122	12,200	12,078	122	12,200				24,156	244	24,400
2.2.2	Enginering Fee	293	73	366	293	73	366				586	146	732
2.2.3	VAT	0	1,257	1,257	0	1,257	1,257				0	2,514	2,514
	Sub-total (2.2)	12,371	1,452	13,823	12,371	1,452	13,823				24,742	2,904	27,646
	Total (2.1 + 2.2)	54,362	21,985	**76,347**	12,371	1,452	**13,823**	31,698	17,899	**49,597**	98,431	41,336	**139,767**

Table 30.10.15 Summary of Project Cost for Samarinda (2)

	Civil Work		Equipment		Total	
	Foreign	Local	Foreign	Local	Foreign	Local
Samarinda	73,689	38,432	24,742	2,904	98,431	41,336
Palaran: 4-Berth Case	175,965	94,966	236,316	30,165	412,281	125,131
Palaran: 6-Berth Case	233,945	125,399	354,475	45,246	588,420	170,645
Land Acquisition						
4-Berth Case						28,200
6-Berth Case						32,040
Total of Samarinda						
4-Berth Case	249,654	133,398	261,058	33,069	510,712	194,667
6-Berth Case	307,634	163,831	379,217	48,150	686,851	244,021

(Unit in Million Rp.)

30.11 Phased Planning

30.11.1 Existing Terminal

The measures to be taken at the existing terminal up to 2025 are summarized below (Table 30.11.1). It can deal with the projected volume of general cargo with these measures (Figure 30.11.1).

Table 30.11.1 Milestone at Existing Terminal

Year	Milestone	Procurement	Construction
2006		3 Mobile Cranes, 10 Forklifts	
2007	Container handling moved to Palaran, The existing Terminal dedicated to General Cargo (7 Wharves)		
2010		3 Mobile Cranes, 10 Forklifts	1 General Cargo Wharf, Replacement of the existing Sheds with New Sheds
2011	2 more wharves become operational		
2018			1 Passenger Wharf, Demolition of the existing Passenger Terminal Building
2019	New Passenger Terminal becomes operational		

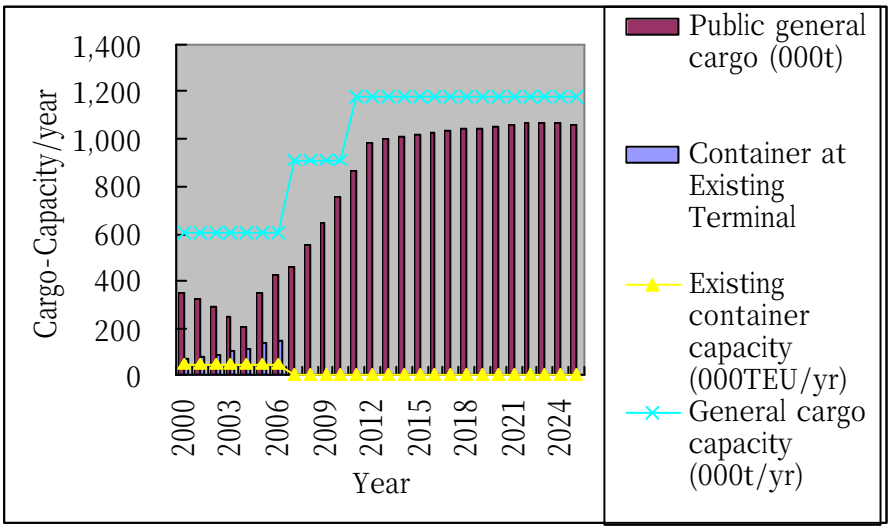


Figure 30.11.1 Demand and Capacity at Existing Terminal

30.11.2 Palaran

The measures to be taken at Palaran up to 2025 are summarized below (Table 30.11.2 and Table 30.11.3). Palaran terminal can deal with the projected volume of container cargo with these measures (Figure 30.11.2 and Figure 30.11.3).

Table 30.11.2 Milestone at Palaran (6-Berth Scenario)

Year	Milestone	Procurement	Construction
2006		3 Gantrie Cranes, 6 RTG, 12 Yard Tractors	3 Container Wharves, CFS, Access Road
2007	Container Terminal becomes operational (3 Wharves)		
2010		1 Gantry Crane, 2 RTG, 4 Yard Tractors	1 Container Wharf, CFS
2011	1 more Wharf becomes operational		
2016		1 Gantry Crane, 2 RTG, 4 Yard Tractors	1 Container Wharf
2017	1 more Wharf become operational		
2022		1 Gantry Crane, 2 RTG, 4 Yard Tractors	1 Container Wharf
2023	1 more Wharf become operational		

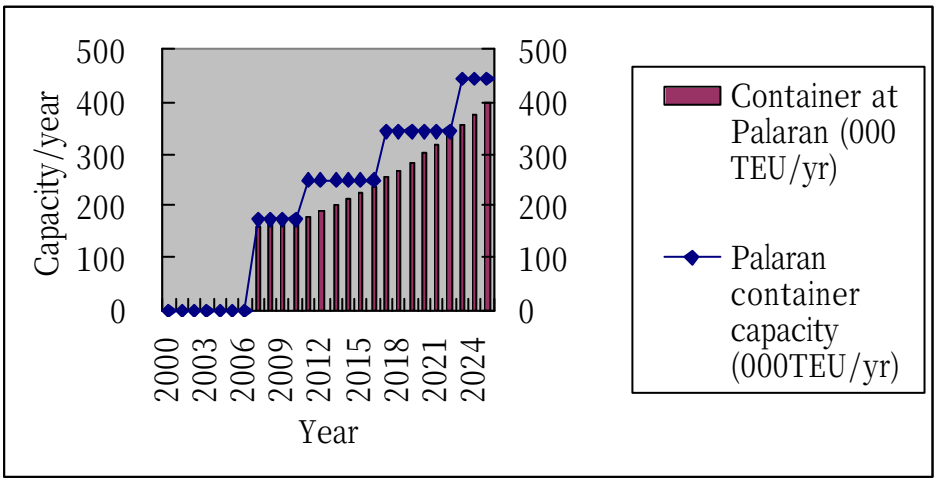


Figure 30.11.2 Demand and Capacity at Palaran Container Terminal (6-berth scenario)

Table 30.11.3 Milestone at Palaran (4-Berth Scenario)

Year	Milestone	Procurement	Construction
2006		2 Gantry Cranes, 4 RTG, 8 Yard Tractors	2 Container Wharves, CFS, Access Road
2007	Container Terminal becomes operational (2 Wharves)		
2010		1 Gantry Crane , 2 RTG, 4 Yard Tractors	1 Container Wharf, CFS
2011	1 more Wharf become operational		
2018		1 Gantry, 2 RTG, 4 Yard Tractors	1 Container Wharf
2019	1 more Wharf become operational		

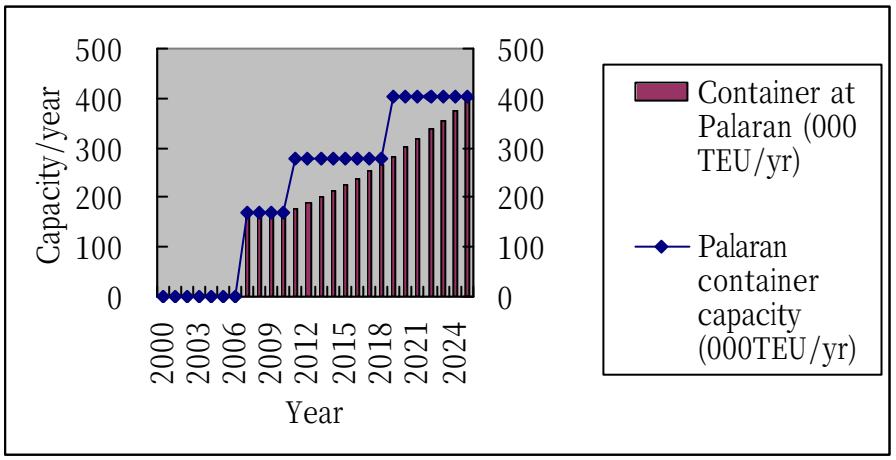


Figure 30.11.3 Demand and Capacity at Palaran Container Terminal (4-Berth Scenario)

30.12 Capacity Evaluation

30.12.1 Simulation Model

Two scenarios were examined for the Short Term Plan (target year 2007) and the Master Plan (target year 2025) of Samarinda. The purpose of this chapter is to carry out the "Vessel Traffic Simulation" for both scenarios and to examine their results.

A numerical simulation model "WITNESS 2000" was employed to evaluate whether the port capacity and the channel capacity would be sufficient to cope with the increasing cargo and vessel traffic throughout the planning period of this study.

The list of the data used in the simulation is shown in Table 30.12.1. The volume of cargoes and the number of calling vessels are in line with the traffic demand forecast for 2007 and 2025. The scenarios are "Case 1 (Four-Berth Scenario)" and "Case 2 (Six-Berth Scenario)". Table 30.12.2 and Table 30.12.3 show the numbers of berths, berth productivity and working hours for Case 1 and Case 2.

The navigation conditions of the Mahakam River such as the river sailing route are shown in Table 30.12.4. These conditions are based on the interviews with IPC IV offices and the statistics issued by IPC IV Samarinda office.

Figure 30.12.1 exemplifies a simulation model.

Table 30.12.1 Cargo Volume and Vessel Call Condition (2007 & 2025)

Berth	Cargo Type	(Year)	Cargo Volume (for one year)	Vessel Calls (for one year)
Public Berth	General Cargo	2007	455,000 tons	1,276
		2025	1,065,000 tons	1,185
	Container Cargo	2007	156,000 TEUs	542
		2025	399,000 TEUs	985
	Passenger	2007	277,000 person	70
		2025	472,000 person	79
Private Berth	Coal	2007	6,633,000 tons	2,315
		2025	16,200,000 tons	4,761
	Timber & Log	2007	2,674,000 tons	2,357
		2025	2,900,000 tons	1,491
	Others	2007	1,304,000 tons	4,863
		2025	1,661,000 tons	3,661

Source: JICA Study Team

Table 30.12.2 Case 1 (4-Berth Scenario) Berth Conditions (2007 & 2025)

Berth	(year)	Nos. of Berth	Productivity	Working Hours
General Cargo	2007	7 nos.	40 tons/hour	24 hours
	2025	9 nos.	40 tons/hour	24 hours
Container Cargo	2007	2 nos.	24 TEUs/hour	24 hours
	2025	4 nos.	24 TEUs/hour	24 hours
Passenger	2007	1 no.	-	2 days
	2025	1 no.	-	2 days

Source: JICA Study Team

Table 30.12.3 Case 2 (6-Berth Scenario) Berth Conditions (2007 & 2025)

Berth	(year)	Nos. of Berth	Productivity	Working Hours
General Cargo	2007	7 nos.	40 tons/hour	18 hours
	2025	9 nos.	40 tons/hour	18 hours
Container Cargo	2007	3 nos.	20 TEUs/hour	18 hours
	2025	6 nos.	20 TEUs/hour	18 hours
Passenger	2007	1 no.	-	2 days
	2025	1 no.	-	2 days

Source: JICA Study Team

Table 30.12.4 Navigation Conditions of Mahakam River

No.	Navigation Condition		Remarks
1.	Maximum Vessel Size	LOA = 153.0m, Draft = 6.80 m	
2.	Vessel Speed	less than 12 knots/hour	
3.	Navigation Activity	24 hours	
4.	Traffic	2 Ways (except at Narrow Points)	One-way Traffic at 6 Points

Source: IPC IV Samarinda Office

30.12.2 Capacity Evaluation of Samarinda Short Term Plan (2007)

The output of the simulation over a span of one year (2007) is shown below. The average berth occupancy rate (BOR) is given in Table 30.12.5. The average BOR of the container berths is 47.7% (Case 1) and 47.0% (Case 2), and do not differ very much from one another.

The average berth waiting time is given in Table 30.12.6. Case 2 requires a waiting time

of 128 minutes, considerably shorter than the 181 minutes in Case 1.

Table 30.12.5 Berth Occupancy Rate (BOR on 2007)

Public Berth	Case 1 (4 Berths Scenario)		Case 2 (6 Berths Scenario)	
	No. of Berth	Average BOR	No. of Berth	Average BOR
General Cargo	7 nos.	24.3 %	7 nos.	30.8 %
Container Cargo	2 nos.	47.7 %	3 nos.	47.0 %
Passenger	1 no.	16.1 %	1 no.	21.5 %

Source: by "WITNESS 2000" Simulation Result

Table 30.12.6 Berth Waiting Time (2007)

Public Berth	Case 1 (4 Berths Scenario)		Case 2 (6 Berths Scenario)	
	No. of Berth	Average Berth Waiting Time	No. of Berth	Average Berth Waiting Time
General Cargo	7 nos.	0 min.	7 nos.	2 min.
Container Cargo	2 nos.	181 min.	3 nos.	128 min.
Passenger	1 no.	69 min.	1 no.	138 min.

Source: by "WITNESS 2000" Simulation Result

30.12.3 Capacity Evaluation of Samarinda Master Plan (2025)

The output of the simulation over a span of one year is shown below. The average BOR is given in Table 30.12.7. The average BOR of the container berths is 55.6% (Case 1) and 57.6% (case 2), and do not differ very much from one another. BOR in both cases can be judged reasonable. The input data for productivity and working hours need to be examined further. The average berth waiting time is given in Table 30.12.8. Case 2 requires a waiting time of 88 minutes, slightly shorter than the 117 minutes of Case 1. With the waiting time less than 2 hours, both cases can be considered reasonable.

Table 30.12.7 Berth Occupancy Rate (BOR on 2025)

Public Berth	Case 1 (4-Berth Scenario)		Case 2 (6-Berth Scenario)	
	No. of Berth	Average BOR	No. of Berth	Average BOR
General Cargo	9 nos.	38.0 %	9 nos.	50.1 %
Container Cargo	4 nos.	55.6 %	6 nos.	57.6 %
Passenger	1 no.	25.9 %	1 no.	34.4 %

Source: by "WITNESS 2000" Simulation Result

Table 30.12.8 Berth Waiting Time (2025)

Public Berth	Case 1 (4-Berth Scenario)		Case 2 (6-Berth Scenario)	
	No. of Berth	Average Berth Waiting Time	No. of Berth	Average Berth Waiting Time
General Cargo	9 nos.	2 min.	9 nos.	12 min.
Container Cargo	4 nos.	117 min.	6 nos.	88 min.
Passenger	1 no.	194 min.	1 no.	363 min.

Source: by "WITNESS 2000" Simulation Result

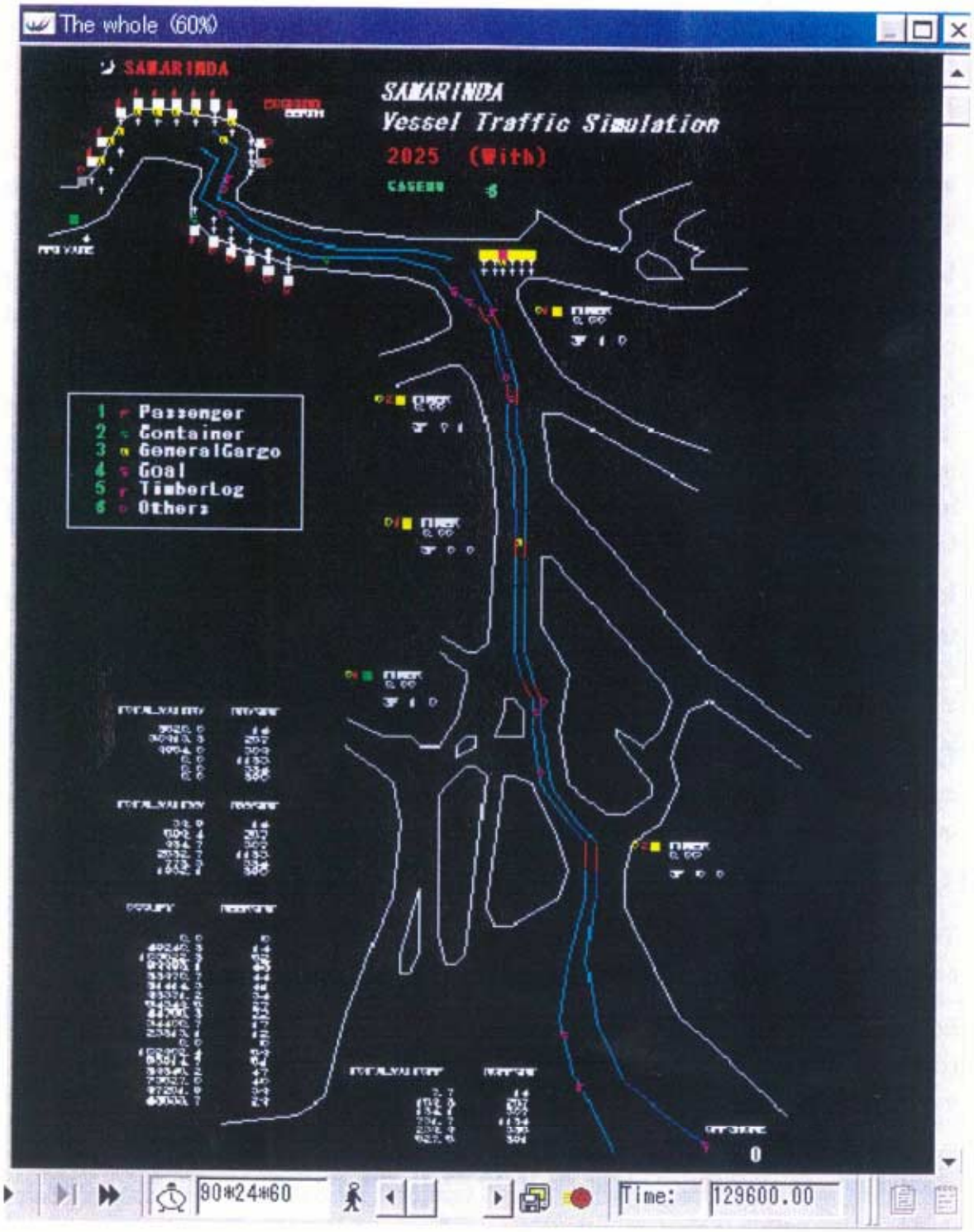


Figure 30.12.1 Samarinda Simulation Model by "WITNESS 2000"

30.13 Economics of Port Master Plan Development at Samarinda

30.13.1 General Introduction to Economic Evaluation

The purpose of economic evaluation is to provide a view of the feasibility of investment from the national, resource viewpoint. It differs from financial analysis which provides information on the direct financial implications of investment including profitability.

Economic evaluation, therefore, considers only resource costs and excludes transfers such as taxes. It also takes into account the price of local (non-traded) inputs which may be overpriced or underpriced relative to market conditions.

In this project, the 'without' scenario is defined as the existing port at Samarinda having minimal development and very little change occurring in infrastructure, equipment and operational procedures.

In this project, under the 'without' case, the existing port facilities will be used to their maximum capacity with an increasing degree of congestion and delay at the berths and in the terminals. This would result in increased waiting time, lower port efficiency and increased transport costs. Container traffic would also be handled at the existing general cargo berths at lower handling rates than would be anticipated at specialized berths.

Ultimately, traffic would be increasingly diverted to other ports such as Balikpapan and this is already happening to some extent, although Balikpapan will not be an adequate alternative until the planned Kariangau terminal is built. Kariangau is expected by 2007 and is a key policy objective of East Kalimantan government.

Under the 'with' project scenario the specialized and additional facilities will enable cargo to be handled more efficiently and cost effectively with ships experiencing less queuing and faster on berth turnaround times.

30.13.2 Methodology

This section evaluates the Master Plan in economic terms. Section 31.5 describes the economic analysis of the short-term programme of port development at Samarinda.

Economic analysis is carried out by means of well-developed techniques and the EIRR (Economic Internal Rate of Return) and NPV (Net Present Value) are the two most often used.

To calculate the NPV of a project, the discount rate is input and a discounted project value (i.e., the value of the project in today's values) is the output. If the output is greater than zero, the project is economically feasible.

In Indonesia, in recent years, the minimum rate required for projects has been 15 percent for non-social projects and 12 percent for social projects such as housing.

Both local costs and all benefits are shadow priced. The foreign portion is regarded as already at market prices so no adjustment is made for imported (traded) inputs.

All costs and benefits are expressed in real terms (i.e., there is no allowance for inflation) although costs and benefits may be increased if there is expected to be an increase in real terms (i.e., above the general level of inflation). Costs and benefits are expressed in real or constant values in the base year of study which for this project is 2001.

The exchange rate used throughout is US$1.0=Rp.9,500.

30.13.3 Project Period

Infrastructure projects are expensive but have long economic and physical lives. Hence, the evaluation period is usually at least 20 years, excluding construction, and often 30 years. Thirty years has been chosen for this project. Costs and benefits are specified for each of the project years. Discounting means that costs and benefits after about 20 years usually have relatively small impacts on the economic feasibility.

30.13.4 Project Costs

Costs for each scenario are divided into capital costs and annual costs. Capital costs are incurred both for the initial investment, and any subsequent, phase and for replacement of fully depreciated assets within the 30 year period (usually equipment has an economic life of less than 30 years). Dredging at Samarinda is only required on an annual basis.

The economic costs of implementing the projects have been estimated based on the financial cost including physical contingency. Price contingency, interest during construction and taxes and duties are then all excluded from the financial cost.

In order to shadow price the projects costs and benefits, a standard conversion factor (SCF) of 0.924 has been generally applied to non-traded (local portion) costs and benefits and a specific factor of 0.75 has been applied to unskilled labour. These factors are currently being applied in other Indonesian project evaluations.

Annual costs (i.e., operating and maintenance costs) are assumed to have only a moderate local content and a SCF of 0.9 has been applied.

All traded costs (foreign portion) have been valued at their border price (i.e., the SCF is assumed as 1.0).

a. <u>Capital Costs and Maintenance Costs</u>
   These have been specified in Section 29.10 and the assumptions made detailed therein. The without scenario envisages minimal development and so the capital and maintenance costs are the incremental costs. Current maintenance expenditure is minimal.

b. <u>Operating Costs</u>

These have been projected originally for the branch based on 1999 and 2000 data and then converted to incremental costs based on incremental cargo volumes for each scenario. The estimates involve a two-stage process. First a realistic assessment of the base year data is needed to establish the reliability of the data and then the future year costs must be estimated taking into account that some costs will directly vary with cargo growth and other costs are fixed or semi-fixed**.**

Base year costs were reviewed in relation to other Indonesian ports including on an IPC wide basis for the 4 IPCs. Secondly, cost data was disaggregated and an estimate made of the likely proportion of fixed sub-costs and variable sub-costs. Based upon a weighted average of these two, an estimate could be made of the link between cargo growth and operating cost growth. So for example, at Samarinda, as cargo growth increases by 10 %, operating costs were estimated to increase by 5%-6%.

The basis of the estimation of operating costs is shown in Table 28.3.

c. Dredging Costs

Dredging costs are subsidised (i.e., RUKINDO contracts are less than cost recovery price), and a substantially increased price was allowed. However, it is unclear as to whether any subsidy still remains in our estimated prices. Hence, only dredging costs were shadow priced by removing the taxable element. As dredging is capital intensive, the shadow pricing of dredging would have only a marginal impact in any case.

30.13.5 Benefits-Quantifiable

The principal quantified benefits of each such project are reduction in ship time in port and/or queuing and avoided land transport and /or transshipment costs. The benefits of the land side passenger terminal area improvements include reduced passenger and vehicle waiting times.

a. Ship Queuing and Savings to Ships

Ship waiting time with and without the project are estimated with a simulation model and this was described in section 20.11. The resulting time savings are then costed by applying the daily cost of the average vessel in key years. Vessel cost per day were established by surveys with ship operators and charterers. These costs are increased in real terms in line with the increased size of vessel projected over time. There is considerable competition in shipping rates at present with the economic recession in Indonesia and elsewhere but the possible increase in real costs over time is difficult to estimate.

The three types of vessels handled at Samarinda public port are container, general cargo and passenger vessels. Since passenger vessels getting priority on arrival, are

relatively few and the proposed terminal is not planned until 2019, savings to passenger vessels were ignored at this stage of the economic analysis.

Ship costs per day are interpolated between 2007 and 2025.

Type of Vessel	GRT, Tonne (t) or TEU	Year	Cost per Day(Rp.m.)
Container	227 teu	In 2007	26.6
	405 teu	**By** 2025	40.9
General Cargo	357 t./300-400 grt	In 2007	6.2
	899 t./650-900 grt	**By** 2025	11.4

Notes: Conversion of tonnes to GRT or v.v. based on Indonesian fleet data and load factors

Sources: Research in Indonesia with shipping companies and charterers.

b. Ship Service Time on Berth and Savings to Ships

Benefits are also generated by faster turnaround of vessels. The simulation model gives time on berth with and without project and annual savings are calculated and costed as in a) above.

c. Avoided Transport Costs

At the point at which the 'without' project capacity is reached, overflow cargo is assumed to be handled elsewhere. In accordance with this likely situation, the Consultants have assumed 100% will be handled at Balikpapan/Kariangau some 105 km. from Samarinda. The avoided costs (benefits) are based on the economic cost and truck transport data used in Indonesia for highway planning.

Road transport costs are based on cost models currently in use in Indonesia. These models are based on the World Bank Highway Development Manual and adapted over many years to Indonesian conditions. The main inputs are vehicle type, speed and road surface.

Heavy truck costs are estimated to amount to Rp3,096 per truck/km assuming that each truck will carry 10 tonnes payload. A load factor of 90% has been assumed bearing in mind traffic imbalance but also probable truck overloads.

It is quite possible that in a regional port study, there would be justification of including some additional capital costs for 'overflow' ports and other infrastructure. In this study, since a specific Master Plan is being assessed, the regional infrastructure requirements have not been considered in detail.

d. Transport Disbenefits

Palaran is some 20 km from the existing Samarinda port and there will be some disbenefit from the additional distance. However, companies are likely to move in the longer term nearer the port and industrial development areas are planned in the

Palaran area. Further, Samarinda city will become increasingly congested and impose penalties on port users.

The disbenefit is assumed to be on the same cost basis as the avoided costs above.

However, for the reasons above, it is assumed that in year 1 of operation the disbenefit for container traffic will be 100 % of the maximum. By 2025 this percentage is assumed to fall to 20 % with the increasing relocation of businesses (In this regard, Palaran is assumed have a locational advantage over Marang Kayu).

Traffic is forecast only up to 2025 and therefore, by convention, all benefits are kept constant thereafter to avoid overestimation.

30.13.6 Unquantified Costs and Benefits

Environmental and social impacts are usually impossible or very difficult to quantify in monetary terms.

Similarly, the generation of employment and employment opportunities, development of the economy and the facilitation of agriculture, trade and industry are all aspects which this project will help develop in a very important manner.

As described in Chapters 8 and 9, East Kalimantan province is resource rich and requires improved river/sea transport to provide much needed support to exploit these resources. The Samarinda Port Master plan sets out to significantly support economic development through the phased implementation of infrastructure and equipment, together with associated operational and related improvements.

The net benefits are shadow priced at 0.923. Conventionally, only benefits to Indonesian shippers and others are included. Therefore, 10% of benefits were assumed to accrue to foreign entities.

30.13.7 Residual Values

The cost of land was allowed to appreciate at 3 % in real terms per year as part of the residual value in 2036. It is also assumed that none of the equipment but that all infrastructure provided between 2020 and 2036 will have 50% life remaining.

The resultant value (about US$18.0 million) has little discernable effect on the EIRR

30.13.8 Results of the Economic Evaluation

The EIRR for the proposed Master Plan was estimated as shown in Table 30.13.1 which also shows the sensitivity analysis.

Table 30.13.1 EIRR Analysis for Samarinda Port Master Plan-4 Berth Option

Samarinda Port Master Plan	EIRR of the 4 Berth option	All Costs: Plus 10%	Benefits: Minus10%	Costs and Benefits Reductions in columns (2) and (3) Combined
	(1)	(2)	(3)	(4)
EIRR (%)	21.8	19.9	19.7	17.9

The EIRR analysis show that the Master Plan is economically viable and that even with two unfavourable factors, combined the EIRR remains well above 15 percent.

At 15 % discount rate, the Net Present Value (NPV) amounts to Rp. 171,806 million. Any positive value of the NPV means the project is viable.

Table 30.13.2 EIRR Analysis for Samarinda Port Master Plan-6 Berth Option

Samarinda Port Master Plan	EIRR of the 6 Berth Option	Cost + 10%	Benefits-10%	Costs and Benefits Reductions in columns (2) and (3) Combined
	(1)	(2)	(3)	(4)
EIRR (%)	17.2	15.5	15.3	13.8

The 6-berth option costs significantly more than the 4-berth, but the incremental benefits between options are either small or not easily measurable. Therefore, the 6-berth imposes additional costs over the 4-berth, but very few additional and measurable benefits.

The EIRR analysis show that the 6-berth Master Plan is economically viable but that with two unfavourable factors, combined the EIRR falls to 13.8 percent.

At 15 % discount rate, the Net Present Value (NPV) amounts to Rp. 65,460 million. Any positive value of the NPV means the project is viable.

It would appear, unless there are measurable benefits and differences between the 4- and 6-berth scenarios, that the 6-berth imposes additional costs for few additional benefits.

Table 30.13.3 ECONOMIC ANALYSIS

EIRR AND NPV for SAMARINDA 4 BERTH -MASTER PLAN

Number	Year	Container Benefits	General Cargo	Avoided Cost	Benefits	Land Transport Disbenefits	NET BENEFIT	Capital Costs	Maintenance and Dredging Costs	NET COST BENEFITS
1	2004							-6,678	0	(6,678)
2	2005							-110,493	0	(110,493)
3	2006							-173,280	0	(173,280)
4	2007	42,135	564	34,574	77,274	(23,282)	44,851	0	-15,204	29,647
5	2008	43,202	582	57,743	101,527	(27,164)	61,773	-1,460	-15,564	44,750
6	2009	44,297	601	79,452	124,350	(25,512)	82,105	-57,391	-15,935	8,778
7	2010	45,423	619	101,381	147,424	(22,716)	103,595	-125,414	-17,217	(39,037)
8	2011	46,580	639	129,651	176,869	(26,387)	125,006	0	-20,492	104,514
9	2012	47,769	658	159,831	208,259	(29,778)	148,264	0	-20,901	127,363
10	2013	48,991	679	167,235	216,905	(32,395)	153,272	0	-21,150	132,122
11	2014	50,247	699	175,060	226,006	(34,776)	158,855	0	-21,407	137,448
12	2015	51,539	720	182,881	235,140	(36,906)	164,673	0	-21,672	143,001
13	2016	52,867	741	190,697	244,306	(38,776)	170,734	-15,102	-21,945	133,687
14	2017	54,233	762	198,301	253,297	(40,056)	177,139	-46,401	-22,226	108,512
15	2018	55,638	784	205,688	262,110	(41,133)	183,565	-100,995	-22,516	60,054
16	2019	57,083	805	213,283	271,172	(42,008)	190,366	0	-26,465	163,901
17	2020	58,570	827	222,151	281,548	(42,683)	198,425	-10,757	-26,791	160,877
18	2021	60,100	849	230,593	291,543	(42,936)	206,518	-5,622	-27,127	173,769
19	2022	61,675	870	239,666	302,211	(43,253)	215,117	0	-27,473	187,644
20	2023	63,296	891	247,887	312,075	(43,201)	223,353	0	-27,830	195,523
21	2024	64,965	912	256,738	322,615	(43,193)	232,116	0	-28,198	203,918
22	2025	66,683	933	265,159	332,775	(43,031)	240,690	-5,622	-28,577	206,491
23	2026						240,690	-59,346	-28,577	152,767
24	2027						240,690	0	-28,577	212,113
25	2028						240,690	-4,345	-28,577	207,767
26	2029						240,690	0	-28,577	212,113
27	2030						240,690	-32,879	-28,577	179,234
28	2031						240,690	-63,205	-28,577	148,907
29	2032						240,690	0	-28,577	212,113
30	2033						240,690	0	-28,577	212,113
31	2034						240,690	0	-28,577	212,113
32	2035						240,690	-31,603	-28,577	180,510
33	2036						240,690	-20,724	-28,577	362,632
								-871,318	-743,042	
										171,243
										Residual Value
										Land
										13,200
										36,061
										Infrastructure
										270364
										135182

Total Capital and Annual Costs= (in	1,614,360

EIRR=	21.8%

NPV @15%
171,806

0.923 SCF

0.9 Carried in Indonesian Ships

Table 30.13.4 ECONOMIC ANALYSIS

EIRR AND NPV for SAMARINDA 6 BERTH-MASTERPLAN

Number	Year	Container Benefits	General Cargo	Avoided Cost	Benefits	Land Transport Disbenefits	NET BENEFIT	Capital Costs	Maintenance and Dredging Costs	NET COST BENEFITS
1	2004						-	(8,139)	-	(8,139)
2	2005						-	(129,851)	-	(129,851)
3	2006						-	(241,828)	-	(241,828)
4	2007	42,135	1,226	27,869	71,230	11,677	49,470	-	(17,776)	31,694
5	2008	43,202	1,242	45,099	89,542	11,213	65,068	(1,460)	(17,776)	45,832
6	2009	44,297	1,257	60,421	105,975	10,315	79,465	(54,526)	(17,776)	7,162
7	2010	45,423	1,271	75,645	122,339	9,377	93,838	(122,731)	(18,675)	(47,567)
8	2011	46,580	1,284	96,698	144,562	9,085	112,541	-	(21,459)	91,082
9	2012	47,769	1,296	119,216	168,281	8,821	132,463	-	(21,459)	111,004
10	2013	48,991	1,307	125,789	176,087	8,536	139,184	-	(21,459)	117,726
11	2014	50,247	1,316	132,784	184,348	8,274	146,264	-	(21,459)	124,805
12	2015	51,539	1,324	139,902	192,766	8,031	153,459	(30,674)	(21,459)	101,327
13	2016	52,867	1,331	147,144	201,342	7,801	160,775	(104,073)	(21,459)	35,243
14	2017	54,233	1,335	154,237	209,806	7,551	168,012	(22,372)	(23,956)	121,684
15	2018	55,638	1,338	161,304	218,280	7,315	175,249	(20,930)	(23,956)	130,363
16	2019	57,083	1,338	168,644	227,065	7,089	182,735	-	(25,269)	157,465
17	2020	58,570	1,336	177,001	236,907	6,870	191,092	(10,757)	(25,287)	155,048
18	2021	60,100	1,330	185,061	246,492	6,638	199,247	(31,057)	(25,305)	142,885
19	2022	61,675	1,322	193,814	256,811	6,433	207,990	(79,722)	(25,323)	102,945
20	2023	63,296	1,311	201,971	266,578	6,214	216,284	-	(27,668)	188,616
21	2024	64,965	1,296	210,822	277,083	6,018	225,174	-	(27,688)	197,486
22	2025	66,683	1,276	219,499	287,458	5,824	233,953	(5,622)	(27,708)	200,623
23	2026						233,953	(90,159)	(27,708)	116,087
24	2027						233,953	-	(27,708)	206,245
25	2028						233,953	-	(27,708)	206,245
26	2029						233,953	-	(27,708)	206,245
27	2030						233,953	(32,879)	(27,708)	173,367
28	2031						233,953	(94,808)	(27,708)	111,437
29	2032						233,953	(4,345)	(27,708)	201,900
30	2033						233,953	-	(27,708)	206,245
31	2034						233,953	-	(27,708)	206,245
32	2035						233,953	(31,603)	(27,708)	174,643
33	2036						233,953	(51,537)	(27,708)	325,951
										171,243
										Residual Value
										Land
										13,200
										36,061
										Infrastructure
										270364
										135182

Total Capital and Annual costs= (in Rp. M.)	1,906,780

EIRR=	17.2%

NPV @15%
65,460

0.923 SCF

0.9 Carried in Indonesian Ships

30.14 Preliminary Financial Analysis

30.14.1 Objective and Methodology of Financial Analysis

(1) Objective

The purpose of the financial analysis is to evaluate the financial feasibility of the project. The analysis focuses on the viability of the project.

(2) Methodology

1) Viability of the Project

The viability of the project is analyzed using the Discount Cash Flow Method and appraised by the Financial Internal Rate of Return (FIRR). The FIRR is the discount rate that makes the discounted costs and revenues over the project life equal, i.e., the rate "r" that satisfies the following formula:

$$\sum_{I=1}^{n} \frac{Bi - Ci}{(1+r)^{i-1}} = 0$$

Where, n : Project life
Bi : Revenue in the i-th year : the first year is the base year
Ci : Cost in the i-th year
r : Discount rate

The revenues and costs that are taken into account for the FIRR calculation are summarized in Table 30.14.1.

Table 30.14.1 Revenues and Costs Employed in FIRR Calculation

Revenues	Costs
1) Operating Revenues by the Project	1) Investments for the Project (installation of handling equipment and replacement/overhaul of equipment) 2) Operating Expenses such as Maintenance, Repair, Rental, Personnel and Other Costs

The revenue and cost items excluded from the FIRR calculation are summarized in Table 30.14.2.

Table 30.14.2 Revenues and Costs Exempted the FIRR Calculation

Revenues	Costs
1) Fund Management Income	1) Depreciation Cost 2) Repayment of the Loan Principal 3) Interest on Loans

When FIRR exceeds a certain threshold, the project is assessed to be financially feasible. The weighted average of the interest rates of various funds generated for the project is used as the threshold.

30.14.2 Assumption for Financial Analysis

(1) Scope of Analysis

The viability of the project was assessed using the revenues and costs related to the project.

1) Base Year

Price as of year 2001 is used in this financial analysis. Price escalation due to inflation for the future is not considered.

2) Project Life

Taking account of conditions of the long-term loans and service lives of port facilities, the project life for the financial analysis is determined as 33 years including 3-year design and construction period.

3) Revenues and Port Tariff

Revenues for the project will be generated from receiving vessels and handling cargoes charged according to the port tariff. The present Samarinda port tariff is basically incorporated in this financial analysis.

4) Costs

Capital cost and annual cost for the project are summarized in Table 30.14.3 and Table 30.14.4. Maintenance dredging cost is included in the annual cost of the project.

5) Fund Raising

It is assumed that 85 % of the total project cost is financed by foreign funds. The remaining 15 % of the total cost is assumed to be raised by domestic funds. The following conditions are employed for each fund in this financial analysis.

a. Foreign Fund

The foreign loan conditions are assumed as follows:

- Loan period : 30 years
- Grace period : 10 years
- Interest rate : 1.0 % per annum
- Repayment : Fixed amount repayment of principal
- Ratio of investment : Less than 85 % of the project cost

b. Domestic Fund

The domestic loan conditions are assumed as follows:

Disbursement Schedule for Samarinda (4 Berth Case)
MASTER PLAN-FINANCIAL

Table 30.14.3 Project Cost of Samarinda Port Development (6-berth Scenario)

Description	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1 Capital Cost																	
1.1 Existing Port																	
(1) Construction																	
1) Construction Cost + Contingency						25,954	24,054										
2) Engineering Fee for Construction					1,402	2,716	2,716										
3) VAT for Construction					120	2,767	2,360										
(2) Equipment																	
4) Equipment Cost			13,200				13,200						6,566				6,570
5) Engineering Fee for Equipment			166				366										
6) VAT for Equipment			1,257				1,257						651				670
1.2 Palaran Container Terminal																	
(1) Construction																	
1) Construction Cost + Contingency		34,667	42,233			26,930	26,699							20,828	20,828		
2) Engineering Fee for Construction	6,929	3,464	3,463			1,833	1,912							3,091	1,585		
3) VAT for Construction	693	3,813	4,560			2,036	3,334							2,181	2,231		
(2) Equipment																	
4) Equipment Cost			117,600				38,200						8,806		58,330		4,400
5) Engineering Fee for Equipment		2,646	885			1,178	588							1,175	588		
6) VAT for Equipment		265	11,818			110	3,959						881	118	5,967		440
(3) Compensation Fee		15,000															
(4) Land Acquisition Cost		13,200															
1.3 Passenger Terminal																	
(1) Construction																	
1) Construction Cost + Contingency														20,283	20,290		
2) Engineering Fee for Construction														3,006	1,503		
3) VAT for Construction														2,330	1,179		
1.4 Dredging																	
(1) Initial Dredging																	
1) Dredging																	
2) Engineering Fee																	
3) VAT																	
Sub-Total	7,621	129,059	134,520	0	8,690	65,372	141,032	0	0	0	0	0	16,910	53,874	113,557	0	11,898
Foreign Portion	4,436	69,058	102,412	0	1,160	46,623	113,375	0	0	0	0	0	14,520	35,533	90,138	0	10,435
Local Portion	3,185	58,969	32,107	0	451	18,749	27,874	0	0	0	0	0	1,202	17,640	22,757	0	1,355
Local Goods	95	20,580	8,476	0	44	5,314	7,581	0	0	0	0	0	594	4,999	4,737	0	774
Local Skilled Labour	2,812	11,255	15,169	0	303	10,278	14,450	0	1	0	0	0	948	8,129	11,527	0	667
Local Unskilled Labour	319	23,043	8,547	0	40	4,256	5,865	0	1	0	0	0	420	4,693	3,672	0	314
2 Annual Cost																	
2.1 Existing Port																	
(1) Maintenance																	
1) Facilities							938	998	998	953	996	993	998	358	938	998	558
2) Equipment				356	366	366	755	331	755	733	733	733	733	755	733	731	733
(2) Operation																	
1) Administration Cost																	
2) Operation Cost																	
2.2 Palaran Container Terminal																	
(1) Maintenance																	
1) Facilities				3,510	2,543	2,540	3,540	3,608	3,628	3,608	3,633	3,628	3,608	3,608	3,608	4,452	4,442
2) Equipment				3,502	3,523	3,528	3,518	5,292	5,292	5,272	5,292	5,321	5,392	5,190	5,270	3,050	7,056
2 Operation																	
Incremental Operation Cost for all Cargo				1,791	2,182	2,805	3,332	3,472	3,927	4,219	4,430	4,733	4,880	5,339	5,327	6,031	4,395
2.4 Passenger Terminal																	
(1) Maintenance																	
1) Facilities																812	812
(2) Operation Cost																647	663
2.5 Maintenance Dredging																	
1) Maintenance Dredging				7,200	7,833	7,599	7,900	7,603	7,850	7,600	7,850	7,800	7,200	7,200	7,800	7,800	7,833
2) VAT				780	783	780	780	780	780	780	780	780	780	780	780	780	780
Sub-Total	0	0	0	16,897	17,236	17,068	19,644	22,162	22,133	24,414	23,699	23,993	24,208	24,605	24,331	23,339	25,881
Grand Total	7,621	129,059	194,532	16,897	25,926	82,508	160,137	22,667	22,133	24,414	23,699	23,993	41,126	77,787	137,888	23,339	43,071

Description	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	Total
1 Capital Cost																	
1.1 Existing Port																	
(1) Construction																	
1) Construction Cost + Contingency																	49,008
2) Engineering Fee for Construction																	6,735
3) VAT for Construction																	[illegible]
(2) Equipment																	
4) Equipment Cost	5,300				4,700	6,300				6,600						32,236	76,002
5) Engineering Fee for Equipment																	392
6) VAT for Equipment	570				572	650				550						8,720	7,678
1.2 Palaran Container Terminal																	
(1) Construction																	
1) Construction Cost + Contingency																	232,079
2) Engineering Fee for Construction																	24,776
3) VAT for Construction																	16,610
(2) Equipment																	
4) Equipment Cost						39,600		4,400		26,400	84,000				33,038	8,698	416,383
5) Engineering Fee for Equipment																	7,096
6) VAT for Equipment						5,160		440		2,640	8,400				3,250	350	44,536
(3) Compensation Fee																	15,000
(4) Land Acquisition Cost																	13,200
1.3 Passenger Terminal																	
(1) Construction																	
1) Construction Cost + Contingency																	40,573
2) Engineering Fee for Construction																	4,509
3) VAT for Construction																	4,557
1.4 Dredging																	
(1) Initial Dredging																	
1) Dredging																	0
2) Engineering Fee																	0
3) VAT																	0
Sub-Total	4,210	0	0	0	6,170	65,116	0	4,840	0	91,030	20,436	0	0	0	35,100	23,116	863,012
Foreign Portion	4,503	0	0	0	5,501	58,646	0	4,259	0	57,891	67,445	0	0	0	31,333	20,493	767,232
Local Portion	303	0	0	0	705	1,470	0	547	0	4,139	7,955	0	0	0	3,978	2,610	216,085
Local Goods	188	0	0	0	188	2,163	0	170	0	1,189	3,523	0	0	0	3,042	732	62,837
Local Skilled Labour	391	0	0	0	499	3,606	0	201	0	2,096	4,023	0	0	0	2,042	1,266	41,531
Local Unskilled Labour	182	0	0	0	192	5,504	0	102	0	656	1,540	0	0	0	734	602	61,730
2 Annual Cost																	0
2.1 Existing Port																	0
(1) Maintenance																	0
1) Facilities	998	993	993	998	958	938	993	993	958	998	998	998	938	993	998	998	26,958
2) Equipment	732	722	742	732	732	732	732	732	732	752	733	732	732	732	732	732	20,456
(2) Operation																	0
1) Administration Cost																	0
2) Operation Cost																	0
2.2 Palaran Container Terminal																	0
(1) Maintenance																	0
1) Facilities	4,442	4,442	4,442	4,442	4,442	4,442	4,442	4,442	4,442	4,442	4,442	4,442	4,442	4,442	4,442	4,442	115,971
2) Equipment	7,055	7,056	7,056	7,056	7,056	7,056	7,053	7,656	7,056	7,566	7,056	7,856	7,656	7,050	7,050	7,056	182,454
2 Operation																	
Incremental Operation Cost for all Cargo	5,785	7,112	7,403	7,873	8,374	8,274	8,274	8,274	8,274	8,274	8,334	8,274	8,274	8,274	8,274	8,234	187,651
2.4 Passenger Terminal																	0
(1) Maintenance																	0
1) Facilities	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812	812	14,615
(2) Operation Cost	681	701	729	751	773	773	773	773	773	773	775	773	773	773	773	773	13,465
2.5 Maintenance Dredging																	0
1) Maintenance Dredging	7,350	7,803	6,843	6,900	7,800	7,800	7,500	7,800	7,803	7,803	7,200	7,800	7,800	7,832	7,800	7,800	234,000
2) VAT	780	780	780	780	780	780	780	780	780	780	780	780	780	780	780	780	23,400
Sub-Total	28,054	20,437	30,834	31,344	31,066	31,566	31,666	31,688	31,066	31,596	31,646	31,666	31,566	31,666	31,676	31,566	823,000
Grand Total	32,264	20,437	30,834	31,344	37,506	97,778	31,666	36,528	31,666	61,296	102,066	31,666	31,566	31,666	65,166	54,768	1,686,033

Table 30.14.4 Project Cost of Samaritada Port Development (4-berth Scenario)

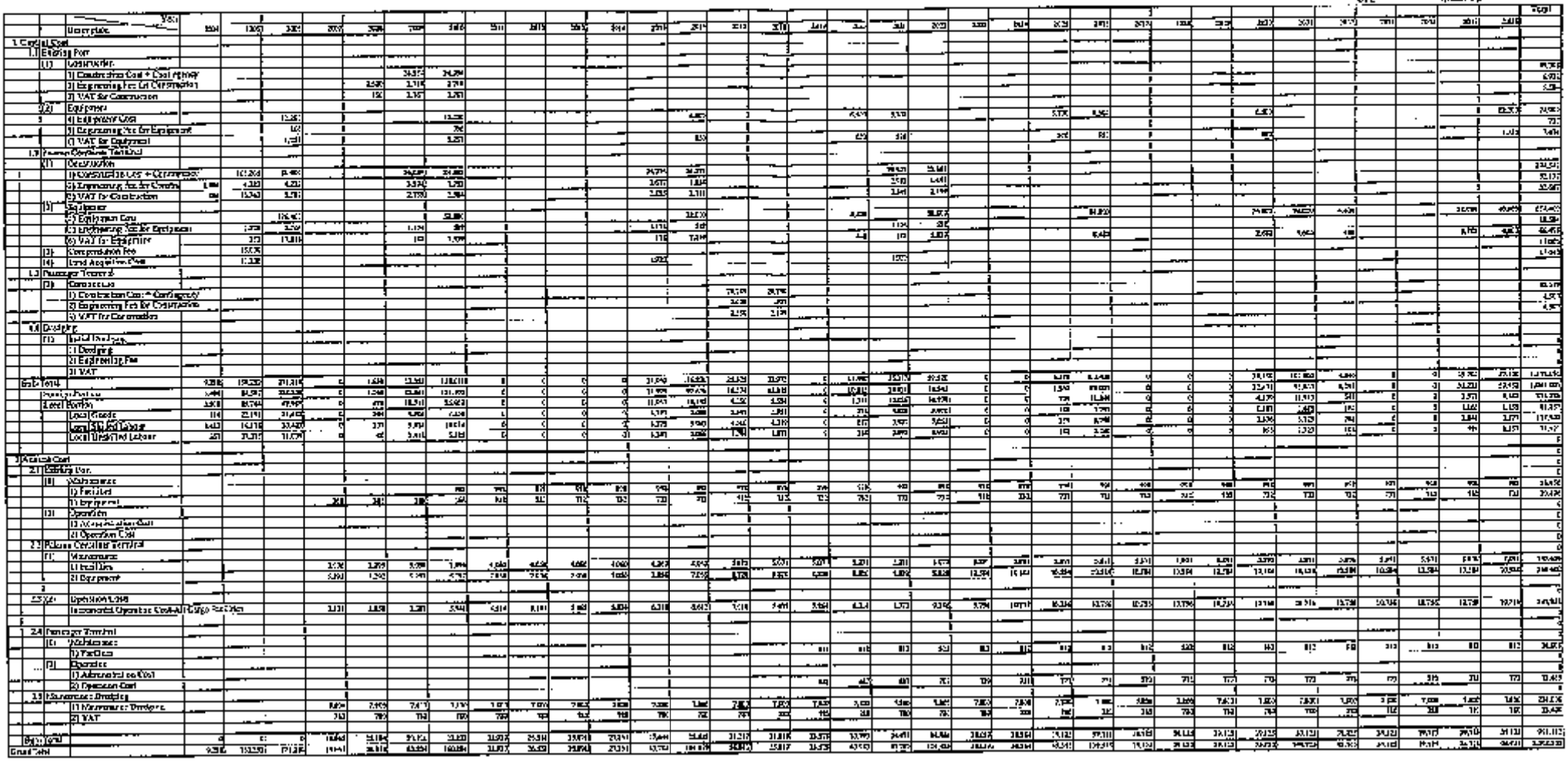


Table 30.14.5 FIRR Calculation (6-berth Scenario)

(Unit:Million USD)

	Year	Revenue (1)	Cost(2)			Difference (1)-(2)	Net Present Value		
			Investment	Expenses	Total		Revenue	Cost	Difference
1	2,004	0	9,288	0	9,288	-9,288	0	9,288	-9,288
2	2,005	0	150,252	0	150,252	-150,252	0	139,568	-139,568
3	2,006	0	257,386	0	257,386	-257,386	0	222,083	-222,083
4	2,007	42,950	0	13,453	13,453	29,497	34,424	10,782	23,641
5	2,008	44,984	0	13,713	13,713	31,271	33,490	10,209	23,281
6	2,009	45,366	31,646	13,982	45,628	-262	31,373	31,554	-181
7	2,010	44,984	93,751	14,259	108,010	-63,026	28,897	69,384	-40,487
8	2,011	47,602	0	17,273	17,273	30,329	28,404	10,307	18,097
9	2,012	50,544	0	17,569	17,569	32,975	28,015	9,738	18,277
10	2,013	53,486	0	17,749	17,749	35,737	27,538	9,138	18,400
11	2,014	56,685	0	17,934	17,934	38,751	27,110	8,577	18,533
12	2,015	60,172	35,062	18,125	53,187	6,985	26,731	23,628	3,103
13	2,016	63,915	109,671	18,322	127,993	-64,078	26,375	52,817	-26,442
14	2,017	67,660	0	21,300	21,300	46,360	25,935	8,165	17,770
15	2,018	89,551	0	21,510	21,510	68,041	31,885	7,659	24,226
16	2,019	94,899	0	21,726	21,726	73,173	31,387	7,186	24,201
17	2,020	100,579	4,840	21,948	26,788	73,791	30,900	8,230	22,670
18	2,021	106,260	29,048	22,178	51,226	55,034	30,324	14,619	15,705
19	2,022	112,609	89,520	22,414	111,934	675	29,851	29,672	179
20	2,023	118,957	0	25,242	25,242	93,715	29,291	6,215	23,076
21	2,024	125,974	0	25,494	25,494	100,480	28,813	5,831	22,982
22	2,025	133,326	0	25,753	25,753	107,573	28,327	5,472	22,855
23	2,026	141,012	93,280	25,753	119,033	21,979	27,829	23,492	4,338
24	2,027	147,528	0	25,753	25,753	121,775	27,045	4,721	22,324
25	2,028	147,528	0	25,753	25,753	121,775	25,122	4,385	20,736
26	2,029	147,528	0	25,753	25,753	121,775	23,335	4,074	19,262
27	2,030	147,528	29,480	25,753	55,233	92,295	21,676	8,115	13,561
28	2,031	147,528	105,600	25,753	131,353	16,175	20,135	17,927	2,208
29	2,032	147,528	4,840	25,753	30,593	116,935	18,703	3,878	14,825
30	2,033	147,528	0	25,753	25,753	121,775	17,373	3,033	14,340
31	2,034	147,528	0	25,753	25,753	121,775	16,138	2,817	13,321
32	2,035	147,528	35,200	25,753	60,953	86,575	14,990	6,193	8,797
33	2,036	147,528	44,000	25,753	69,753	77,775	13,924	6,584	7,341
	Total	3,076,795	1,122,864	653,227	1,776,091	1,300,704	785,341	785,341	0

FIRR= 7.66%

Table 30.14.6 FIRR Calculation (4-berth Scenario)

(Unit:Million USD)

	Year	Revenue (1)	Cost(2)			Difference (1) (2)	Net Present Value 96,832		
			Investment	Expenses	Total		Revenue	Cost	Difference
1	2,004	0	7,621	0	7,621	-7,621	0	7,621	-7,621
2	2,005	0	128,055	0	128,055	-128,055	0	115,476	-115,476
3	2,006	0	180,706	0	180,706	-180,706	0	146,949	-146,949
4	2,007	42,950	0	10,865	10,865	32,085	31,496	7,967	23,528
5	2,008	44,984	0	11,064	11,064	33,920	29,747	7,316	22,431
6	2,009	45,366	34,935	11,271	46,206	-840	27,053	27,554	-501
7	2,010	44,984	96,832	11,484	108,316	-63,332	24,190	58,247	-34,057
8	2,011	47,602	0	14,536	14,536	33,066	23,084	7,049	16,035
9	2,012	50,544	0	14,765	14,765	35,779	22,103	6,457	15,646
10	2,013	53,486	0	14,902	14,902	38,584	21,092	5,876	15,215
11	2,014	56,685	0	15,045	15,045	41,640	20,157	5,350	14,807
12	2,015	60,172	0	15,192	15,192	44,980	19,296	4,872	14,424
13	2,016	63,915	9,680	15,343	25,023	38,892	18,483	7,236	11,247
14	2,017	67,659	27,550	15,499	43,049	24,610	17,643	11,225	6,418
15	2,018	89,551	89,915	15,661	105,576	-16,025	21,058	24,827	-3,768
16	2,019	94,899	0	18,425	18,425	76,474	20,124	3,907	16,217
17	2,020	100,579	4,840	18,596	23,436	77,143	19,233	4,482	14,752
18	2,021	106,260	0	18,772	18,772	87,488	18,324	3,237	15,087
19	2,022	112,609	0	18,954	18,954	93,655	17,511	2,947	14,564
20	2,023	118,957	0	19,142	19,142	99,815	16,681	2,684	13,997
21	2,024	125,974	0	19,336	19,336	106,638	15,930	2,445	13,485
22	2,025	133,326	0	19,535	19,535	113,791	15,204	2,228	12,976
23	2,026	135,001	58,960	19,535	78,495	56,506	13,882	8,072	5,811
24	2,027	135,001	0	19,535	19,535	115,466	12,519	1,812	10,707
25	2,028	135,001	4,840	19,535	24,375	110,626	11,289	2,038	9,251
26	2,029	135,001	0	19,535	19,535	115,466	10,180	1,473	8,707
27	2,030	135,001	29,480	19,535	49,015	85,986	9,180	3,333	5,847
28	2,031	135,001	70,400	19,535	89,935	45,066	8,278	5,515	2,764
29	2,032	135,001	0	19,535	19,535	115,466	7,465	1,080	6,385
30	2,033	135,001	0	19,535	19,535	115,466	6,732	974	5,758
31	2,034	135,001	0	19,535	19,535	115,466	6,071	878	5,192
32	2,035	135,001	35,200	19,535	54,735	80,266	5,474	2,220	3,255
33	2,036	135,001	9,680	19,535	29,215	105,786	4,937	1,068	3,868
34	Total	2,945,513	788,694	513,272	1,301,966	1,643,547	494,417	491,417	0

FIRR= 10.89%

- Loan period : 10 years
- Interest rate : 18.0 % per annum
  (The real interest rate excluding inflation rate)
- Repayment : Fixed amount repayment of principal

c. Weighted Average Interest Rate

The weighted average interest rate of the funds for investments is 3.55 % per annum under the loan conditions stated above. (1.0 * 0.85 + 18.0 * 0.15 = 3.55)

30.14.3 Evaluation of Project

(1) Viability

FIRR of the projects are shown in Table 30.14.5 and Table 30.14.6. FIIRR of each project is exceeding the weighted average interest rate of loan of 3.55 %.

(2) Sensitivity Analysis

Sensitivity analysis is carried out to examine the impact of unexpected future changes such as cargo volume, construction cost, inflation or exchange rate. The following cases are envisioned.

- Case 1 : Investment costs increase by 10 %.
- Case 2 : Revenues decrease by 10 %.
- Case 3 : Investment costs increase by 10 %, and revenues decrease by 10 %.

Results of the sensitivity analysis are shown in Table 30.14.7. In all cases, FIRR exceeds the weighted average interest rate of loan (3.55 % per annum).

Table 30.14.7 Results of Sensitivity Analysis

Case	Samarinda 6-Berth Case	Samarinda 4-Berth Case
Original Case	7.66%	10.89%
Case 1	6.39%	9.60%
Case 2	6.26%	9.46%
Case 3	4.99%	8.20%

30.14.4 Conclusion

Judging from the above analysis, both projects are regarded as financially feasible.