5.4.4 Port Basin and Navigation Channel

(1) Dimension of Navigation Channel

274. Required width of navigation channel for individual type of objective ships is compared in **Table 5.41** by using Indonesian Design Criteria and Japanese Standard respectively. Considering the above comparison, existing conditions of navigation channel and forecasted number of ship calls, the width of channel is recommended to be 1.0 x L (where L = ship length) as summarized in **Table 5.41.**

275. While, the depth of navigation channel should be carefully examined since the water depth of the channel will largely affect the construction and maintenance cost. For this purpose two alternative depth were compared viz.:

Depth (A): The water depth of channel is determined as below LWS (Low Water Spring).

Depth (B): The water depth of channel is determined as below MSL (Mean Sea Level).

276. The water depth of navigation channel is summarized in **Table 5.43** for both alternative depth (A) and (B).

(2) Dredging Volume

277. As shown in **Fig. 5.26** to 5.31, dredging volume of navigation channels and port basins were calculated. The volume for individual ports are shown in **Table 5.43.**

Table 5.41 Width of Navigation Channel

	Indonesian Design Criteria	Japanese Standard
	(4B - 7B) + 30 m	L ~ 1.5L
A-1	158 ~ 254 m	250 ~ 375 m
A-2	142 ~ 226 m	195 ~ 293 m
A-3	126 ~ 198 m	162 ~ 243 m
B-1	114 ~ 177 m	138 ~ 207 m

B: Beam of Ship L: Length of Ship

Table 5.42 Standard Section of Navigation Channels

Name of Port	Max. objective Ships				MSL	Navigation Channel		
	Type	Length (LOA)	Draft (d)	Beam (b)		Depth		Width (LOA)
						(A)	(B)	
Belawan	A-2	(m) 195	(m) 10.3	(m) 28	(LWS, m) 1.5	(LWS, m) -12.0	(LWS, m) -10.5	(m) 195 m
						(-9.5)		(100 m)
Panjang	A-2	195	10.3	28	0.8	-12.0	-11.2	195 m
						(-11.0)		(150 m)
Tg. Priok (I)	A-1	250	11.6	32	0.6	-13.5	-12.9	250 m
						(-11.0)		(200 m)
Tg. Priok (II)	A-2	195	10.3	28	0.6	-12.0	-11.4	195 m
						(-11.0)		(200 m)
Bojonegara	A-1	250	11.6	32	0.6	-13.5	-12.9	250 m
						(-)		(-)
Tg. Emas.	A-2	195	10.3	28	0.6	-12.0	-11.4	195 m
						(-9 m)		(150 m)
Tg. Perak	A-1	250	11.6	32	1.5	-13.5	-12.0	250 m
						(-9 m)		(100 m)
Uj. Pandang	A-2	195	10.3	28	0.9	-12.0	-11.1	195 M
						(-11 m)		(200 m)

Notes: 1 Figures in parenthesis show existing channel.
2 Depth (A) = LWS - desired water depth
Depth (B) = MSL - desired water depth

Table 5.43 Summary of Dreging Volume

(Unit in Thousand cu.m)

Name of port	Required depth below		
	Depth (A) LWS	Depth (B) MSL	Remarks
Belawan Port	11,890	5,190	
Panjang Port	0	0	
Tg. Priok (Alternative I)	8,280	7,540	
Tg. Priok (Alternative II)	11,810	10,980	
Tg. Priok (Alternative III)	5,140	3,450	
Tg. Priok (Alternative IV)	3,960	2,950	
Bojonegara (Alternative III)	3,040	2,700	
Bojonegara (Alternative IV)	4,120	3,700	
Tg. Emas Port	12,860	11,720	
Tg. Perak Port	13,670	6,740	
Ujung Pandang Port	438	110	

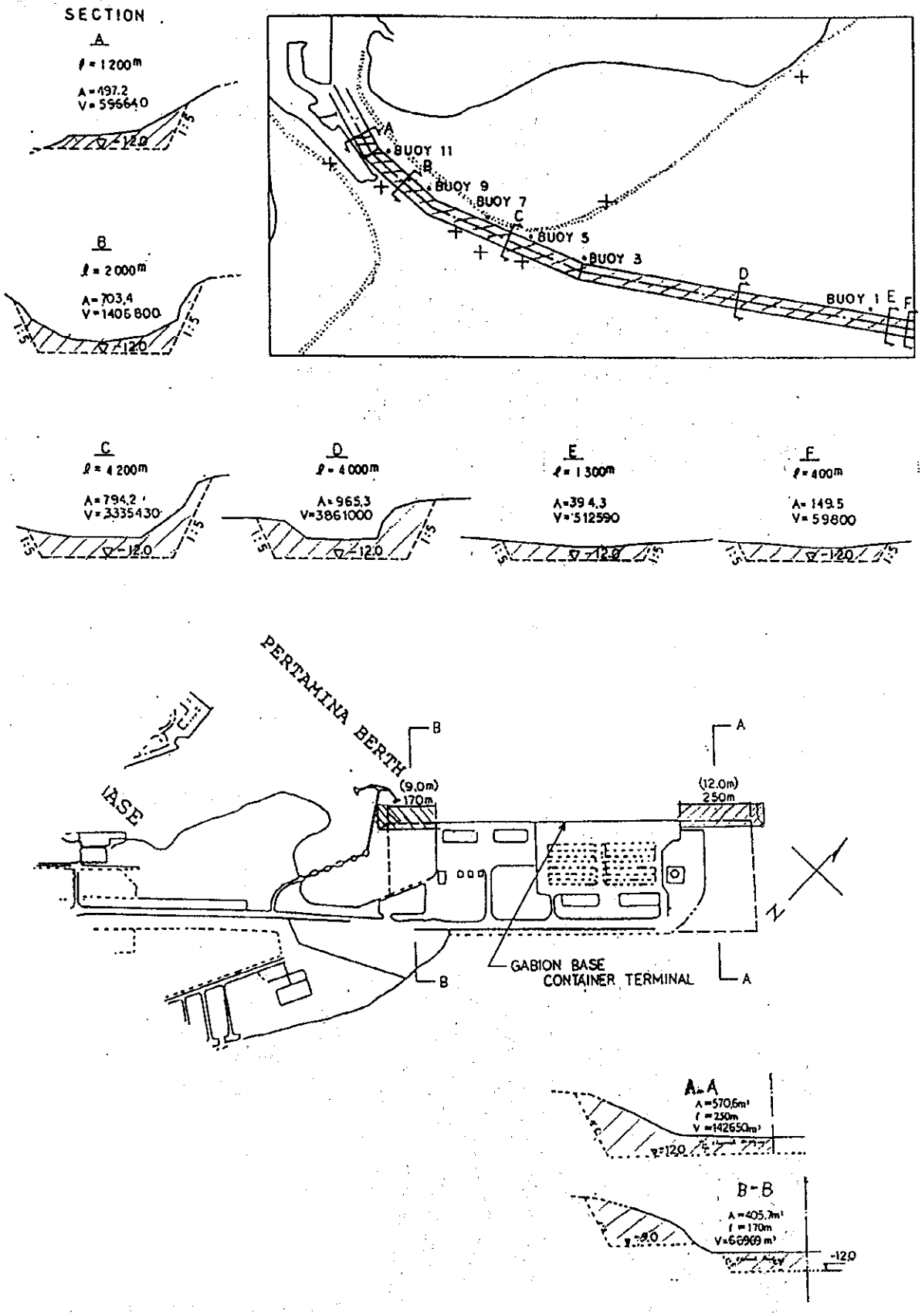
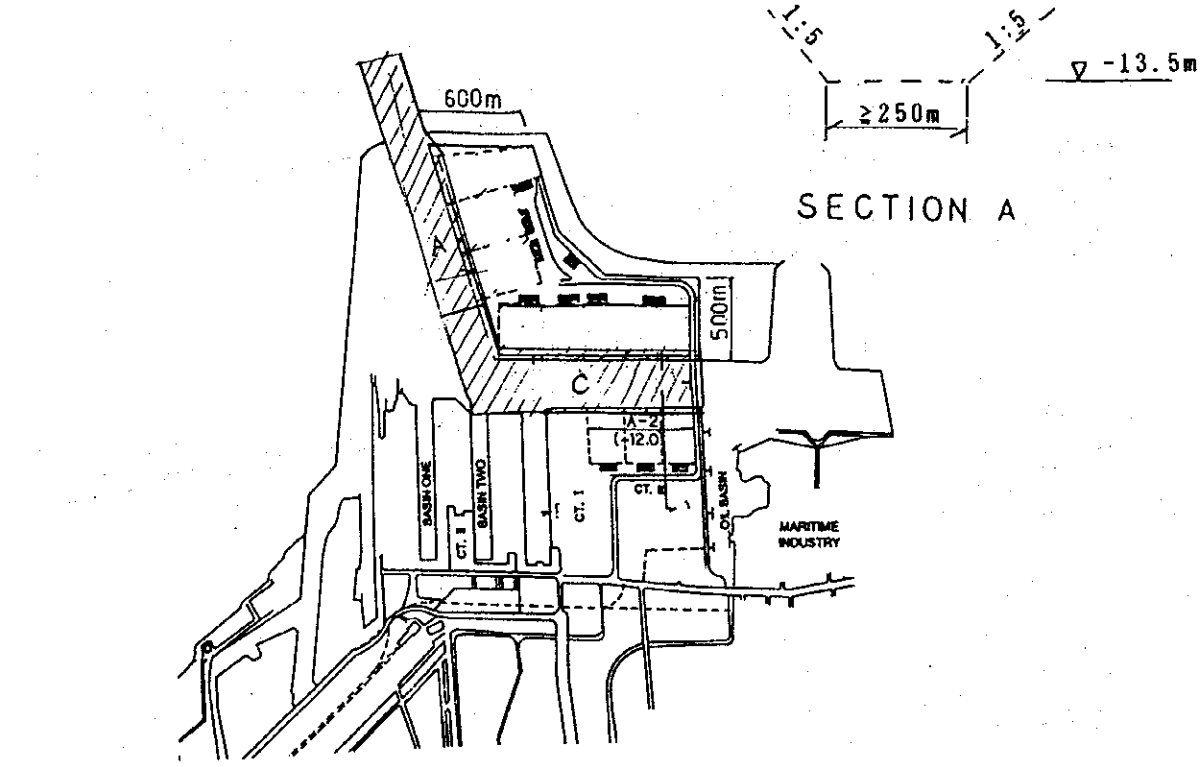
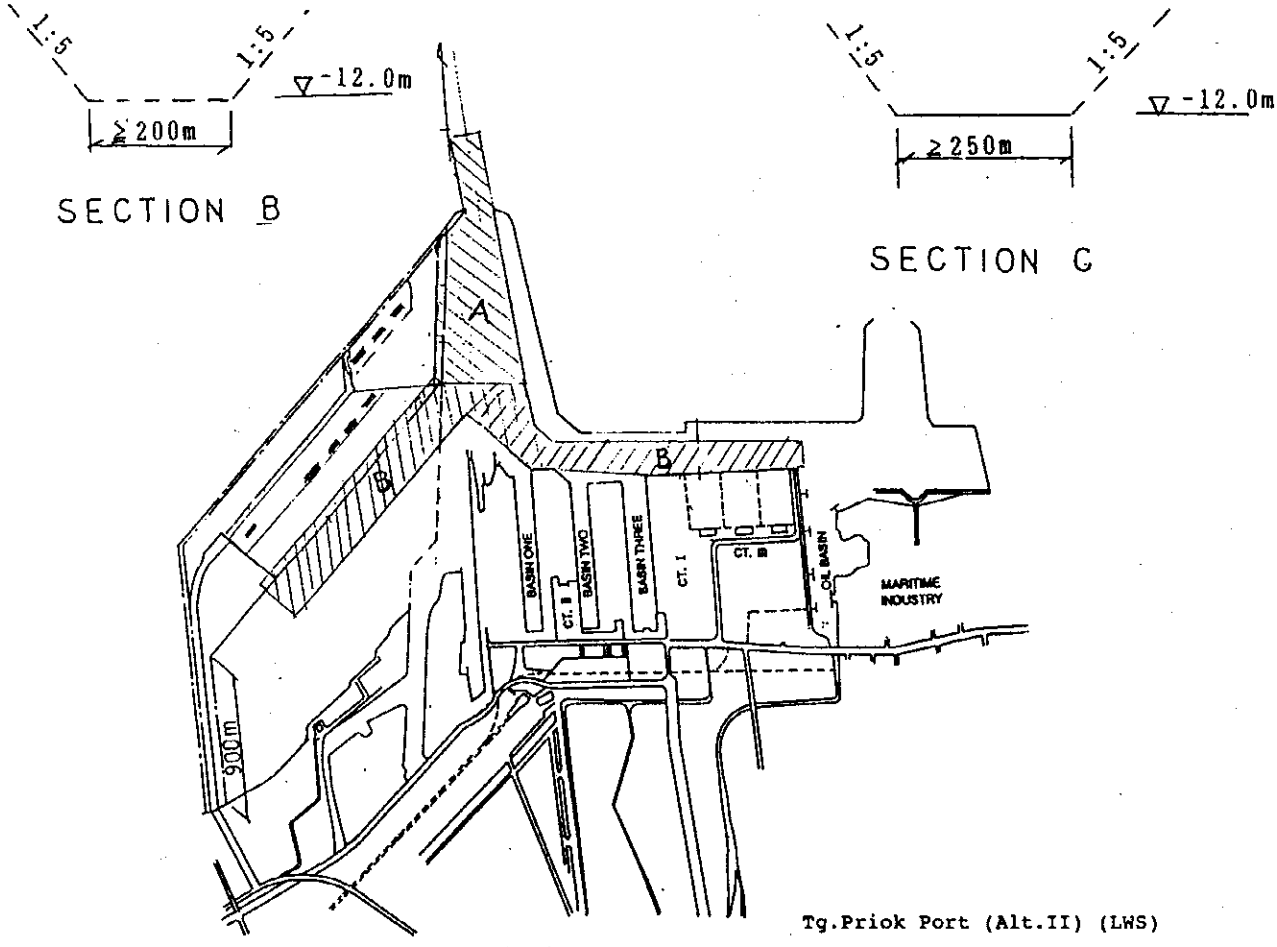


Fig. 5.26 Dredging Access Channel and Basin of Belawan Port



Tg.Priok Port (Alt.I) (LWS)



Tg.Priok Port (Alt.II) (LWS)

Fig. 5.27 Dredging Access Channel and Basin of Tanjung Priok Port (1,2)

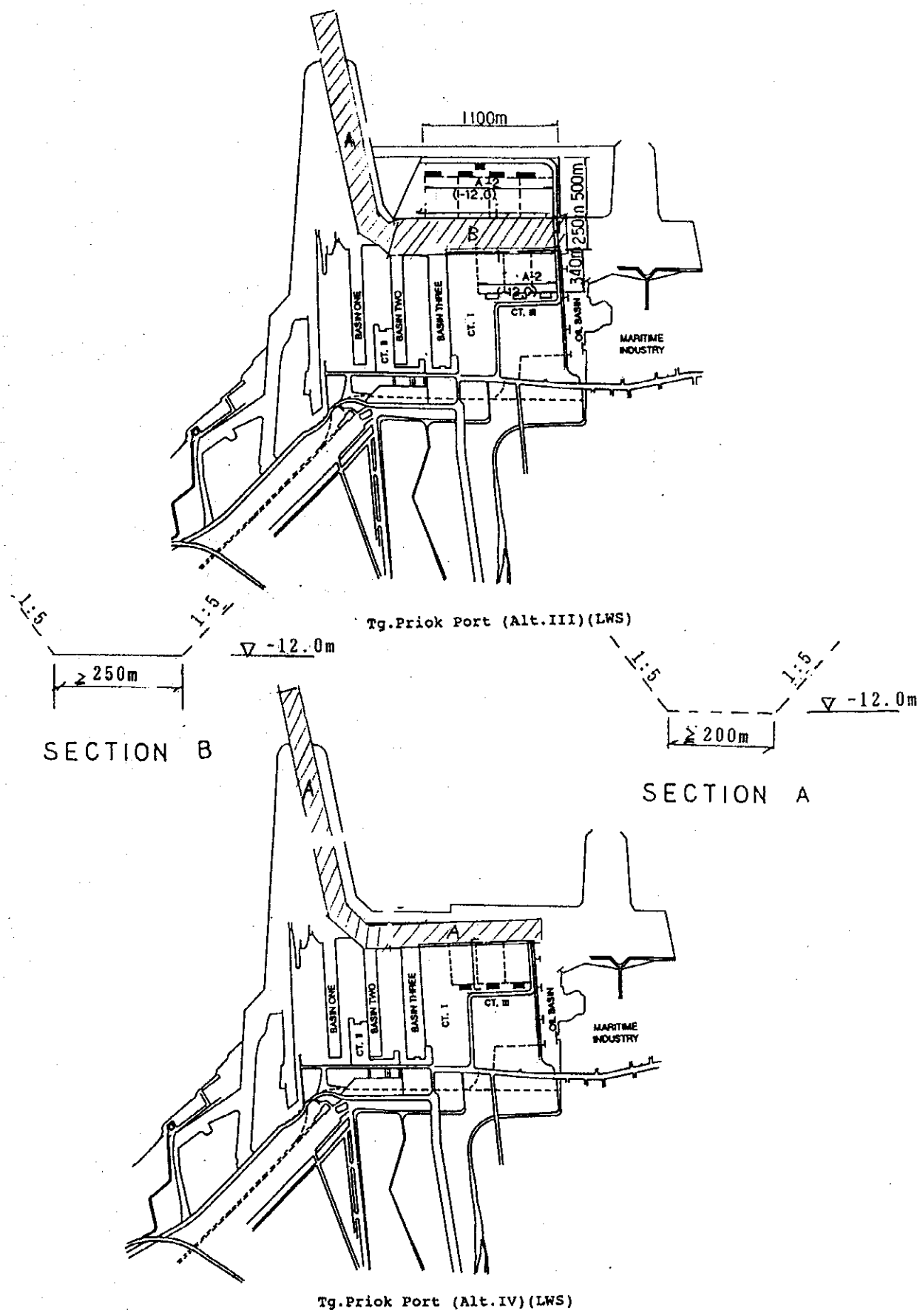


Fig. 5.28 Dredging Access Channel and Basin of Tanjung Priok Port (3,4)

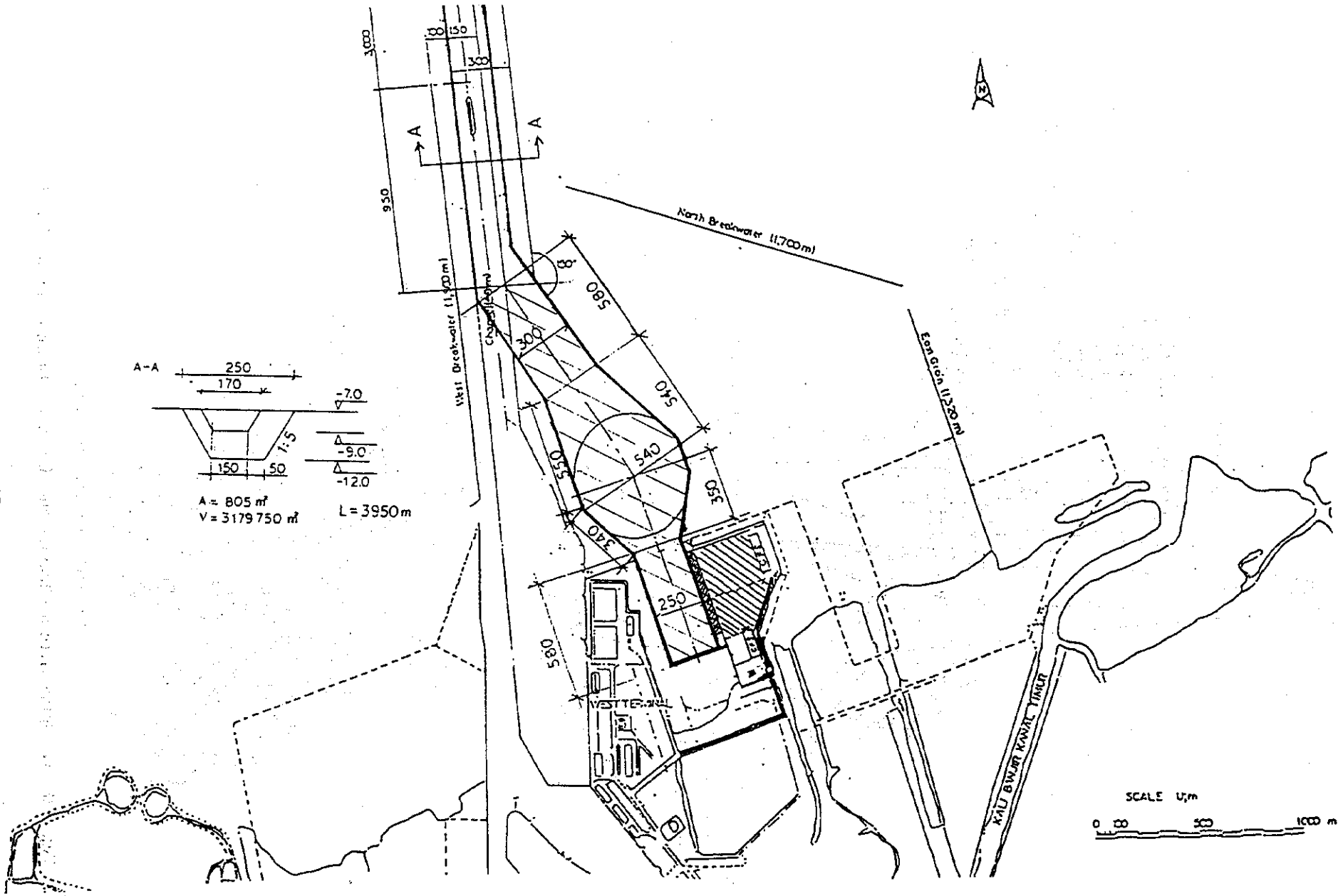


Fig. 5.29 Dredging Access Channel and Basin of Tanjung Emas Port

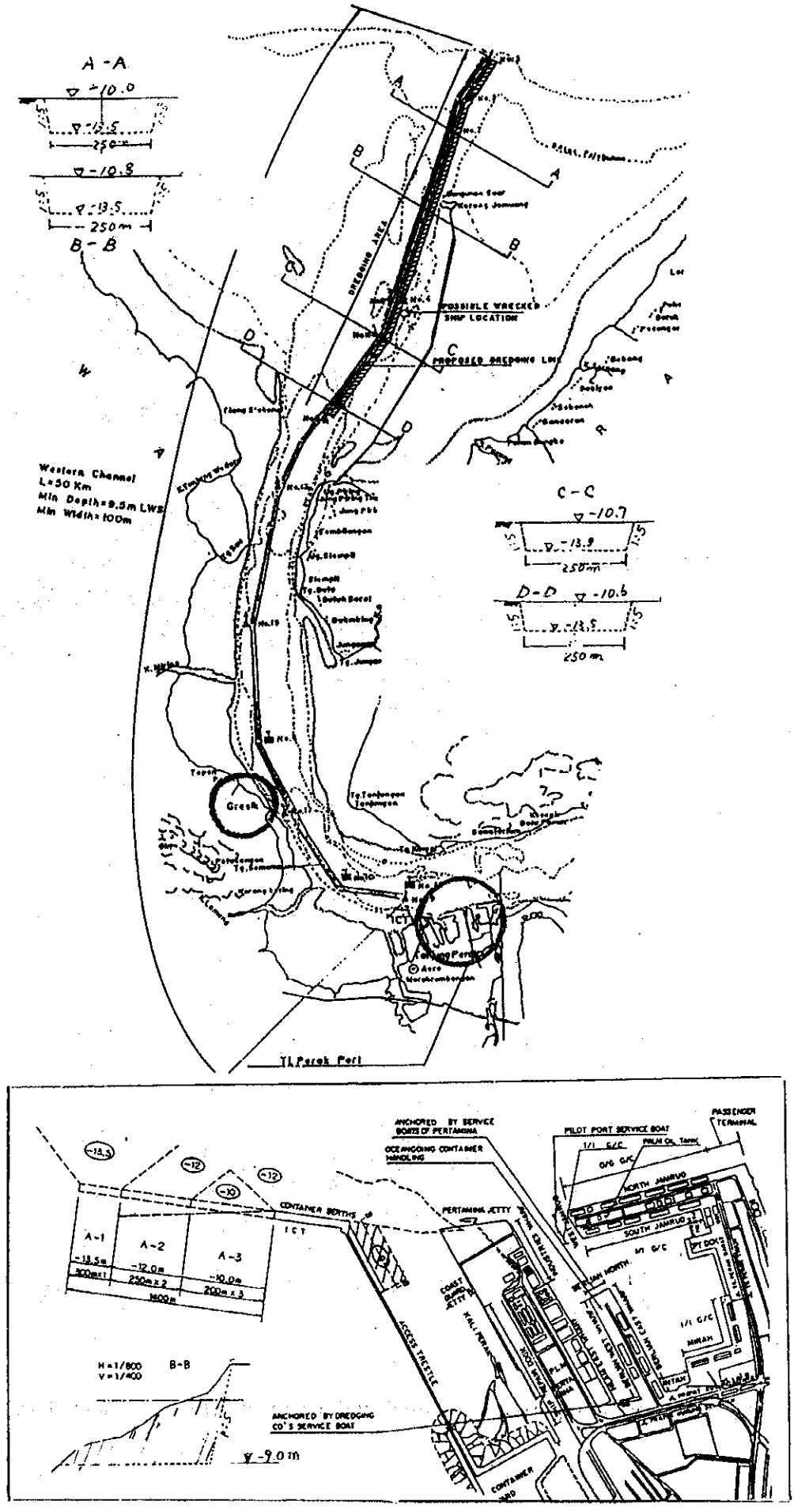


Fig. 5.30 Dredging Access Channel and Basin of Tanjung Perak Port

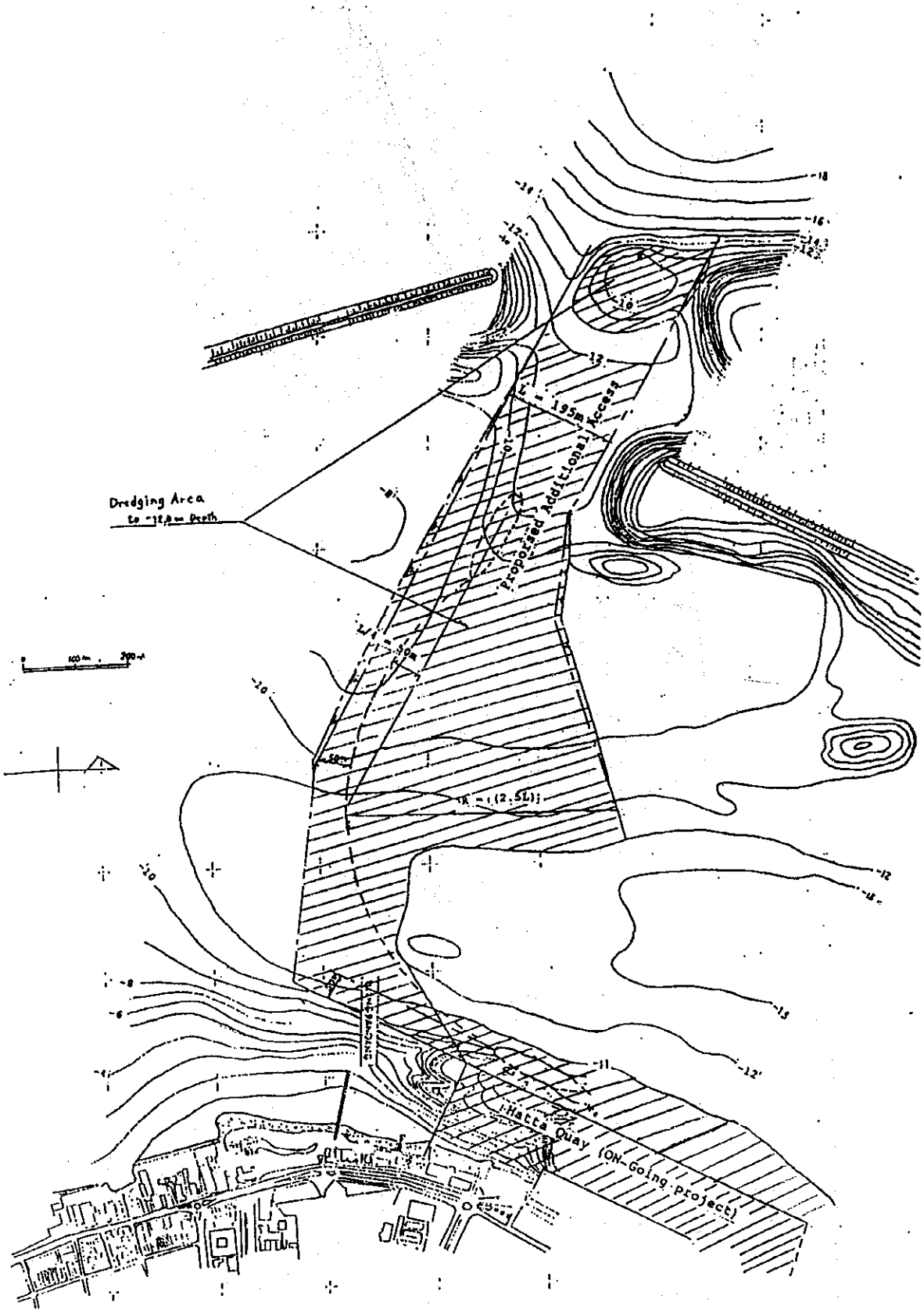


Fig. 5.31 Dredging Access Channel and Basin of Ujung Pandang Port

5.4.5 Container Yard and Facilities

278. The major on-land facilities for the ports other than major marine facilities are determined in this section as described hereunder.

(1) Container Yard and Circular Area

279. Since all proposed port areas are planned by reclamation, soil improvement is recommended for those ports with soft sub-soil such as Belawan, Tg. Priok, Tg. Emas and Tg. Perak. At the same time additional reclamation soil volume is considered for the margin of the settlement by consolidation of sub-soil for the above-mentioned ports.

280. The pavement of the port area will be also affected by the settlement of the reclamation area. A concrete block type pavement for Container Yard is, therefore, considered for the area where heavy container handling equipment will be applied, while ordinary asphalt pavement is considered for the circular area including car parking.

(2) Utilities

1) Power Supply

281. Electric power will be supplied for following facilities.

i) Gantry Cranes.
ii) Reefer container outlets
iii) Street and yard lighting
iv) Work shop
v) Water supply and fire fighting pumps
vi) Buildings consumption

282. Additional connection of main power line and preparation of power center for all ports will be required.

283. As for Bojonegara as an alternative port of Tg. Priok, new connection or supply will be needed not only for electrical power but also for water supply, bunkering and other port maintenance/operation services such as gerbage collection, man-power supply and etc.

2) Fresh Water Supply

284. Water supply for port buildings, work shop, yard, ship supply outlets, green area is considered. Extension from existing port water supply or city water service line are considered except for Bojonegara, where port's own water source should be secured.

3) Fire Fighting System

285. Fire fighting pump system using sea water together with alarm system is recommended.

4) Sewerage

286. Sewage from office, canteen, work shop, vehicle cleaning area and ship sewage are considered to be treated by sewage system.

287. Waste oil cllection tank and treatment system with incinerator should also be provided.

288. As for container box cleaning, which is considered to be done outside of the port by private companies.

(3) Buildings and Miscellaneous Structures

289. For the port operation and control, following buildings and other items are considered.

i) Administration building
ii) CFS
iii) Work shop and garage
iv) Truck scale
v) Guard house, pump house, gate house, public toilet, gate and fence
vi) Green area

(4) Harbour Support Boats

290. For the towing and maneuvering of ships several tug boats and line boats should be considered under the Master Plan.

(5) Others

291. As a miscellaneou item for port operation the following items should also be considered.

i) Communication system (SSB/VHF/UHF etc.)
ii) Port safety, security system (sign boards, public address, etc)
iii) Navigation aids system (light/marker buoys, leading mark/light, etc)

5.4.6 Container Handling Equipment

(1) General

292. As explained in the master plan, each type of the berth is required to be installed the calculated number of the container handling equipment. The required container handling equipment concerned with the new berth extension and additional equipment for the existing facilities are shown in **Table 5.44.**

Table 5.44 Procurement of Handling Equipment

Name of Port	Name of Equipment	Procurement Number	Remarks
Belawan	Rail Mounted Gantry Crane	6	Required quantity=8 (Existing =2)
	Rubber Tired Gantry Crane	15	For 3 Container Berth
	Yard Hustler	27	For 3 container berth and 1 multi purpose berth
	Chassis	53	"
	Top-Loader	4	For 1 multi purpose berth
	Side-Lifter	6	For 3 container berth and 1 multi purpose berth
Panjang	Rail Mounted Gantry Crane	2	Excluding the on-going project
	Rubber Tired Gantry Crane	5	"
	Yard Hustler	8	"
	Chassis	15	"
	Top-Loader	0	
	Side-Lifter	3	"
Tanjung Priok (Alternative 1) (Alternative 2)	Rail Mounted Gantry Crane	25	For New Constructing Berth including CT III
	Rubber Tired Gantry Crane	78	"
	Yard Hustler	108	"
	Chassis	221	"
	Top-Loader	0	
	Side-Lifter	21	"
Tanjung Priok (Alternative 3)	Rail Mounted Gantry Crane	14	"
	Rubber Tired Gantry Crane	47	"
	Yard Hustler	69	"
	Chassis	137	"
	Top-Loader	0	
	Side-Lifter	13	"
and Bojonegara	Rail Mounted Gantry Crane	13	For New Construction Berth
	Rubber Tired Gantry Crane	38	"
	Yard Hustler	53	"
	Chassis	105	"
	Top-Loader	0	
	Side-Lifter	12	"
Tanjung Priok (Alternative 4)	Rail Mounted Gantry Crane	6	For New Constructing Berth including CT III
	Rubber Tired Gantry Crane	20	"
	Yard Hustler	30	"
	Chassis	59	"
	Top-Loader	0	
	Side-Lifter	6	"
and Bojonegara	Rail Mounted Gantry Crane	21	For New Construction Berth
	Rubber Tired Gantry Crane	62	"
	Yard Hustler	89	"
	Chassis	177	"
	Top-Loader	0	
	Side-Lifter	16	"
Tanjung Emas	Rail Mounted Gantry Crane	4	For new construction berth
	Rubber Tired Gantry Crane	11	"
	Yard Hustler	18	"
	Chassis	34	"
	Top-Loader	0	"
	Side-Lifter	4	"
Tanjung Perak	Rail Mounted Gantry Crane	19	"
	Rubber Tired Gantry Crane	73	"
	Yard Hustler	78	"
	Chassis	155	"
	Top-Loader	0	"
	Side-Lifter	17	"
Ujung Pandang	Rail Mounted Gantry Crane	3	For the on-going construction berth
	Rubber Tired Gantry Crane	14	"
	Yard Hustler	54	"
	Chassis	108	"
	Top-Loader	6	"
	Side-Lifter	14	"
Total	Rail Mounted Gantry Crane	59	
	Rubber Tired Gantry Crane	196	
	Yard Hustler	293	
	Chassis	586	
	Top-Loader	10	
	Side-Lifter	65	

(2) Rail Mounted Gantry Crane

293. The master plan recommended for the each port is the rail mounted gantry crane which can work the handling of the 40t containers. Preliminary technical specification is referred to hereunder for a reference purpose.

Preliminary technical specification :

Rated load	: 40 LT
Out reach	: 40 m
Rail gauge	: 20 m
Lift height	: 30 m
Hoist speed	: 50m/120min
Trolley speed	: 180m/min

(3) Rubber Tired Gantry Crane (RTG)

294. The master plan recommended for each port is the rubber tired gantry crane which can work on the six row and four high stacked containers for the new stacking yard. For the existing yard, additional RTGs are provided based on the required numbers. Considering the present situation, additional RTGs are recommended the same type of the existing RTG for the stacking arrangement. Preliminary technical specification is referred to hereunder for reference purposes.

Preliminary technical specification :

Rated load	: 40 LT
Container Stacking	: 4 Tiers + 1 Over (6 Rows + 1 Chassis Lane)
Main Dimension	
Lift height	: 15.24m
Span	: 23.47m
Clearance between legs	: 21.3m
Traversing distance	: 19.07m
Hoist Speed	: min. 20m/min
Travel Speed	: min. 120m/min
Spreader type	: 20'/40'/45' Telescopic

(4) Yard Hustler, Chassis, Top-loader and Side-Lifter

295. Additional Yard Hustler and Chassis are planned to be procured on the basis of the required numbers of the master plan. Additional equipment is recommended to be procured the same type or same suppliers equipment which has existed.

296. Top-loaders are required to be procured for the new domestic container berth without gantry crane, is planned to work handling 40t containers and four high stacked containers. The side lifter is utilized for empty container stacking, are planned to work handling the 10t containers of 40' and four high stacked empty containers.

5.4.7 Cost Estimation of the Master Plan

(1) General

297. The construction cost and procurement cost is estimated on the basis of the preliminary design and required equipment of the port in the master plan. The basic prices are as of 1994 and the foreign currency exchange rate of:

US$=2,134 Rupiah =105.85 Yen

298. The unit prices for the construction cost is summarized in Appendix "D".

(2) Construction Cost

299. The construction cost is estimated based on the combined cost of the construction work. For the new construction in Bojonegara area, it is assumed that the electricity supply and water supply is provided by the electric company and municipal water authority to the site. Therefore, the estimation of water supply and electricity supply system within the each port area is conducted in this study. As to the on-going project of the Ujung Pandang Port, the cost for the additional facilities for New Hatte Quay was considered in this study.

(3) Procurement Cost

300. The procurement prices are determined on the basis of the the imported CIF Jakarta prices, and Indonesian tax and duties are not included.

(4) Project Cost

301. In addition to the construction and procurement costs, the engineering fee for the detailed design and construction supervision, the physical contingency and VAT are estimated in this study.
The contingency for price escalation is not included because it is difficult to predict this with accuracy, especially in the Long-range term.

302. The summary of the cost estimation of each port is presented in the following **Table 5.45**. The comparison of the alternatives of Tanjung Priok Port is shown in **Table 5.46**. Project cost of the each ports are presented in **Table 5.47-5.57**.

Table 5.45 Summary of Project Cost

Name of Port	Description	Quantity	Cost Million Rp	Engineering Fee and Physical Contingency	Remarks
Belawan port	Berth Construction	L.S	51,273	10,255	
	Yard Construction	L.S	149,773	29,955	
	Facilities Construction	L.S	41,298	8,260	
	Dredging and Disposal				
	Case "A"	11,890,000m3	107,010	21,402	
	Case "B"	5,195,000m3	46,755	9,351	
	Procurement Cost	L.S	158,580	4,757	
	(Total) Case "A"			582,562	
	(Total) Case "B"			510,256	
Panjang Port	Berth Construction	L.S	21,862	4,372	
	Yaed Construction	L.S	3,735	747	
	Facilities Construction	L.S	0	0	
	Dredging	80,000m3	1,838	368	
	Procurement Cost	L.S	47,300	1,419	
	Total Cost			81,640	
Tanjung Priok Port Alternative I	Berth Construction	L.S	361,054	72,211	
	Yard Construction	L.S	626,174	125,235	
	Facilities Construction	L.S	234,120	46,824	Excluding the Access
	Dredging and Disposal			0	Road to Highway
	Case "A"	8,280,000m3	74,520	14,904	
	Case "B"	7,540,000m3	67,860	13,572	Excluding the East
	Procurement Cost	L.S	685,680	20,570	Channel Dredging
	(Total) Case "A"			2,261,292	
	(Total) Case "B"			2,253,300	
Tanjung Emas Port	Berth Construction	L.S	53,298	10,660	
	Yard Construction	L.S	81,048	16,210	
	Facilities Construction	L.S	39,528	7,906	
	Dredging and Disposal			0	
	Case "A"	12,864,350m3	115,779	23,156	
	Case "B"	11,724,620m3	105,522	21,104	
	Procurement Cost	L.S	109,930	3,298	
	(Total) Case "A"			460,812	
	(Total) Case "B"			448,503	
Tanjung Perak Port	Berth Construction	L.S	329,094	65,819	
	Yard Construction	L.S	361,464	72,293	
	Facilities Construction	L.S	159,502	31,900	
	Dredging and Disposal			0	
	Case "A"	13,670,000m3	136,700	27,340	
	Case "B"	6,740,000m3	67,400	13,480	
	ProcurementCost	L.S	564,690	16,941	
	(Total) Case "A"			1,765,743	
	(Total) Case "B"			1,682,583	
Ujung Pandang Port	Berth Construction	L.S	0	0	
	Yard Construction	L.S	24,822	4,964	
	Facilities Construction	L.S	14,577	2,915	
	Dredging and Disposal			0	Including the Land
	Case "A"	695,000	8,288	1,658	Acquisition Fee
	Case "B"	438,000	5,300	1,060	
	Procurement Cost	L.S	126,858	3,866	
	Land Acquisition	L.S	164	0	
	(Total) Case "A"			190,112	
	(Total) Case "B"			186,525	
Total	Berth Construction			979,897	
	Yard Construction			1,496,419	
	Facilitie Construction			586,830	
	Dredging and Disposal				
	Case"A"			579,475	
	Case"B"			351,404	
	Procurement			1,697,170	
Grand Total (Alternative I)	Case "A"			5,339,792	
	Case"B"			5,111,721	

Table 5.46 Project Cost of Tanjung Priok Port (Alternative 1~4)

Name of Port	Description	Quantity	Cost Million Rp	Engineering Fee and Physical Contingency	Remarks
Tanjung Priok Port Alternative I	Berth Construction	L.S	361,054	72,211	
	Yard Construction	L.S	626,174	125,235	
	Facilities Construction	L.S	234,120	46,824	Excluding the Access
	Dredging and Disposal			0	Road to Highway
	Case "A"	8,280,000m3	74,520	14,904	
	Case "B"	7,540,000m3	67,860	13,572	Excluding the East
	Procurement Cost	L.S	685,680	20,570	Channel Dredging
	(Total) Case "A"			2,261,292	
	(Total) Case "B"			2,253,300	
Tanjung Priok Port Alternative II	Berth Construction	L.S	328,705	65,741	
	Yard Construction	L.S	710,012	142,002	
	Facilities Construction	L.S	234,120	46,824	
	Dredging and Disposal			0	
	Case "A"	11,810,000m3	106,290	21,258	
	Case "B"	10,980,000m3	98,820	19,764	
	Procurement Cost	L.S	685,680	20,570	
	(Total) Case "A"			2,361,203	
	(Total) Case "B"			2,352,239	
Tanjung Priok Port Alternative III	Berth Construction	L.S	224,350	44,870	
	Yard Construction	L.S	290,778	58,156	
	Facilities Construction	L.S	150,926	30,185	Excluding the Access
	Dredging and Disposal			0	Road to Highway
	Case "A"	5,140,000m3	46,260	9,252	
	Case "B"	3,450,000m3	31,050	6,210	Excluding the East
	Procurement Cost	L.S	392,030	11,761	Channel Dredging
	(Total) Case "A"			1,258,568	
	(Total) Case "B"			1,240,316	
Bojonegara Alternative III	Berth Construction	L.S	129,666	25,933	
	Yard Construction	L.S	109,334	21,867	
	Facilities Construction	L.S	122,540	24,508	Excluding the Access
	Dredging and Disposal			0	Road to the Highway
	Case "A"	2,240,000m3	16,464	3,293	
	Case "B"	1,900,000m3	13,965	2,793	Excluding the Water
	Procurement Cost	L.S	350,400	10,512	and Power Supply to
					the site
	(Total) Case "A"			814,517	
	(Total) Case "B"			811,518	
Total Alternative III	Case "A"			2,073,085	
	Case "B"			2,051,834	
Tanjung Priok Port Alternative IV	Berth Construction	L.S	82,587	16,517	
	Yard Construction	L.S	43,705	8,741	
	Facilities Construction	L.S	64,886	12,977	
	Dredging and Disposal			0	
	Case "A"	3,960,000m3	35,640	7,128	
	Case "B"	2,950,000m3	26,550	5,310	
	Procurement Cost	L.S	168,310	5,049	
	(Total) Case "A"			445,541	
	(Total) Case "B"			434,633	
Bojonegara Alternative IV	Berth Construction	L.S	213,556	42,711	
	Yard Construction	L.S	201,639	40,328	
	Facilities Construction	L.S	192,896	38,579	
	Dredging and Disposal			0	Excluding the Access
	Case "A"	720,000m3	5,292	1,058	Road to the Highway
	Case "B"	300,000m3	2,205	441	
	Procurement Cost	L.S	561,070	16,832	Excluding the Water
					and Power Supply to
	(Total) Case "A"			1,313,962	the site
	(Total) Case "B"			1,310,257	
Total Alternative IV	Case "A"			1,759,503	
	Case "B"			1,744,890	

Table 5.47 Project Cost of Belawan Port

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Berth Construction				
	Quay Dredging	m3	250000	7350	1838
	Sand Replacement	m3	250000	23000	5750
	Steel Pipe Pile(D=608mm t=12 l=45m)	No	712	33075000	23549
	Slope Protection	m2	22000	168000	3696
	Deck and Facilities	m2	12000	1370000	16440
	Sub-total				51273
2	Yard Construction				
	Reclamation	m3	2200000	23000	50600
	Sand Compaction	m3	1950000	5300	10335
	Soil improvement(paper drain 40m)	m	9690000	5059	49022
	Slope Protection	m2	12000	168000	2016
	Yard pavement	m2	230000	135000	31050
	Road pavement	m2	25000	110000	2750
	Utilities	L.S	1		4000
	Sub-total				149773
3	Facilities Construction				
	CFS construction(60mx180m)x2unit	m2	28800	1260000	36288
	Terminal building	m2	0	0	0
	Yard gate	unit	0	0	0
	Repair shop(1000m2)	m2	1000	1260000	1260
	Utilities	L.S	1		3750
	Sub-total				41298
4	Dredging and disposal				
	Dredging channel and basin				
	Case "A " Depth=From LWS	m3	11,890,000	9000	107010
	Case"B" Depth=From MSL	m3	5,195,000	9000	46755
	Sub total(Case"A")				349,354
	Sub total(Case"B")				289,099
	Engineering Fee	%	10		34,935
	Physical Contingency	%	10		34,935
	Total(Case"A")				419,224
	Total (Case"B")				346,919
	Procurement of Equipment			Million(Rp)	
1	Rail Mounted Gantry Crane	unit	6	12,500	75000
2	Rubber Tired Gantry Crane	unit	15	3,900	58500
3	Yard Hustler	unit	27	200	5400
4	Chassis	unit	53	50	2650
5	Top-Loader	unit	4	1,250	5000
6	Side-Lifter	unit	6	150	900
7	Tug-boat 2000HP	unit	2	5,460	10920
8	Mooring Boat 100HP	unit	1	210	210
	Sub total				158,580
	Engineering Fee	%	3		4757.4
	Total				163,337
	Grand total "A"				582,561
	Grand total"B"				510,256

Table 5.48 Project Cost of Panjang Port

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Berth Construction				
	Quay Dredging	m3	80,000	7,350	1,838
	Steel Pipe Pile(D=500mm t=12 l=45m)	No	308	27,400,000	8,439
	Steel Pipe Pile(D=608mm t=12 l=52m)	No	132	38,220,000	5,045
	Slope Protection	m2	8,000	168,000	1,344
	Deck and Facilities	m2	5,134	1,370,000	7,034
	Sub-total				23,700
2	Yard Construction				
	Reclamation	m3	0	0	0
	Sand Compaction	m3	0	0	0
	Soil improvement(paper drain 40m)	m	0	0	0
	Slope Protection	m2	0	0	0
	Yard pavement	m2	23,000	135,000	3,105
	Road pavement	m2	0	0	0
	Utilities	L.S	1		630
	sub-total				3,735
	Sub-total				27,435
	Engineering Fee	%	10		2,743
	Physical Contingency	%	10		2,743
	Total				32,921
	Procurement of Equipment			Million(Rp)	
1	Rail Mounted Gantry Crane	unit	2	12,500	25,000
2	Rubber Tired Gantry Crane	unit	5	3,900	19,500
3	Yard Hustler	unit	8	200	1,600
4	Chassis	unit	15	50	750
5	Top-Loader	unit	0	1,250	0
6	Side-Lifter	unit	3	150	450
7	Tug-boat 2000HP	unit	0	5,460	0
8	Mooring Boat 100HP	unit	0	210	0
	Sub total				47,300
	Engineering Fee	%	3		1,419
	Total				48,719
	Grand Total				81,640

Table 5.49 Project Cost of Tg. Priok Port (Alternative 1)

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Berth Construction				
	Quay Dredging	m3	1,096,000	7,350	8,056
	Sand Replacement	m3	1,096,000	23,000	25,208
	Steel Pipe Pile(D=608mm t=12 l=35m)	No	5,390	25,725,000	138,658
	Slope Protection	m2	158,000	168,000	26,544
	Deck and Facilities	m2	94,500	1,370,000	129,465
	Steel Sheet Pile25mx750m, 15m x 2400m	m	136,875	242,000	33,124
	sub-total				361,054
2	Yard Construction				0
	Reclamation	m3	12,000,000	23,000	276,000
	Sand Compaction	m3	12,000,000	5,300	63,600
	Soil improvement(paper drain 19m)	m	16,000,000	5,059	80,944
	Slope Protection	m2	65,000	168,000	10,920
	Yard pavement	m2	1,100,000	135,000	148,500
	Road pavement	m2	51,000	110,000	5,610
	Trestle	m	300	25,000,000	7,500
	Utilities	L.S	1		32,300
	sub-total				625,374
3	Facilities Construction				0
	CFS construction(80mx180m)x6unit	m2	86,400	1,260,000	108,864
	CFS (80mx200m)x3unit	m2	48,000	1,260,000	60,480
	CFS (70mx150m)x2unit	m2	21,000	1,260,000	26,460
	Terminal building(6,000m2x1, 1200m2x1)	m2	7,200	1,580,000	11,376
	Yard gate	unit	2	450,000,000	900
	Repair shop(1000m2)x4unit	m2	4,000	1,260,000	5,040
	Utilities	L.S	1		21,000
	sub-total				234,120
4	Dredging and disposal				0
	Dredging channel and basin				0
	Case "A " Depth=From LWS	m3	8,280,000	9,000	74,520
	Case"B" Depth=From MSL	m3	7,540,000	9,000	67,860
5	Demolishing Breakwater	m	3,200	250,000	800
	Sub total(Case"A")				1,295,868
	Sub total(Case"B")				1,289,208
	Engineering Fee	%	10		129,587
	Physical Contingency	%	10		129,587
	Total(Case"A")				1,555,042
	Total (Case"B")				1,547,050
	Procurement of Equipment			Million(Rp)	
1	Rail Mounted Gantry Crane	unit	25	12,500	312,500
2	Rubber Tired Gantry Crane	unit	78	3,900	304,200
3	Yard Hustler	unit	108	200	21,600
4	Chassis	unit	221	50	11,050
5	Top-Loader	unit	0	1,250	0
6	Side-Lifter	unit	21	150	3,150
7	Tug-boat 2000HP	unit	6	5,460	32,760
8	Mooring Boat 100HP	unit	2	210	420
	Sub total				685,680
	Engineering Fee	%	3		20,570
	Total				706,250
	Grand Total Case"A"				2,261,292
	Grand Total Case"B"				2,253,300

Table 5.50 Project Cost of Tg. Priok Port (Alternative 2)

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Berth Construction				
	Quay Dredging	m3	1,117,000	7,350	8,210
	Sand Replacement	m3	1,117,000	23,000	25,691
	Steel Pipe Pile(D=608mm t=12 l=35m)	No	4,921	25,725,000	126,593
	Slope Protection	m2	138,000	168,000	23,184
	Deck and Facilities	m2	84,000	1,370,000	115,080
	Steel Sheet Pile25mx750m, 15m x 2050m	m	123,750	242,000	29,948
	sub-total				328,705
2	Yard Construction				0
	Reclamation	m3	14,600,000	23,000	335,800
	Sand Compaction	m3	14,600,000	5,300	77,380
	Soil improvement(paper drain 19m)	m	18,000,000	5,059	91,062
	Slope Protection	m2	110,000	168,000	18,480
	Yard pavement	m2	1,100,000	135,000	148,500
	Road pavement	m2	69,000	110,000	7,590
	Trestle	m	0	25,000,000	0
	Utilities	L.S	1		31,200
	sub-total				710,012
3	Facilities Construction				0
	CFS construction(80mx180m)x6unit	m2	86,400	1,260,000	108,864
	CFS (80mx200m)x3unit	m2	48,000	1,260,000	60,480
	CFS (70mx150m)x2unit	m2	21,000	1,260,000	26,460
	Terminal building(6,000m2x1, 1200m2x1)	m2	7,200	1,580,000	11,376
	Yard gate	unit	2	450,000,000	900
	Repair shop(1000m2)x4unit	m2	4,000	1,260,000	5,040
	Utilities	L.S	1		21,000
	sub-total				234,120
4	Dredging and disposal				0
	Dredging channel and basin				0
	Case "A " Depth=From LWS	m3	11,810,000	9,000	106,290
	Case"B" Depth=From MSL	m3	10,980,000	9,000	98,820
5	Demolishing Breakwater	m	2,300	250,000	575
	Sub total(Case"A")				1,379,702
	Sub total(Case"B")				1,372,232
	Engineering Fee	%	10		137,970
	Physical Contingency	%	10		137,970
	Total(Case"A")				1,655,642
	Total (Case"B")				1,646,678
	Procurement of Equipment			Million(Rp)	
1	Rail Mounted Gantry Crane	unit	25	12,500	312,500
2	Rubber Tired Gantry Crane	unit	78	3,900	304,200
3	Yard Hustler	unit	108	200	21,600
4	Chassis	unit	221	50	11,050
5	Top-Loader	unit	0	1,250	0
6	Side-Lifter	unit	21	150	3,150
7	Tug-boat 2000HP	unit	6	5,460	32,760
8	Mooring Boat 100HP	unit	2	210	420
	Sub total				685,680
	Engineering Fee	%	3		20,570
	Total				706,250
	Grand Total Case"A"				2,341,322
	Grand Total Case"B"				2,332,358

Table 5.51 Project Cost of Tg. Priok Port (Alternative 3)

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Berth Construction				
	Quay Dredging	m3	447,600	7,350	3,290
	Sand Replacement	m3	447,600	23,000	10,295
	Steel Pipe Pile(D=608mm t=12 l=35m)	No	3,528	25,725,000	90,756
	Slope Protection	m2	90,000	168,000	15,120
	Deck and Facilities	m2	60,000	1,370,000	82,200
	Steel Sheet Pile(25mx750m, 15mx1250m)	m	93,750	242,000	22,688
	sub-total				224,350
2	Yard Construction				0
	Reclamation	m3	5,000,000	23,000	115,000
	Sand Compaction	m3	5,000,000	5,300	26,500
	Soil improvement(paper drain 40m)	m	560,000	5,059	2,833
	Slope Protection	m2	55,000	168,000	9,240
	Yard pavement	m2	760,000	135,000	102,600
	Road pavement	m2	48,000	110,000	5,280
	Trestle	m	300	25,000,000	7,500
	Utilities	L.S	1		21,500
	sub-total				290,453
3	Facilities Construction				
	CFS construction(80mx180m)x7unit	m2	100,800	1,260,000	127,008
	Terminal building(1800m2x2unit)	m2	3,600	1,580,000	5,688
	Yard gate	unit	1	450,000,000	450
	Repair shop(1000m2 x3unit)	m2	3,000	1,260,000	3,780
	Utilities	L.S	1		14,000
	sub-total				150,926
4	Dredging and disposal				0
	Dredging channel and basin				0
	Case "A " Depth=From LWS	m3	5,140,000	9,000	46,260
	Case"B" Depth=From MSL	m3	3,450,000	9,000	31,050
5	Demolishing Breakwater	m	1,300	250,000	325
	Sub total(Case"A")				712,314
	Sub total(Case"B")				697,104
	Engineering Fee	%	10		71,231
	Physical Contingency	%	10		71,231
	Total(Case"A")				854,776
	Total (Case"B")				836,524
	Procurement of Equipment			Million(Rp)	
1	Rail Mounted Gantry Crane	unit	14	12,500	175,000
2	Rubber Tired Gantry Crane	unit	47	3,900	183,300
3	Yard Hustler	unit	69	200	13,800
4	Chassis	unit	137	50	6,850
5	Top-Loader	unit	0	1,250	0
6	Side-Lifter	unit	13	150	1,950
7	Tug-boat 2000HP	unit	2	5,460	10,920
8	Mooring Boat 100HP	unit	1	210	210
	Sub total				392,030
	Engineering Fee	%	3		11,761
	Total				403,791
	Grand total "A"				1,258,567
	Grand total"B"				1,240,315

Table 5.52 Project Cost of Tg. Priok Port (Alternative 4)

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Berth Construction				
	Quay Dredging	m3	0	7,350	0
	Sand Replacement	m3	0	23,000	0
	Steel Pipe Pile(D=608mm t=12 l=35m)	No	1,323	25,725,000	34,034
	Slope Protection	m2	38,000	168,000	6,384
	Deck and Facilities	m2	22,500	1,370,000	30,825
	Steel Sheet Pile(25mx750m,)	m	46,875	242,000	11,344
	sub-total				82,587
2	Yard Construction				0
	Reclamation	m3	0	23,000	0
	Sand Compaction	m3	0	5,300	0
	Soil improvement(paper drain 40m)	m	0	5,059	0
	Slope Protection	m2	0	168,000	0
	Yard pavement	m2	255,000	135,000	34,425
	Road pavement	m2	18,000	110,000	1,980
	Trestle	m	0	25,000,000	0
	Utilities	L.S	1		7,300
	sub-total				43,705
3	Facilities Construction				
	CFS construction(80mx180m)x3unit	m2	43,200	1,260,000	54,432
	Terminal building(1800m2x1unit)	m2	1,800	1,580,000	2,844
	Yard gate	unit	1	450,000,000	450
	Repair shop(1000m2 x1unit)	m2	1,000	1,260,000	1,260
	Utilities	L.S	1		5,900
	sub-total				64,886
4	Dredging and disposal				0
	Dredging channel and basin				0
	Case "A " Depth=From LWS	m3	3,960,000	9,000	35,640
	Case"B" Depth=From MSL	m3	2,950,000	9,000	26,550
5	Demolishing Breakwater	m	0	250,000	0
	Sub total(Case"A")				226,818
	Sub total(Case"B")				217,728
	Engineering Fee	%	10		22,682
	Physical Contingency	%	10		22,682
	Total(Case"A")				272,182
	Total (Case"B")				261,272
	Procurement of Equipment			Million(Rp)	
1	Rail Mounted Gantry Crane	unit	6	12,500	75,000
2	Rubber Tired Gantry Crane	unit	20	3,900	78,000
3	Yard Hustler	unit	30	200	6,000
4	Chassis	unit	59	50	2,950
5	Top-Loader	unit	0	1,250	0
6	Side-Lifter	unit	6	150	900
7	Tug-boat 2000HP	unit	1	5,460	5,460
8	Mooring Boat 100HP	unit	0	210	0
	Sub total				168,310
	Engineering Fee	%	3		5,049
	Total				173,359
	Grand total "A"				445,541
	Grand total"B"				434,631

Table 5.53 Project Cost of Bojonegara (Alternative 3)

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Berth Construction				
	Steel Pipe Pile(D=608mm t=12 l=26m)	No	2,324	19,110,000	44,412
	Slope Protection	m2	63,000	168,000	10,584
	Deck and Facilities	m2	39,600	1,370,000	54,252
	Steel Sheet Pile25mx1350m,	m	84,375	242,000	20,419
	sub-total				129,666
2	Yard Construction				0
	Dredging and Reclamation	m3	800,000	10,500	8,400
	Sand Compaction	m3	800,000	5,300	4,240
	Soil improvement(paper drain 19m)	m	0	5,059	0
	Slope Protection	m2	63,000	168,000	10,584
	Yard pavement	m2	460,000	135,000	62,100
	Road pavement	m2	91,000	110,000	10,010
	Trestle	m	0	25,000,000	0
	Utilities	L.S	1		14,000
	sub-total				109,334
3	Facilities Construction				0
	CFS construction(80mx200m)x3unit	m2	48,000	1,260,000	60,480
	CFS (80mx150m)x1unit	m2	12,000	1,260,000	15,120
	CFS (70mx150m)x1unit	m2	10,500	1,260,000	13,230
	Terminal building(6,000m2x1.)	m2	6,000	1,580,000	9,480
	Yard gate	unit	1	450,000,000	450
	Repair shop(1000m2)x3unit	m2	3,000	1,260,000	3,780
	Utilities and Others	L.S	1		20,000
	sub-total				122,540
4	Dredging and Disposal				0
	(Excluding Reclamation Volume)				0
	Case "A " Depth=From LWS	m3	2,240,000	7,350	16,464
	Case"B" Depth=From MSL	m3	1,900,000	7,350	13,965
5	Demolishing Breakwater	m	0	250,000	0
	Sub total(Case"A")				378,004
	Sub total(Case"B")				375,505
	Engineering Fee	%	10		37,800
	Physical Contingency	%	10		37,800
	Total(Case"A")				453,604
	Total (Case"B")				450,607
	Procurement of Equipment			Million(Rp)	
1	Rail Mounted Gantry Crane	unit	13	12,500	162,500
2	Rubber Tired Gantry Crane	unit	38	3,900	148,200
3	Yard Hustler	unit	53	200	10,600
4	Chassis	unit	105	50	5,250
5	Top-Loader	unit	0	1,250	0
6	Side-Liffter	unit	12	150	1,800
7	Tug-boat 2000HP	unit	4	5,460	21,840
8	Mooring Boat 100HP	unit	1	210	210
	Sub total				350,400
	Engineering Fee	%	3		10,512
	Total				360,912
	Grand Total Case"A"				814,516
	Grand Total Case"B"				811,519

Table 5.54 Project Cost of Bojonegara (Alternative 4)

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Berth Construction				
	Steel Pipe Pile(D=608mm t=12 l=26m)	No	4,482	19,110,000	85,651
	Slope Protection	m2	102,000	168,000	17,136
	Deck and Facilities	m2	65,750	1,370,000	90,078
	Steel Sheet Pile15mx2280m,	m	85,500	242,000	20,691
	Sub-total				213,556
2	Yard Construction				0
	Dredging and Reclamantion	m3	3,400,000	10,500	35,700
	Sand Compaction	m3	3,400,000	5,300	18,020
	Soil improvement(paper drain 19m)	m	0	5,059	0
	Slope Protection	m2	68,000	168,000	11,424
	Yard pavement	m2	710,000	135,000	95,850
	Road pavement	m2	119,500	110,000	13,145
	Trestle	m	250	22,000,000	5,500
	Utilities	L.S	1		22,000
	sub-total				201,639
3	Facilities Construction				0
	CFS construction(80mx200m)x3unit	m2	48,000	1,260,000	60,480
	CFS (80mx180m)x3unit	m2	43,200	1,260,000	54,432
	CFS (70mx150m)x2unit	m2	21,000	1,260,000	26,460
	Terminal building(6,000m2x1,1800m2x1)	m2	7,800	1,580,000	12,324
	Yard gate	unit	2	450,000,000	900
	Repair shop(1000m2)x5unit	m2	5,000	1,260,000	6,300
	Utilities and Others	L.S	1		32,000
	sub-total				192,896
4	Dreging and Disporsal				0
	(Exculuding Reclamation Volume)				0
	Case "A " Depth=From LWS	m3	720,000	7,350	5,292
	Case"B" Depth=From MSL	m3	300,000	7,350	2,205
5	Demolishing Breakwater	m	0	250,000	0
	Sub total(Case"A")				613,383
	Sub total(Case"B")				610,296
	Engineering Fee	%	10		61,338
	Physical Contingency	%	10		61,338
	Total(Case"A")				736,059
	Total (Case"B")				732,356
	Procurement of Equipment			Million(Rp)	
1	Rail Mounted Gantry Crane	unit	21	12,500	262,500
2	Rubber Tired Gantry Crane	unit	62	3,900	241,800
3	Yard Hustler	unit	89	200	17,800
4	Chassis	unit	177	50	8,850
5	Top-Loader	unit	0	1,250	0
6	Side-Lifter	unit	16	150	2,400
7	Tug-boat 2000HP	unit	5	5,460	27,300
8	Mooring Boat 100HP	unit	2	210	420
	Sub total				561,070
	Engineering Fee	%	3		16,832
	Total				577,902
	Grand Total Case"A"				1,313,961
	Grand Total Case"B"				1,310,258

Table 5.55 Project Cost of Tg. Emas Port

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Berth Construction				
	Quay Dredging	m3	250,000	7,350	1,838
	Sand Replacement	m3	250,000	23,000	5,750
	Steel Pipe Pile(D=608mm t=12 l=43m)	No	699	31,605,000	22,092
	Slope Protection	m2	21,000	168,000	3,528
	Deck and Facilities	m2	11,750	1,370,000	16,098
	Steel Sheet Pile, 15m x 440m	m	16,500	242,000	3,993
	sub-total				**53,298**
2	Yard Construction				0
	Reclamation	m3	1,200,000	23,000	27,600
	Sand Compaction	m3	1,200,000	5,300	6,360
	Soil improvement(paper drain 32m)	m	4,870,000	5,059	24,637
	Slope Protection	m2	32,000	168,000	5,376
	Yard pavement	m2	87,000	135,000	11,745
	Road pavement	m2	23,000	110,000	2,530
	Trestle	m	0	25,000,000	0
	Utilities	L.S	1		2,800
	sub-total				**81,048**
3	Facilities Construction				0
	CFS construction(80mx180m)x1unit	m2	14,400	1,260,000	18,144
	CFS (80mx200m)x3unit	m2	0	1,260,000	0
	CFS (70mx150m)x1unit	m2	10,500	1,260,000	13,230
	Terminal building, 1800m2x1	m2	1,800	1,580,000	2,844
	Yard gate	unit	1	450,000,000	450
	Repair shop(1000m2)x1unit	m2	1,000	1,260,000	1,260
	Utilities	L.S	1		3,600
	sub-total				**39,528**
4	Dredging and disposal				0
	Dredging channel and basin				0
	Case "A " Depth=From LWS	m3	12,864,350	9,000	**115,779**
	Case"B" Depth=From MSL	m3	11,724,620	9,000	**105,522**
5	Demolishing Breakwater	m	0	250,000	0
	Sub total(Case"A")				**289,653**
	Sub total(Case"B")				**279,396**
	Engineering Fee	%	10		28,965
	Physical Contingency	%	10		28,965
	Total(Case"A")				**347,583**
	Total (Case"B")				**335,276**
	Procurement of Equipment			Million(Rp)	
1	Rail Mounted Gantry Crane	unit	4	12,500	50,000
2	Rubber Tired Gantry Crane	unit	11	3,900	42,900
3	Yard Hustler	unit	18	200	3,600
4	Chassis	unit	34	50	1,700
5	Top-Loader	unit	0	1,250	0
6	Side-Lifter	unit	4	150	600
7	Tug-boat 2000HP	unit	2	5,460	10,920
8	Mooring Boat 100HP	unit	1	210	210
	Sub total				109,930
	Engineering Fee	%	3		3,298
	Total				**113,228**
	Grand Total Case"A"				**460,811**
	Grand Total Case"B"				**448,504**

Table 5.56 Project Cost of Tg. Perak Port

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Berth Construction				
	Quay Dredging	m3	0	0	0
	Sand Replacement	m3	0	0	0
	Steel Pipe Pile(D=1117mm t=14 m l=70m,)	No	358	110,250,000	39,470
	Steel Pipe Pile(D=1016mm t=14m l=65m,)	No	176	92,820,000	16,336
	Steel Pipe Pile(D=900mm t=14m l=65m)	No	1,432	82,000,000	117,424
	Steel Pipe Pile(D=812mm t=14mm l=63m)	No	440	72,765,000	32,017
	Slope Protection	m2	0	168,000	0
	Deck and Facilities	m2	90,400	1,370,000	123,848
	sub-total				329,094
2	Yard Construction				0
	Reclamation	m3	3,700,000	31,500	116,550
	Sand Compaction	m3	3,700,000	5,300	19,610
	Soil Improvement(paper drain 19m)	m	7,600,000	5,059	38,448
	Slope Protection	m2	72,000	168,000	12,096
	Yard pavement	m2	920,000	135,000	124,200
	Road pavement	m2	21,000	110,000	2,310
	Trestle	m	1,330	25,000,000	33,250
	Utilities	L.S	1		15,000
	sub-total				361,464
3	Facilities Construction				0
	CFS construction(80mx300m)x1unit	m2	24,000	1,260,000	30,240
	CFS (80mx180m)x3unit	m2	43,200	1,260,000	54,432
	CFS (80mx150m)x3unit	m2	36,000	1,260,000	45,360
	Terminal building(6,000m2x1,)	m2	6,000	1,580,000	9,480
	Yard gate	unit	1	450,000,000	450
	Repair shop(1000m2)x4unit	m2	4,000	1,260,000	5,040
	Utilities	L.S	1		14,500
	sub-total				159,502
4	Dredging and disposal				0
	Dredging channel and basin				0
	Case "A " Depth=From LWS	m3	13,670,000	10,000	136,700
	Case"B" Depth=From MSL	m3	6,740,000	10,000	67,400
5	Demolishing Breakwater	m	0	250,000	0
	Sub total(Case"A")				986,761
	Sub total(Case"B")				917,461
	Engineering Fee	%	10		98,676
	Physical Contingency	%	10		98,676
	Total(Case"A")				1,184,113
	Total (Case"B")				1,100,953
	Procurement of Equipment			Million(Rp)	
1	Rail Mounted Gantry Crane	unit	19	12,500	237,500
2	Rubber Tired Gantry Crane	unit	73	3,900	284,700
3	Yard Hustler	unit	78	200	15,600
4	Chassis	unit	155	50	7,750
5	Top-Loader	unit	0	1,250	0
6	Side-Lifter	unit	17	150	2,550
7	Tug-boat 2000HP	unit	3	5,460	16,380
8	Mooring Boat 100HP	unit	1	210	210
	Sub total				564,690
	Engineering Fee	%	3		16,941
	Total				581,631
	Grand Total Case"A"				1,765,744
	Grand Total Case"B"				1,682,584

Table 5.57 Project Cost of Ujung Pandang Port

No	Description	Unit	Quantity	Unit Price (Rp)	Cost Million Rp
1	Inland Container Terminal(Yard Construction)				
	Reclamation	m3	375,000	25,300	9,488
	Sand Compaction	m3	375,000	3,300	1,238
	Concrete Block Pavement	m2	81,500	66,000	5,379
	Asphalt Concrete Pavement	m2	31,500	55,000	1,733
	Concrete Pavement	m2	7,000	66,000	462
	Revetment and Slope Protection	L.S	1		1,548
	Utilities and others	L.S	1		4,975
	sub-total				24,822
2	Inland Container terminal (Building)				
	CFS Construction	m2	15,750	605,000	9,529
	Work shop Construction	m2	600	660,000	396
	Terminal Office Building	m2	400	660,000	264
	Terminal Gate	L.S	1	88,000,000	88
	Utilities and Others	L.S	1		330
	Sub-total				10,607
3	Access Channel Dredging				
	Case "A" Depth=fromLWS(-12m)	m3	685,000	12,100	8,288
	Case "B" Depth=fromMSL(-11m)	m3	438,000	12,100	5,300
	Other Utilities	L.S	1		495
4	Other Construction and Land Acquisition				
	Hatta Quay Additional Facilities	L.S	1		1,800
	Access Road and Connecting Road	L.S	1		1,675
	Sub-total				3,475
	Sub-total(Case"A")				47,687
	Sub-total(case"B")				44,699
	Engineering Fee	%	10		4,769
	Physical Contingency	%	10		4,769
	Land Acquisition and Compensation Expense	L.S	1		164
	Total(Case "A")				57,388
	Total(case "B")				53,801
	Procurement of Equipment			Million(Rp)	Million(Rp)
1	Rail Mounted Gantry Crane	unit	3	12,650.00	37,950
2	Rubber Tired Gantry Crane	unit	14	4,180.00	58,520
3	Yard Hustler	unit	54	220.00	11,880
4	Chassis	unit	108	55.00	5,940
5	Top-Loader	unit	6	1,375.00	8,250
6	Side-Liffter	unit	14	155.10	2,171
7	Fork-lift	unit	12	99.00	1,188
8	Generator(150KVA)	unit	2	121.00	242
9	Generator(400KVA)	unit	2	440.00	880
10	Computer (Terminal)	unit	11	22.00	242
11	Package- Software	unit	1	1,595.00	1,595
	Sub total				128,858
	Engineering Fee	%	3		3,866
	Total				132,724
	Grand Total Case"A"				190,112
	Grand Total Case"B"				186,525

5.5 INITIAL ENVIRONMENTAL EXAMINATION(IEE)

5.5.1 General

278. In general, initial environmental examination (IEE) is the examination which is undertaken at the outset of the development project planning stage to determine the environmental impacts that may be created by the particular project based on existing information and data, easily accessible information relating to the particular project, and comments and judgements of specialists who are familiar with the environmental impacts of past similar projects. This examination should be carried out in a short period at a low cost.

279. On the new regulation of AMDAL in Indonesia, IEE (PIL) is not required, ANDAL and TOR for ANDAL previous to ANDAL are required directly. However, the IEE is useful to make TOR for EIA(Environmental impact assessment).

280. In case of "Master plan of container cargo handling ports, dry ports and connecting railways", IEE was carried out at each project site i.e. Belawan port, Panjang port, Tanjung Priok, Tanjung Emas, Tanjung Perak, and Ujung Pandang port.

281. Generally, the impacts which has the possibility to affect the environment while the project activities will be conducted in the port area as follows;

- The water pollution at the dredging works.
- The water pollution and soil contamination by disposal of dredging spoils.
- The water pollution by the hazardous materials
- The impact to the ecosystem, fishery and land property values by the activities.
- The erosion at the proposed container berth and reclamation area.
- The traffic congestion and pollution such as air pollution and noise problem by the increased traffic volume.
- The resettlement problems caused by expansion of the port facilities area.
- The impact to socio-economic aspect, increase in the employment opportunity and economic activities.

(1) Object of IEE

282. The objective of IEE is to examine the environmental impact which might be caused from the construction at the each project sites and to select items of the environmental estimation and the evaluation.

283. Initial environmental examination has the following functions.

- Identification of environmental impact, might be caused from the project, may be created based on collecting of existing data and information, and site-observation
- judgment of necessary EIA (Environmental impact assessment) or not
- finding required environmental elements for EIA

284. IEE is carried out in the master plan phase, and EIA is carried out on priority projects in the feasibility study commonly. In case on "Master plan of container cargo handling ports, dry ports and connecting railways" IEE in Phase II (Master plan phase), EIA in Phase III.

(2) Methodology of IEE

a. Procedure of IEE

285. The procedure of IEE is shown in **Fig.5.32.** Generally IEE is carried out based on existing information, data and site observation, to grasp the existing environmental conditions, and identification of possible environmental impact. JICA study team prepared the environmental impact matrix(**Table 5.58**). The matrix showed the relation between project activities and environmental factors. It can be available for initial environmental examination.

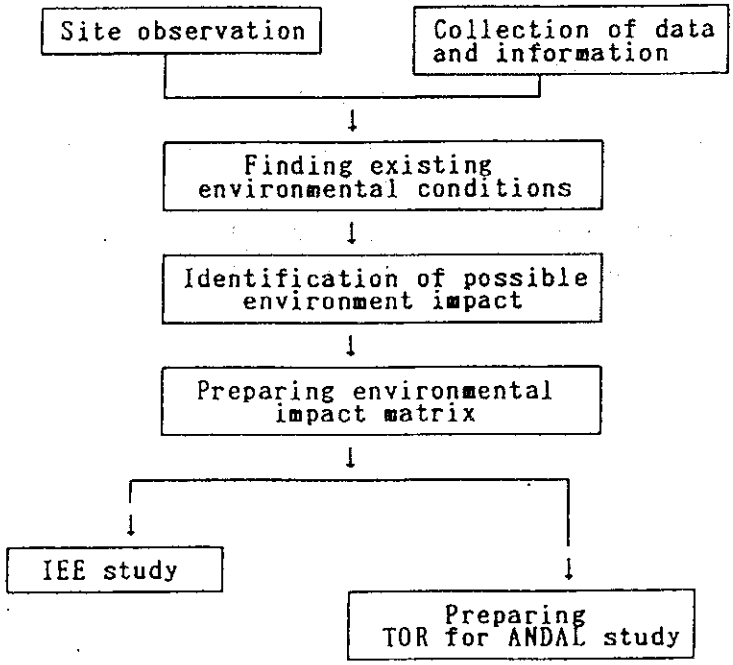


Fig. 5.32 Procedure of IEE study

b. Environmental components and its items

286. Three environmental components and its items in the matrix(**Table 5.58**) as follows;

-Physical/Chemical component

- Climate
- Land subsidence
- Soil contamination
- Coastal sedimentation
- Water quality
- Ground water quality
- Noise
- Offensive odor
- Aesthetics
- Slope stabilities
- Soil erosion
- Costal erosion
- Hydrology
- Ground water use
- Air pollution
- Vibration
- Natural disaster

-Biological component

- Terrestrial flora/fauna

- Aquatic flora/fauna

-Socio-economic component

- Land use
- Resettlement
- Traffic
- Split of communities
- Archaeology/cultural site
- Recreation
- Coastal use
- Economic activities
- Infrastructures
- Employment
- Public health

Table 5.58 Environmental impact matrix of each project sites

Ports

Project Areas/Phases		Physical/Chemical																		Biolog		Socio-Economic													
	Environmental Components	Climate	Slope stabilities	Land subsidence	Soil erosion	Soil contamination	Coastal Erosion	Coastal Sedimentation	Hydrology	Water quality	Ground water use	Groundwater quality	Air pollution	Noise	Vibration	Offensive odor	Natural disaster	Aesthetic	Terrestrial Flora/Fauna	Aquatic Flora/Fauna	Land Use	Coastal Use	Resettlement	Economic activities	Traffic	Infrastructures	Split of communities	Employment	Archaeology/Cultural sites	Public Health	Recreation
Belawan	Pre-Construction																					-	-												
	Construction			-				-	-	-			-	-	-				-	-		-		+	-			+		-					
	Service and Maintenance			-			-	-	-				-	-	-						+-	+		+	-			+		-					
Panjang	Pre-Construction																					-													
	Construction									-			-	-	-				-	-		-		+	-			+		-					
	Service and Maintenance												-	-	-						+-	+		+	-			+		-					
Tanjung Priok	Pre-Construction																					-	-												
	Construction			-				-		-			-	-	-				-	-		-		+	-			+		-					
	Service and Maintenance			-				-					-	-	-						+-	+		+	-			+		-					
Tanjung Emas	Pre-Construction																					-	-												
	Construction			-				-		-	-	-	-	-	-				-	-		-		+	-			+		-					
	Service and Maintenance			-				-			-	-	-	-	-						+-	+		+	-			+		-					
Tanjung Perak	Pre-Construction																					-													
	Construction			-				-	-	-			-	-	-				-	-		-		+	-			+		-					
	Service and Maintenance			-				-	-				-	-	-						+-	+		+	-			+		-					
Ujung Pandang	Pre-Construction																					-	-												
	Construction					-		-		-			-	-	-				-	-		-		+	-			+		-		-			
	Service and Maintenance							-					-	-	-						+-	+		+	-			+		-					

+: Positive Environmental Impact

– : Negative Environmental Impact

5.5.2 IEE for each project sites

(1) Environmental impact matrix of each port

287. **Table 5.58** shows general environmental impact matrix of each port. " + " is the symbol for "Positive environmental impact", and "-" is the symbol for "Negative environmental impact" that is related between project activities and environmental elements respectively.

(2) Project activities and environmental impact in each proje sites in the long term development plan.

288. The possibility of environmental impacts at each project site is explained respectively. The grade of environmental impact level is based on JICA Environment Guideline

a. Belawan port (See Table 5.59)

Existing plan target year
Long term : 2010

Type of the works : 1) Reclamation of about 2,200,000m^3 behind the existing container yard.

2) Construction of two new wharves (9.0 m depth x 170 long, 12.0 depth x 250 depth) in front of existing wharf

3) Dredging on access channel of 12 million m^3

Table 5.59 Environment impacts and its countermeasures

Belawan port

Activities affecting environment	Damage to environment	Forecasted impact level	Countermeasures
1.Reclamation	1.Turbid water by soil	B	1.Proper control of surplus soil
	2.Coastal sedimentation	B	1.Control the waste soil
	3.Fauna/Flora	D	1.Control of surplus soil
2.Construction of new wharf	1.Disposal of construction materials	B	1.Proper control of dumping materials 2.Proper control of waste/sewage from facilities
	2.Fauna/Flora	D	1.Proper control of dumping materials
3.Operation of heavy equipment	1.Sea water pollution	D	1.Proper control of waste oil disposal
	2.Noise and vibration	D	
4.Dredging the access channel	1.Turbid water by dumped soil	B	1.Proper selection of dumping site
	2.Turbid water by sea bed excavation	B	1.Selection of dredger type
	3.Aquatic Fauna/Flora	D	1.Select the deep dumping site

Note: Impact level
A: Significant negative impact
B: Moderately negative impact
C: Unknown
D: Negligible negative impact

289. Considering the above forecasted impacts, for the project an Environmental Impact Assessment (EIA) is required on the items such as water quality, coastal sedimentation and other items discussed.

b. Panjang port (See Table 5.60)

Existing plan target year
Long term : 2010

Type of works: 1) Construction of new wharf (12 m depth x 170 m long).

2) Dredging of 80,000 m^3 at the new wharf area.

290. Considering the above forecasted impacts, for the project an Environmental Impact Assessment (EIA) is required on the items such as water quality, coastal sedimentation and other items discussed.

c. Tanjung Priok (See Table 5.61)

Existing plan target year
Long term : 2010

Type of the works 1) Shoreline protection works and reclamation

2) Construction of new wharf

3) Dredging on access channel and basin

4) Removal of existing breakwater

Table 5.60 Environmental impacts and its countermeasures

Panjang port

Activities affecting environment	Damage to environment	Forecasted impact level	Countermeasures
1.Construction of new wharf	1.Disposal of construction materials	B	1.Proper control of dumping materials 2.Proper control of waste/sewage from facilities
	2.Fauna/Flora	B	1.Proper control of dumping materials 2.Extraordinary attention to sedimentation on Panjang reef
2.Operation of heavy equipment	1.Sea water pollution	D	1.Proper control of waste oil disposal
	2.Noise and vibration	D	
3.Dredging the access channel	1.Turbid water by dumped soil	B	1.Proper selection of dumping site
	2.Turbid water by sea bed excavation	B	1.Selection of dredger type
	3.Aquatic Fauna/Flora	B	1.Select the deep dumping site 2.Extraordinary attention to Panjang reef

Note: Impact level A: Significant negative impact
B: Moderately negative impact
C: Unknown
D: Negligible negative impact

Table 5.61 Environmental impacts and its countermeasures

Tanjung Priok

Activities affecting environment	Damage to environment	Forecasted impact level	Countermeasures
1.Reclamation	1.Turbid water by soil	B	1.Proper control of surplus soil
	2.Coastal sedimentation	B	1.Control the waste soil
	3.Fauna/Flora	D	1.control of surplus soil
2.Construction of new wharf	1.Disposal of construction materials	B	1.Proper control of dumping materials 2.Proper control of waste/sewage from facilities
	2.Fauna/Flora	D	1.Proper control of dumping materials
3.Operation of heavy equipment	1.Sea water pollution	D	1.Proper control of waste oil disposal
	2.Noise and vibration	D	
4.Dredging the access channel	1.Turbid water by dumped soil	B	1.Proper selection of dumping site
	2.Turbid water by sea bed excavation	B	1.Selection of dredger type
	3.Aquatic Fauna/Flora	D	1.Select the deep dumping site
5.Removal of existing break water	1.Turbid water by demolished materials	D	1.Proper selection of dumping site
	2.Seabed sediment	D	

Note: Impact level A: Significant negative impact
B: Moderately negative impact
C: Unknown
D: Negligible negative impact

291. Considering the above forecasted impacts, for the project an Environmental Impact Assessment(EIA) is required on the items such as water quality, coastal sedimentation and other items discussed.

d. Tanjung Emas (See Table 5.62)

Existing plan target year
Long term : 2010

Type of works :
1) Reclamation of 1.2 million m^3 and shoreline protection works
2) Construction of two new berth
3) Dredging on the navigation channel and port basin

292. Considering the above forecasted impacts, for the project an Environmental Impact Assessment (EIA) is required on the items such as water quality, coastal sedimentation and other items discussed.

e. Tanjung Perak (See Table 5.63)

Existing plan target year
Long term : 2010
Type of works :
1) Reclamation and construction of access trestle and container yard
2) Construction of new container berth (2200m long) connecting existing ICT
3) Dredging of 14 million m^3 on shipping lane from Java sea to Tanjung Perak

Table 5.62 Environmental impacts and its countermeasures

Tanjung Emas

Activities affecting environment	Damage to environment	Forecasted impact level	Countermeasures
1.Reclamation	1.Turbid water by soil	B	1.Proper control of surplus soil
	2.Coastal sedimentation	B	1.Control the waste soil
	3.Fauna/Flora	D	1.control of surplus soil
2.Construction of new wharf	1.Disposal of construction materials	B	1.Proper control of dumping materials 2.Proper control of waste/sewage from facilities
	2.Fauna/Flora	D	1.Proper control of dumping materials
3.Operation of heavy equipment	1.Sea water pollution	D	1.Proper control of waist oil disposal
	2.Noise and vibration	D	
4.Dredging the access channel	1.Turbid water by dumped soil	B	1.Proper selection of dumping site
	2.Turbid water by sea bed excavation	B	1.Selection of dredger type
	3.Aquatic Fauna/Flora	D	1.Select the deep dumping site
5.Existing condition	1.Land subsidence	B	1.Wise use of ground water 2.Supplying inland water

Note: Impact level A: Significant negative impact
B: Moderately negative impact
C: Unknown
D: Negligible negative impact

Table 5.63 Environment impacts and its countermeasures

Tanjung Perak

Activities affecting environment	Damage to environment	Forecasted impact level	Countermeasures
1.Reclamation	1.Turbid water by soil	B	1.Proper control of surplus soil
	2.Coastal sedimentation	B	1.Control the waste soil
	3.Fauna/Flora Small mangrove community habits at the reclamation area	B	1.control of surplus soil 2.Transplantation of mangroves
2.Construction of new wharf	1.Disposal of construction materials	D	1.Proper control of dumping materials 2.Proper control of waste/sewage from facilities
	2.Fauna/Flora	D	1.Proper control of dumping materials
	3.Hydrology	B	1.Extraordinary attention the hydrological regime
3.Operation of heavy equipment	1.Sea water pollution	D	1.Proper control of waste oil disposal
	2.Noise and vibration	D	
4.Dredging the access channel	1.Turbid water by dumped soil	B	1.Proper selection of dumping site
	2.Turbid water by sea bed excavation	B	1.Selection of dredger type
	3.Aquatic Fauna/Flora	D	1.Select the deep dumping site

Note: Impact level A: Significant negative impact
B: Moderately negative impact
C: Unknown
D: Negligible negative impact

293. Considering the above forecasted impacts, for the project an Environmental Impact Assessment (EIA) is required on the items such as water quality, coastal sedimentation and other items discussed.

f. Ujung Pandang port

Type of works : 1) Dredging of (685.000) m^3 for new access channel between breakwaters

2) Construction of new inland container terminal

Table 5.64 Environment impacts and its countermeasures
Dredging activity in Ujung Pandang port

Activities affecting environment	Damage to environment	Forecasted impact level	Countermeasures
1.Dredging the access channel	1.Turbid water by dumped soil	B	1.Proper selection of dumping site
	2.Turbid water by sea bed excavation	B	1. Selection of dredger type
	3.Aquatic Fauna/Flora	D	1.Select the deep dumping site
2.Operation of heavy equipment	1.Sea water pollution	B	1.Proper control of waste oil disposal
	2.Noise and vibration	D	

Construction of inland container terminal

1.Contruction of access road	1.Resettlement	D	1.Proper rout course and compensation
2.Reclamation	1.Noise	D	
	2.Turbid water by soil	D	1.Proper control of surplus soil
	3.Fauna/Flora	D	1.Planting of Mangroves around the project site
3.Transportation	1.Traffic jam	D	1.Proper rout course

Note: Impact level A: Significant negative impact
B: Moderately negative impact
C: Unknown
D: Negligible negative impact

294. Considering the above forecasted impacts, for the project an Environmental Impact Assessment (EIA) is required on the items such as water quality, coastal sedimentation and other items discussed.

g. Bojonegara

Type of works : 1) Reclamation

2) Construction of new container berth

3) Construction of new access roads

Table 5.65 Environment impacts and its countermeasures

Bojonegara

Activities affecting environment	Damage to environment	Forecasted impact level	Countermeasures
1.Reclamation	1.Turbid water by soil	B	1.Proper control of surplus soil
	2.Coastal sedimentation	D	1.Control the waste soil
	3.Fauna/Flora	D	1.control of surplus soil
2.Construction of new berth	1.Disposal of construction materials	D	1.Proper control of dumping materials 2.Proper control of waste/sewage from facilities
	2.Fauna/Flora	B	1.Proper control of dumping materials
3.Operation of heavy equipment	1.Sea water pollution	D	1.Proper control of waste oil disposal
	2.Noise and Vibration	B	
4.Construction the new access roads	1.Traffic	B	
	2.Disposal of demolished materials	D	1.Proper selection of dumping sites
	3.Air pollution	D	

Note: Impact level A: Significant negative impact
B: Moderately negative impact
C: Unknown
D: Negligible negative impact

295. Considering the above forecasted impacts, for the project an Environmental Impact Assessment(EIA) is required on the items such as water quality, traffic and other items discussed.

5.6 OVER-ALL EVALUATION OF THE PLAN

5.6.1 Belawan

296. Belawan Ports need three international container berths and two domestic container berths. These expantion can be implemented in line with the existing master plan. By introducong another pair of gantry cranes and expanding the yard area by five ha in the existing International container wharf, the terminal is given enough handling capacity up to the year 2003. Another berth which will be needed in 2004 can be added by extending the existing wharf. A domestic container terminal will be needed in the year 2000.

297. Domestic container terminal is also required by the year 2002. The existing multipurpose berth may serve as the domestic container berth, and, by introducing gantry crane there, the handling capacity can be upgraded to cover the domestic container traffic in 2010.

298. All the necessary expansion mentioned above can be done by minor modification of the existing plan.

299. Since no drastic change in layout plan is needed, the impact of the expansion of the container handling facilities on the environment is suposed to be minimal. The access road has been already operational, and the container terminal is isolated from the conventional wharves. Thus, the impact on the residencial and commercial area also seems to be small.

5.6.2 Panjang

300. When the on-going project is completed in 1995, the port has enough handling capacity to cover the container traffic, both international and domestic, up to 2003, provided that domestic containers are handled at the existing multipurpose berth.

301. To comply with the container traffic in 2010, the expansion of the container yard by three (3) ha., and the space seems to be available within the port area.

302. Thus, the existing container terminal expansion plan is suitable enough in the light of the container traffic forecast done in this study.

5.6.3 Tanjung Priok

303. The container cargo traffic at Tanjung Priok Port has already reached the handling capacity of existing contianer handling facilities. The terminal is operated very efficiently at present, and it seems to be quite difficult to increase its handling capacity without additional container berths and yard.
It is very urgent to start the construction of Container Terminal III (CT-III).

304. However, even with the CT-III, which have three berths having a depth of -12 m, the traffic volume exceed the handling capacity in 1997 or 1998. Thus, an immediate action should be taken for the construction of further expansion of the facilities. Possible measures are:
Alternative 1;

305. An island outside Borth Breakwaters for the additionalberths and container yards (see **Fig.5.29**),

Alternative 2;

Reclamed area outside West Breakwaters, and this layout plan is in line with the existing master plan (see **Fig. 5.29**),

Alternative 3;

Simultaneous construction of both Tanjung Priok and Bojonegara Port.(see **Fig.5.31** and **5.33**)

Alternative 4;

Development of Bojonegara port for an alternative port to Tanjung Priok Port.(see **Fig.5.32** and **5.34**)

306. Each plan has both advantage and dis advantage. The following is the comparison among these four alternatives.

(1) Alternative 1

307. a. Advantage

The new terminal and the existing (including CT-III) facilities can be operated as one body. This plan is most effective way for the expansion from the operational and managerial standpoint of view.

308. b. Disadvantage

The port od Tanjung Priok is split into to parts by the connecting bridge: West Port and East Port. The East Channel must be deepened and widened for the navigation of bulk carriers calling grain and oil terminal.

All the container cargoes are concentrated to the gate of the terminal, access road for the cargo truck need to be constructed.

(2) Alternative 2

309. a. Advantge

The Port is not split. The layout plan is in line with the existing master plan. Construction cost is lower than Alternative 1. Access to the new terminal is easier, for a tool highway pass near the entrance, and this may ease the traffic at the entrance of the existing container terminal.

310. b. Disadvantge

The container terminal is split into two locations, and, therefore, the operation and management of the terminals eill be more complicated than the alternative 1.

The same situation will occuer for the operation of railway terminal at Tanjung Priok.

(3) Alternative 3

311. a. Advantage

With another gateway of West Java, the socioeconomic activities in the nearby provinces will be greatly promoted. All the industries near Bojonegara Port are highly benefitted. In addition the congestion presently observed in Tanjung Priok Port and Jakarta area will be eased.

Since the development of the ports will be done in accordance with the economic growth of the provinces of West Java, adverse impact seems to be smaller than other Alternatives.

312. b. Disadvantage

Total construction cost is the largest of the four Alternatives.

(4) Alternative 4

313. a. Advantage

Bojonegara provide suitable site for deep port, and the construction and the maintenance cost will be lower than Alternative 1 and 2.

314. b. Disadvantage

Impact on the land transportation system in West Java is supposed to be fairly large, for the container cargo flow will change completely after Bojonegara Port starts operation. Highways and railways interconnecting Bojonegara port and Jakarta area are need to be strengthened. This change may cause the reformation of the existinf socioeconomic structure in West Java.

315. In any case, the furter expansion of Tanjung Priok after the completion of CT-III involves quite a lot of elements such as road and railway sectors as well as port sector. In addition, the impact of the project on socioeconomy in West Java is supposed to be large. It is recommended to start further study immediately to identify the most feasible alternatives for the development of Tanjung Priok and Bojonegara Port.

5.6.4 Tanjung Emas

316. With completion of new container berth in 1997, the contaner terminal can meet the container traffic up to 2004, and by the year 2010, another international container berth and one domestic berth with gantry crane are needed. It might be one possible way to renovate the existing multi purpose wharf to container wharf.
However, taking into account of the present situation observed in Old Port, where the port facilities are flooded duling the high tide, and the existing master plan being out of date, it is recommended the the master plan and the feasibility study for the whole port be conducted as soon as possible.

5.6.5 Tanjung Perak

317. The container cargo traffic is reaching the capacity of the existing container handling facilities. Domestic container terminals are also needed. The master plan and the feasibility study of Tanjung Priok has been recently completed under the loan pacage by ADB. Comparison should be done between the results of the two studies for identifying the most feasible plan.

5.6.6 Ujung Pandang

318. As the new container wharf is completed in 1997, a couple of gantry cranes sould be furnished immediately. Further more, an additional pair of gantry cranes and yard expansion (about 5 ha) must be needed by the year 2002. With two fully equipped container berths, the container terminal will be able to handle the containers up to 2010.

319. The most important element for the full operation of the container berths is to prepare enough yard area. It seems to be quite difficult to reserve to reserve some area for the container terminal in the present port area. Thus, the use of inland depots must be considered as alternative measures. There already exist an inland depot and a new toll highways connecting the Ujung Pandang Port and Airport. In this case, due consideration should be given to the problems which may occure dur to the hevy traffic near port area.

6. LONG-TERM DEVELOPMENT PLAN OF DRY PORTS AND CONNECTING RAILWAYS

6.1 GENERAL

1. The following are the outstanding observations in the survey of the four railways routes.

a. Railway routes

Gdb - Tpk route needs not only some improvements of stations, but also doubling track works to cope with the growing number of trains in recent years. The other routes are found out to be where the rail traffic is not so heavy. Because not only the number of trains and the growth rate of them, but also potential resource is small and they would not be easy to reach such situations before 2010 that are required TRCT. It can be concluded that these routes should be bearable to container traffic demand up to 2010 without any improvement.

b. The improvement such as extension and widening container platforms to accommodate a TRCT has been completed at each Dry Port. Therefore, the main issue to be discussed is when heavy handling machines should be introduced to these Dry Ports. Sometimes the introduction of these machines may lead to the unbalance between the containers handling cost and investment cost over the long initial stage before the container traffic reaches the expected full scale stage.

2. However, to promote the railway container transportation, even though some deficit is anticipated, it is sometimes required to furnish the heavy machines when the container traffic volume increase and exceeds the handling capacity at the Dry Ports without these machines, i.e., with man power. The timing of the introduction of the handling machines is the key point.

c. The arrangement of infrastructure is necessary for the North trunk line in Sumatra Island more than anything else. One wagon one TEU transportation would not be payable even for direct operation cost caused by such ineffectiveness.

d. Gdb facilities should be enough capable in accordance with the set up of TCT III. Gdb has not staying siding, so that the improvement is urgent. Based on the above the team has planned each route as follows.

6.2 DEVELOPMENT PLAN OF INDIVIDUAL DRY PORTS AND CONNECTING RAILWAYS

6.2.1 Tebing Tiggi Dry Port and connecting Railway

(1) The Result of the Forecast of Container Cargo Traffic

3. The result of the forecast of container cargo traffic on this route is shown in following **table (quoted from section 3.5.1, figure in ( ) shows TEUs/day/one way)**

Table 6.1 Forecast of Container Cargo Traffic (TEUS)

Year	1993	2003	2010	2018
Scenario 1	592	0	0	0
	(0.8)	(0)	(0)	(0)
Scenario 2	592	1,700	2,000	2,300
	(0.8)	(2.3)	(2.7)	(3.2)
Scenario 3	0	3,000	3,600	4,500
	(0)	(4.1)	(4.9)	(6.2)

Note: The competitions employed in these sections one.

Scenario 1: The competitiveness of container transportation of railway will fall further due to development of land transportation systems, and the railway container transportation volume will maintain zero in the future.

Scenario 2: Rubber production grows at the rate of 2%, and 9.1% of the rubber production in the hinterland of the Dry Port will be transported by railway, (where the share 9.1% is the percentage realized in 1991).

Scenario 3: In such case that a new Dry Port is established in Kisaran located 178 km away from Belawan Port, 20% of rubber products in the near area will be transported by railway.

4. The result of the demand forecast in 2010 shows that the railway container traffic is less than only five (5) TEUs per day per one way for all these scenarios. It is judged that the traffic is far below the level that requires as a normal Dry Port. Even though little demand increase is expected in case that Dry Port is arranged at Kisaran, the conclusion remains the same as the above.

(2) Development Plan

a. Dry Port

5. It is necessary to increase the competitiveness against the road transportation. Therefore, it is necessary to solve the existing issues pointed out in 2.7.1 (6), but the transportation demand is only a little and the origins of container cargoes are widely scattered in the region, and the improvement of railway infrastructure (see 2.7.1 (6) i), ii)) is delayed. And so it can be said, they are in an extremely difficult situation for rational transportation.
As the conclusion, consideling not only until the subject period of M/P (by 2010), but the late stage until 2018, it is judged that the railway transportation demand keeps it remained too low level to recommend a normal Dry Port. Therefore, a positive investment for the Dry Port should refrain from planning, and it is judged that the dry Port should watch the economic situation during the coming decades. That is, it is desirable to improve the Dry Port in accordance with increase of the demand.

b. Connecting Railway

6. The connecting railway is also necessary to improve a competitive power against the road transportation. At first the infrustructurural improvement(clause 2.7.1 (6) b i), ii)) of railway is indispensable. Two plans shown in **Fig 2.46** are under study to connect directly with the container terminal Gabion Port and the existing railway terminal at Belawan Port, but the transportation demand is only a little. Therefore, the plans are regarded to be immature. In order to strengthen competitiveness of the railway container service, at first the allowable axle load should be increased to 15 t by improving the track structure. This is indispensable not only for the container transportation, but for the whole transportation service. It is concluded that such efforts described above should be made to achieve a transportation service for the future.
Anyhow, it is desirable to improve the connecting railway in accordance with increase

of the demand.

6.2.2 Kertapati Dry Port

7. It seems that the investment on infrastructure for marine containers has not been conducted on site, and all the freight handling facilities except those for the coal are in little usage.
The revival of container transportation would not be expected under the present circumstances. This freight station with on-land and water handling facilities is available to the connection between trains and barges, the rehabilitation should be studied though the team can't find immediately what to do.

6.2.3 Gedebage Dry Port and connecting railway

8. The transportation route includes North and South Trunk line and the traffic volume has shown remarkable growth for the past few years. It would be worthwhile to list up various items anticipated to happen in the connecting decade items in Indonesia and other countries.

(1) A rapid economic growth rate would not continue forever and will change to mild growth.

(2) The express way between Jakarta and Bandung will be used extensively, within a few years from now. At the same time the traffic congestion in Bandung city will become worse. Nevertheless, it would be certain that the modal sift from railway to express way will occur for both passengers and container cargoes. Railway will, thus have to make such much effort in its sales promotion by providing rapid and frequent services.

(3) The trunk Line between Cikampek and Bandung will be upgraded to double truck route by 2003 year. As shown in **Fig. 6.1**, the whole route between Tpk and Bdg. St. is doubled the through on going project. Therefore, single track section remains between Kac. and Gdb.

(4) However, the route between Jatinegara and Bekasi will be used not only for

intercity service but also for commuter and freight services. The track capacity on this section might not be enough to allow the increase of the container trains. To settle this problem two possible alternatives are considered after 2000 year when TCT III will be operational as follows ; multiplication of existing route or choosing another like a new line that will be constructed under other railway projects.
(This item will be studied in the F/S.)

(5) An expansion work at Gedebage presently going on will be finished soon and additional C.T will be completed as well by 2003. (**Fig. 8.1**).
The establishment of another C.T does not seem to be recommendable with the consideration of negative like the following.
The theme should be considered on the head of 21 century.

a. It would be difficult to regard the textile industry, which presently produce the main export commodities in Bandung area, as one of the growing industries in the long run, though it shows rapid export growth. The same argument can be said for tea export.

b. The imbalance between loaded containers mainly for export and empty containers mainly for import is expected to improve. This is because that the former is expected to stagger, while the latter increases accordingly to the increase of the inflow of consumer goods.

c. There are vacant land spaces that are abolished freight yards besides Pwk. or Pdl. St. The new industrial zones would be developed around these stations. In the Master Plan such possibilities should be taken into consideration. Considering the fact that multiple unit trains are easy for dividing and merging, the use of these stations are worthy as the small car depot. The land space at the abolished freight stations may be well utilized, for these purposes.

(6) If Tg. Priok Port is called on by bigger container carriers, on which containers bound for various destinations are loaded together and a dry port is installed at either Pwk. or Pdl, the shunting sidings at each station would be considerably complicated. **Fig. 6.2** shows the transportation type for three possible locations of freight stations. If the Type C is chosen after 2000, the following shunting method would be recommended.

a. Wagons are classified by two different destinations at each end station.

b. A marshalling yard is installed on the way of the route and each station

sends unclassified wagons to the marshalling yard where the wagons are classified for two different arrival stations.

Advantages and disadvantages of these shunting methods are as follows.

a. Invites a little decrease of possible handling trains, because the classification work is surcharged on the existing storage sidings at the departure station.
b. Invites the increase of marshalling time at the intermediated yard and causes the unstable delay of arrival time at the terminal.

9. Accordingly, finally the above Type a is chosen for its advantage of punctuality. Type a requires shunting tracks in TCT III and the storage sidings at Pasoso surcharged for classification work. The above discussion that the successive installation of new dry ports makes the trains operation difficult, even though new container resource for Tg. Priok is expected. Construction of the new dry port should be done in accordance with the increase of TCT III.

Considering the above discussion, a remarkable growth at Gdb is unlikely and the share of the railway containers in the container cargo traffic between Gdg. and Tpk. will reach the saturated level in future as shown in **Fig. 3.23**. Since no element will happen to make the sudden growth is identified, the forecast traffic on the basis of Scenario 1 in **Table 3.86** is employed for the master Plan, where the container cargo traffic is moderate value of 210,000 TEUs in total of full and empty in 2010.

This traffic value requires ten trains at each direction at peak time. That is three times as many as the number at present. Incidentally, the handling capacity of Tg. Priok port will increase about 2.5 times of the present handling volume based on the setup of TCT III.

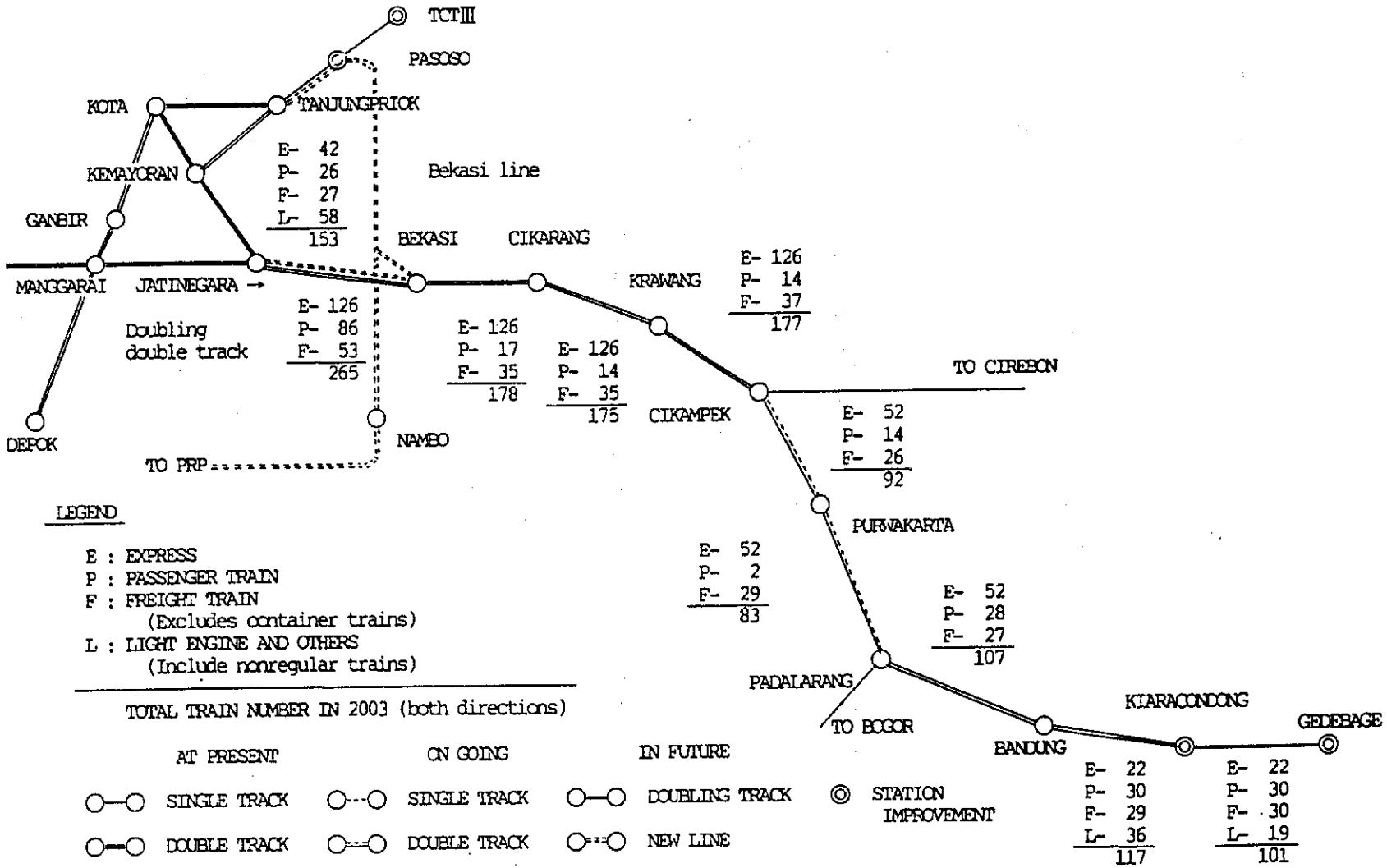


Fig. 6.1 Main Improvements for Container Transportation

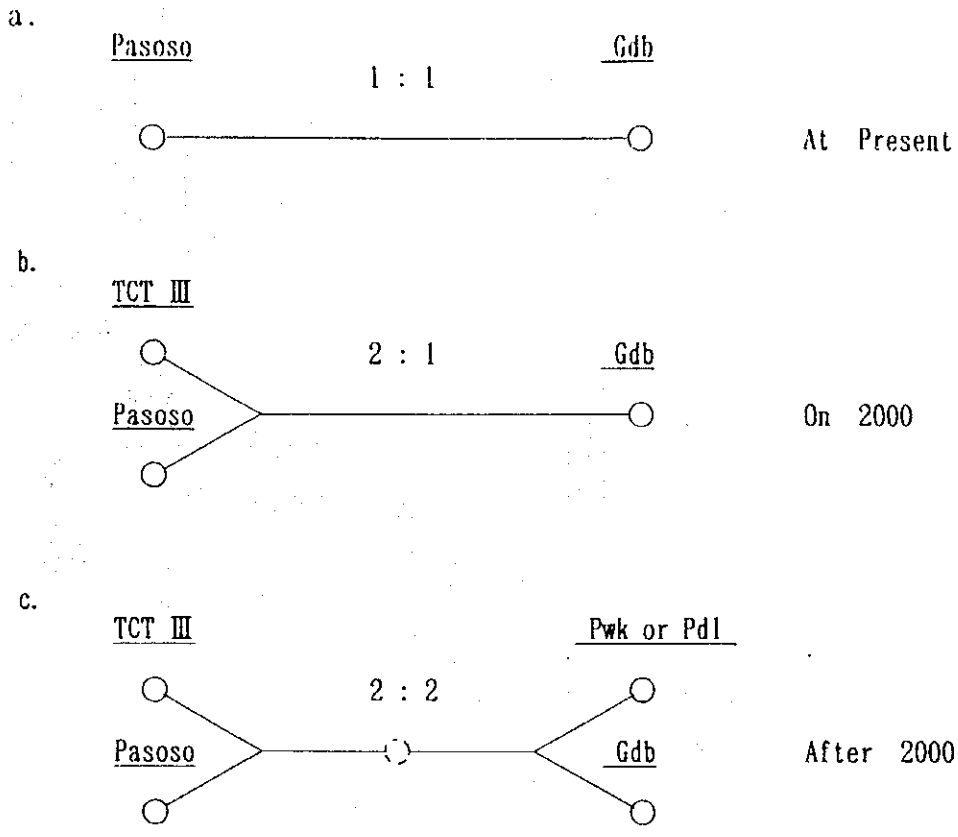


Fig. 6.2 The classification of transportation from

6.2.4 Solojebres Dry Port and Connecting Railways

(1) Demand Forecast

10. The macro forecast of container cargo traffic in 2010 (refer to section 3.5.4 is a demand forecast of railway container transport for the dry port at Solojebres.

11. This forecast express the next three cases in actual figures.

* Scenario 1: Containers exported from the dry port are predicted to account for 50% of background region demand.
* Scenario 2: Containers exported from the dry port are predicted to account for 90% of background region demand.
* Scenario 3: Containers exported from the dry port are predicted to account for the same percentage of background demand at the present.

12. The following factors would influence on the container cargo throughput at Solojebres dry port:

a. The distance between Tanjung Emas and Solojebres, will be only 100 km, which is the minimum length financially payable for container train operations.
b. An expressway is planned between Solojebres and Semarang.
c. Road transport is faster in the view of time.
d. The city of Solo regulates container transportation.

13. Considering these factors, even the maximum effort to attract customers will be difficult to increase the present share of about 22% to 90%. The percent forecasted in Scenario 1 should be adopted, since 50% would be probably a more realistic prediction.

Table 6.2 Macro Forecast of Container Cargo Traffic

(TEUS/year, round trip)

Year	1993	1994	2000	2003	2010	2018
Scenario 1	2,153	2,900	8,200	1,000	18,000	32,000

Table 6.3 Macro Forecast of Container Cargo Traffic

(TEUS/day, one way)

Year	1993	1994	2000	2003	2010	2018
Scenario 1	2.9	4.0	11.2	13.7	24.7	43.8

(2) Development Plan

14. a. Dry Port and Inland Terminal

i) Semarang Gudang (Railway station in the city of Semarang)

The current facilities have enough capacity to cover the demand in 2010. If the container terminal at Tg. Emas Port starts the service, the efficiency of the work will be upgraded. Therefore, this station needs no special action.

ii) Container terminal at Tg. Emas port

The service at this terminal has not started, but it should be started as soon as possible after taking the necessary actions to solve the following problems.

(Problems)

* Since cables run above the current loading/unloading yard, a mobile crane mighttouch them.
* The platform has some level difference due to roadbed subsidence.

The storage capacity of 64 TEUs is 2.5 times the transport demand of 25 TEUs/day estimated for the year 2010, and 1.5 times the transport demand of 44 TEUs/day estimated for the year 2018. Therefore, existing railway facilities will be able to manage larger transport volume. However, containers can be loaded and unloaded at only one place because the platform is only 14 m wide. It will not present any problem at the beginning, but it will lower the efficiency according as the container cars are forced to move frequently. The platform width should be broadened so that cargo can be handled anywhere on the platform.

iii) Solojebres Dry Port

The dry port has the storage capacity of 88 TEUs that is enough to manage traffic

volume forecasted for the year 2010 and 2018. It means that this capacity is 1.7 times the total volume of container cargo for export and import at present.
Therefore, the existing railway facilities are adequate in keeping their present state. However, the loading and unloading operations must be improved. As long as present operations with manual power are employed only 14 loaded containers can be handled per day. Thus, problems will occur in the year 2008, when container transport volume reaches to the level of 22 TEU/day per directions and one TRCT is needed. Under such circumstance, a toplifter should also be adopted since manual loading and unloading cannot to handle 29 TEU per day. In addition two trains with 11 to 14 cars are required which makes toplifter operations profitable (Appendix 4.3.1). The demand for 40 ft containers, which will become the standard size in the future, is expected to increase with the introduction of a toplifter. At present (as of 1993), 40 ft containers account for 4% of import containers and 18% export containers. If heavy cargo can handle easily and efficiently by employing a top lifter, 40 ft export containers would increase and this, in turn, would increase the handling efficiency. Although the regulations for road transportation brought a new problem for truck operators, the demand would increase owing to the regulations because any kinds of loaded containers are required to be carried by railway.

15. b. Related Railway

i) A container train with 14 cars should be employed cope with transport demand predicted for 2010. The route via Gbn. where container trains can be adequately manage as well as the route via Bdg. has enough track capacity. In addition, since the track at each station has enough effective to accommodate the scheduled expanded trains formation up to 16 cars, the existing railway facilities will not require any special measures.

ii) Rolling Stock

At present, Container cars are connected with ordinary freight cars. When a TRCT is operated, a hauling locomotive must be purchased. The Locomotive hauling capacity of at least 600 tons in consideration of increasing demand the future. Sixteen PPCW container wagons for a TRCT need to be purchased in 2008. Currently operated container freight cars will be able to cope with the increase of transport volume until this purchase (2008).

iii) Signalling and Communication Facilities

Since the current facilities are sufficient to meet the transportation demand expected in 2010, this dry port needs not specific expansion. However, it is desirable that signalling and communication facilities should be modernized under other railway project. Because most of the current facilities are old-type, so electronic interlocking devices, an automatic block system and arrangement of the communication network should be introduced, so that high speed operation and increase the transportation capacity can be realized.

6.2.5 Rambipuji Dry Port and Connecting Railway

(1) Demand Forecasts

16. a. The Jember region is the background district of Rambipuji dry port. This rural district covers all routes in the region including the cities of Jember and Banyuwangi. The demand forecast for container cargo based on figures 1993, are estimated as the increase of 128% in 2003, 135% in 2010 and 185% in 2018. These figures show that drastic increase cannot be expected. (see section 3.5.5)

Table 6.4 Transport Demand Forecast for Container Cargo in Jember Region

(TEU)

Year	1993	2003	2010	2018
Export	11,500	14,721	17,499	21,320
Import	11,500	14,721	17,499	21,320
Total	23,000 (100)	29,442 (128)	34,997 (152)	21,320 (185)

17. b. According to the demand forecast, the railway share of transport demand in 2010 will be 6.2 times that of 1993 in Scenario 1 (Share 50%), about 110 times in Scenario 2 (Share 90%) and 2.7 times in Scenario 3 (Share: the same as 1993). The railway share of all container cargoes in the Jember region was 11% in 1993, which resulted in only 3.4 TEUs per day on the average. Typical commodities transported by

railway were tobacco and stones, tobacco was 70% and that of the building stone was practically 100%. Railway share in the container traffic is bound to 90% because of technical reasons and the preference of the customers. hence Scenario 2 seems to be too optimistic. Therefore, the Master Plan is studied based on demand in Scenario 1.

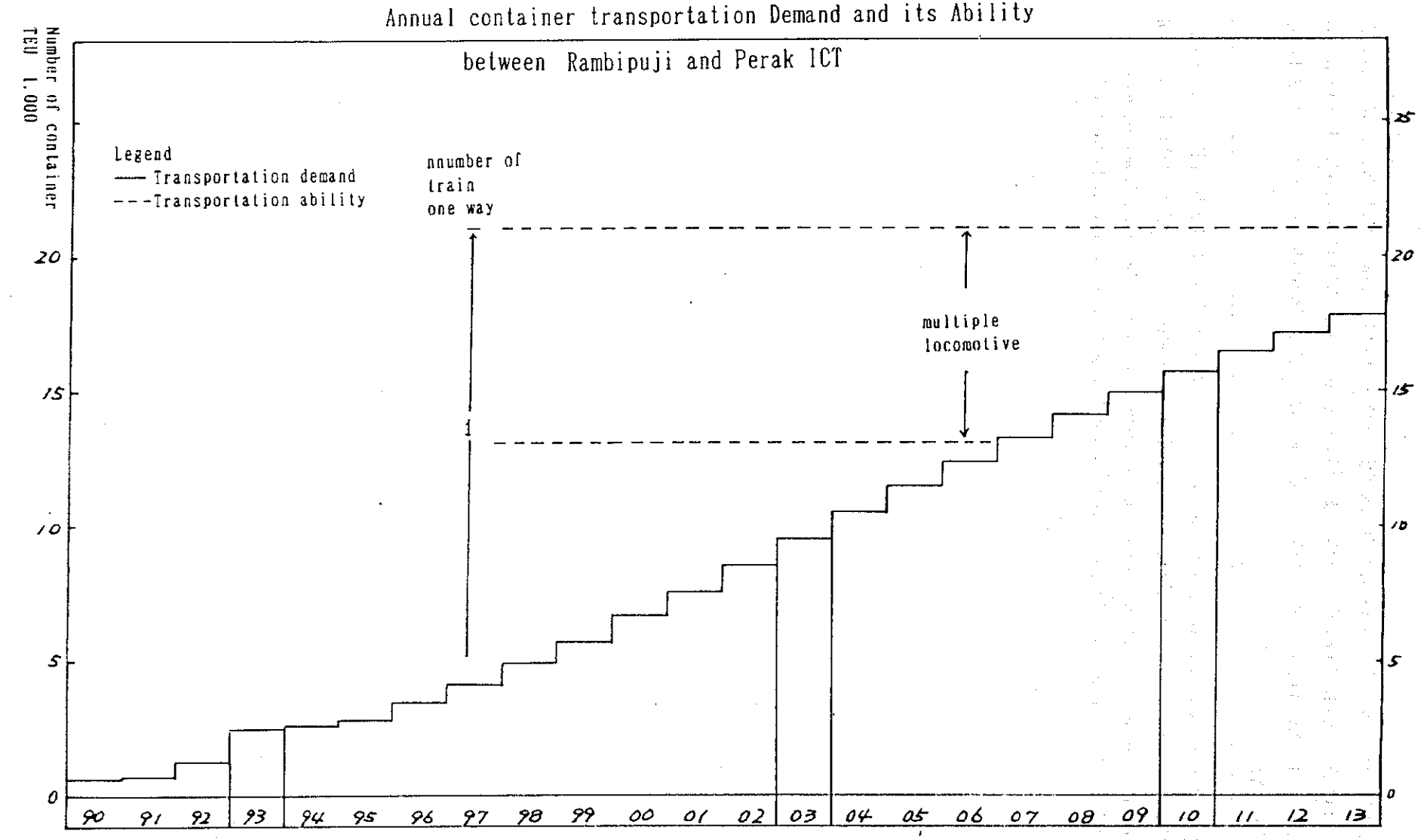
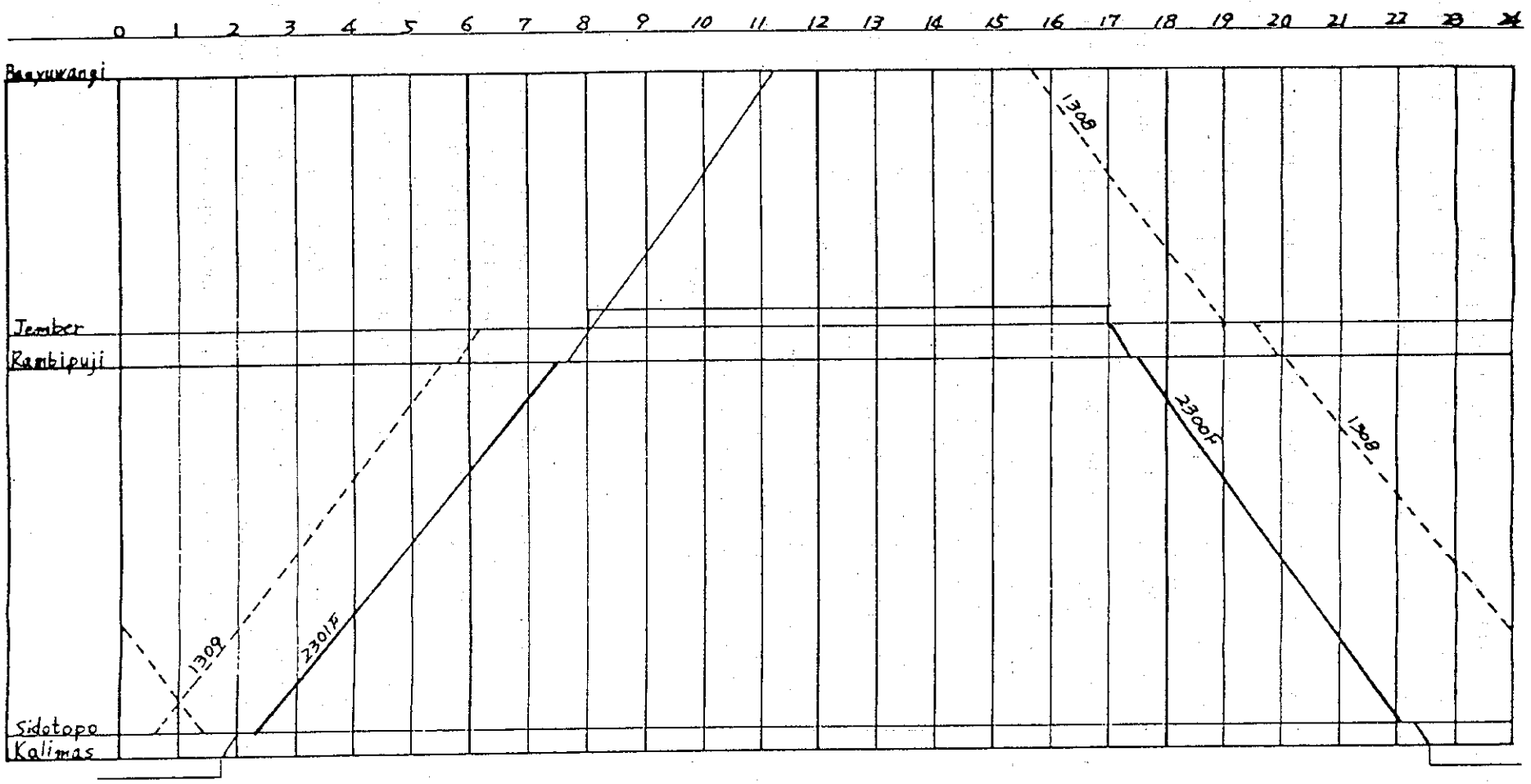


Fig 6.3 Annual container transportation Demand and its Ability

Container train diagram : Klimas and Banyuwangi



Notes
—— 2300F, 2301F : none regular Container train
--- 1308, 1309 : regular Rapid freight train (container together)

Fig 6.4 Container train diagram: Klimas and Banyuwangi

Table 6.5 Demand Forecast for Railway Container Transport

(TEU)

Year	1993	2003	2010	2018
Jember Area	23,000 (100)	29,442 (128)	34,997 (152)	42,641 (185)
Scenario 1	2,516 (100)	9,519 (378)	15,699 (624)	20,918 (831)
Share %	10.9	32.3	44.9	49.1
Scenario 2	2,516 (100)	12,054 (479)	24,789 (985)	36,569(1453)
Share %	10.9	40.9	70.8	85.9
Scenario 3	2,516 (100)	5,328 (212)	6,883 (274)	8,510 (338)
Share %	10.9	18.1	19.7	20.0

* Scenario 1: Railway share increases to 50%.
* Scenario 2: Railway share increases to 90%.
* Scenario 3: Railway share remains at present level.

(2) Connecting Railways

18. a. With the assumptions that a TRCT operated under the efficiency of 90% consists of one locomotive and ten container freight cars carrying 20 TEUs, the annual transport capacity of one TRCT is 13,140 TEUs (total of both directions)

2 TEUs x 10 cars x 365 days x 2 x 0.9 = 13,140 TEUs / year

A TRCT with two locomotives and 16 container freight cars carrying 32 TEUs, annual transport ability rises 1.6 times up to 21,024 TEUs.

2 TEUs x 16 cars x 365 days x 2 x 0.9 = 21,024 TEUs / year

A current non regular TRCT making a daily round trip can cope with transport demand until 2005 in Scenario 1. If this train is powered up by adding one more locomotive in 2006, it can cope with demand until 2018 by a single round trip every day (see **Fig. 6.3**).

19. b. Daily TRCT will improve reliability of the train service among the customers. This would promote, in turn, future shift of transport demand to railways from trucks. For the development and changes of the industrial structure in Jember Region, it is inevitable to promote the reliability towards railways and this is the key element to assure the subsequent growth of railway demand.

20. c. A policy based on Scenario 1 should be endorsed by predicting the status of future container freight demand. **Table 6.6 shows the required number of trains for each Scenario.**

Table 6.6 Required Number of Container Trains for the Jember Region (one way)

Year	1993	2003	2006	2007	2016	2018
Scenario 1	1		(1)			
Scenario 2	1	(1)		+ 1	(1)	
Scenario 3	1		(1)			

Note 1: A non-regular TRCT makes one round trip as of March 1993.
Note 2: (1) represents the time of the introductions of a double locomotive container train.
(see **Fig.6.3, 6.4** and Appendix)

21. d. The following units of rolling stock should be employed when of regularly operating a double locomotive TRCT trains starts daily operation.

* Locomotives : 2
* Container wagons :23

(3) Dry Port

22. a. Effective track length at Rambipuji Dry Port is enough to accommodate a single TRCT (16 cars carrying 32 TEU) hauled by two locomotives. In addition to Rambipuji Dry Port, there are general.

23. b. The stations that the conventional train can collect and deliver containers, are dispersed along the route and conduct mannal stuffing operation. If the receiving and releasing of containers are limited only at Rambipuji Dry Port, it is not convenient for customers. Therefore, delivery of loaded containers to other stations as well as the dry port is recommended. The container traffic volume at Rambipuji is too small for the efficient use of heavy machines for 40 ft containers (see **Table** 2.33). It is concluded that, at Rambipuji Dry Port, manual operations are inevitable for the financial reasons until the container traffic demand reaches the level that can afford to introduce heavy handling machines.

6.3 Long - term Improvement Plan of Management and Operation of Dry Ports

(1) Bandung Area

24. a. Facilities

i) Early establishment of the unloading container facilities at Kac. St. next to Gdb. St. is required to meet the increase of the container traffic demand in Bandung area. Not only all arrival containers but debanning work at CFS in Gdb. St. should be move to at Kac. St.

ii) all outbound containers should be handled at Gedebage as it is.

iii) Necessary information system should be arranged.

25. b. Organization and Management

These two stations are new type dry ports with the sharing of the functions of a Dry Port, i.e., arrival and departure. Therefore the operating body is required to have such an organization suitable, that is for the simultaneous and well-interfaced operations of both dry ports. The organization and management will be discussed and reported in detail in the F/S of this study, where the possibility of privatization will be also discussed.

(2) The other Areas

26. The use of a dry port would be attractive for customers, if they can complete all

the export and import procedures such as customs, inspection and exchange of foreign currency and can receive all the information about shipment at the dry port. The dry ports established at Solojebres and Rambipuji at the time when the traffic demand increased to certain levels, should provide the available services as well as Gedebage Dry Port.

6.4 PRELIMINARY DESIGN AND COST ESTIMATE

6.4.1 Tebing Tinggi Dry Port and Connecting Railway

27. As mentioned on the clause 6.2.1, the equipment investment will not be applied for the subject period of M/P.

6.4.2 Kertapati Dry Port

28. As mentioned on the clause 6.2.2, the equipment investment will not be applied for the subject period of M/P.

6.4.3 Gedebage dry port and connecting railway

29. The team has only to consider the handling facilities corresponding to the completion of TCT III and countermeasure for the transportation route between Jatinegara and Bekasi.
(refer to the design contents in F/S)

30. As the object on F/S

i) Improvement at Gdb. St.
Kac. and Gdb. St. are functionally separated and the former handles imported empty containers and the later handles exported ones and imported full ones.

ii) Doubling track between Kac. and Gdb.

iii) The improvement of Pasoso and the new installation of platform for loading and unloading at TCT III.

As the proper project after 2003(**Fig. 6.5**)

iv) Pasoso changes to PERUMKA St. for the arrival and departure trains via new Bekasi line, with the branch line to join the Bekasi line constructed with elevated structure. (after 2010)

v) Two shunting tracks are multiplied at TCT III by anticipated new dry port. (after 2010)

vi) Bandung car-depot is improved in accordance with the multiplication of locomotives, if necessary.

vii) Kac still more handles imported full containers for the alleviation of the burden at Gdb.

viii) The purchase of rolling stock.

The improvement at Gdb st. pays attention to be adaptable to the handling volume on M/P.

loco : 8 wagon : 68

The total cost amount for M/P is as follows.

* Facilities(civil works etc.)	53.10	Billion Rp
	+(8.53)	Billion Rp - after 2010
* Utilities (signal etc.)	19.89	Billion Rp
	+(3.34)	Billion Rp - after 2010
* loco and wagon	39.20	Billion Rp
* handling machines	8.20	Billion Rp
Total	120.39	Billion Rp
	+(11.87)	Billion Rp - after 2010
	Total	<132.26 Billion Rp>

( ) Corresponds to the branch line to join the Bekasi line and additional two shunting tracks for TCT III. (after 2010, noticed again)

31. The breakdown is shown on Table 6.7

6.4.4 Solo Jebres Dory Port and connecting railway

32. As mentioned on the clause 6.2.4, the railway facilities will not be required, but preparation of the locomotive, container wagon and container handling equipment will be required for the subject period of M/P.

(1) Locomotive

33. A locomotive equivalent to CC201 with the tractive capacity of 600 t should be provided by 2008.

(2) Container wagons

34. Container wagons for a train consisting of 16 container wagons should be provided by 2008, including the future requirement for container transportation demand.

(3) Container handling equipment

35. A top-lifter should be provided by 2008, because, in spite of the investment does not pay, stuffing work to the container by the man power will be over the limit.

(4) Estimation for the purchasing of the rolling stock and container handling equipment

Unit : Million Rp

	Budget
Rolling stock	6,050
Handling machine	1,540
Total	7,590

6.4.5 Rambipuji Dry Port and connecting railway

36. From the result of the demand forecast and the site survey of container handling work and container handling facilities, the team gets the following conclusion.

i) Container handling facilities at present have enough capacity for the container transportation demand by 2010.

ii) Purchasing of the heavy container handling machine should be study about year 2000 confirming the transportation demand.

iii) Preparation of the locomotive and the container wagon will be required at the time that the operation of through container train is required every day.

(1) Number for the purchasing of the rolling stock

Locomotive : 2
Container wagon : 23

(2) Time for the purchasing of the rolling stock

Please refer to the clause 6.2.5

(3) Estimation for the purchasing of the rolling stock

Rolling stock : 10,714 Million Rp

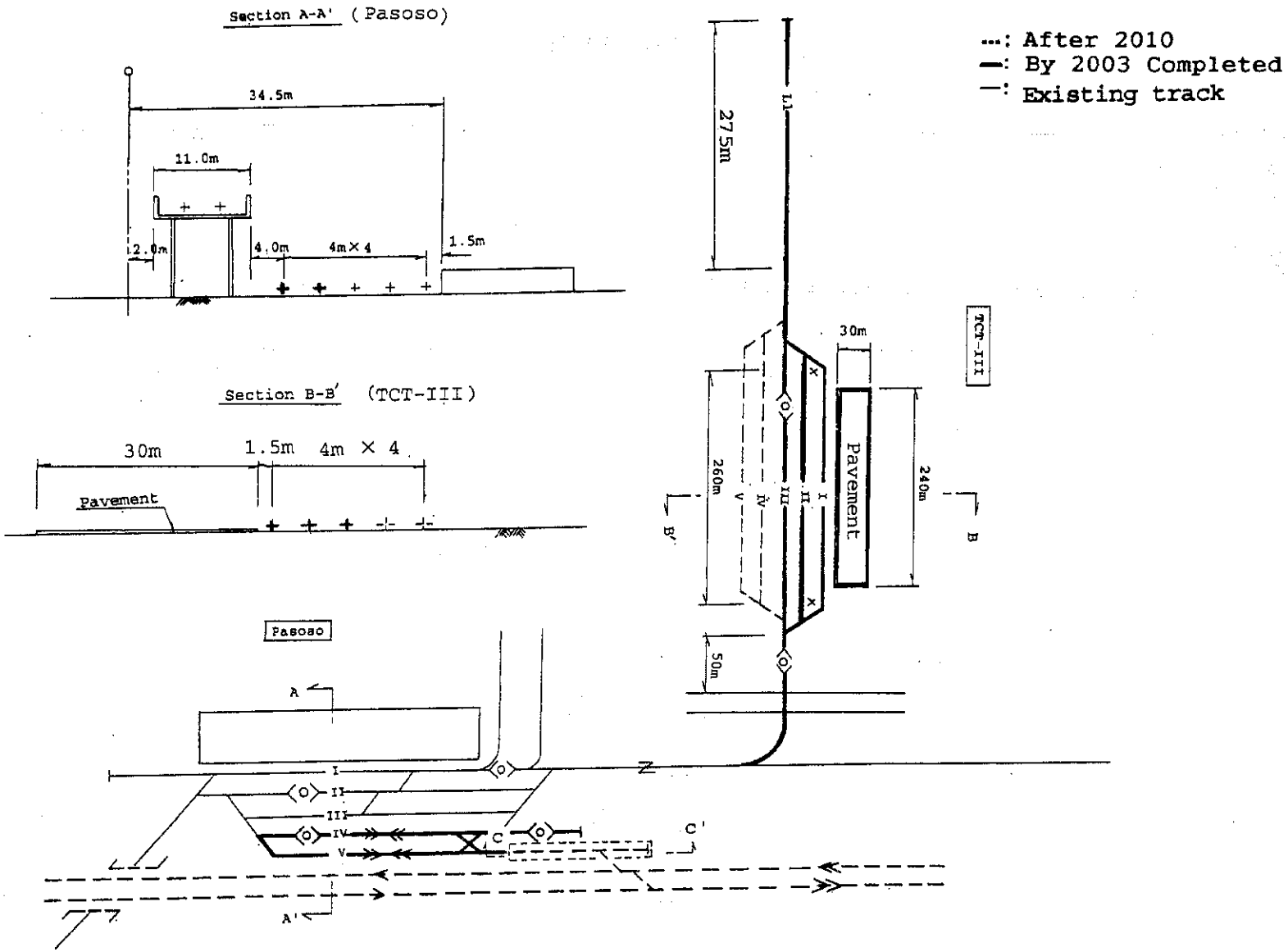


Fig. 6.5 Track Layout at Tg. Priok (Pasoso, TCT-III)

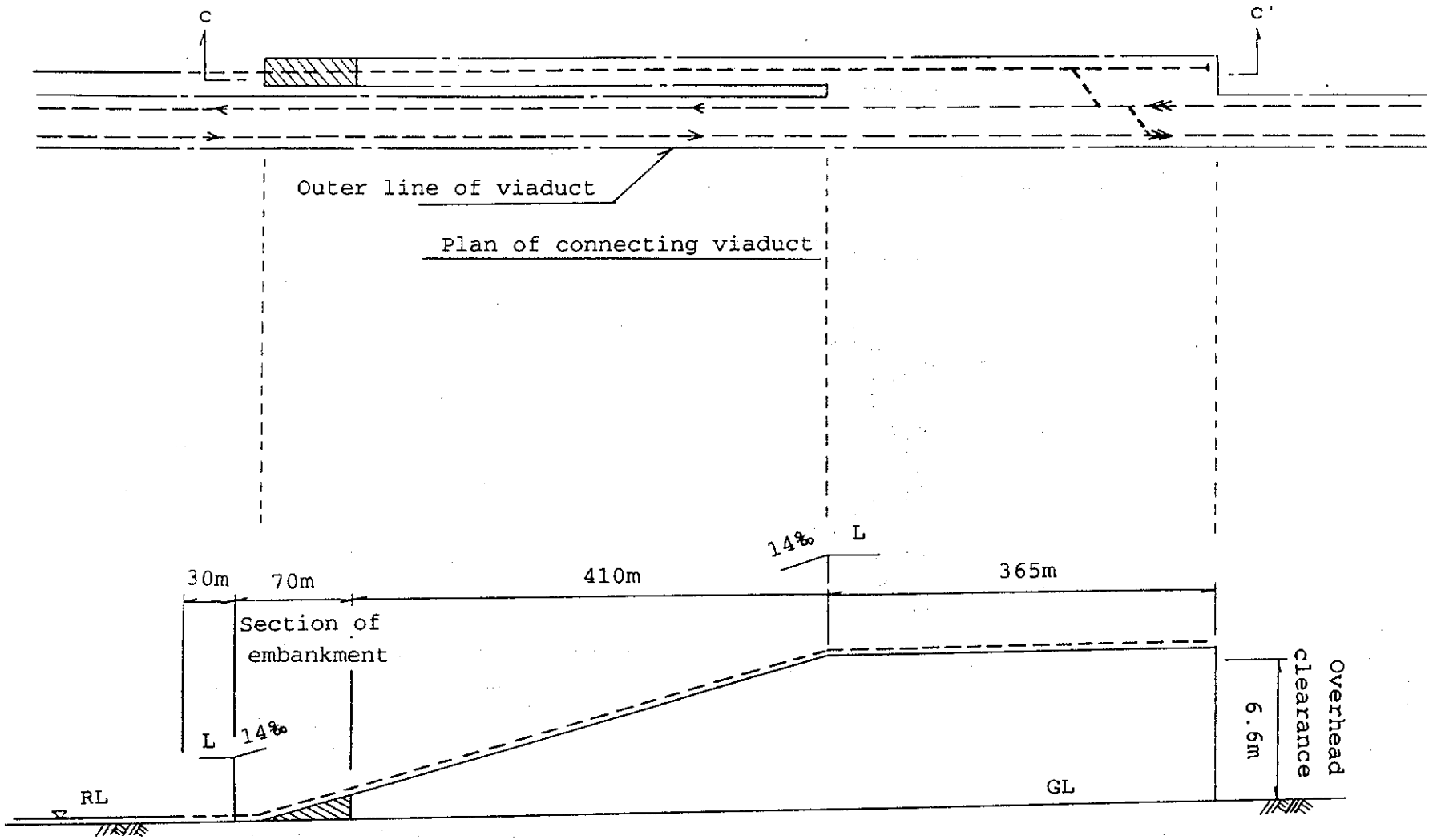


Fig. 6.6 Profile c-c'

Table 6.7 Total cost amount for M/P (Gedebage dry port and connecting railway)

(Unit: Billion Rp)

Stage	Item	Facilities (Civil etc)	Utilities (Signal etc)	Locomotive and Wagon	Handling Machine	Total	Remarks
F/S	i) Urgent Plan at Gdb and Kac	7.24	12.77	6.52	0.30	26.83	2 storage tracks, Pavement2,920m2
	ii) Improvement at Gdb and Kac	17.22	3.36		7.15	27.73	4 sub-main tracks, Pavement23,350m2
	iv) Improvement at Pasoso	2.49				2.49	2 storage tracks
	v) Improvement at TCT-III	3.71				3.71	3 storage tracks
	vi) Rolling Stock			3.30		3.30	
	vii) Management Cost 10%	3.07	1.61	0.98	0.75	6.41	
	Sub Total	33.73	17.74	10.80	8.20	70.47	
After 2003	i) Doubling Track (Gdb---Kac)	17.61	1.95			19.56	L=3,935m
	ii) Improvement at Pasoso	(6.48)	(3.04)			(9.52)	1 sub-main tracks, (After 2010)
	iii) Improvement at TCT-III	(1.27)				(1.27)	2 storage tracks, (After 2010)
	iv) Rolling Stock			25.82		25.82	
	v) Management Cost 10%	1.76 (0.78)	0.20 (0.30)	2.58		4.54 (1.08)	(After 2010)
	Sub Total	19.37 (8.53)	2.15 (3.34)	28.40	0.00	49.92 (11.87)	
Total		53.10 (8.53)	19.89 (3.34)	39.20	8.20	120.39 (11.87)	
<Grand Total>		< 61.63 >	< 23.23 >	< 39.20 >	< 8.20 >	< 132.26 >	Include after 2010

Note : ( ) Shows After 2010

6.5 Initial Environmental Examination(IEE)

6.5.1 General

37. In general, initial environmental examination(IEE) is the examination which is undertaken at the outset of the development project planning stage to determine the environmental impacts that may be created by the particular project based on existing information and data, easily accessible information relating to the particular project, and comments and judgements of specialists who are familiar with the environmental impacts of past similar projects. This examination should be carried out in a short period at a low cost.

38. On the new regulation of AMDAL in Indonesia, IEE(PIL) is not required, ANDAL and TOR for ANDAL previous to ANDAL are required directly. However,the IEE is useful to make TOR for EIA(Environmental impact assessment).

39. In case of "Master plan of container cargo handling ports, dry ports and connecting railways",IEE was carried out at each dry port and connecting railways i.e. Tebing Tinggi, Kertapati, Gedebage, Solo Jebres, Rambipuji and railways between Belawan and Tebing Tinggi, Tanjung Priok and Gedebage, Semarang and Solo Jebres, Surabaya and Rampipuji.

40. Generally, the impacts which has the possibility to affect the environment while the project activities conducted in the dry port and connecting railways are as follows;

- The water pollution in the drain or river by surplus soil, hazardous materials.
- The impact to the ecosystem, land property values by the activities.
- The traffic congestion and pollution such as air pollution and noise and vibration problems by the increased traffic volume.
- The resettlement problems caused by doubling,installation of railways or expansion of station facilities.
- The impact to socio-economic aspect, increase the employment opportunity and economic activities.

(1) Object of IEE

41. The objective of IEE is to examine the environmental impact which might be caused from the construction at the each project sites and to select items of the environmental estimation and the evaluation.

42. Initial environmental examination has the following functions.

- Identification of environmental impact, might be caused from the project, may be created based on collecting existing data and information, and site-observation
- judgment of necessary EIA(Environmental impact analysis) or not
- finding required environmental elements for EIA

43. IEE is carried out on the master plan phase, and EIA is be carried out at priority projects in feasibility study commonly. In case on "Master plan of container cargo handling ports, dry ports and connecting railways" IEE in Phase II(Master plan phase), EIA in Phase III.

(2) Methodology of IEE

a. Procedure of IEE

44. The procedure of IEE is shown in **Fig.5.32**. Generally IEE is carried out based on existing information, data and site observation, and grasp the existing environmental conditions,and identification of possible environmental impact. JICA study team prepared environmental impact matrix(**Table 6.8**, **Table 6.9**). The matrix showed relation between project activities and environmental factors. It can be available for initial environmental examination.

b. Environmental components and its items

45. Three environmental components and its items in the matrix(**Table 6.8, Table 6.9**) as follows;

-Physical/Chemical component

- Climate
- Land subsidence
- Soil contamination
- Ground water use
- Air pollution
- Vibration
- Natural disaster
- Aesthetic
- Slope stabilities
- Soil erosion
- Water quality
- Ground water quality
- Noise
- Offensive odor

-Biological component

- Terrestrial flora/fauna
- Aquatic flora/fauna

-Socio-economic component

- Land use
- Economic activities
- Infrastructures
- Employment
- Public health
- Recreation
- Resettlement
- Traffic
- Split of communities
- Archaeology/cultural site

Table 6.8 Environmental impact matrix of each project site

Dry Ports

Project Areas/Phases	Environmental Components	Physical/Chemical																Biological		Socio-Economic											
		Climate	Slope stabilities	Land subsidence	Soil erosion	Soil contamination	Hydrology	Water quality	Ground water use	Groundwater quality	Air pollution	Noise	Vibration	Offensive odor	Natural disaster	Aesthetic	Terrestrial Flora/Fauna	Aquatic Flora/Fauna	Land Use	Resettlement	Economic activities	Traffic	Infrastructures	Split of communities	Employment	Archaeology/Cultural sites	Public Health	Recreation
Tebing Tinggi	Pre-Construction																												
	Construction																												
	Service and Maintenance																												
Kertapati	Pre-Construction																												
	Construction																												
	Service and Maintenance																												
Gedebage	Pre-Construction																		-	-									
	Construction						-	-			-	-	-			-	-	-			+	-			+		-		
	Service and Maintenance										-	-	-						+-		+	-			+				
Solo Jebres	Pre-Construction																												
	Construction																												
	Service and Maintenance																												
Rambipuji	Pre-Construction																												
	Construction																												
	Service and Maintenance																												

+: Positive Environmental Impact

– : Negative Environmental Impact

Table 6.9 Environmental impact matrix of each project site

Railways

Project Areas/Phases	Environmental Components	Physical/Chemical																	Biological		Socio-Economic										
		Climate	Slope stabilities	Land subsidence	Soil erosion	Soil contamination	Hydrology	Water quality	Ground water use	Groundwater quality	Air pollution	Noise	Vibration	Offensive odor		Natural disaster	Aesthetic		Terrestrial Flora/Fauna	Aquatic Flora/Fauna	Land Use	Resettlement	Economic activities	Traffic	Infrastructures	Split of communities	Employment	Archaeology/Cultural sites	Public Health	Recreation	
Sumatra	Pre-Construction																														
	Construction																														
	Service and Maintenance																														
Tanjung Priok	Pre-Construction																					-									
-	Construction			-		-	-	-			-	-	-						-	-			+	-			+		-		
Gedebage	Service and Maintenance										-	-	-								+-		+	-			+				
Semarang	Pre-Construction																														
-	Construction																														
Solo Jebres	Service and Maintenance																														
Surabaya	Pre-Construction																														
-	Construction																														
Rambipuji	Service and Maintenance																														

+: Positive Environmental Impact

– : Negative Environmental Impact

6.5.2 IEE for each project sites

(1) Environmental impact matrix of each dry ports and connecting railways

46. **Table 6.8** and **Table 6.9** shows *General* environmental impact matrix of each dry ports and connecting railways. " + " is the symbol for "Positive environmental impact", and "-" is the symbol for "Negative environmental impact" that is related between project activities and environmental elements respectively.

(2) Project activities and environmental impact in priority project sites in development plan.

47. The possibility environmental impact in priority project site is explained. The Grade of environmental impact level is based on JICA Environment Guideline.

a. Gedebage and Kiaracondong dry port and connecting railways

Type of works :

1) Kiaracondong
- Pavement of container yard
- Installation of a gantry crane
- Installation of new railway
- Construction of new C.F.S

2) Gedebage
- Addition of arrival and departure tracks
- Construction of steel bridge
- Installation of lead track

3) Railway
- Doubling of track between Kiaracondong st. and Gedebage st..

4) Tanjung Priok
- Addition of siding track at Pasoso st.
- Construction of TCT-III

-Installation of railway
-Pavement of new container yard

Table 6.10 Environmental impacts and its countermeasures
Gedebage dry port and connecting railway

Activities affecting environment	Damage to environment	Forecasted impact level	Countermeasures
1.Pavement of the yards 2.Installation of railways	1.Noise and vibration 2.Air pollution 3.Water pollution	B	1.Extraordinary attention to surrounding residential area especially hospitals, schools etc. 2.Proper control of drainage
1.Installation of gantry crane	1.Landscape	D	
1.Doubling of track	1.Resettlement	B	1.Proper rout plan of new track
1.Transportation of construction materials	1.Traffic	B	1.Proper access road plan to the station
1.Construction of structures	1.Disposal of construction materials	D	1.Proper control of dumping materials

Tanjung Priok TCT-III

1.Installation new rail way	1.Land acquisition, resettlement	C	1.Properrout plan and compensation
1.transport of train	1.Noise,vibration	C	1.Proper work way and materials

Note: Impact level
A: Significant negative impact
B: Moderately negative impact
C: Unknown
D: Negligible negative impact

48. Considering the above forecasted impacts, for the project an Environmental Impact Assessment(EIA) is required.

b. Solo Jebres dry port and connecting railway

Type of works : 1) Installation of new rolling stock(locomotive, container wagons)

2) Installation of handling machine

Table 6.11 Environmental impacts and its countermeasures
Solo Jebres dry port and connecting railway

Activities affecting environment	Damage to environment	Forecasted impact level	Countermeasures
1.Installation of new rolling stock	1.Noise and vibration	D	Attention to surrounding residential area esp.hospital, school
1.Operation of handling machine	1.Noise and vibration	D	Attention to surrounding residential area esp.hospital, school

Note: Impact level A: Significant negative impact
B: Moderately negative impact
C: Unknown
D: Negligible negative impact

49. Considering that significant impacts are not forecasted, an Environmental Impact Assessment(EIA)is not required.

c. Rambipuji dry port and connecting railway

Type of works : 1) Installation of new rolling stock
- Locomotives
- Container wagons

Table 6.12 Environmental impacts and its countermeasures
Rambipuji dry port and connecting railway

Activities affecting environment	Damage to environment	Forecasted impact level	Countermeasures
1.Installation of new rolling stock	1.Noise and vibration	D	Attention to surrounding residential area esp.hospital, school
1.Operation of handling machine	1.Noise and vibration	D	Attention to surrounding residential area esp.hospital, school

Note: Impact level A: Significant negative impact
B: Moderately negative impact
C: Unknown
D: Negligible negative impact

50. Considering that significant impacts are not forecasted, an Environmental Impact Assessment(EIA)is not required.

6.6 OVER-ALL EVALUATION OF THE PLANS

6.6.1 Tebing Tinggi Dry Port and connecting railway

(1) Dry port

51. In the subject period (by 2010) of M/P, the railway transportation demand is in shortage to request the installation of a normal Dry port. Therefore a positive investment plan for the Dry port is unnecessary, and the equipment investment will not be applied in the subject period of the M/P.

(2) Connecting railway

52. Regarding the railway transportation from the Dry port, equipment investment should not be applied as well as the Dry port.
From the above, if the plan connecting directly between the container terminal Gabion Port and the existing railway is used only for the railway container transportation from the Dry port, the plan has to be reserved and to be watched for a while.

53. Not only for container transportation, but for keeping a competitive power for the railway transportation, the allowable axle load should be increased up to 15 t by the track improvement, which is necessary to make the rational transportation possible and to prepare for the competitive power in future.
The above improvement should be done as soon as possible, and planned separately from this M/P, as it is out of S/W for this M/P.

6.6.2 Kertapati Dry Port

54. The new establishment of direct container transportation route to Singapore has invited structural damage on the railway containers.
We have to recognize that freight transportation always stands on the free competition basis.
The evacuation from marine container transportation to get to Panjang would be inevitable in view of economic structure in South Sumatra.

6.6.3 Gedebage Dry Port and connecting railway

55. The transportation system in 2010 will end up with the facility investment completed based on F/S corresponding to the demand in 2003.
It is capable to handle three times present container handling volume.
The Set up of the functionally separated container stations at Gdb. and Kac. will be bearable to the 2010 year demand.
After improvement of the above stations, the utilization of the land space attached to Pwk. or Pdl. in the northern part of Bandung might have the possibility to revive, so that TCT III will take one new dry port at the above mentioned stations into consideration for the track layout in it.

56. The earlier completion of Bekasi line project is indispensable to resolve the bottleneck between Jng. and Bks. St.
The container route will take advantage of the Bekasi line by means that Pasoso changes to PERUMKA's station and extends the branch line to join the Bekasi line. Based on this policy, the industrial railway between Tpk and Pasoso st. can stop the operation disturbing the traffic at the square in front of Tpk. St., it not only resolve the detour of transportation route, but contribute the profitability of Bekasi line.

6.6.4 Solojebres Dry port and connection railway

(1) If the container traffic is large, several through container trains can operate as well as Gedebage Dry Port. The efficiency of cargo handling can be raised by introducing heavy machines such as a transtainer or a top lifter. Since these will increase the reliability of customers, based on the constant service availability, the increase of traffic demand will be brought. Efforts should be made to increase the container volume sufficiently to operate a through container train for this purpose.

(2) The total cost difference between roads and railways is advantageous for railways. As long as a cost difference exists, the container volume handled by railways will keep mild increasing in parallel with economic growth. Remarkable growth might be expected if only PERUMKA takes the following policy to decrease the total delivery time:

a. Install heavy handling machines.
b. Operate two freight trains a day for containers.

c. A shipping company installs a delivery depot at Solo.

If the above actions are taken, the total delivery cycle will be decreased from 3 days to 2 days. As a result, an enormous increase in container cargo can be expected. However, sufficient marketing efforts and time seem to be necessary in order that the volume grows enough to be profitable.

Of course, it is necessary to conduct market survey such as a questionnaire study to check customers' opinions concerning the effects. PERUMKA (or forwarders) will have to anticipate some work loss for the time being based on the above policy.

(3) The most ideal system for transport is to pack products into containers at the factory, deliver these loaded containers to the dry port and then transport them by train. Transport volume will not increase unless the dry port handles loaded containers.

However, the city government of Solo is presently, regulating road transport of containers in the city. It would be necessary to provide the access road for container vehicles driving to Solojebres dry port to encourage conversion from road transport to railway transport.

(4) As the conclusion, prior investment on Top Lifters and early adoption of through container train will be effective to lure customers, but force to invite the deficit cost for a while. The decision will be requested whenever the primitive manual power gets difficult to handle owing to the increase of container volume.

The improvement for modernization such as the increase of transportation ability or high speed operation would not necessitate only for container transportation.

6.6.5 Rambipuji Dry Port and Connecting Railway

(1) Dry port

57. As already explained in section 6.2.5, demand forecast and studies of handling operations at each station prove that existing facilities and handling equipment can manage the demand for the time being. The adoption time of handling machines should be determined by watching the transport result around the year 2000 when the rate of non-regular container train operations exceeds 50% (see Appendix), because the max operation ability by manual power has not been explicit.

(2) Connecting railways

a. Since the utilization rate for the minimum volume of track capacity between Surabaya and Jember is still 55%, it is subsequently safe to expand future train operations.

b. The effective length of tracks at the intermediate stations is long enough to manage trains with double locomotives.

c. As demand increases slowly, transport ability can be easily reinforced by multiplying locomotive and container freight cars based on these transport demand surveys. Refer to section 6.2.5 (2) for car multiplication periods based on the demand forecast.

7. CONCLUSIONS AND RECOMMENDATIONS

7.1 PORT DEVELOPMENT

General

1. Indonesia has achieved remarkable economic development. Even during the recent worldwide recession, Indonesia maintained an annual growth rate of more than 5%.

2. This economic success is largely attributed to a series of deregulation and liberalization measures in various sectors including finance, industry, ports and shipping.

3. In line with this economic progress, Indonesia's trade with foreign countries has expanding rapidly. The nation's foreign trade has increased at average annual rates of 21.2% (export*) and 17.7% (import*) over the last five years, which are higher than the GDP growth rate during the same time period.
* excluding petroleum and gas

4. The high growth in foreign trade has included a rapid increase in international trade cargoes. On a tonnage basis, these cargoes have increased at average annual rates of 6.6% (export*) and 9.7% (import*) over the last five years.
*excluding raw materials (inedible) and mineral fuel

5. Container cargo has recorded the highest increase among international trade cargoes, due to the increasing in containerization of container cargoes.

6. The annual growth of container cargo was 28.8% during the last five years. This is equivalent to approximately over four times higher than the GDP growth rate. This high growth rate is unique even among the ASEAN nations whose container traffic has been increasing at a rapid pace.

7. The volume of international container throughput in Indonesia reached 1.5 million TEUs in 1993 and 1.8 million TEUs in 1993, which is greater than those Thailand and Malaysia.

8. Indonesia's network of direct container service via mother vessels is composed of ones plying routes of Japan/Korea (10 times per week), Taiwan/Hong Kong (5 times per week), Singapore (over 25 times per week), Australia/New Zealand (5 times per week), the Middle East (weekly), and Europe and the U.S.East Coast (weekly) by RO/RO ships.

9. However, Indonesia is primarily connected with Europe and North America via feeder service with the transhipment of containers at the ports of Singapore, Kaoshiung/Keelung and Hong Kong.

10. Second Generation container ships maximum 1,500TEUs loading carriers are engaged on the direct routes, and vessels with 200-600TEU loading capacity are employed for the feeder transport routes, except for the Hong Kong route.

11. There are 15 ports (1992) which handle international containers in Indonesia. The major ports are Tg. Priok, Tg. Perak, Belawnw, Tg. Emas and Panjang.

12. Together with the new customs clearance system, the new open port policy (which replaced the four gateway ports system) has increased the number of ports accommodating international containers.

13. Direct service are limited to mainly the ports of Tg. Priok and Tg. Perak, but a few service are provided to Belawan and Tg. Emas. While the other ports are served by feeder ships connecting with Singapore, Hong Kong and Kaoshiung.

14. The government of Indonesia placed high priority on developing container handling ports. This is one of the major targets for the marine transport sector specified i Repelita VI, starting in 1994/1995.

15. The government is endeavoring to introduce privatization into port development, management and operation in order to keep pace with the rapid economic growth and the expected increase in the demand for transport facilities as well as to raise efficiency.

16. Domestic container traffic is still mostly undeveloped throughout Indonesia. There are, however, some domestic routes connecting main islands with small islands by conventional ship, such as the routes between Tg. Priok, Tg. Perak, Uj. Pandang and

other small ports.

Issues concerning Port Development and Modernization for Containerization

17. The development of container ports has fallen behind the rapid increase of container traffic. This generates numerous problems impeding the smooth handling of containers, and impedes the economic and industrial progress of Indonesia.

18. Ports developed for conventional cargo ships are not necessarily suited for accepting container ships, especially large-sized container carriers. There are some ports that have to expand facilities and deepen channels and basins in order to accommodate large container ships safely and efficiently.

19. At the port of Tg. Priok, the size of container stacking yard is definitely insufficient, and it seems to be difficult to provide an additional area inside the Port at this time. The port is trying to rapidly develop the Third Container Terminal, which will be completed before the year 2000. Nevertheless, additional container yards are urgently required prior to the completion of the Third Container Terminal.

20. Port development should be promoted in concert with the construction of related infrastructure like highways and railways. However, the linkage between internal and external facilities is not effective at some ports due to insufficient coordination at the planning and implementation stages among the organization in charge.

21. In this regard, the connecting railways between the port of T. Priok and the Getebage dry port (which serves Bandung) urgently need to be improved and strengthened along with the dry port and other related facilities in order to expand container transport capacity.

22. The total budget for the transport sector had been reduced since Repelita V, with the introduction in 1992 of PELABINDO to replace PERSERO for port management and operation. This system is expected to generate sufficient revenue from expansion of activities. However, whether all PELABINDOs can generate sufficient revenues to finance their own facilities or not will be a problem for further development. Moreover, most private sector enterprises have not yet reached the stage where they enjoy profits from the undeveloped ports.

23. Private sector participation in port projects, particularly in container port development and operation, is expected to complement and strengthen the container handling capacity in the West Java area. This system has proven effective in overcoming the shortage of public resources and in raising the efficiency of port management and operation by introducing profit motive.
However, taking of consideration the public role of ports as a main pillar of national socioeconomic development, the government should be responsible for supervising all port projects to ensure stable, continuous operations.

24. Although Indonesia's domestic container traffic is developing gradually, facilities are inadequate at most of the ports. Most of the quay structures are not strong enough to accommodate heavy cargoes, and suitable handling equipment is not available.

25. Statistics related to container movement are not consistent among the ports handling containers. The compilation and reporting systems for container data and other information need to be improved.

Master Plan

26. The basic purpose of this study id to formulate a strategy for the national network of container port and railway facilities, as well as to provide a long-term plan for the development of priority ports and railways.

27. In order to forecast future container traffic, three scenarios are set up for medium, high and conservative growth cases as scenario I, II and III, respectively. The socioeconomic frame of scenario I is estimated based on those in Repelita VI and the Long-term Development Plan II.

28. While the national average annual growth rate of GDP is set at 6.2% up to the year 1998/1999, the target year of Repelita VI, the projected GDP growth rate from 1999 to 2010 is set at 6.2% -8.7% (Scenario I).

29. Population is estimated to increase at an annual rate of 1.51% up to the year 1998/1999 and at 0.95-1.43% per year until 2010 based on both the target of the Long-term Development Plan II and the estimation made by the cooperative venture between the Demographic Institute Faculty of Economics, University of Indonesia and the

National Development Planning Board (Scenario I).

30. Based on these projections, in the target year 2010, the volume of international container traffic will increase by approximately 4.3 times and domestic traffic by approximately 16 times over the present figures.

31. The volume of containers carried by railways between T. Priok and Gedebage will expand by approximately 3.4 times in 2010 over the present volume. The other traffic on railways connecting ports with dry ports will also increase, but this volume will still be insufficient for economic container transport via railway.

32. International shipping lines are building very large Post Panamax container carriers in pursuit of efficient operation and economic profitability, and to survive the stiff competition brought on by surplus capacity in container carrier market. These shipping lines will be forced to utilize Post Panamax carriers on major three routes: between the Far East and North America, Europe and North America, and the Far East and Europe. Therefore it will be difficult for Indonesian ports to attract Post Panamax vessels engaging in the routes in the near term because of long deviation from major calling ports. (These major ports are referred to as "Trunk Port" and this concept is known as the "Trunk Line Policy".)

33. However, Indonesia is planning to develop Batam Port not only as a trade port for importing and exporting materials and products generated from the proposed free zone, but also as a hub port for international containers by making good use of its location. After the completion of this project, Post Panamax carriers are expected to call at Batam Port in a good location, which will provide facilities not worse than those at the port of Singapore.

34. Since Post Panamax carriers will be placed in service for the three major routes in the near future, it is forecast that Third Generation container ships loading over 2,000-3,500 TEUs will overflow from the major routes and be shifted to the Indonesian routes, especially the route between the Far East/Japan and Indonesia.

35. Taking into account both the volume of international container traffic forecast regional and worldwide and the Trunk Line Policy, direct services to Indonesia by mother vessels will mainly cover the Far East/Japan, Australia/New Zealand and Mid

East routes. Foreign trade with Europe and North America by Post Panamax carriers will be connected to Singapore/Batam by feeder ships with transhipment of containers.

36. However it is not likely that the major routes will be only be served by Post Panamax carriers, because some shippers may choose to provide more frequent services using smaller vessels. In this case, container ships loading around 3,000TEUs (smaller than Post Panamax) may continue to serve these routes, and they are expected to call directly at Indonesian ports.

37. Taking into consideration the future trend of the world container transport mentioned above, container ports in Indonesia are divided into three categories, namely principal (container) ports, major (container) ports and local (container) ports. Apart from these categories, Batam Port is expected to become one of hub ports for south east Asia.

38. The function of the principal ports should be strengthened so these ports may serve as national gateways to accept direct service calls by large-sized container carriers loading around 3,000TEUs. The ports of T. Priok and T. Perak should be developed as principal ports.

39. The major ports, on the other hand, should function as both cores of regional development and as intra-regional distribution centers. These ports will mainly accommodate Intra-Asia feeders loading around 1,500TEUs. However, direct calls are also expected from Far East and nearby regions, even if the service is not much frequent. The ports of Belawan, T. Emas, Uj. Pandang and Panjang should be developed as major ports.

40. In addition, both the principal ports and the major ports will require berths to serve domestic container vessels and feeder ships connecting to Batam/Singapore.

41. With the progress of domestic container movement, other local (container) ports should also be developed as regional distribution centers. a few of these local ports will function as regional gateways for international trade.

42. The strategy studied above is entitled "The Development Strategy for the National Container Ports Network of Indonesia". The major characteristic of the strategy is that

container ports forming the Network will be directly and indirectly open to the world. Thus, this strategy is also referred to as the "Multi-Gate Container Network (MUGNET) Policy".

43. Indonesia's container ports must be improved and expanded to keep pace with the projected development outlined above. In addtion, the container cargo handling capacity of the existing facilities of the major container ports is estimated as well as the saturation year of the capacity on the basis of the assumed berth criteria and the cargo traffic forecast. The results are shown below:

	Handling Capacituy (x 1,000)	Saturation Year	
Belawan	127 Box(184 TEU)/Year	1994	(Existing)
Panjang (New Terminal)	116 Box(145 TEU)/Year	2003-2010	
Tg. Priok (Existing)	839 Box(1,153 TEU)/Year	1993	
Tg. Emas (New Terminal)	140 Box(196 TEU)/Year	1999-2004	
Tg. Perak (Existing)	254 Box(368 TEU)/Year	1992	
Uj. Pandang (New Terminal)	116 Box(145 TEU)/Year	1999-2002	

Recommendations

44. In order to respond the projected increase in international and domestic container traffic, the listed Table-1 to 3 will be required for accepting container ships and handling containers.
The requirements are summarized as follows:

No. of container berths

Six container ports 25 berths

Other container ports	16 berths

Yard and CFS area

	Yard(ha)	CFS(m^2)
Six container ports	211	451
Other container ports	68	112

The program presented in these tables should be implemented during the period of 1995 to 2010.

45. The projected cost to provide facilities listed in Table-1 and -2 is estimated with procurement cost of related equipment as follows:

Civil Works (incld. berths, yard, dredging and buildings)	Rp. 3,643 bil.
Equipment	1,697 bil.
Total	5,340 bil.

Note: (1)Construction case: Alternative I of T. Priok
(2)Including contingency and engineering fee

46. It is recommended that following works be implemented or considered for effective and efficient development, management and operation of container ports.

a) The master plan should be reviewed and revised periodically taking into consideration the changes in the socioeconomic conditions in Indonesia and worldwide.

b) Based on the results of the Master Plan study, the following feasibility studies should be implemented on an urgent basis.

(a) Container handling facilities are being constructed at the port of Uj. Pandang and will be completed in 1997. However, it is impossible to provide sufficient container yards inside the existing port area. Accordingly, a feasibility study is urgently needed for the construction of additional yards as well as introduction of computerization into

the terminal, in order to ensure the efficient operation just once the new facilities are completed.

(b) the Study Team agreed with the Steering Committee at the final meeting held in Jakarta on July 5th, 1994 to conduct a feasibility study of Uj. Pandang after the completion of the Master Plan study.

(c) The government is studying a new port development project at Bojonegara, which will supplement insufficient container handling capacity at T. Priok. According to this Master Plan study, additional container berths will be required in 2003, even though the Third Container Terminal will be completed in 1999. Therefore in view of preparation time necessary for study and construction work, a feasibility study should be started immediately, including an examination of the division of functions between T. Priok and Bojonegara.

(d) Taking into account limit of future forecast reliability, it is difficult to say definitely, at this time, that T. Priok or Bojonegara should be developed as a port to accept Post Panamax carriers. But it is suggested that future situations on this field should be carefully watched. Further, in case that works or studies for development are conducted for the ports, an ample room should be considered for reserving possibility to accommodate Post Panamax carriers.

(e) The construction work for the new container terminal will soon start at the port of T. Emas. This terminal will be fully used soon after the completion of construction work. Accordingly, an additional feasibility study should be conducted to examine the need for additional facilities at the port.

c) The government is planning and implementing several port development projects. These projects should be closely coordinated with the development of related facilities such as highways and railways, in order to achieve effective and efficient port operations.

d) Regarding environment problems caused by new port development projects, it is likely that these projects will extensively affect natural conditions as well as social activities around the project sites, because not only is the construction of ports involved, but also related facilities such as factories and houses; in addition, transport

infrastructure i.e. roads and railways, are likely to be developed. Accordingly, the assessment of a project should be done carefully, especially for new port development.

e) Since Eastern Indonesia is relatively underdeveloped compared to the West, the government should provide incentives to attract more private investment to the eastern half of the country.

f) Taking into consideration the public role of ports as a main pillar of socioeconomic development, privatization into a port development field should be carefully introduced to ensure stable, continuous port operations.

g) Training programs should be upgraded to raise the efficiency of container loading/unloading on quays and of handling in the terminal. Further, new training programs for experts should be established to introduce computerization into the terminal operations of container ports.

h) Additional container yards should be urgently provided inside the proposed Third Container Terminal area, if possible, or outside the port of Tg. Priok as inland depots to be operated as a part of the port facilities prior to the completion of the Third Container Terminal.

i) The establishment of comprehensive database for all national port activities including container traffic is urgently needed as an essential tool for the effective supervision, planning and operation of ports by all the parties and organizations concerned.

Table 7.1 Berth Requirement

Port	Existing (Completed by 2003)		2003				2010			
	Berth		Required			Need	Required			Need
	Length	Depth	Length	Depth	No.		Length	Depth	No.	
Belawan	500 350*	-11 -10	250 200 170	-12 -10 - 9	1 1 1	Deepening of A-2 berth Construction of 1 domestic berth w/o crane	250 200 170	-12 -10 - 9	2 1 2	200m extension for A-2 berth & 2 domestic berths: one domestic w/crane
Panjang	300	-12	250 170	-12 - 9	1 1	none	250 170	-12 - 9	1 1	one domestic berth w/crane
Tg Priok Alternative 1 & 2	820 360	-11 - 8	300 250 200 170	-13.5 -12 -10 - 9	2 4 4 2	New berths:300mx-13.5x2, 250mx-12x2 w/cranes, and 2 domestic berths w/o cranes	300 250 200 170	-13.5 -12 -10 - 9	3 6 6 2	new berths: 300mx13.5x3, 250mx-12x6 w/cranes, and 2 domestic berths w/cranes
Tg. Priok Alternative 3	820 360	-11 - 8	250 200 170	-12 -10 - 9	3 4 1	New berths:250mx-12mx3	250 200 170	-12 -10 - 9	3 4 2	New berths: 250mx-12x3 Domestic berths: one w/crane and one w/o crane
Bojonegara	-		250 200 170	-12 -10 - 9	3 2 1	New berths: 250mx-12x3, 200mx-10x4. One domestic berth w/o crane	300 250 200 170	-13.5 -12 -12 - 9	3 3 2 1	New berths:300mx-13.5mx2, 250mx-12mx3 and 200mx-10mx2. One domestic berth w/crane
Tg Priok Alternative 4 Tg. Priok	820 360	-11 -8	250 200 170	-12 -10 - 9	5 2 1	new berths:250mx-12x3	250 200 170	-12 -10 - 9	7 4 2	new berths: 250mx-12x7 2 domestic berths: 1 w/ crane, 1 w/o crane
Bojonegara	-	-	250 200 170	-12 -10 - 9	2 2 1	new berths:250x-12x2, 200mx-10x2 and 1 domestic berth w/o crane	300 250 170	-13.5 -12 - 9	3 1 1	new berths: 300mx-13.5x3, 250mx-12x1 and 1 domestic berth w/crane
Tg. Emas	345 605*	-10	250 170	-12 - 9	1 1	none	250 200 170	-12 -10 - 9	1 1 1	new berth: 250m x -12x1, and 1 domestic berth w/crane
Tg Perak	500	-11	250 200 170	-12 -10 - 9	2 3 2	250mx-12x2, 200mx-10x1 and 2 domestic berths w/crane	300 250 200 170	-13.5 -12 -10 - 9	1 4 3 3	300mx-13.5x1, 250mx-12x4 200mx-10x1, and 3 domestic berths w/cranes
Uj Pandang	490	-10	250 200	-12 -10	1 1	none	250 200	-12 -10	1 1	none

Note: * in the column of existing berth denotes the berth lengths of multi-purpose wharves.

Table 7.2 Requirement of Yard and CFS Area

Port	Existing (Completed by 2003)		2003			2010		
	Yard		Required		Need	Required		Need
	Yard (ha)	CFS (sqm)	Yard (ha)	CFS (sqm)		Yard (ha)	CFS (sqm)	
Belawan	9.46 -	6,240 -	14.4 -	24,000 -	Yard expansion 4.94ha	22.2 8.6	38,000 15,000	Yard expansion 13.44 ha and 8.6 ha for domestic yard
Panjang	10.05 -	21,400 -	5.7 4.0	10,000 7,000	enough area is available both for yard and CFS	8.5 4.6	14,000 8,000	need 3.05 ha for domestic yard
Tg Priok Alternative 1 & 2	28 -		82.6 8.0	116,000 14,000	Yard expansion 54.6 ha and domestic yard 8.0 ha	123.5 9.2	204,000 16,000	Yard expansion 95.5 ha domestic yard 9.2 ha
Tg. Priok Alternative 3	28 -		51.1 4.6	86,000 8,000	Yard expansion: 25.1 ha Domestic yard 4.6 ha	53.1 8.6	86,000 15,000	Yard expansion 25.1 ha Domestic yard 8.6 ha
Bojonegara	- -	- -	39.3 4.0	64,000 7,000	Yard construction 39.3 ha Domestic yard 4.0 ha	70.8 4.6	118,000 8,000	Yard expansion to 70.8 ha Domestic yard 4.6 ha
Tg Priok Alternative 4 Tg. Priok	28 -		56.3 4.6	92,000 8,000	Yard expansion 28.3 ha domestic yard 4.6 ha	87.1 8.6	142,000 15,000	Yard expansion 59.1 ha, and domestic yard 8.6 ha
Bojonegara	-	-	30.8 4.0	50,000 7,000	Total 34.8 ha is needed	40.0 4.6	38,000 8,000	Total 44.6 ha is needed
Tg. Emas	8.34 -		8.5 4.0	14,000 7,000	Yard expansion 4.16 ha for domestic yard	14.4 4.6	24,000 8,000	Yard expansion 6.06ha and domestic yard 4.6 ha
Tg Perak	15.4 -		37.7 9.2	61,000 16,000	Yard expansion 22.3 ha and domestic yard 9.2 ha	62.5 13.8	10#,000 24,000	Yard expansion 47.1 ha and domestic yard 13.8 ha
Uj Pandang	5.02		9.9	17,000	Yard expansion 4.88 ha	14.4	24,000	Yard expansion 9.38 ha

Upper row: International Container Terminal
Lower row: Domestic Container Terminal

Table 7.3 Container Cargo Traffic and Required Berths in 2010 in other Ports

Region	Port	Container Traffic Vol. (TEU/Y)	Required Berths & Yard(ha), CFS(1,000 sqm) area and Total Terminal area(ha)			
			Berth	Yard (ha)	CFS 1000 sqm	Total (ha)
Sumatra	Palembang	87,864	B-2:1	4.0	7	4.7
	Dumai Teluk Bay	202,680	B-2:3	12.0	21	16.0
	Jambi Benkulu	60,322	B-2:1 Conv.	4.0	7	4.7
Java	Cilacap Cirebon	14,224	Conv.			
Kalimantan	Banjarmasin Balikupapan Samarinda	388,168	B-2:5	23.5	35	20.0
	Pontianak	81,399	B-2:2	8.0	14	9.4
Sulawesi	Parepare Pantroan Kendar	108,096	B-2:2	8.0	14	9.4
	Bitung	33,470	Conv.			
Nusa Tenggara	Lamber Kupang Dili	110,268	B-2:2	8.0	14	9.4
Maluku & Irian Jaya	Ternate Ambon Solong Biak Jayapura	47,338	Conv.			

7.2 DRY PORT AND RAILWAY DEVELOPMENT

7.2.1 CONCLUSIONS

47. The dry ports might be planned under the assumption that the government would entirely regulate road transport by trailer. However:

i) Extreme regulation is not implemented. Otherwise, trucks might carry instead of trailers to the ports obeying economic principles.

ii) Regulations will be ineffective if expressways replace regular highways.

iii) When the absolute volume of total demand is overestimated, the railway transport of containers, which was supposed to be increased by conversion, seems to lose the attraction. Therefore, the facility utilization was forced to be inefficient.

These factors might have undermined the above expectations.

48. As the conclusion, the most recommendable route as priority project is Gedebage - Tanjung Priok route and the next is Solo -Semarang route.

The other routes are on the cradle stage, where enough economic growth adaptable for railway transportation or modernization of railway beforehand is desirable.

The team is expecting big economic growth in future for container transportation.

49. **Table 7.4** shows the comparison based on the result of individual routes analyzed in Chapter 6, where each item is substituted for points.

Gedebage is obviously superior. However, we can see little difference between Solo and Rambipuji. The reason would be that background factors (potential demand) are underestimated in a strict sense.

7.2.2 Recommendations

Urgent implementation plan which is the front half of F/S, should be carried out as soon as possible, because both the storage capacity for container wagons at Gdb and track capacity between Gdb and Kac are in shortage even now.

Further more,

(1) Transport system

50. As seen in Chapter 2 of Vol. 2, railway transport of marine container is still popular in the container of America and Europe with large inland regions. However, this cannot always become a good example for Indonesia, an island country that has entirely different topographical condition.

(2) Developing domestic container transport

51. It seems that the efforts to modernize the domestic freight transport system by using small size container transport to compete with trucks have been neglected.
Large-scale boxes such as marine containers are impractical for domestic transport of general merchandise.
Strictly speaking, Japanese freight transport would not be profitable. However, container transport is considered to be more advantageous than other types of freight transport from the perspective of carriage occupancy rates. Furthermore, when the total volume of freight transport dropped from 200 million tons to 60 million tons, these annual decreases have not affected container transportation even under the remarkable transfer to vehicles.

52. The cities are located along the Northern line from Jakarta to Surabaya (726 km), and the team is informed that considerable amount of freight is traveling between these two points. Market survey is probably necessary to organize a nationwide container network and to discover potential demand.

(3) Dry ports

53. New construction or improvement of railway facilities is too costly, on the other hand, a small increases of transport cannot reach payable.
Nevertheless, the transport industry is under perfect free competition, and freight is vulnerable to economy fluctuation. It would be inevitable for low-volume freight to be supported by truck transport for the time being, and to persuade customers to convert to railway transport when its demand has sufficiently grown up. Thus, the installation of new dry port might be difficult without premises that there exist strong requests by

customers group or powerful forwarders are fostered.

(4) Revising development plans

54. It is difficult to predict circumstances in the year 2010, since freight transport is sensitive to the economic changes and conditions. Therefore, the development is forced to rely on medium-range treatment. Continual revision of the existing future plans is necessary, in particular, soon after the construction based on this F/S has been completed.

(5) Infrastructure facilities

55. Current marine container boxes do not exceed construction gauge limits, but exceed car gauge limits.
It is uncertain whether this is because containers are ensured enough to avoid clearance limit violations, owing to small jolting or because Indonesia is currently experiencing a transitional period for developing a special low-bed freight car and the car clearance excess is specifically allowed in some sections. In any cases, safety concerns still are remained.

7.2.3 Basic policy for F/S concerning Dry Port and connecting Railway

56. F/S is proceeded based on the following policy.
(1) The object for F/S is Gdb dry port and the relatives (Refer to **Table 7.4**).

(2) As the premises, the necessary doubling of track and automatic signalization between Ckp and Pdl is completed by another project.

(3) F/S includes urgent implementation plan and objectifies only additional number of handling containers and the additional investment from 1995, based on the container traffic demand.

(4) F/S studies whether the present transportation route can be responsible for the forecasted demand at Gedebage in 2003 year and for the set up of TCT-III expected in 2000 year or not.

(5) Main facilities to be improved are as follows. **(Fig. 8.1)**

a. New additional Container terminal at Gdb
   The study of the way of using concerning Gdb and Kac.
b. Improvement of Tpk and Pasoso corresponding to the above and the Tg. Priok port improvement action plan.
c. Improvement of car depot if necessary.
d. Doubling track between Gdb and Kac and the automatic signalization between them.

Table 7.4 The forecast comparison for years 2003 to 2010.

I t e m	Gedebage		Solojebres		Rambipuji		Tebing Tinggi	
Background	◎	Industrial zone, municipal population : 1.8 million	○	Industrial zone, municipal population : 0.5 million	×	Agricultural zone No growth	×	Agricultural zone No growth
Transport distance	◎	187 km	○	112 km	◎	194 km	○	104 km
Container handling platform at port	×	Out of C.T. 900m	◎	NeXt to M.Y. after installation	×	Next to C.T. 500m	×	Apart from C.T. 2km
Degree of facility untilization by train	◎	Ten container trains required in 2010	○	One container train required in future (2008)	○	One irregular container train settled new	×	No container train
Degree of machinary utilization	◎	Sufficiently Utilizing machinery	×	Requires machinery expansion	○	No machinery expansion required	○	No machinery expansion required
Competing conditions with road transport	×	Expressway available	×	Expressway planned	×	Partial expressway served	×	Expressway available
Procedures, Services	◎	Completed at dry port	○	Possible in the same city	○	Possible in the same city	×	No functions as dry port
Evaluation	10		6		5		2	

Notes ◎ : 2 points
○ : 1 point
× : 0 points

8. URGENT IMPLEMENTATION PLAN

8.1 CAPACITY IMPROVEMENT OF DRY PORT GEDEBAGE AND CONNECTING RAILWAY

1. The team was asked to make an urgent implementation plan, and the railway team selected Gedebage-Tanjung Priok route for container transportation. The urgent implementation plan (until 1999) forms the front half of the execution of works in the F/S (until 2003) of Tanjung Priok-Gedebage route.

2. Urgent implementation plan is to increase both the handling capacity at Gdb, where is handling space at the platform and storage sidings, and the track capacity between Gdb and Kac, they are in shortage even now.

Transportation demand to check the facilities is based on 1999 year. The demand forecast concerning all kinds of trains is quoted from another report. ("Modernization/Capacity Study Corridor Jakarta-Bandung" Final Report Jan 1994)
Still more, the necessary doubling track and automatic Signalling between Ckp and Pdl are on the finance stage at present, they from the premises for the study of this plan.

8.1.1 Transportation plan

8.1.1.1 Transportation demand of marine containers

3. The transportation performance between Gdb and Tpk for past seven years during 1987-1993 is as follows, and the growth rate is remarkable. The result in 1993 shows that full export containers occupies 92% at Gdb and full import containers occupy 30% at Tpk of each handling container volume for departure.

Table 8.1 Actual Result of Container Transportation between Tpk-Gdb

(TEU)

Year	GDB Dept.	TPK Arr.	TPK Dept.	GDB Arr.	Total			Growth Rate/Year %
	FCL	Empty	FCL	Empty	FCL	Empty	Total	
1987	1,027	336	490	742	1,517	1,078	2,595	
1988	3,313	1,159	1,430	2,985	4,743	4,144	8,887	342
1989	6,182	1,153	1,849	5,623	8,031	6,176	14,807	167
1990	8,880	2,722	3,811	7,652	12,691	10,341	23,065	156
1991	14,926 (90)	2,996 (10)	4,755 (20)	13,159 (80)	19,681 (55)	16,155 (45)	35,836 (100)	155
1992	23,327 (92)	2,498 (8)	5,322 (30)	20,861 (70)	28,649 (61)	23,359 (39)	52,008 (100)	145
1993	28,238	2,610	8,941	21,129	37,179	23,739	60,918	117

Note : Figures in ( ) show occupying ratio of the full and empty

4. According to the final report, Technical survey on the development of Gedebage Dry Port by 2000 year, the container transportation demand in 1999 will be 123,059 TEUs that mean twice as many as the result in 1993.

The max. transportation ability per train is regulated by no more than 17 wagons that can load two TEUs.

The necessary no. of estimated trains in 1999 are 3,619 trains in a year that means seven trains a day single way and 14 trains a day double ways based on the following table (**Fig. 8.2, 8.3**).

Table 8.2 Container Transportation Demand and Necessary Train Number, between Tg. Priok and Gedebage

Year	Total	Growth rate	Necessary Train No.			Settled No. on dia/double way		
			/year	/day	/one way	Regular	Non Regular	Total
1993	60,918	117	1,792	4.9	2.45	8	2	10
1994	69,744	114	2,051	5.6	2.80	8	2	10
1995	80,407	115	2,365	6.5	3.25	8	2	10
1996	91,068	113	2,679	7.3	3.65	10	2	12
1997	101,736	112	2,992	8.2	4.10	10	2	12
1998	112,397	110	3,306	9.1	4.55	12	2	14
1999	123,059	109	3,619	9.9	4.95	12	2	14
2000	133,725	109	3,933	10.8	5.04			

5. However actual no. of operating trains double way are eight at present, the team expects that twice the handling volume in 1999 comparing with 1993 will be absorbed in TCT III.

8.1.1.2 Necessary transportation ability in each year

6. Based on present train table, four regular container trains and one non-regular one respectively single way are settled. The max. transportation ability based on the above is estimated as 124,100 TEUs that are calculated as follows.

(1) Ability per train

a. Connected wagon	17	
b. No. of loaded containers on a wagon	2	TEUs
c. Possible no. per train	34	TEUs

(2) Settled no. of trains 5 trains

single way
Regular 4

Non-regular 1

(3) The max. ability in a year

5*2*34 TEUs*365 days=124,100 TEUs

However, comparing with the result of 60,918 TEUs and average 167 TEUs a day in 1993, the max. ability is calculated twice actual transported result.

The team has to take into consideration of the fluctuation of weekly demand.

(4) Estimated ability

a. Weekly fluctuation on operating trains at present is as follows.

On Sundays and Mondays	: two trains
At peak period of 60 days in a year	: four trains
On the other weekdays	: three trains

The above shows the change of the no. of operated train in accordance with weekly fluctuated demand.

b. Calculation of estimated ability at present

On Sundays and Mondays	: 2*2*104	= 416	trains
At peak period	: 4*2*60	= 480	trains
On the other weekdays	: 3*2*201	= 1,206	trains
Total	:	2,102	trains

Transportation ability for containers : 34*2,102=71,468 TEUs/year

7. Based on the above weekly train operation performance, the team can estimates container transportation ability as follows.

Annual operated trains	: 2102
Average no. of daily operated train	: 2102/365=5.8 trains double way = 3 trains single way

8. Transportation performance in 1993 is 60,918 TEUs (may be 1792 trains in a year). This occupies 85.2% of the transportation ability (71,468 TEUs). The index is called "operating efficiency." The operating efficiency of 85 - 95% seems to be moderate, as the team considers the transportation adjustment owing to demand fluctuation or

inevitable operation stop owing to the obstacles that mean accident or disaster etc. For instance the above index in Japan shows 93 - 97%.

(5) The transportation capacity based on the present train diagram

The container trains settled on the train diagram in 1994 would be as follows according to aforementioned pattern.

a. Weekly operated trains
   On Sundays and Mondays : three trains single way
   At peak period in a year : five trains single way
   On the other weekdays : four trains single way
b. Yearly transportation ability substituted in TEUs
   On Sundays and Mondays
   34 TEUs * 3 trains * 2 * 104 days = 21,216 TEUs
   At peak period five days a month
   34 TEUs * 5 trains * 2 * 60 days = 20,400 TEUs
   The other days
   34 TEUs * 4 trains * 2 * 201 days = 54,672 TEUs
   Total 96,288 TEUs

(6) Yearly transportation demand in future

The team assumes the above tendency that the transportation volume drops on Sundays and Mondays would continue as well after 1995, and then try to combine it with yearly transportation demand forecast.
The result necessitates the increase of one train single way in 1996 and 1998 year respectively to the present train time table **(Fig. 2.50)**

Table 8.3 Transportation Demand and Necessary Train Numbers

Year		1993	1994	1995	1996	1997	1998	1999
Transportation Demand (TEU)	A	60,918	69,744	80,407	91,068	101,736	112,397	123,059
Train Numbers A/34	B	1,792	2,051	2,365	2,678	2,992	3,306	3,619
Weekly Train Numbers								
Sunday & Monday (104 days)		2	2	3	3	3	3	3
Weekday (201 days)		3	3	4	5	5	6	6
Peak day (60 days)		4	4	5	6	6	7	7
Annual Train Driving								
Sunday & Monday		416	416	624	624	624	624	624
Weekday		1,206	1,206	1,608	2,010	2,010	2,412	2,412
Peak day		480	480	600	720	720	840	840
Total	C	2,102	2,102	2,832	3,354	3,354	3,876	3,876
Operating Efficiency B/C	D	85.3	97.6	83.5	79.8	89.2	85.3	93.4
Container Transportation Ability	E	71,468	71,468	96,288	106,964	106,964	131,784	131,784

9. Based on the above necessary trains, the max staying wagon formations at Gdb and Pasoso are found on the present train diagram by interpolating necessary increased container train. (**Fig. 2.50, 8.2, 8.3**)
The result is summarized as **Tab. 8.4.**

Table 8.4 The Max Staying Wagon Formation

Year	1994 - 5	1996 - 7	1998 - 9	Remarks
The Max train single way	5	6	7	
Max Number of Wagon Formation at Gedebage	4	4	5	
Max Number of wagon Formation at Pasoso	4	4	5	

8.1.1.3 Whole transportation demand

10. Following the increase of container trains, the transportation route between Tpk and Gdb has to secure track capacity through the lines.
The sections between Ckp and Pdl and between Kac and Gdb are single track lines, the track capacity is going to be in shortage. The bottleneck sections and the forecasted running trains in future quoted from "Modernization/capacity study corridor Jakarta-Bandung" (Final Report Jan.1994.) are as follows.

Table 8.5 Number of Running Train

	Between Ckp and Pdl			Between Kac and Gdb		
	1993	1997	1999	1993	1997	1999
Parahyangan	30	34	36	-	-	-
Express	12	12	12	18	18	18
Rapid and Commuter	2	2	2	34	34	34
(Passenger sub total)	(44)	(48)	(50)	(52)	(52)	(52)
General	13	13	13	14	14	14
Container	10	12	14	10	12	14
(Cargo sub total)	(23)	(25)	(27)	(24)	(26)	(28)
Dead Head	-	-	-	11	13	15
Total	67	73	77	87	91	95