2.2.6 Natural conditions

136. In order to obtain the information on natural conditions of proposed port site, following site survey and investigations were conducted in Ujung Pandang Port and proposed Inland Container Terminal site at Kel. Tallo during the field survey period of the Study in November and December 1994. For the location of survey and investigation, refer to **Figs. 2.11** and **2.12**.

(1) Topographical and hydro-graphical survey

137. Topographical and hydro-graphical survey was conducted by using echo sounder and land survey equipment for the area of alternative navigation channel and Benten Fort areas. The survey maps are attached in **Appendix B-1** and **B-2**. As shown in **A-1**, the seabed along the face line of New Hatta Quay was being excavated during the survey period for the on-going construction works of the Quay and ,therefore, the seabed depth is still changing.

138. As for the Inland Container Terminal area, a rough survey was conducted by using sounding staff, since the ground configuration of the proposed area is shallow as shown in **Fig. 2.12** with a ground elevation of 0.0 to 2.0 m above LWS covered with sand, and considered to be not costly for land reclamation.

(2) Soil investigations

139. Two(2) offshore borings at proposed navigation channel of Ujung Pandang Port were carried out by using a rotary boring machine on a temporary platform. Boring results show that the depth of hard strata are approximately at -15.0 m and -19.5 m below LWS at the entrance of proposed navigation channel and in front of Benten Fort respectively. The layer covering the hard strata could be classified into two(2) layers, i.e;

a. Upper layer consists of soft silty fine sand with N-value of 0 to 1. This layer is getting thinner as the location is farther from sea-shore as shown in **Fig. 2.13**.

b. Lower layer consists of fine sand or sandy silt with N-value of 1 to 13.

This layer is also getting thinner seaward as shown in **Fig. 2.13.**

140. As for the proposed inland container terminal area at Kel. Tallo, particular soil boring was not conducted by the Study Team, since previous boring data conducted at existing Paotere Port, located approximately 800 m west side of the proposed site were obtained which shows that the subsoil is consisted of moderately compacted fine sand sediment on the hard stratum with the depth of -11 to -18 m below LWS. (see **Fig. 2.14**)

(3) Current observation

141. The observation was conducted at two(2) locations at proposed navigation channel at spring tide conditions during the new moon period in the second week of December 1994. At each location, upper current (at 0.2 of water depth) and lower current (at 0.8 of water depth) were observed by using directional reading current flow meter type B.F.M.008Mk3 at the intervals of every 15 minutes for a consecutive three (3) days. The observed maximum current velocity was, however, moderate of 0.8 knots with significant direction of north bound. The observation data are summarized in **Figs. 2.15** and **2.16.**

(4) Tide level observation

142. The observation was carried out at proposed navigation channel (see **Fig. 2.11**) for consecutive two(2) weeks from November 22 to December 8, 1994 by using an automatic tide level recorder. The observation results compared with tidal prediction are summarized in **Fig. 2.17**. The tidal range is obtained through harmonic analysis as shown hereunder:

H. W. S.(High Water Spring);	+	175.74	cm,
M. S. L.(Mean Sea Level);	+	87.87	cm,
L. W. S.(Low Water Spring);		0.00	cm.

(5) Seabed sampling

143. Seabed soil sampling was made at two(2) locations along proposed navigation channel as shown in **Fig. 2.11.** The seabed soil is classified to be silt with average grain size of 0.025 to 0.030 mm.

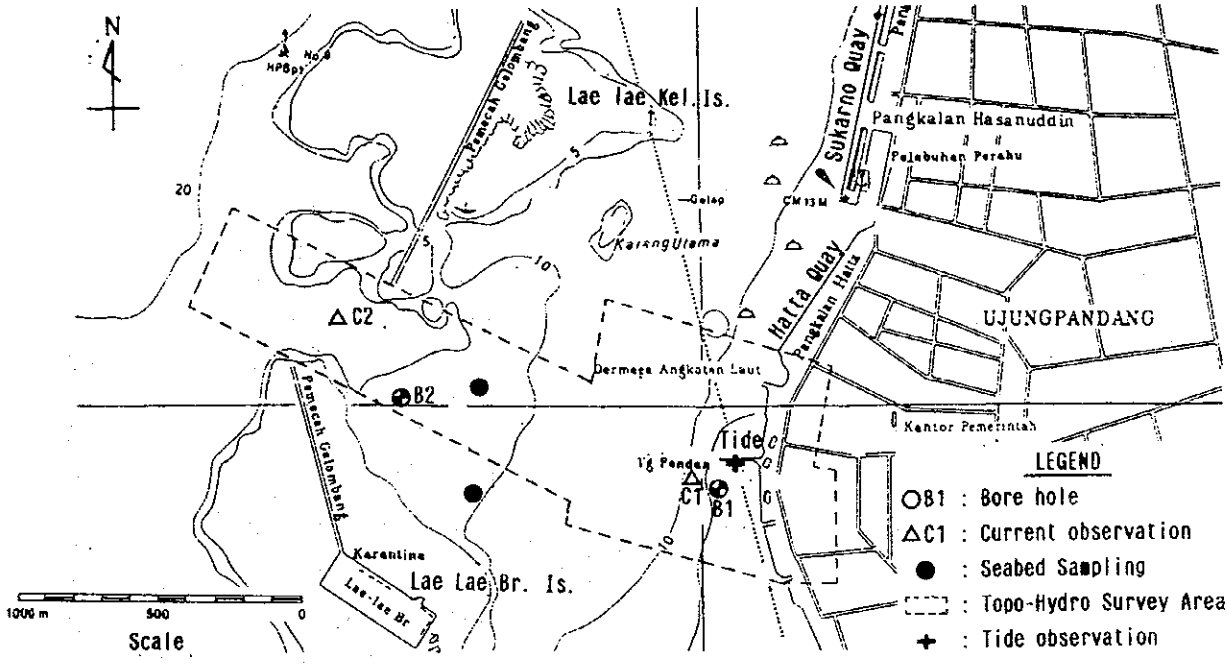


Fig. 2.11 Location Plan of Natural Condition Survey at Proposed Navigation Channel of Ujung Pandang Port

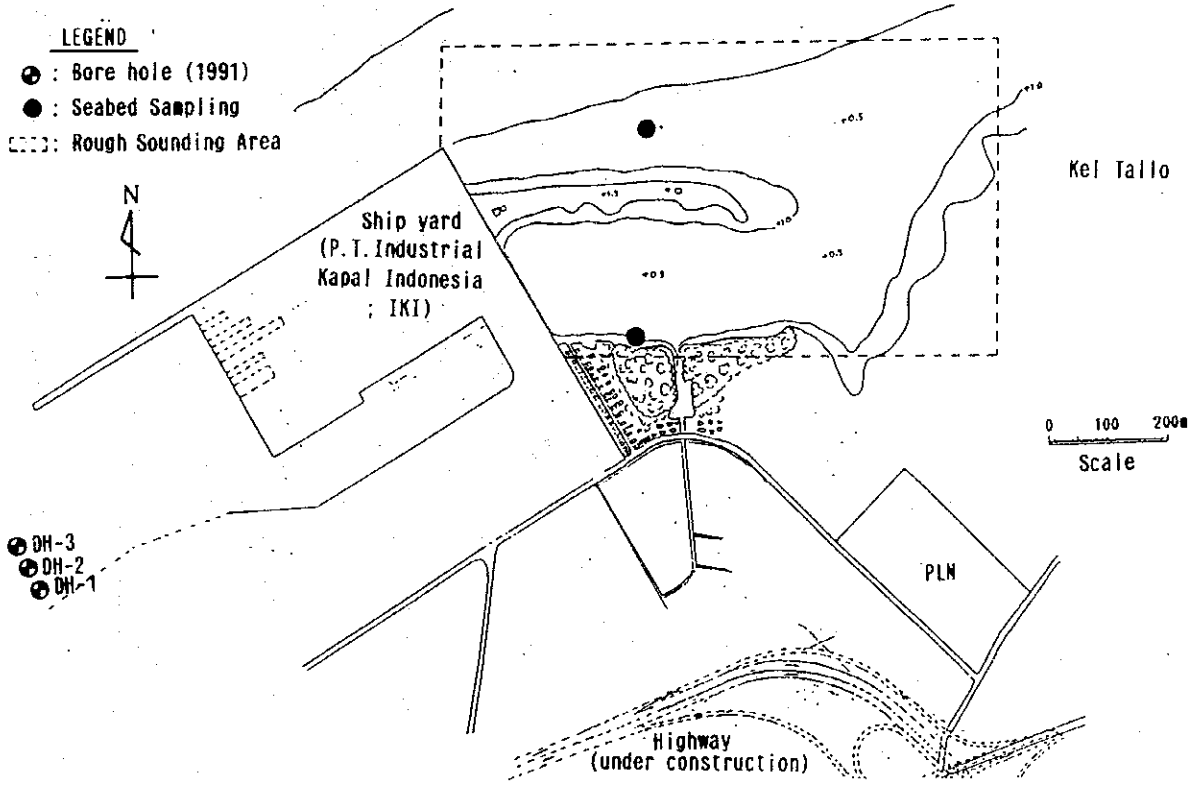


Fig. 2.12 Location Plan of Natural Condition Survey at Proposed Inland Container Terminal at Kel. Tallo

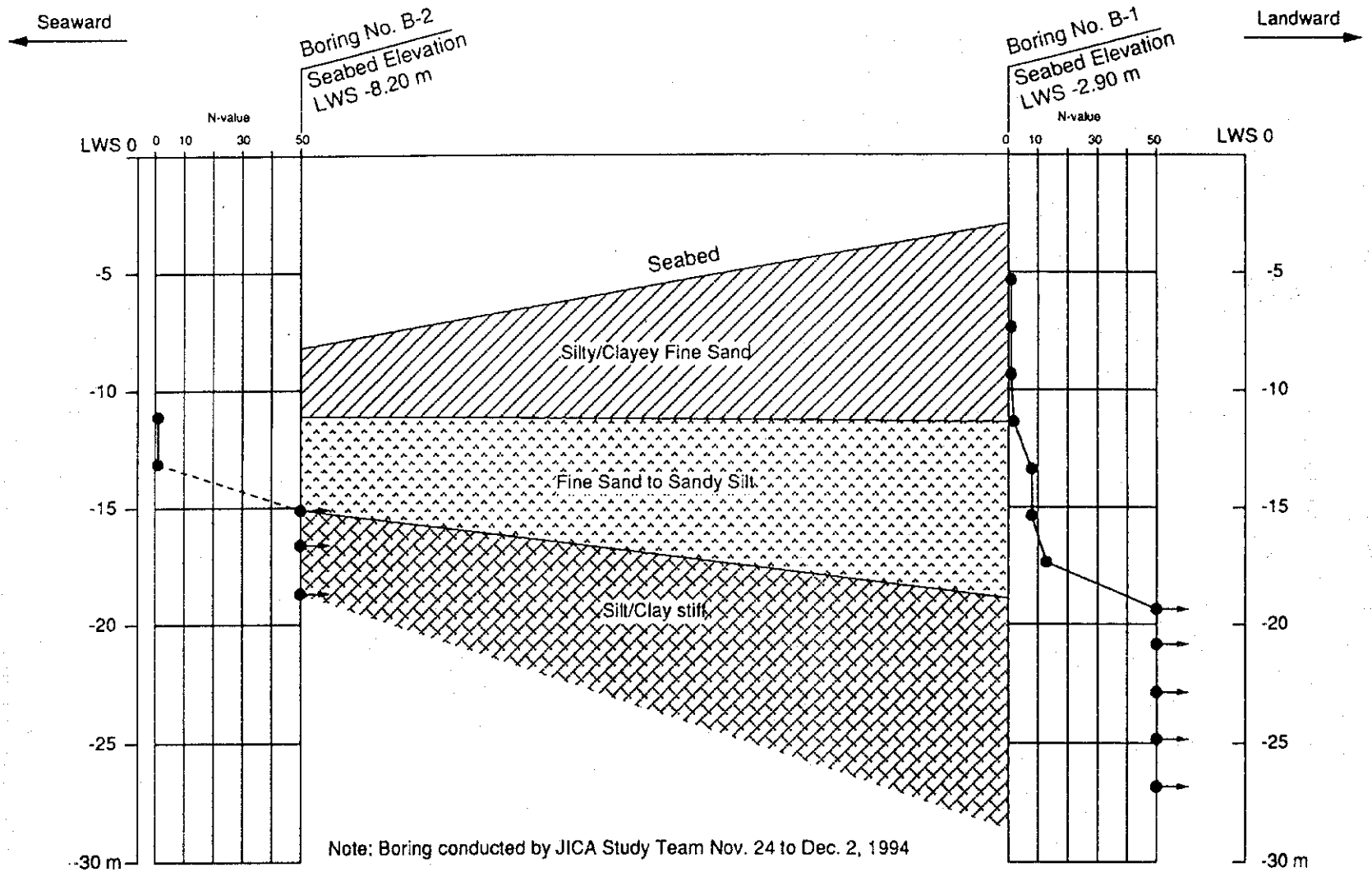
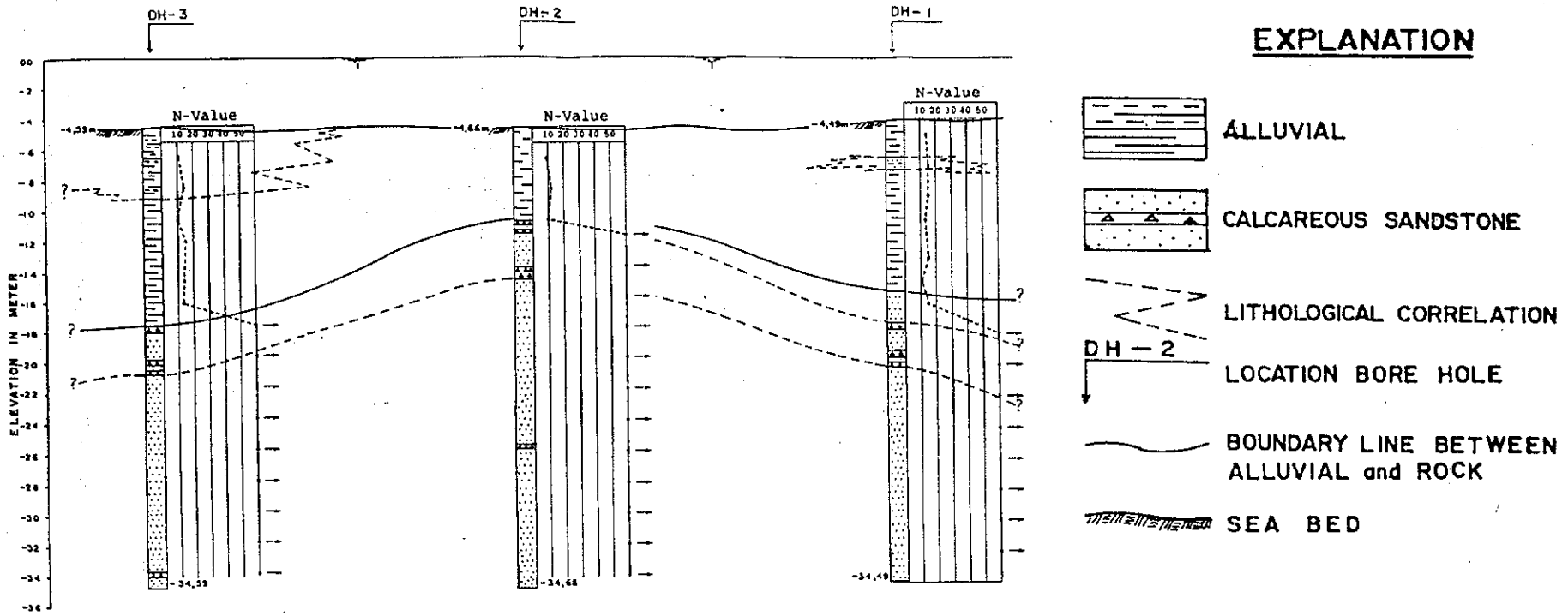


Fig. 2.13 Sub-soil Profile at Proposed Navigation Channel of Ujung Pandang Port

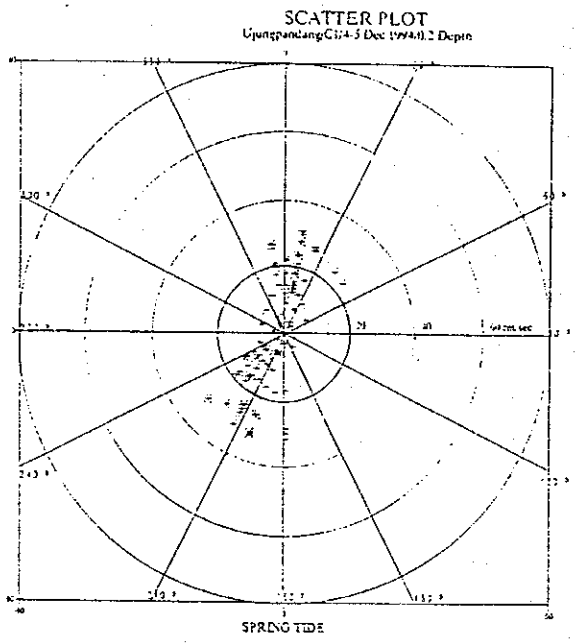


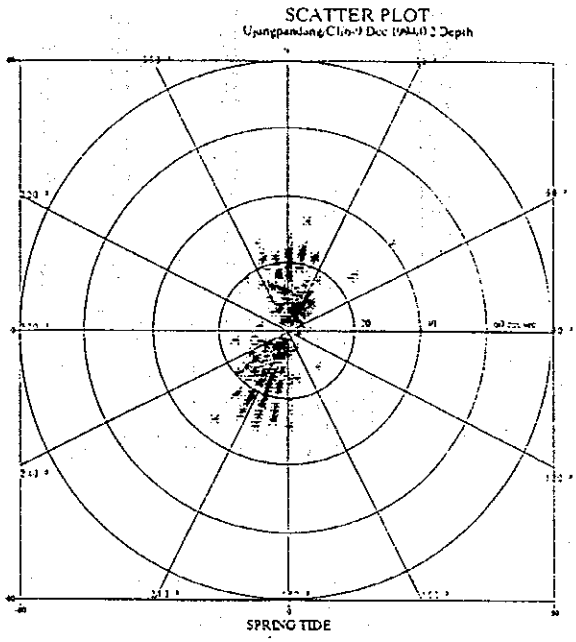
NOTE; "Soil Investigation Kolam Pang Kalan Paotere"
July 1991 by P.T.Geoace

SCALE V 1:400
H 1:500

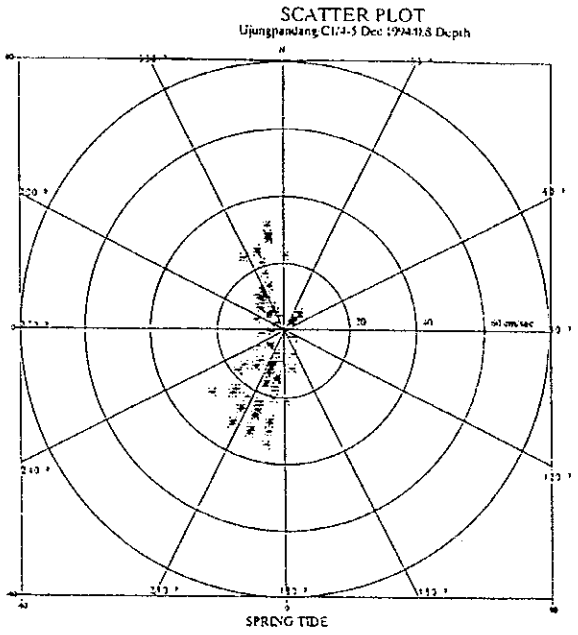
Fig. 2.14 Soil Profile at Paotere Port

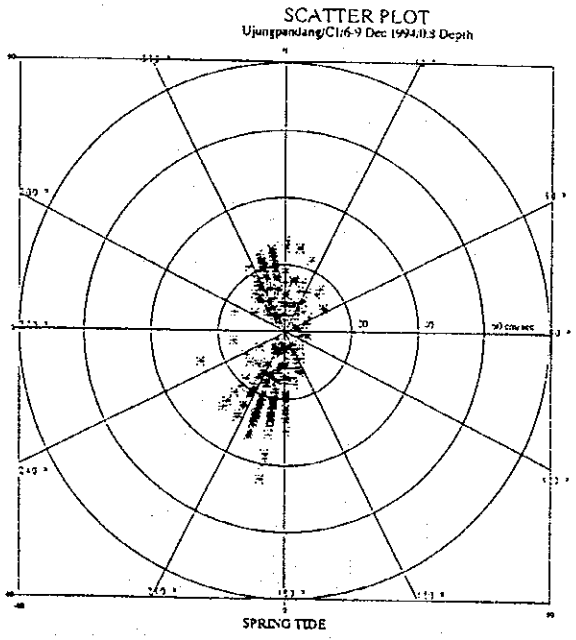
Upper current (0.2 depth)





Lower current (0.8 depth)

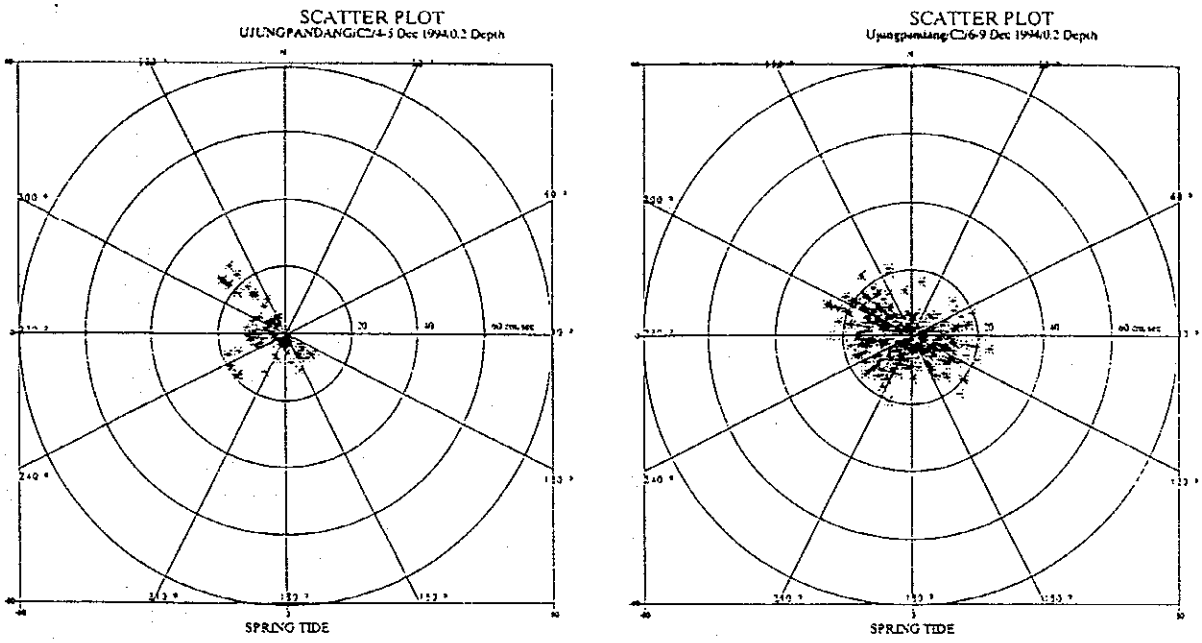




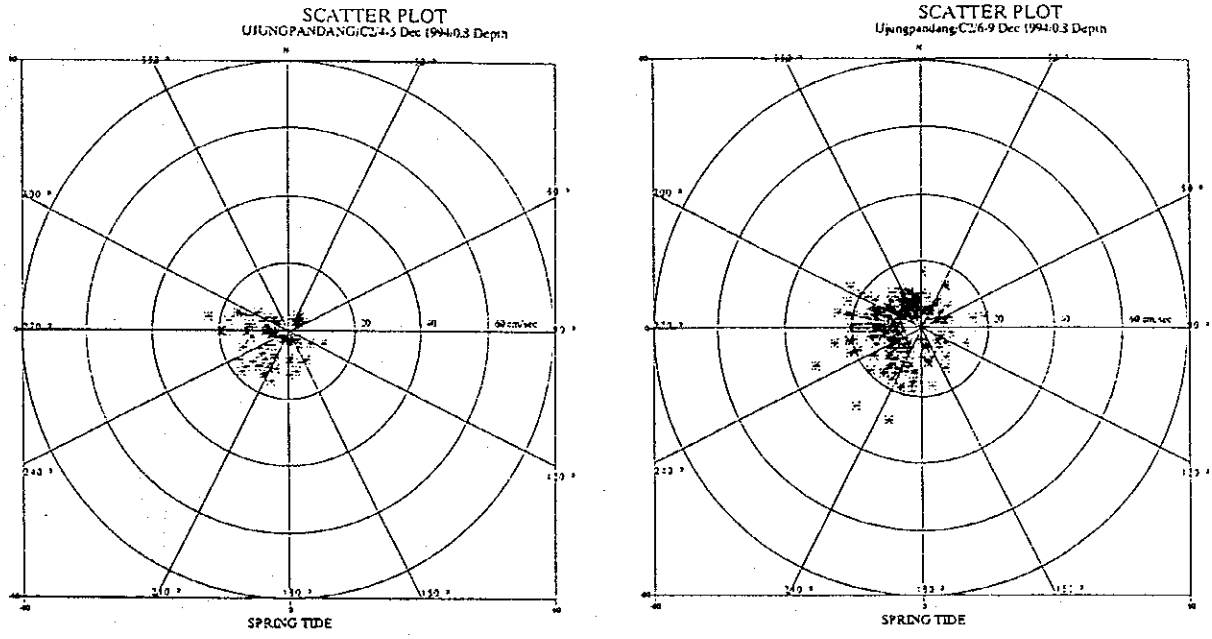
Note : At point C1 (Sea shore side)

Fig. 2.15 Current observation result at proposed navigation channel of Ujung Pandang Port (1)

Upper current (0.2 depth)



Lower current (0.8 depth)



Note : At point C2 (off-shore side)

Fig. 2.16 Current observation result at proposed navigation channel of Ujung Pandang Port (2)

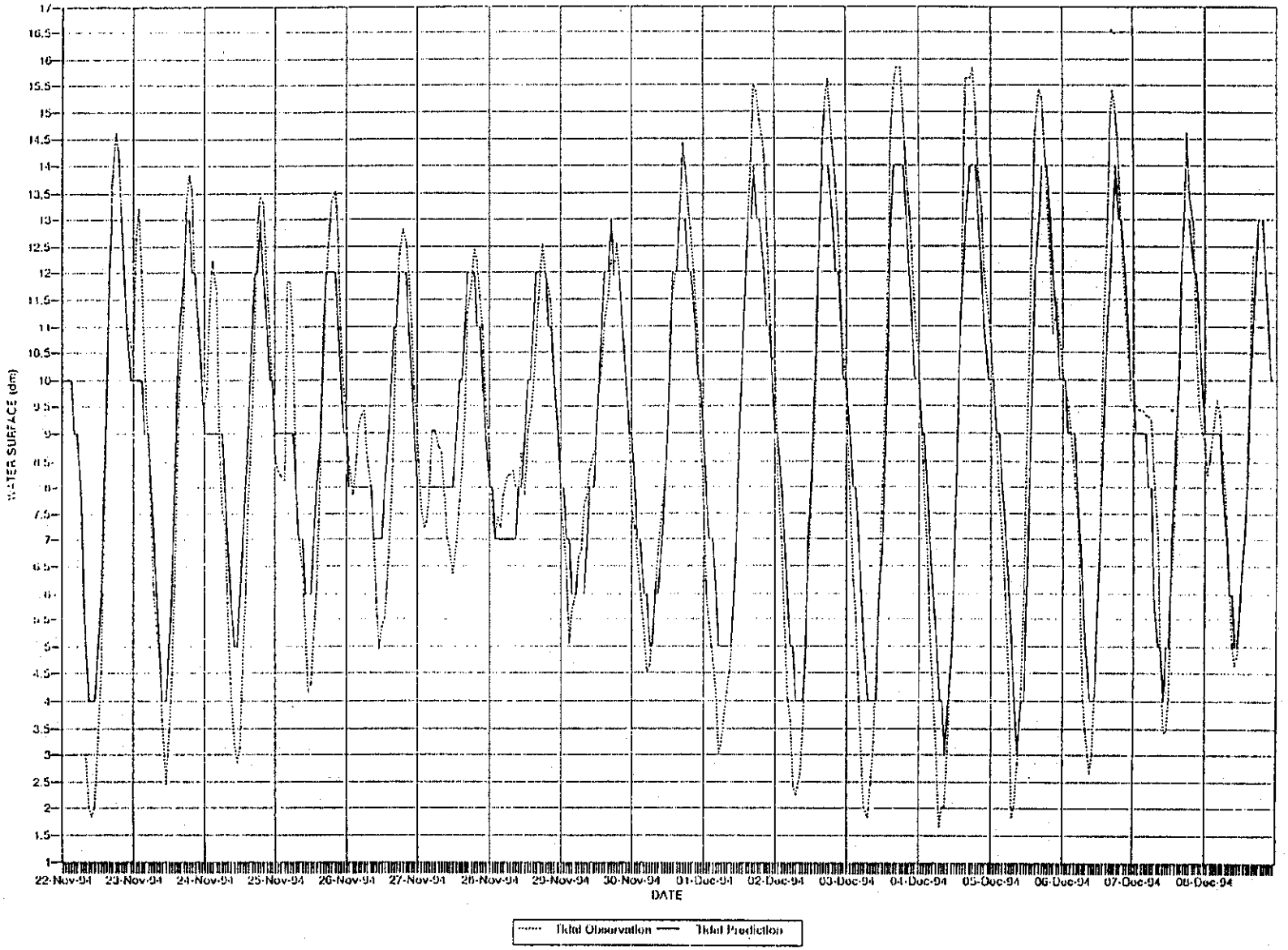


Fig. 2.17 Tide observation result at Ujung Pandang Port

2.2.7 Present environment situation

144. This section describes the present environmental situation in Ujung Pandang and its neighborhood with consultation of the secondary data and observation.

(1) Climate

145. The Ujung Pandang Port is located in the tropical zone (05°8' south latitude 119° 24' east longitude), and is in the city of Ujung Pandang the capital city in South Slawasi Province. Ujung Pandang city has population of 912,800, with a population growth rate of 1.62.

i) Rainfall

146. The rainfall data are the secondary data collected from the Meteorological and Geophysical Agency of Anakukang Station with base year 1981-1994. According to the data, the area's rainfall range between 1 mm to 115 mm/month.

147. The minimum rainfall, 1 mm/month, occured on August 1981, September 1982 and September 1986, and the maximum rainfall 115 mm/month occured on December 1987.

148. Viewing the data of each month, the maximum average rainfall occured on December-January that ranges between 347.0-491.0 mm/month, and the minimum rainfall occured on July-August which ranges between 3.0-2.0 mm/month.

149. The each monthly data also shows that the maximum rainy-day occured on December-January and the minimum on July-August.

ii) Temperature and humidity

150. The 1981-1991 data show the minimum, maximum temperature and relative humidity condition for that period of year as follows

Table 2.28 Temperature and Humidity in Ujung Pandang

Month	Min.(℃)	Max.(℃)	Humidity (%)	Rainfall (mm)
January	21.8-23.0	31.0-33.6	85-91	491.0
February	21.5-23.0	31.0-34.0	85-90	316.0
March	21.0-23.0	31.6-34.2	83-90	353.0
April	19.6-22.4	32.0-33.9	83-88	165.0
May	19.3-22.1	32.4-35.0	79-87	26.0
June	17.6-21.6	32.2-35.4	74-84	162.0
July	16.0-21.0	32.4-34.6	67-82	3.0
August	16.5-19.1	34.1-35.2	61-77	2.0
September	17.6-19.7	34.6-36.4	59-82	83.0
October	18.0-21.2	34.2-37.4	62-80	32.0
November	17.8-23.0	33.4-35.8	69-86	155.0
December	19.8-23.0	31.0-33.5	80-90	347.0

iii) Wind

151. Average wind speed data in the 1998-1991 period is between 1-5 knots. The minimum speed took place in the months of May, June and November, and the maximum in the month of August.

152. The South-West wind most dominated during that period which occured during the month of January, March, April, June, July, August, September, October, November and December. On the contrary the South East wind recorded a minimum during the month of November.

153. The maximum wind speed was from the South-West direction on January 1986 with a speed of 36 knots. The minimum speed also was from the South-West direction, with a speed of 6 knots.

d. Physiography

154. The physiography condition of Ujung Pandang municipality consists of plain, rolling, hilly area, where it is also found some permanent and temporary muddy areas particularly during the wet months(rainy season).

155. In some areas like the Ujung Tanah, Tallo, Mariso, Tamalate and Wajo municipalities, the ground level is relatively smooth with an altitude of 0-5 meters, above the sea water level (SWL). Other ares such as Biringkanaya, Panakkukang consist of plain hilly/rolling (with the level of 5-23 meters above the sea water level).

156. The rock characteristic in the Ujung Pandang municipality and its surrounding constitutes volcanic rock, beach and river alluvial sediment. Part of the volcanic rock settled in the West part, which consists of shallow sea water environment, which is composed of :

- Volcanic rock which was formed from Sand-ash and volcanic gravel which was composed of tufa, Sandy-tufa, fragment of Sandstone and limestone characterized by fossil, and it spreads over the Bulurokeng, Daya, Tidung, Biringromang and Tamalanrea areas.

- The rock characteristic in the Biringkanaya area is characterized by grain/coarse components and grey-brawny color which consists of igneous, andesite basalt, driftstones and limestones.

157. General description of the Ujung Pandang municipality geological condition is characterized by a base rock layer which is shaped with cavities filled by sediment from the Tallo river and Jene Berang delta. On top of the base rock layer, there is a sedimentation of clay and fine stone from the Tallo river. The sediment formed low-swampy-land at the norther of Ujung Pandang (including the dockyard area, and the area around the Paotere port Ujung Pandang)

(2) Container cargo handling port, the port of Ujung Pandang

158. The Ujung Pandang port (Makassar) which is located on the position of 05°08' 08" SL and 119°24'02"EL is one of the primary ports in Indonesia. The space of Ujung

Pandang port covers an area of 16,572,690 m^2.

Present situation around the Ujung Pandang port as follows :

- On Makassar Sea there are scattered small islands. As they make a place of scenic beauty, it is expected to provide tourism resources.
- Benteng Fort, which is a historical property ; old fort of Dutch time, is close with Ujung Pandang Port.
- As traffic congestion occurs on the access road to the entrance of the port while the passengers getting on/off the passenger boats, primary data collected in this study is described in chapter 7 "Environmental Impact Assessment".

(3) Proposed inland container terminal

159. Proposed inland container terminal is located on the riparian land of river Tallo between IKI (P.T. Industry Kapal Indonesia) and Tallo community.

Present environmental situation are as follows :

- Behind the proposed inland container terminal, dwarf mangrove community occurs along the coast line (*Avicennia officinalis, Rhizophora* spp.), it is dwarfed but plays a important role as a wind-breaker for the community.
- The sand dune on the proposed inland container terminal has been expanding due to the current change by the existing IKI yard.
- Fish ponds occur surrounding the inland container terminal and its access road, waterway leads to the fish ponds from the Tallo river through the proposed container terminal.

160. Further detail environmental factors such as ; physical-chemical, biological and socio-economic are described in Chapter 7 "Environmental Impact Assessment".

3. MACRO FORECAST OF THE PORT DEMAND IN 2010

3.1 Methodology of macro demand forecast

1. There are two methods usually used to forecast the cargo volume. The first one is a macro forecast and another is micro forecast. Macro forecast is adopted in this chapter.

2. Macro forecast will be conducted based on the assumption that the cargo volume handled at the port reflects the socioeconomic activity in the ports hinterland, the total cargo volume is estimated using the historical relation between cargo volume and macro socioeconomic indices such as GRDP and population.

3.2 Hinterland analysis

3. The hinterland of Ujung Pandang port is South Sulawesi province whose population is approximate 7.3 million in 1993 and annual growth rate of population for past 5 years is 1.5%. The GRDP of the hinterland was Rp.3,062 billion and per capita GRDP was Rp.434,000 in 1991.

4. Further eastern Indonesia area is regarded as a kind of hinterland of Ujung Pandang port, because the port is one of the major hub ports of above area.

5. Major industries of the hinterland are agriculture, fishing and industry. Major commodities of agriculture are cocoa, rice, cassava and molasses. Main commodity of fishing is shrimp.

6. Industries are distributed around Ujung Pandang city and one of the major industrial zone is managed by PT.Kawasan Industri Makassar (PT.KIMA), which is one of a state own enterprise, established in 1988 and has provided an area of 203 ha. At there, following industries are operating; marine products, plastic, timber, spare parts of vehicles and light industry. Further, PT.KIMA has expand an area of 34 ha to be an export processing zones (Bonded zone), which is designated for any foreign or domestic investors who purpose their products to be exported and also supplying imported materials.

3.3 Socioeconomic framework of the hinterland

3.3.1 Population projection

7. The hinterland of Ujung Pandang port is South Sulawesi province whose population is estimated to reach 8.7 million in 2010.

3.3.2 Economic framework

8. Based on The 25 Year Long Term Development Plan (PJP II) and REPELITA VI, the GRDP growth rate of the hinterland is estimated by applying the correlation between the GDP growth rate of Indonesia and the GRDP growth rate of hinterland from 1984 to 1992. The estimated GRDP growth rate is listed below.

Table 3.1 Estimated GRDP Growth Rate

	1994-1998	199-2003	2004-2008	2009-2013	2014-2018
Growth Rate	*6.8%	7.1%	7.1%	7.1%	7.0%

Source : PJPII, *REPRELITA VI and Study Team Estimation

3.4 Future port demand

3.4.1 International cargo volume

9. International cargo is classified into export and import cargo, and further divided by cargo type such as liquid bulk cargo, dry bulk cargo, general cargo, bagged cargo, united cargo and container cargo.

10. The elasticity between the increase rate of each cargo type and the GRDP growth rate is calculated, and by adopting this value, the future cargo volume of each cargo type is estimated.

11. The potential container cargo volume is estimated by assuming the final containerized ratio for each cargo type. Then the growth of the containerized ratio is estimated from the correlation between the past trend and the logistic curve. Container

cargo volume in the target year is forecast by multiplying potential container cargo volume by the containerized ratio.

12. Then the final cargo volume of each cargo type is estimated by containerized cargo volume of each cargo type is deducted from estimated cargo volume by each type.

13. The results are shown in Table 3.6, further cement is under planning to export from the exclusive berth by bagged cargo which volume will be 600,000 tons/year. International cargo volume is summarized below.

Table 3.2 Estimation of International Cargo Volume at Ujung Pandang Port

(Unit : 1,000 tons)

	1993	1998	2003	2010
Bagged Cargo	194	215	219	326
With Cement		815	819	926
Dry Bulk Cargo	369	421	490	619
Liquid Bulk	48	65	87	139
General Cargo	170	176	90	90
Container Cargo	12	120	412	754
Total Cargo	792	998	1,298	1,928
With Cement		1,598	1,898	2,528
Container (TEU)	1,653	21,000	76,000	139,000

Source : Estimated by The Study Team

3.4.2 Domestic cargo volume

14. The domestic cargo is also classified into loading and unloading cargo, and further divided by cargo type such as liquid bulk cargo, dry bulk cargo, general cargo, bagged cargo, united cargo and container cargo.

15. The elastic value between the increase rate of each cargo type and the GRDP is calculated, and by adopting this value, future cargo volume of each cargo type is estimated.

16. The potential of container cargo volume is estimated by assuming the final containerized ratio for each cargo type. The growth of containerized ratio is estimated from the correlation between the past trend and the logistic curve. Container cargo volume in the target year is forecast by multiplying the potential container cargo volume by the containerized ratio.

17. Then the final cargo volume of each cargo type is estimated by containerized cargo volume of each cargo type is deducted from estimated cargo volume by each type.

18. The results are shown in Table 3.7, further cement is planned to unload at exclusive berth which will be same berth as export berth in the port by dry bulk cargo which volume will be 600,000 tons/year. Total domestic cargo volume is summarized below.

Table 3.3 Estimation of Domestic Cargo Volume at Ujung Pandang Port

(Unit : 1,000 tons)

	1993	1998	2003	2010
Bagged Cargo	737	886	1,210	1,961
Dry Bulk Cargo With Cement	264	371 971	524 1,124	849 1,449
Liquid Bulk	1,247	1,612	2,135	3,179
General Cargo	645	356	349	577
Container Cargo	393	930	1,438	2,371
Total Cargo With Cement	3,286	4,154 4,754	5,654 6,254	8,938 9,538
Container (TEU)	45,699	105,000	165,000	272,000

Source : Estimated by The Study Team

3.4.3 Total cargo volume at Ujung Pandang port

19. Total cargo volume which is totaled international cargo volume and domestic cargo volume, results of which are shown in Table 3.8 and summarized below.

Table 3.4 Estimation of Total Cargo Volume at Ujung Pandang Port

(Unit : 1,000 tons)

	1993	1998	2003	2010
Bagged Cargo	930	1,101	1,429	2,289
With Cement		1,701	2,029	2,889
Dry Bulk Cargo	633	792	1,014	1,468
With Cement	1,233	1,392	1,614	2,068
Liquid Bulk	1,296	1,678	2,222	3,318
General Cargo	815	532	438	667
Container Cargo	405	1,049	1,849	3,126
Total Cargo	4,078	5,152	6,953	10,866
With cement		6,352	8,153	12,066
Container (TEU)	47,352	126,000	241,000	411,000

Source : Estimated by The Study Team

3.4.4 Passenger traffic forecast

20. According to the passenger traffic statistics, number of passenger ship has been stagnant recent year. While number of passenger has been increasing, but increase rate of passenger is decreasing. Number of passenger per ship also has increased.

21. Based on above, future passenger and number of calling passenger ship is estimated as follows; Number of passenger ship will be 500 and 1,000,00 passengers, because it is assumed that increasing of per capita income will make passenger to sift air plane from ship.

Table 3.5 Number of calling passenger ship and passenger at Ujung Pandang port

Year	No. Ships	Departing	Boarding	Total
1988	257	212,348	210,293	422,641
1989	340	298,227	307,326	605,553
1990	344	318,678	335,504	654,182
1991	466	355,718	344,629	700,347
1992	430	346,445	386,107	732,552
1993	440	386,627	413,286	799,913
1998	470	460,000	480,000	940,000
2003	500	480,000	520,000	1,000,000
2010	500	480,000	520,000	1,000,000

Source : Estimated by The Study Team

Table 3.6 Forecast of International Cargo Traffic at Ujung Pandang Port

Type of Trade : International Cargo

Port		Ujung			Form of Cargo					Container			Container		
	GRDP	Pandang	Container	Convention	Bagged	Dry Bulk	Liquid Bul	General	Container	Potential	Container		Loaded	Empty	Total
	Increase	Total	Cargo	Cargo	Cargo	Cargo	Cargo	Cargo	Cargo	Container	Cargo	Ratio	Container	Container	
Unit	Rate	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton		Ton		TEU	TEU	TEU
1984	4.45%	523,901	140	523,761	109,121	271,014	26,058	117,568	140	174,874	140	0.08%	12		
1985	7.43%	496,099	146	495,953	73,978	307,941	26,392	87,642	146	127,416	146	0.11%	11		
1986	9.36%	684,396	252	684,144	91,420	385,444	29,879	177,400	252	226,350	252	0.11%	20		
1987	3.58%	688,955	397	688,558	83,740	395,526	36,633	172,659	397	218,589	397	0.18%	31		
1988	10.01%	634,298	772	633,526	119,382	309,962	54,908	149,274	772	215,228	772	0.36%	63		
1989	6.48%	623,980	1,829	622,151	122,013	267,107	46,562	186,469	1,829	253,960	1,829	0.72%	156		
1990	6.74%	596,425	2,426	593,999	125,303	235,831	52,763	180,102	2,426	250,455	2,426	0.97%	202		
1991	9.96%	637,728	5,173	632,555	183,095	250,675	2,613	196,172	5,173	293,154	5,173	1.76%	445		
1992	6.90%	668,361	7,424	660,937	141,816	318,292	41,870	158,959	7,424	241,478	7,424	3.07%	637	344	981
1993	7.24%	792,296	12,079	780,217	193,559	368,509	48,352	169,797	12,079	283,491	12,079	4.26%	1,021	632	1,653
1994	7.09%	828,794	18,679	810,116	196,780	378,743	51,478	183,114	18,679	301,841	18,679	6.19%	1,659	1,049	2,708
1995	6.94%	866,973	31,070	835,903	203,620	388,863	54,827	188,593	31,070	321,354	31,070	9.67%	2,769	1,964	4,733
1996	6.80%	906,810	50,410	856,400	209,301	398,858	58,219	190,023	50,410	342,030	50,410	14.74%	4,508	3,554	8,062
1997	6.89%	950,324	79,322	871,002	213,436	409,595	61,735	186,236	79,322	364,652	79,322	21.75%	7,116	6,142	13,258
1998	6.97%	997,777	119,818	877,959	215,362	421,132	65,362	176,102	119,818	389,369	119,818	30.77%	10,778	9,980	20,758
1999	7.12%	1,050,035	171,900	878,135	215,232	433,762	69,170	159,971	171,900	416,576	171,900	41.27%	15,496	15,077	30,573
2000	7.12%	1,105,986	232,105	873,881	213,861	446,954	73,156	139,910	232,105	445,888	232,105	52.05%	20,955	21,053	42,008
2001	7.11%	1,165,851	294,960	870,891	213,107	460,740	77,447	119,597	294,960	477,438	294,960	61.78%	26,656	27,304	53,960
2002	7.11%	1,229,871	355,599	874,272	214,659	475,158	82,158	102,297	355,599	511,370	355,599	69.54%	32,156	33,293	65,450
2003	7.11%	1,298,310	411,655	886,655	219,401	490,245	87,360	89,649	411,655	547,841	411,655	75.14%	37,240	38,761	76,001
2004	7.11%	1,371,456	463,168	908,288	227,431	506,045	93,080	81,732	463,168	587,023	463,168	78.90%	41,911	43,705	85,616
2005	7.11%	1,449,619	511,465	938,153	238,427	522,602	99,325	77,799	511,465	629,099	511,465	81.30%	46,288	48,263	94,551
2006	7.10%	1,533,134	558,191	974,943	251,971	539,966	106,097	76,909	558,191	674,268	558,191	82.78%	50,522	52,603	103,125
2007	7.10%	1,622,354	604,814	1,017,541	267,712	558,184	113,403	78,242	604,814	722,740	604,814	83.68%	54,745	56,877	111,622
2008	7.10%	1,717,667	652,499	1,065,167	285,409	577,312	121,259	81,187	652,499	774,746	652,499	84.22%	59,063	61,204	120,268
2009	7.10%	1,819,489	702,135	1,117,354	304,926	597,410	129,688	85,331	702,135	830,531	702,135	84.54%	63,558	65,673	129,230
2010	7.09%	1,928,267	754,396	1,173,871	326,207	618,539	138,719	90,404	754,396	890,360	754,396	84.73%	68,289	70,348	138,637

Source : PTPI IV and Estimated by The Study Team

Table 3.7 Forecast of Domestic Cargo Traffic at Ujung Pandang Port

Type of Trade : Domestic Cargo

Port		Ujung	Form of Cargo					Container			Container		
	GRDP	Pandang	Bagged	Dry Bulk	Liquid Bul	General	Container	Potential	Container		Loaded	Empty	Total
	Increase	Total	Cargo	Cargo	Cargo	Cargo	Cargo	Container	Cargo	Ratio	Container	Container	
Unit	Rate	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton		TEU	TEU	TEU
1984	4.45%	1,699,684	267,415	63,835	756,369	607,345	4,720	826,130	4,720	0.57%	372		
1985	7.43%	1,867,026	296,512	166,304	766,045	631,876	6,288	869,313	6,288	0.72%	474		
1986	9.36%	2,519,281	393,930	239,704	867,274	1,007,895	10,477	1,312,543	10,477	0.80%	791		
1987	3.58%	2,983,841	500,189	288,195	1,063,312	1,115,307	16,839	1,505,410	16,839	1.12%	1,276		
1988	10.01%	2,811,806	603,068	168,015	1,062,556	948,621	29,546	1,415,502	29,546	2.09%	2,258		
1989	6.48%	2,795,511	471,553	120,324	1,178,911	966,929	57,794	1,431,095	57,794	4.04%	4,642		
1990	6.74%	3,130,757	619,540	117,763	1,257,997	1,050,765	84,691	1,650,145	84,691	5.13%	6,557		
1991	9.96%	3,096,439	724,310	106,927	1,194,556	912,000	158,645	1,664,894	158,645	9.53%	12,940		
1992	6.90%	3,230,229	708,935	200,295	1,147,030	932,719	241,250	1,814,427	241,250	13.30%	18,760	5,144	23,904
1993	7.24%	3,286,113	736,925	264,398	1,247,395	644,861	392,535	1,809,297	392,535	21.70%	32,443	13,256	45,699
1994	7.09%	3,480,391	778,682	283,273	1,318,189	650,695	449,552	1,940,589	449,552	23.17%	39,903	11,630	51,533
1995	6.94%	3,613,738	794,707	303,081	1,384,318	552,647	578,986	2,078,498	578,986	27.86%	51,489	13,884	65,374
1996	6.80%	3,762,903	815,702	323,840	1,453,408	465,712	704,241	2,223,155	704,241	31.68%	62,666	16,466	79,132
1997	6.89%	3,942,423	845,914	346,298	1,529,241	399,812	821,159	2,379,875	821,159	34.50%	73,058	19,329	92,387
1998	6.97%	4,154,442	885,939	370,614	1,612,326	355,930	929,633	2,549,804	929,633	36.46%	82,671	22,316	104,986
1999	7.12%	4,401,000	935,863	397,174	1,703,860	331,288	1,032,815	2,735,719	1,032,815	37.75%	91,799	25,323	117,122
2000	7.12%	4,675,148	993,739	425,631	1,801,788	321,400	1,132,590	2,935,177	1,132,590	38.59%	100,622	28,271	128,894
2001	7.11%	4,975,714	1,058,900	456,121	1,906,184	322,698	1,231,811	3,149,163	1,231,811	39.12%	109,400	31,171	140,570
2002	7.11%	5,302,123	1,130,912	488,785	2,017,186	332,412	1,332,828	3,378,723	1,332,828	39.45%	118,342	34,058	152,400
2003	7.11%	5,654,432	1,209,571	523,779	2,135,007	348,572	1,437,503	3,624,989	1,437,503	39.66%	127,614	36,981	164,595
2004	7.11%	6,033,221	1,294,874	561,268	2,259,924	369,851	1,547,304	3,889,171	1,547,304	39.78%	137,345	39,985	177,331
2005	7.11%	6,439,489	1,386,968	601,428	2,392,265	395,403	1,663,425	4,172,570	1,663,425	39.87%	147,641	43,112	190,754
2006	7.10%	6,874,568	1,486,116	644,450	2,532,403	424,726	1,786,874	4,476,579	1,786,874	39.92%	158,590	46,398	204,989
2007	7.10%	7,340,022	1,592,664	690,532	2,680,734	457,548	1,918,543	4,802,663	1,918,543	39.95%	170,271	49,874	220,145
2008	7.10%	7,837,676	1,707,041	739,890	2,837,701	493,771	2,059,273	5,152,417	2,059,273	39.97%	182,758	53,567	236,326
2009	7.10%	8,369,562	1,829,736	792,756	3,003,781	533,408	2,209,881	5,527,550	2,209,881	39.98%	196,123	57,505	253,628
2010	7.09%	8,937,904	1,961,295	849,376	3,179,480	576,562	2,371,190	5,929,893	2,371,190	39.99%	210,438	61,711	272,149

Source : PTPI IV and Estimated by The Study Team

Table 3.8 Forecast of Total Cargo Traffic at Ujung Pandang Port

Type of Trade : Total Cargo

Port		Ujung	Form of Cargo					Container			Container		
	GDP	Pandang	Bagged	Dry Bulk	Liquid Bul	General	Container	Potential	Container		Loaded	Empty	Total
	Increase	Total	Cargo	Cargo	Cargo	Cargo	Cargo	Container	Cargo	Ratio	Container	Container	
Unit	Rate	Ton	Ton	Ton	Ton	Ton	Ton		Ton		TEU	TEU	TEU
1984	4.45%	2,223,585	376,536	334,849	782,427	724,913	4,860	1,001,005	4,860	0.49%	384		12
1985	7.43%	2,363,125	370,491	474,245	792,437	719,518	6,434	996,729	6,434	0.65%	485		11
1986	9.36%	3,203,677	485,351	625,149	897,153	1,185,296	10,729	1,538,893	10,729	0.70%	811		20
1987	3.58%	3,672,796	583,928	683,721	1,099,945	1,287,966	17,236	1,723,999	17,236	1.00%	1,307		31
1988	10.01%	3,446,104	722,450	477,977	1,117,464	1,097,895	30,318	1,630,730	30,318	1.86%	2,321		63
1989	6.48%	3,419,491	593,566	387,431	1,225,473	1,153,398	59,623	1,685,055	59,623	3.54%	4,799		156
1990	6.74%	3,727,182	744,843	353,595	1,310,760	1,230,867	87,117	1,900,600	87,117	4.58%	6,759		202
1991	9.96%	3,734,167	907,405	357,602	1,197,169	1,108,172	163,818	1,958,048	163,818	8.37%	13,384		445
1992	6.90%	3,898,590	850,751	518,586	1,188,900	1,091,678	248,674	2,055,906	248,674	12.10%	19,397	5,488	24,885
1993	7.24%	4,078,409	930,484	632,907	1,295,747	814,658	404,614	2,092,788	404,614	19.33%	33,464	13,888	47,352
1994	7.09%	4,309,185	975,462	662,016	1,369,667	833,809	468,231	2,242,430	468,231	20.88%	41,562	12,679	54,241
1995	6.94%	4,480,711	998,326	691,944	1,439,145	741,240	610,056	2,399,852	610,056	25.42%	54,258	15,848	70,106
1996	6.80%	4,669,713	1,025,003	722,698	1,511,627	655,734	754,651	2,565,185	754,651	29.42%	67,174	20,020	87,194
1997	6.89%	4,892,748	1,059,349	755,893	1,590,975	586,048	900,481	2,744,527	900,481	32.81%	80,174	25,470	105,645
1998	6.97%	5,152,219	1,101,301	791,746	1,677,688	532,032	1,049,451	2,939,173	1,049,451	35.71%	93,449	32,296	125,745
1999	7.12%	5,451,035	1,151,095	830,937	1,773,029	491,259	1,204,715	3,152,295	1,204,715	38.22%	107,295	40,400	147,695
2000	7.12%	5,781,134	1,207,600	872,585	1,874,944	461,310	1,364,695	3,381,065	1,364,695	40.36%	121,577	49,325	170,902
2001	7.11%	6,141,565	1,272,007	916,861	1,983,632	442,295	1,526,770	3,626,600	1,526,770	42.10%	136,056	58,474	194,530
2002	7.11%	6,531,994	1,345,571	963,942	2,099,345	434,710	1,688,427	3,890,093	1,688,427	43.40%	150,498	67,352	217,850
2003	7.11%	6,952,743	1,428,972	1,014,024	2,222,367	438,220	1,849,158	4,172,830	1,849,158	44.31%	164,854	75,742	240,596
2004	7.11%	7,404,677	1,522,305	1,067,313	2,353,004	451,583	2,010,473	4,476,194	2,010,473	44.91%	179,256	83,691	262,947
2005	7.11%	7,889,108	1,625,394	1,124,031	2,491,590	473,203	2,174,890	4,801,669	2,174,890	45.29%	193,929	91,375	285,305
2006	7.10%	8,407,702	1,738,087	1,184,416	2,638,500	501,635	2,345,065	5,150,847	2,345,065	45.53%	209,112	99,001	308,114
2007	7.10%	8,962,376	1,860,376	1,248,716	2,794,137	535,790	2,523,357	5,525,403	2,523,357	45.67%	225,016	106,751	331,768
2008	7.10%	9,555,342	1,992,450	1,317,203	2,958,960	574,958	2,711,772	5,927,163	2,711,772	45.75%	241,821	114,772	356,593
2009	7.10%	10,189,050	2,134,661	1,390,165	3,133,469	618,739	2,912,016	6,358,081	2,912,016	45.80%	259,680	123,177	382,858
2010	7.09%	10,866,171	2,287,503	1,467,915	3,318,199	666,966	3,125,587	6,820,254	3,125,587	45.83%	278,727	132,059	410,786

Source : PTPI IV and Estimated by The Study Team

4. MASTER PLAN OF UJ. PANDANG PORT

4.1 Basic strategy for the development

1. In the Master Plan presented in Vol. 2, the discussions were made from the view point of the container handling facilities only. Though the container terminals are the vital element of the major ports, the short-term development plan of these facilities should be elaborated in such a manner that various port activities, such as conventional cargoes, container cargoes and passengers, be well organized and performed most efficiently as a whole. In this section, the strategy for the development of the whole Uj. Pandang Port toward the year 2010.

4.1.1 Planning objectives of the target year

2. The Master Plan of Uj. Pandang in this report aims at the following:
   i) to propose a basic strategy for the development of Uj. Pandang Port in the from of zoning of the port areas for the facilities for Container cargo, General Cargo, Dry Bulk Cargo and Passengers,
   ii) to prepare layout plan, implementation plan, basic design and cost estimate of the container cargo handling facilities, necessary for the target year, and
   iii) to proposal of the future development expansion plan beyond 2010..

4.1.2 Proposed network connecting eastern Indonesia

3. As described in Chapter 2, the major trade counterparts of Uj. Pandang Port are Jakarta and Surabaya. A small portion of the cargo transported from these counterpart ports is transhipped to some local ports in Eastern Indonesia. Thus, the principal function of Uj. Pandang Port is the gateway of the South Sulawesi Province.

4. When the container terminal at New Hatta Quay is operational, it would be quite probable that the port might invite cargoes for transhipment from nearby ports: these cargoes are carried by general cargo ships of smaller sizes and stuffed into containers at Uj. Pandang port.

5. However, it seems to be too challenging to estimate this tendency on the basis

of the information presently available, because Uj. Pandang Port has no fully equipped container terminal at present and thus practically no transhipment cargoes traffic is observed in the port statistic data.

6. In the cargo traffic forecast in Chapter 3, the analysis was, thus, made with a conservative assumption that the existing shipping network remain unchanged over the coming decades.

4.1.3 Requirements to be considered in the Master Plan

(1) General perspective of calling ships

a. Ship calls in 1993

7. Uj. Pandang Port was called by total 2,383 ships. The calls of general cargo ship, which include container carriers, accounted for 58 % (see **Table 4.1**). As seen **Table 4.1**, the Dry Bulk Carriers and Tramper of Oil Tankers had the longest ship lengths. The Passenger ships were the next longest. The length of other type of ships were in the range of 60 to 110 m.

Table 4.1 Ship calls at Uj. Pandang Port in 1993

Type of ship		General Cargo ship	Oil Tanker	Dry Bulk Carrier	Passen-ger ship	RO/RO	Non-Oil Ship	Total Ship call
Liner	Calls	1,129	386	29	452	86	16	2,098
	Ave.GRT(ton)	1,563	3,434	16,809	11,626	1,972	905	88.0%
	Ave.DWT(ton)	2,893	6,019	27,253	3,277	1,681	2,082	
	Ave. LOA(m)	72	89	168	130	81	62	
Tramper	Calls	242	21	11	5		6	285
	Ave.GRT(ton)	3,780	10,248	17,203	7,554		4,361	12.0%
	Ave.DWT(ton)	6,889	15,042	30,984	1,788		8,980	
	Ave. LOA(m)	86	162	175	122		111	
Total Calls		1,371	407	40	457	86	22	2,383
Share		57.5 %	17.1%	1.7%	19.2%	3.6%	0.9%	100 %

(Source: PELABINDO IV)

b. Forecast of cargo traffic

8. The macro forecast of cargo throughput at Ujung Pandang Port is summarized as shown in **Table 4.2** (refer to Chapter 3 for detail).

9. As shown in the Table, in 2010, the total cargo volume increases to be 2.7 times that of observed in 1993. While the traffic volumes of Bagged cargoes, Dry Bulk and Liquid Bulk increase about 2.3 to 2.6 times, that of General Cargoes decrease to a level of 82 % of the 1993 volume. This results from the cargo shift from General Cargo to Container cargo.

10. With simple calculation, it is roughly estimated that the loading and unloading facilities at Uj. Pandang need to be expanded 2.7 times as many as presently exist, provided that the manner of cargo handling at the port will remain unchanged.

Table 4.2 Macro Forecast of Total Cargo Throughput (Cargo volume and ratio to 1993 cargo volume)

Unit: 1,000 ton

Year	Total cargo	Bagged cargo	Dry bulk	Liquid bulk	General cargo	Container cargo
1993	4,078 (100)	930 (100)	633 (100)	1,296 (100)	815 (100)	405 (100)
1998	5,152 (126)	1,101 (118)	792 (125)	1,668 (129)	532 (65)	1,049 (259)
2003	6,953 (171)	1,429 (154)	1,014 (160)	2,222 (171)	438 (54)	1,849 (457)
2010	10,867 (266)	2,288 (264)	1,468 (232)	3,318 (256)	667 (82)	3,126 (772)
2020	20,775 (509)	4,574 (492)	2,594 (410)	5,872 (453)	1,436 (176)	6,230 (1,538)

(Source: Estimated by Study Team)

c. Perspective of the size of ships in the future

11. However, it is quite natural to assume that the cargo handling manner should change as the cargo volume increases. The trend of containerization, which is presently observed at all the major ports in Indonesia, is typical example of this change. The general cargoes tend to be converted to container cargoes and, as the container traffic volume increases, bigger container ships are employed in the sea routes. The same holds true for dry and liquid cargoes. The more traffic demand is generated, the bigger dry and liquid bulk carriers would be introduced. Accordingly, these types of cargoes will require deeper water. With specially designed handling equipments, the loading and unloading will be performed very efficiently. Thus, it is unlikely the handling of dry and liquid cargoes require as many berths proportional to the increase of the cargo volume.

12. According to the cargo forecast, the bagged cargo occupies quite large share in the whole cargo and, in 2010, is expected to reach a level of 2.7 times as large as the volume handled in 1993. Once again, the manner of handling of this type of cargo also should be changed as the volume expands. Possible alternative ways of bagged cargo handling are the shift to either dry bulk carriers or container carriers.
When either of these alternative way is realized, the area needed for the cargo handling of bagged cargo might not be 2.7 times as large as those presently utilized.

13. In addition to cargoes, Uj. Pandang Port serves as a terminal of the passengers who are travelling in the east Indonesia regions. A study done as a part of "Ujung Pandang Port Urgent Rehabilitation Project" by PELABINDO IV in 1993 estimated that the passenger traffic will reaches a level of 2 million in 2010 from 0.9 million in 1993. The number of ship calls of passenger ships is expected to increase from 420 to 1,160 (2.8 times). Thus, the ship calls per month increases from 35 to 97.

14. Unlike the case of cargo service, the passenger ships are required more frequent services rather than introduction of larger passenger ships. Thus, it might be expected that the required number of berthing facilities of passenger ship should increase proportionally to the increase of ship calls. However, taking into account that, without heavy cargoes, the passenger ships can load and unload more faster than cargo ships, the berth efficiency can be increased more easily than that of general cargo wharf. Therefore, it seems quite reasonable that one passenger berth can accommodate two or more ships a day.

(2) Discussion of berth requirement

15. In the light of above, the berths requirement for various types of cargoes are estimated as follows:

a. Dry bulk berth

16. At Uj. Pandang, Dry Bulk is carried by large size ships and only 40 ships docked. With the assumption that the size of dry bulk carriers remains the same, the number of ship calls in 2010 is estimated to be 86, which is 2.3 times the present level. Thus, it seems that the existing berth has enough capacity to accommodate dry bulk carriers in 2010.

b. Oil tanker berths

17. In 2010, the number of calls of Oil tankers is expected to increase to 2.6 times the present level (407). The oil terminal at Uj. Pandang Port has a function as the distribution center for the region, and while some of the calling tankers will be larger than those presently employe, small the size tankers would also be operated. Additional berthing facilities will, thus, be needed. The berthing facilities are classified as the special port and operated by PT. PERTAMINA. In the formulation of the development plans of berthing facilities for oil tankers should be done through the cooperation between PELABINDO IV and PERTAMINA.

c. RO/RO berth

18. A 60 m long berth for Roll-on/Roll-off type ships will be operational when New Hatta Quay is completed. It is commonly observed in many countries that more Ro/Ro type ships are introduced in domestic sea shipping for faster and more convenient services. It is also expected that more Ro/Ro type ships will call on Uj. Pandang Port.

19. The Ro/Ro ships in domestic shipping often carry passengers as well as cargoes, and their size tend to increase. The passenger terminal to be constructed in New Hatta Quay should be designed to accommodate this type of Ro/Ro Ships.

d. Passenger berth

20. When New Hatta Quay is completed, a 180 m long passenger berth will be operational. The berth can accommodate only one passenger ship. As discussed in 4.2, the 490 m long container wharf is expected to be fully utilized in 2002. Since tow or more passenger ships may call on the port at the same time, additional berths for passenger ship will be needed.

e. Container berths

21. As described in the Master Plan in Vol. 2, the new container wharf has enough length to handle 420,000 TEUs provided that four gantry cranes are installed. However, additional area of 9.8 ha will be required for the yard operation. More detailed discussion will be given in **Section 4.2**.

f. General cargo berths

22. According to the cargo forecast (**Table 4.2**), the volume of general cargo will decrease while the container cargo increases. On the other hand, the traffic volume of Bagged Cargo, which is carried by general cargo ship, is expected to increase to 2.6 times the level of 1993. The following is the rough estimate of the berth requirement.

23. The existing Soekarno Quay has a total length of 1,210 m, where all the general cargo ships, Ro/Ro ships, Non-oil cargo ships and passenger ships berthed in 1993. The average length over these fur types of ships is about 90 meters. Thus, the Quay can accommodate 12 ships at one time assuming the average berth length to be 100 meters. In 1993, total 1,936 ships docked. This implies that a berth accommodated 161 ships over the year (1,936 ships/12 berths=161 ship/berth).

24. Since Table 2.1 does not show the break down of the number of the container carriers and the cargo ships which carried bagged cargoes, the numbers of ship calls made by the general cargo ships carried these three type of cargoes are estimated on the basis of the share of each type of cargo observed in 1993.

25. In 1993, the cargo volume of Bagged cargo, general cargo and container cargo were 930, 815, and 405 thousand tons, respectively (see **Table 4.2**). The percentiles of these three types of cargoes are 43 %, 38 % and 19 %, respectively. These cargoes were transported by the ships classified in **Table 4.1** as General cargo ships and Non-oil carriers , the number of calls of which is 1,393 in total.

26. With the assumption that the number of ship carried the three type of cargoes be proportional to the percentile of the volumes of each cargo, the number of ships carried Bagged cargoes, General cargoes and Container cargoes are estimated as 599, 529 and 245, respectively.

27. The volumes of the three type of cargoes are thus estimated in terms of number of ship calls, and the number of ships carrying the three types of cargo in 2010 can be estimated by multiplying by the growth rate of respective cargo type:

General cargo ships carrying Bagged cargo; 599 x 2.64 = 1,581 ships,
General cargo ships carrying General cargo; 529 x 0.82 = 433 ships.

28. Since the general cargo ships carrying container cargo are handled at New Hatta Quay, the total number of general cargo ship visiting Soekarno Quay is estimated to be 2,014 ships.

29. If the berth efficiency remains unchanged, the necessary number of berths to accommodate general cargo ships is calculated as follows:

(Calling Ship) 2,014 / (Berth capacity) 161 ship/berth = 12.5 berths.

30. This implies that an additional berth will be needed in 2010. However, if the consideration is made on the statistical facts that the more cargo traffic is generated, the larger ships tend to be employed and that the larger the ship, the higher cargo handling efficiency can be achieved, the existing Soekarno Quay will be able to handle the general cargo, provided that proper investment will be done for upgrading the handling equipments of the Quay.

g. Berth requirement

31. Summing up above discussion, the berth requirement is concluded as follows:

i)	Dry Bulk berth:	no expansion is required,
ii)	Oil Tanker berth:	additional berths will be needed,
iii)	Ro/Ro berth:	provided at Hatta Quay,
iv)	Passenger berth:	additional berth is needed. It is desired to design the berth can accommodate Ro/Ro ships carrying passengers,
v)	Container berth:	no expansion is required. Additional space for container yard is required (see Section 4.2),
vi)	General cargo berth:	need investment in upgrading the handling equipment,
vii)	Other facilities:	As calling ships increases, more small boats for such services as pilot, tug, Custom, Immigration and Quarantine (CIQ), and etc. will be needed, Thus, Hasanuddin Basin between Soekarno and Hatta Quays, which is presently accommodate these small boats, will need to be expanded.

4.1.4 Zoning for the utilization of port area

32. On the basis of the berth requirement disscussed above, the following zoning plan is recommneded to meet the traffic demend in 2010:

i) Dry Bulk berth: the same berth and area as are presently used.

ii) Oil Tanker berth: additional berth can be provided by constructing an additional jetty and off-shore berthing facilities as proposed by PERTAMINA.

iii) Ro/Ro berth: Ro/Ro berth is provided at New Hatta Quay

iv) Passenger berth: In addition to a passenger berth at New Hatta Quay, at least one additional berth will be needed. The location of the additional berth is better chosen next to the one which is under construction.

v) Container berth: The container terminal at New Hatta Quay has enough berth length. However, additional yard space is prepared outside of the port area (see 4.2 for detail).

vi) General cargo berth: Whole Soekarno Quay including the berths which are presently allocated for container carriers and pasenger ships, is used for general cargo ship.

vii) Other facilities: Berthing facilities for small boats are povided at New Hatta Quay. However, toward 2010, Hassanudin Basin will be fully used and additional facilities be needed. Such space should be taken into consideation in the New Hatta Quay expansion plan for passenger berths.

33. **Figure 4.1** is the schematic showing of the zoning plan for the year 2020.

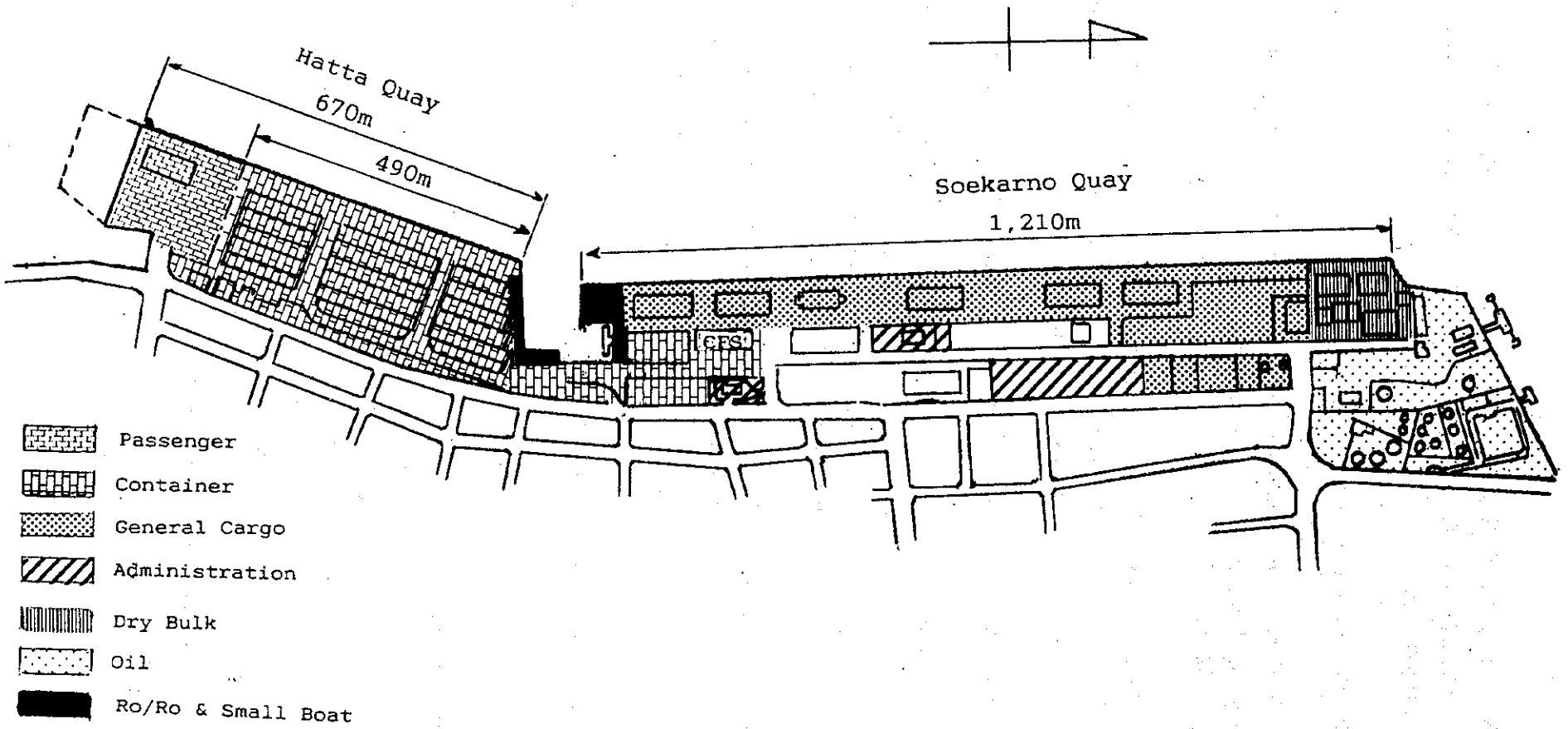


Fig. 4.1 Zoning Plan in Ujung Pandang Port (2010)

4.2 Long-Term Development in the Master Plan

4.2.1 Examination of the facility layout

(1) Container Handling System

a. Cargo flows at the port and inland container depot

Fig. 4.2 shows the flow of containerized cargo at Ujung Pandang port.

34. The total container throughput of Ujung Pandang port in 2010 is estimated to be 366,000 TEUs, with domestic and international cargoes accounting for 70% (269,000 TEUs) and 30% (98,000 TEUs).

35. Because of site limitations, it is difficult to secure a large enough storage yard at Ujung Pandang port. As a result, the container terminal at Hatta Quay must handle both domestic and international containerized cargoes simultaneously.

36. The international container terminal at the port is a bonded area that is intended to store international cargoes awaiting customs clearance. Therefore, it is irregular to store local-produced goods for domestic consumption at the international container terminal. The container yard at Hatta Quay must be split into two sections, one for domestic cargoes and the other for international cargoes, separated, if necessary, by fence. Furthermore, domestic and international cargoes must be stored in such a way as to be clearly distinguishable from one another, without causing confusion.

37. When there remains some reserve capacity in the container yard, unloaded containers, whether stuffed or empty, are stored in the container yard at Hatta Quay. When its storage capacity is exceeded, empty containers can be stored at Saekarno Quay 500 meters away.

38. The container yard in the Ujung Pandang port area will have some reserve space when the new terminal at Hatta Quay comes on stream in 1997. However, steadily increasing containers will eat up the reserve space by 2000. Then, an additional inland container depot will become necessary.

39. A container freight station having an area of 2000 m^2 will come on stream in the port area simultaneously with the start of the operation of the Hatta Quay container terminal in 1977.

40. Assuming that less than container load cargoes(LCL) account for 50% of general cargo, both domestic and international, they will account for 25% (approximately 64,000 TFUs per year) of all laden containers in 2010. While 14,000 TFUs per year may be handled at the container freight station in the port area, the balance (50,000 TFUs per year) will require an additional area where LCL cargoes can be collected, stuffed, unstuffed and sorted as in the container freight station.

41. This report proposes to provide a new container freight station in the inland container depot in the Talo area.

42. The total quantity of LCL container cargoes is estimated to reach 25,000 TFUs per year in 1997. The handling capacity of the container freight station, estimated at 14,000 TFUs per year, will be exceeded then. Thus, there must be some other place to handle the surplus cargo of 11,000 to 12,000 TFUs per year. Because the construction of the inland container depot will not be completed by 1997, some other appropriate handling area must be prepared. Otherwise, container throughput must be lowered by declining the acceptance of LCL container cargo. Some solution must be found urgently.

43. In 2010, a total of 174,000 TFUs per year of containerized cargo, comprising 50,000 TFUs per year of LCL cargo and 124,000 TFUs per year of overflow from the container yard in the port area, is estimated to flow to the inland container depot.

b. Container Yard Handling System

44. When considering the facilities to be installed at the container terminal at Makassar port, the container handling system at the container yard must be decided first.

45. There are four basic types of systems in use today. They are called the chassis system, forklift system, straddle carrier system and transfer crane systems.

46. Although many complex factors must be studied in selecting a container handling

system, it is essential to consider how the terminal will be used in the long run, rather than in the short run.

47. The deciding factors to be considered may be classified into the following three groups: The first group includes such external factors as the intended use of the terminal, connection with inland transport systems, types of containers to be handled, types of ships to call. The second group concerns the characteristics of the handling systems themselves, such as simplicity, flexibility, mobility and automation adaptability. The third group relates to working conditions. More specifically, the safety and other labor conditions of workers and accommodativeness of aged workers. The fourth group concerns economic factors such as storage capacity, initial and maintenance costs.

Tables 4.3 and **4.4** compare these factors.

48. In actuality, the economic factors in the fourth group have the most significant effect on the selection of a handling system. When constructing a terminal area in such a small area as at Ujung Pandang port, in particular, the efficiency of the container yard will become a deciding factor.

49. **Table 4.5** shows the results of a comparative study on the availability of storage capacity in each hectare of space with each of the four handling systems.

50. As can be seen, the transfer crane system is best suited as the handling system for the container terminal at Ujung Pandang port.

c. Cargo Handling Capacities of Main Facilities

(a) Berth Capacity

51. **Table 4.6** shows the container handling capacity of Hatta Quay at Ujung Pandang port, together with the preconditions considered in the estimation.

52. The number of container cranes installed at a container berth most significantly affects its handling capacity. The handling capacities of berths having one and two container cranes were estimated.

53. The handling capacity of a berth with one container crane was estimated to be 115,000 TFUs per year in 2003 and 123,000 TFUs per year in 2010. The handling capacity of a berth with two container cranes was estimated to be 168,000 TFUs per year in 2003 and 188,000 TFUs per year in 2010. At Ujung Pandang port, as is obvious from the above, doubling the number of container cranes will not lead to the doubling of the container handling capacity of the berth.

54. This is due to the fact that the increased handling efficiency in loading and unloading brought about by adding one container crane is offset by the resulting drop in the effective time ratio.

55. Having a length of 490 m, Hatta Quay can provide two or three berths. The overall container handling capacity of Hatta Quay depends upon whether one or two cranes are provided at each berth. **Table 4.7** shows the estimated numbers of berths and container cranes on each berth.

56. **Fig. 4.3** shows the number of container cranes to be installed to meet the forecast demand for container handling capacity between 1998 and 2010. As shown, the container terminal at Hatta Quay will start its operation with two berths each having one container crane. Around 2002, the combination will change to one berth with one crane and the other berth with two cranes. Around 2003, furthermore, the combination must be changed to three berths each having one crane or two berths each having two cranes.

57. **Fig. 4.4** shows the estimated lengths of container ships that will call at Ujung Pandang port.

58. The average and maximum lengths of ships will be 165 m and 195 m in 2003, and 175 m and 205 m in 2010. Considering the overall length of 490 m and the tendency of ship size to increase, it will be difficult to use three berths at Hatta Quay.

59. Thus, the choice must be made by comparing the length of berthing time, which is an indication of the level of services offered to calling ships, and the necessary increase in construction cost.

60. **Fig. 4.5** shows the estimated numbers of containers to be loaded and unloaded

at each call of ships at Ujung Pandang port. The estimated numbers are 250 and 320 containers per ship call in 2003 and 2010. The estimate of the container handling capacities of the berths is based on these figures.

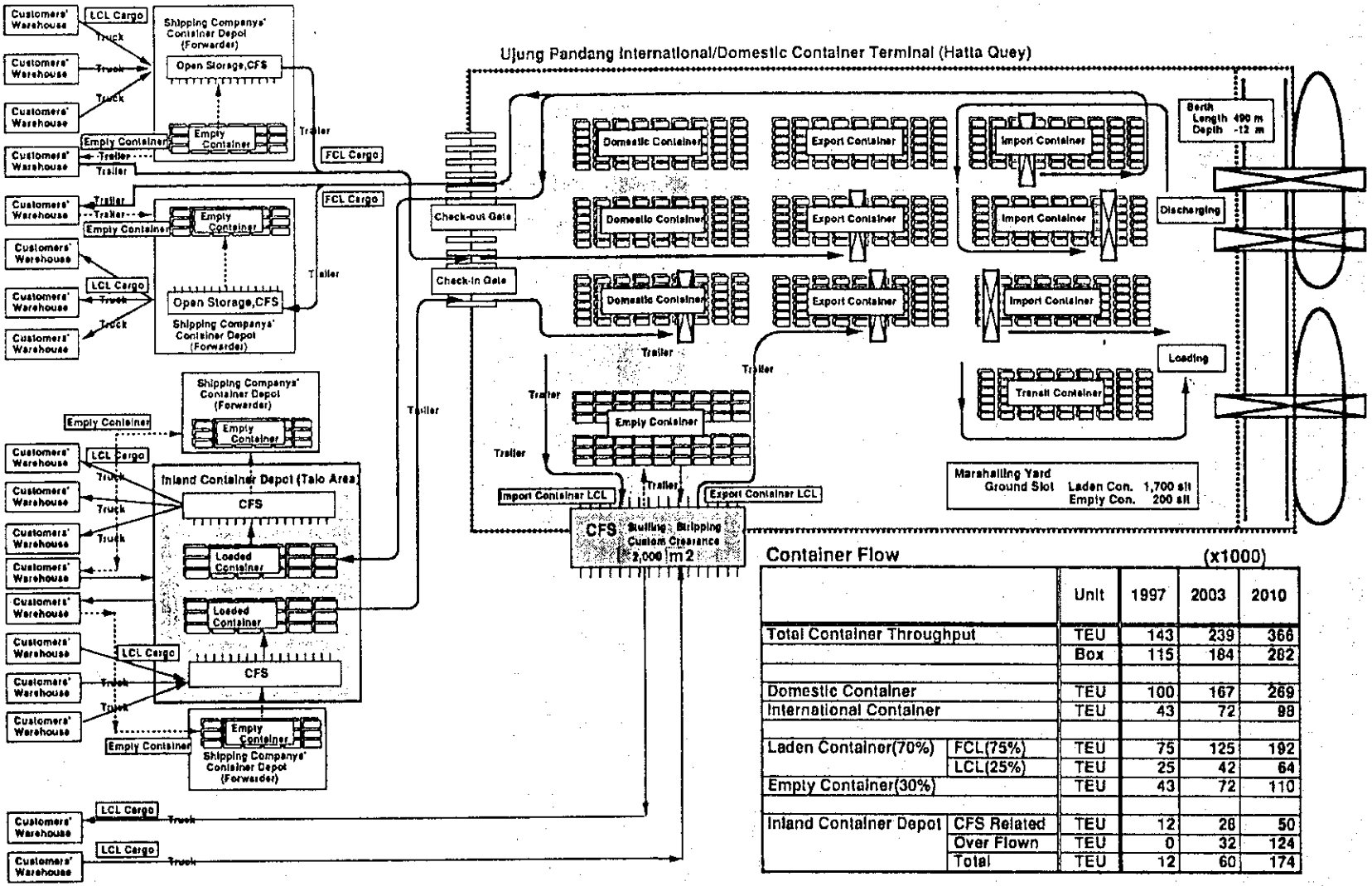
(b) Container Yard Capacity

61. **Table 4.8** shows the number of ground slots estimated to be required in the container yard at Ujung Pandang port between 1997 and 2003 based on the container demand forecast.

62. In 2010, obviously, the container yard will have a storage capacity of approximately 242,000 TFUs per year if 1700 and 200 (for empty containers) ground slots are secured in the neighborhood of Hatta and Saekano quays, respectively. Against the demand forecast of 366,000 TFUs per year for 2010, this means a shortage of 970 ground slots and a cargo overflow of 124,000 TFUs per year.

(c) Other Facilities

63. **Table 4.9** shows the necessary quantities of other facilities at the container terminal at Makassar port between 1997 and 2010 estimated on the basis of the demand forecast, with the data used in the estimation as preconditions. The estimated facilities include the container freight station, inland container depot and container handling machines.



Container Flow (x1000)

		Unit	1997	2003	2010
Total Container Throughput		TEU	143	239	366
		Box	115	184	282
Domestic Container		TEU	100	167	269
International Container		TEU	43	72	98
Laden Container(70%)	FCL(75%)	TEU	75	125	192
	LCL(25%)	TEU	25	42	64
Empty Container(30%)		TEU	43	72	110
Inland Container Depot	CFS Related	TEU	12	28	50
	Over Flown	TEU	0	32	124
	Total	TEU	12	60	174

Fig. 4.2 Container Cargo Flow In the Ujung Pandang International/Domestic Container Terminal

Table 4.3 Viewpoint of Handling System Selection

Viewpoint	Chassis System	Forklift System	Straddle Carrier System	Transfer Crane System
Usage of terminal	Exclusive use	Both exclusive use and public use		
Connection with inland transportation	Road/rail transportation is suitable	Both sea(transip) and road/rail transportation		
Container handled	Empty container storage is not suitable	Laden and Empty container storage is both suitable		
Type of ships called	Both Ro/Ro and Lo/Lo ships are suitable		Lo/Lo ships main	
Land area and lay	Large area is necessary		Medium area is necessary	
	Any shape is acceptable			Rectangular shape land is suitable

Table 4.4 Comparison of Handling System (Terminal Facility and Operation)

No	Criteria	Factors	Chassis System	Forklift System	Straddle Carrier System	Transfer Crane System
1	Storage capacity		poor	poor	good	excellent
2	Initial cost	Acquisition of land	wide area	wide area	good	excellent
		Pavement	fair	fair	heavy	heavy (track)
		Handling equipment cost (including chassis cost)	low (high)	low	high	high
3	Maintenance cost	(Handling equipment & pavement)	low	high	high	low
4	System simplicity	(Handling process, allocation)	excellent	good	good	poor
5	Flexibility	(Rearrange of yard allocation)	excellent	good	good	poor
6	Mobility	(Readiness of shifting/dispatching and selectivity of containers,)	excellent	poor	good	poor
7	Container damage	(Frequency of direct handling)	excellent	poor	poor	good
8	Automation	(Adaptability to automation)	poor	poor	poor	good
9	Safety working		excellent	poor	poor	good
10	Labor condition	(Fatigue of crew, noise, vibration)	fair	fair	poor	good
11	Age limitation of crew		good	fair	poor	good

Table 4.5 Comparison of Yard Efficiency

Handling System	Container Layout (Vs wharf line)	Item		Length of Wharf (m) 200	250	300	350	Storage Capacity Ratio (at WL 350m)
Chassis System	Perpendicular	Ground Slots	(TEU/ha)	186	192	197	200	1.00
		Tiers YOR		1 0.8	1 0.8	1 0.8	1 0.8	
		Storage Capacity	(TEU/ha)	148	154	157	160	1.00
Forklift System	Perpendicular	Ground Slots	(TEU/ha)	185	183	181	186	0.93
		Tiers YOR		2 0.7	2 0.7	2 0.7	2 0.7	
		Storage Capacity	(TEU/ha)	259	256	254	261	1.63
Straddle Carrier System	Perpendicular	Ground Slots	(TEU/ha)	204	233	252	266	1.33
		Tiers YOR		3 0.6	3 0.6	3 0.6	3 0.6	
		Storage Capacity	(TEU/ha)	367	419	454	479	3.00
Transfer Crane System	Parallel	Ground Slots	(TEU/ha)	238	266	285	299	1.50
		Tiers YOR		4 0.6	4 0.6	4 0.6	4 0.6	
		Storage Capacity	(TEU/ha)	571	638	684	718	4.50

Table 4.6 Container Handling Capacity (Berth Capacity)(1)

			1997	1998	1999	2000	2001	200 2	2003	2010
Average Number of Loading/Unloading Containers (Box/Ship call)			220	220	225	230	235	240	250	320
Box (%)			70	70	70	70	70	70	70	70
40' Container Ratio			25	30	30	30	30	30	30	30
Container Crane handling Efficiency (Box/Hr,Cr)			-	19	21	23	25	25	25	25
1 Berth	1 Container Crane (A)	Number of Crane Effective Working	-	0.85	0.85	0.85	0.85	0.85	0.85	0.85
		ERT	-	0.71	0.69	0.68	0.66	0.67	0.68	0.73
		BT	-	19.2	18.2	17.4	16.7	16.9	17.4	20.7
		Number of Shipcall	-	319	337	353	368	363	353	297
		Handling Capacity (Box/Y.B)	-	70	76	81	87	87	88	95
		(TEU/Y.B)	-	91	99	106	112	113	115	123
	2 Container Crane (B)	Number of Crane Effective Working	-	1.6	1.6	1.6	1.6	1.6	1.6	1.6
		ERT	-	0.56	0.54	0.53	0.51	0.52	0.53	0.59
		BT	-	12.3	12.3	11.9	11.5	11.6	11.9	13.6
		Numberof Shipcall	-	478	499	517	534	529	517	451
		Handling Cargo (Box/Y.B)	-	105	112	119	126	127	129	144
		(TEU/Y.B)	-	137	146	155	103	165	168	188

Table 4.7 Container Handling Capacity (Berth)-(2)

Number of Container Crane per Berth				1cc		1cc/2cc		2cc	
Year				2003	2010	2003	2010	2003	2010
Number of Loading and Unloading Containers			Box /ship call	250	320	250	320	250	320
Nmber of Berths	1 Berth	Berthing Time	Hr	17.4	20.7	-	-	11.9	13.6
		Number of Calling Ship	ships	353	297	-	-	517	451
		Handling Capacity	1,000 TEU /Y.B	115	123	-	-	168	188
		Total Number of Container Crane	Set	1	1	-	-	2	2
	2 Berth	Berthing Time	Hr	17.4	20.7	14.1	16.4	11.9	13.6
		Number of Calling Ship	ships	706	594	870	748	1,034	902
		Handling Capacity	1,000 TEU/Y.B	230	246	283	311	336	376
		Total Number of Container Crane	Set	2	2	3	3	4	4
	3 Berth	Berthing Time	Hr	17.4	20.7	-	-	(11.9)	(13.6)
		Number of Calling Ship	ships	1,059	891		-	(1,551)	
		Handling Capacity	1,000 TEU /Y.B	345	369	-	-	(504)	(564)
		Total Number of Container Crane	Set	3	3	-	-	6	6

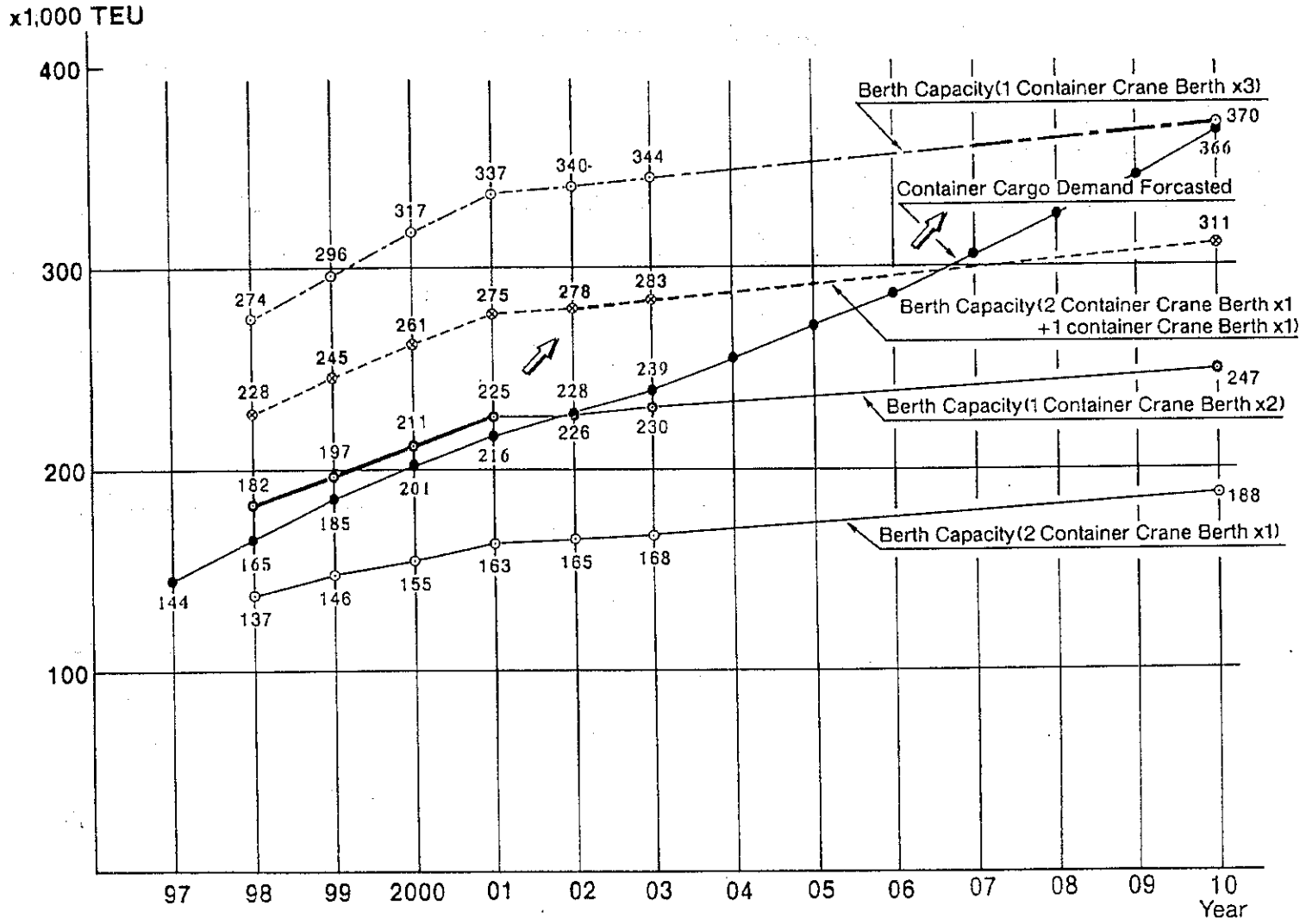


Fig. 4.3 Container Handling Capacity (Berth)

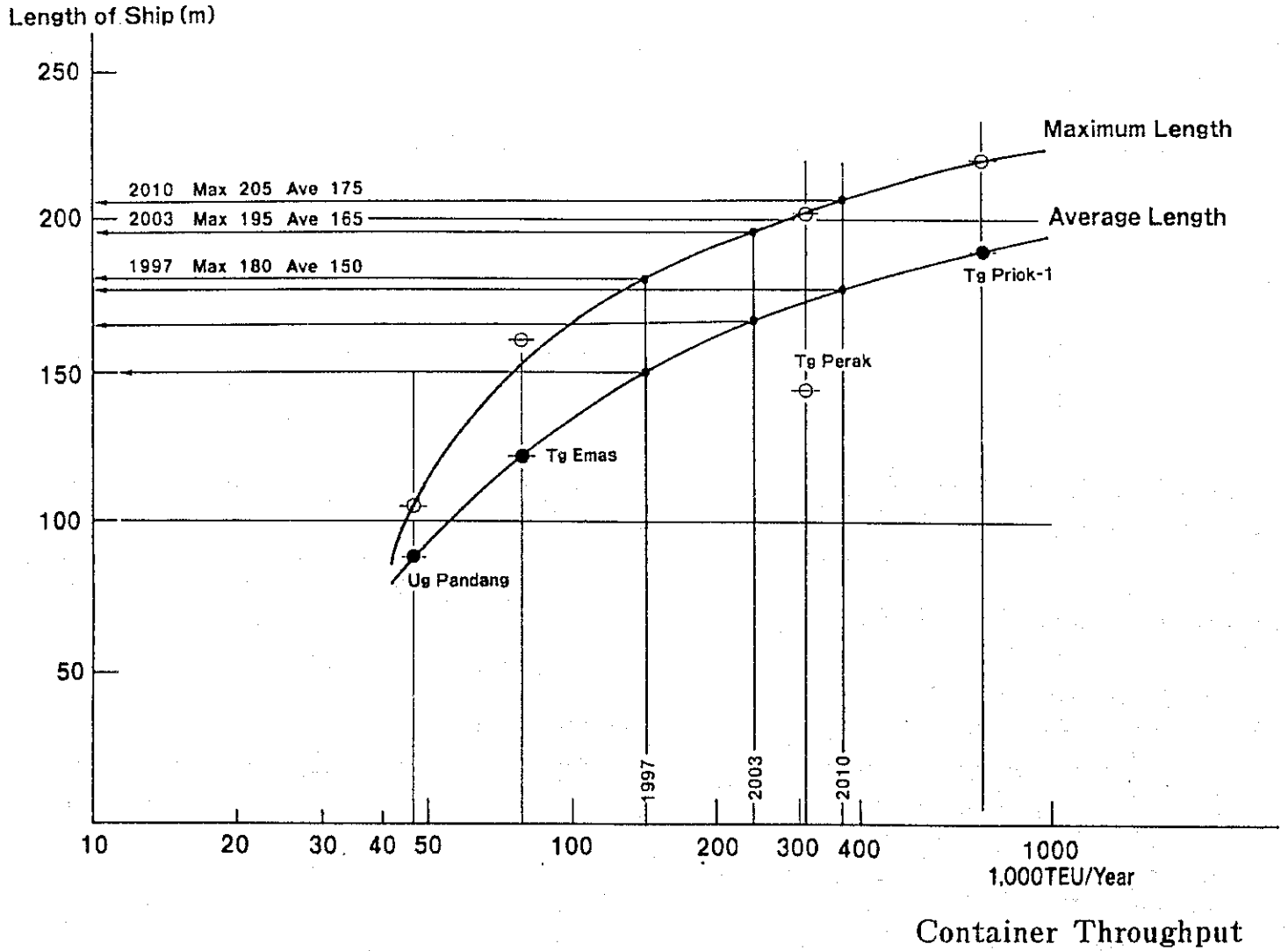


Fig 4.4 Length of Ships Calling

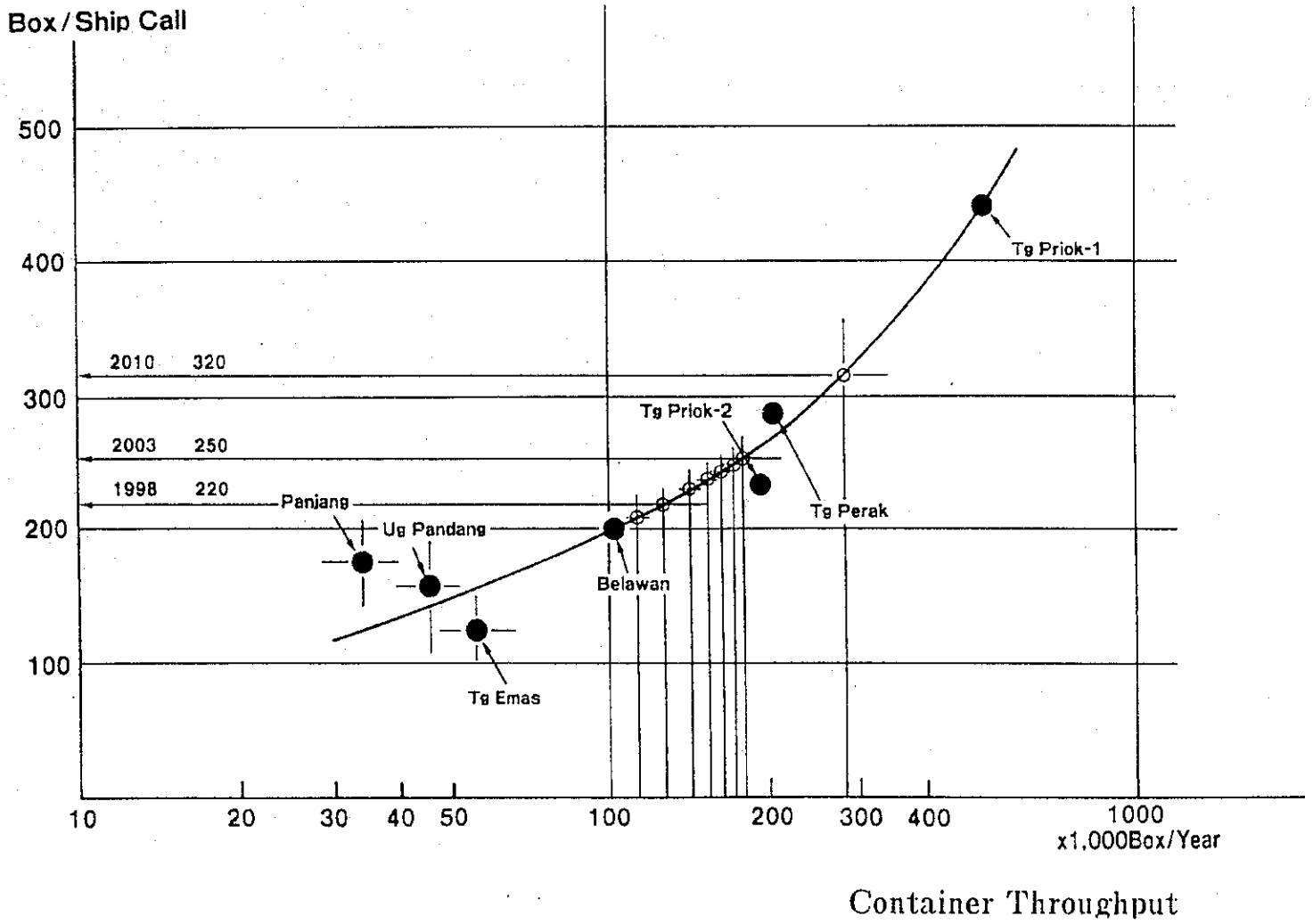


Fig. 4.5 Number of Loading and Unloading Container

Table 4.8 Number of Ground Slots required and Container Storage Capacity (Makassar Port)

YEAR	Container yard ground slots required: Design (Transfer Crane System)															Container Storage Capacity (1,000 TEU/Yr)	Demand forcasted (1,000 TEU/Yr)	Overflow Containers (1000 Box/Y)	Overflow Containers (1000 TEU/Y)
			Prop. (%)	Throughput (1,000 TEU/Yr)	Dwelling Time (Day)	Storage (1,000 TEU)	Stacking Height (lover4)	Required Ground Slot (Thrtcl) (TEU)	YOR	Required Ground Slots (Practical) Total (TEU)	Laden (TEU)	Empty (TEU)	Ground Slots Allocation Laden (TEU)	Empty (TEU)	Shortage of Ground Slot (TEU)				
													(1700)	(200)					
1997	Import	Full	0.35	50.4	10.0	1.38	3.0	461	0.6	768	768								
		Empty	0.15	21.6	8.0	0.47	4.0	118	0.6	197		197							
	Export	Full	0.35	50.4	10.0	1.38	3.5	395	0.6	658	658		-274		-274				
		Empty	0.15	21.6	8.0	0.47	4.0	118	0.6	197		197		195	195				
	Total			144.13	9.4	3.71	3.4	1,092	0.6	1,821	1,426	395	1,700	200	-79	150.4	143.4	(-5.6)	(-7.0)
1998	Import	Full	0.35	57.8	9.0	1.43	3.0	475	0.6	792	792								
		Empty	0.15	24.8	7.0	0.48	4.0	119	0.6	198		198							
	Export	Full	0.35	57.8	9.0	1.43	3.5	407	0.6	679	679		-229		-229				
		Empty	0.15	24.8	7.0	0.48	4.0	119	0.6	198		198		196	196				
	Total			165.22	8.4	3.80	3.4	1,120	0.6	1,867	1,471	396	1,700	200	-33	168.1	165.2	(-2.3)	(-2.9)
1999	Import	Full	0.35	64.6	8.0	1.42	3.0	472	0.6	786	786								
		Empty	0.15	27.7	6.0	0.46	4.0	114	0.6	190		190							
	Export	Full	0.35	64.6	8.0	1.42	3.5	404	0.6	674	674		-239		-239				
		Empty	0.15	27.7	6.0	0.46	4.0	114	0.6	190		190		179	179				
	Total			184.53	7.4	3.74	3.4	1,104	0.6	1,840	1,461	379	1,700	200	-60	190.6	184.5	(-4.7)	(-6.1)
2000	Import	Full	0.35	70.5	8.0	1.54	3.0	515	0.6	858	858								
		Empty	0.15	30.2	5.0	0.41	4.0	103	0.6	172		172							
	Export	Full	0.35	70.5	8.0	1.54	3.5	441	0.6	735	735		-106		-106				
		Empty	0.15	30.2	5.0	0.41	4.0	103	0.6	172		172		145	145				
	Total			201.34	7.1	3.92	3.4	1,163	0.6	1,938	1,594	345	1,700	200	38	197.4	201.3	3.0	3.9
2001	Import	Full	0.35	75.5	8.0	1.66	3.0	552	0.6	920	920								
		Empty	0.15	32.4	5.0	0.44	4.0	111	0.6	185		185							
	Export	Full	0.35	75.5	8.0	1.66	3.5	473	0.6	789	789		8		8				
		Empty	0.15	32.4	5.0	0.44	4.0	111	0.6	185		185		170	170				
	Total			215.86	7.1	4.20	3.4	1,247	0.6	2,078	1,708	370	1,700	200	178	197.3	215.9	14.2	18.6
2002	Import	Full	0.35	79.9	8.0	1.75	3.0	584	0.6	973	973								
		Empty	0.15	34.3	5.0	0.47	4.0	117	0.6	196		196							
	Export	Full	0.35	79.9	7.0	1.53	3.5	438	0.6	730	730		4		4				
		Empty	0.15	34.3	5.0	0.47	4.0	117	0.6	196		196		191	191				
	Total			228.42	6.8	4.22	3.4	1,257	0.6	2,095	1,704	391	1,700	200	195	207.2	228.4	16.3	21.2
2003	Import	Full	0.35	83.8	8.0	1.84	3.0	612	0.6	1,020	1,020								
		Empty	0.15	35.9	5.0	0.49	4.0	123	0.6	205		205							
	Export	Full	0.35	83.8	7.0	1.61	3.5	459	0.6	765	765		86		86				
		Empty	0.15	35.9	5.0	0.49	4.0	123	0.6	205		205		210	210				
	Total			239.41	6.8	4.43	3.4	1,317	0.6	2,195	1,786	410	1,700	200	295	207.1	239.4	24.8	32.3
2010	Import	Full	0.35	128.2	7.0	2.46	3.0	819	0.6	1,366	1,366								
		Empty	0.15	54.9	4.0	0.60	4.0	151	0.6	251		251							
	Export	Full	0.35	128.2	6.0	2.11	3.5	602	0.6	1,003	1,003		669		669				
		Empty	0.15	54.9	4.0	0.60	4.0	151	0.6	251		251		302	302				
	Total			366.25	5.7	5.77	3.3	1,723	0.6	2,871	2,369	502	1,700	200	971	242.4	366.3	95.2	123.9

Table 4.9 Table Requirement of the Facilities in The Container Terminal

		Unit	1997	1998	1999	2000	2001	2002	2003	2010
Forcast of Container volume (1000)		TEU	144	165	185	201	216	228	239	366
		Box	115	127	142	155	166	176	184	282
Average Number of L/UL Boxes		Box	210	220	225	230	235	240	250	320
40' Container Ratio		%	25	30	"	"	"	"	"	"
Empty Container Ratio		%	30	"	"	"	"	"	"	"
Average Yard Dwelling Time		Day	9.4	8.4	7.4	7.1	7.1	6.8	6.8	5.7
LCL Cargo Ratio		%	25	"	"	"	"	"	"	"
Berth	Berth Length(Hatta)	m	490	"	"	"	"	"	"	"
	Number of Berth		3	2	"	"	"	"	"	"
Container Yard	Ground Slot	TEU	1700	"	"	"	"	"	"	"
Empty Container Yard	Ground Slot	TEU	200	"	"	"	"	"	"	"
Inland Container Depot	Groud Slot	TEU	180	200	230	280	370	400	520	1250
	Yard Storage Area	Ha	0.9	1.0	1.2	1.5	1.9	2.1	2.7	6.6
CFS	Total CFS Area	sqm	7500	8600	9600	10500	11300	11900	12500	19100
	CFS in Port Area	sqm	4000	"	"	"	"	"	"	"
	CFS in Inland Depot	sqm	3500	4600	5600	6500	7300	7900	8500	15100
Container Crane	Number of CC	set	0	2	"	"	"	3	"	"
Yard Transfer Crane		set	5	6	7	8	"	9	"	14
Fork Lift(SideLioader)	Container Yard	set	3	3	3	4	4	4	4	7
	Inland Container Depot	set								
Fork Lift(Top Lifter)	Container Yard	set	1	"	"	"	"	"	"	2
	Inland Container Depot	set	2	2	2	2	3	4	4	11
Fork Lift	CFS	set	5	6	"	7	"	8	"	12
Yard Trailer	Truktor Head	set	8	9	10	11	12	13	13	22
	Trailer Chassis	set	16	18	20	22	24	26	26	44
Highway Trailer Head	Truktor Head	set	3	3	4	6	10	11	14	32
	Trailer Chassis	set	6	6	8	12	20	22	28	64

(2) Facilities Layout of Hatta Quay

64. As explained in the Zoning for Utilization of Port Area, the northern side of the Hatta quay having length of 490 m will be utilized for only containers handling, for this perpose the behind area of the quay should be utilized mainly for containers marshaling yard. The transit shed of the original design is therefore not necessary in this area, and a CFS shed planned to be constructed in this area is recommended to be transferred to the southern part of Soekarno quay area The control building for the marshaling containers is recommended to be constructed at the area where should be able to see the marshaling containers yard for the direct control.

65. The required number of container ground slot of the Hatta quay in 2003 is appoloximately 2195 TEU including empty containers. However, the planned ground slot in Hatta quay on this study is not sufficient for the requirement. Therefore, An additional area for the empty container yard with yard fence is proposed in the Soekarno quay area nearby the CFS shed.

66. The daily traffic volume through the terminal gates of the new Hatta Quay and corresponding required number of lanes in the condition of an hourly peaking factor of 1.5 are shown as follows: Receipt Laden container = 355 Vehicles/day (year :2010)
Receipt Empty container = 150 Vehicles/day (year :2010)
Delivery Laden container = 300 Vehicles/day (year :2010)
Delivery Empty container = 205 Vehicles/day (year :2010)
Receipt total 505 chassis , Delivery total 505 chassis
Peaking flow of in-coming lane:505/16hr x1.5x 3min /60min =3 lanes
Peaking flow of out-going lane:505/16hr x1.5x 2min /60min =2 lanes
Thus, five (5) lanes is correspondence totally, 3 lanes for in-coming and 2 lanes for out-going, and a emergency lane for the oversize truck is provided along the out-going lanes.

67. Considering the above, the proposed modifications on the facilities layout of the Hatta quay is presented in **Fig.4.6**. As for the layout arrangement of CFS at Soekarno Quay, two(2) alternative plans were proposed, i.e.:
Alternative 1: The seaside space between CFS and existing transit shed (TS) is proposed to be 8.0 m as shown **Fig. 4.6 and 4.7.**
Alternative 2: The seaside space between CFS and TS is proposed to be 13.0m to secure

wider truck circulation space. The circulation road at the back of the Administration building should, however, be sacrificed as shown in **Fig. 4.8.**

Taking the truck circulation space between CFS and TS into consideration, Alternative 2 is more convenient. Further review on the parking space for Administration building is, however, recommended before the final decision on the Alternatives.

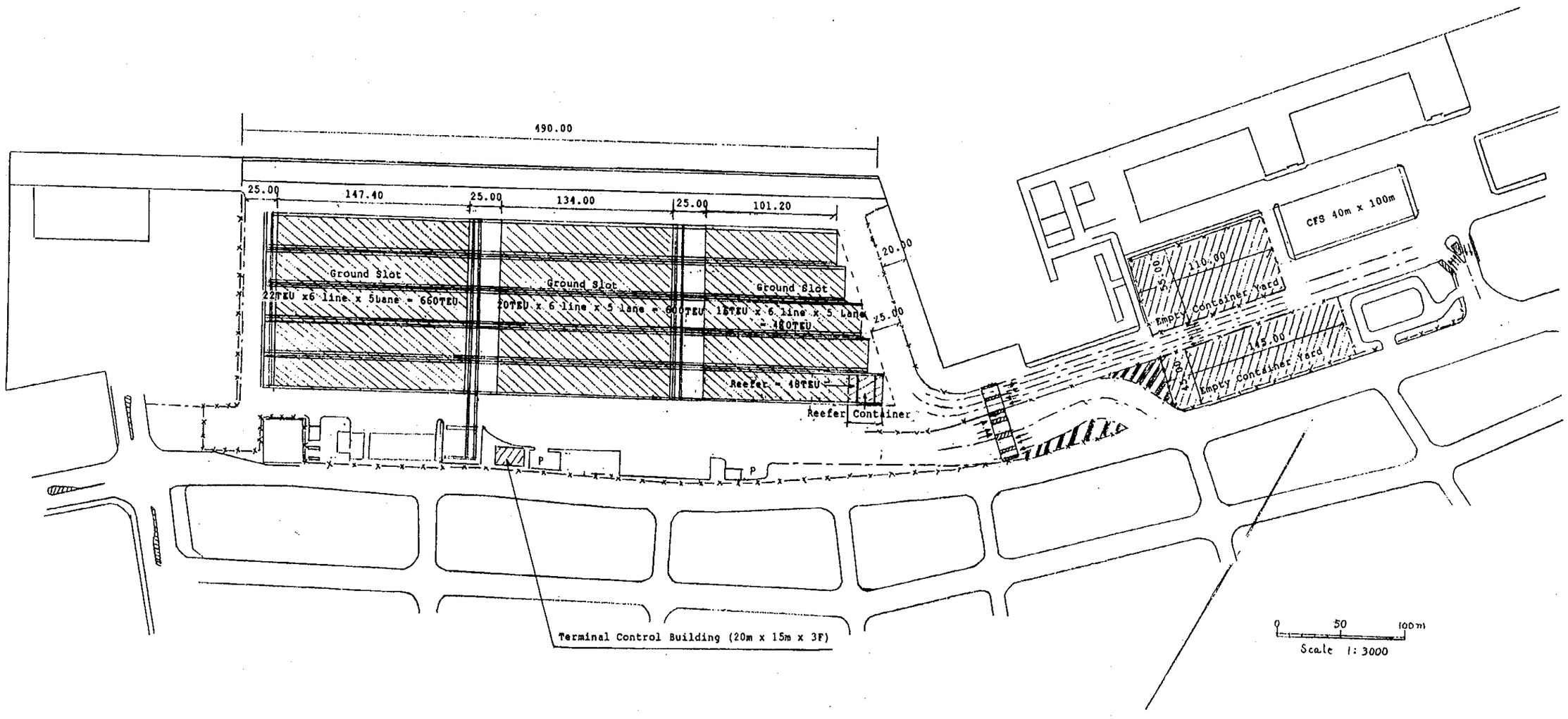


Fig. 4.6 General Layout Plan of Proposed Container Terminal of Ujung Pandang Port

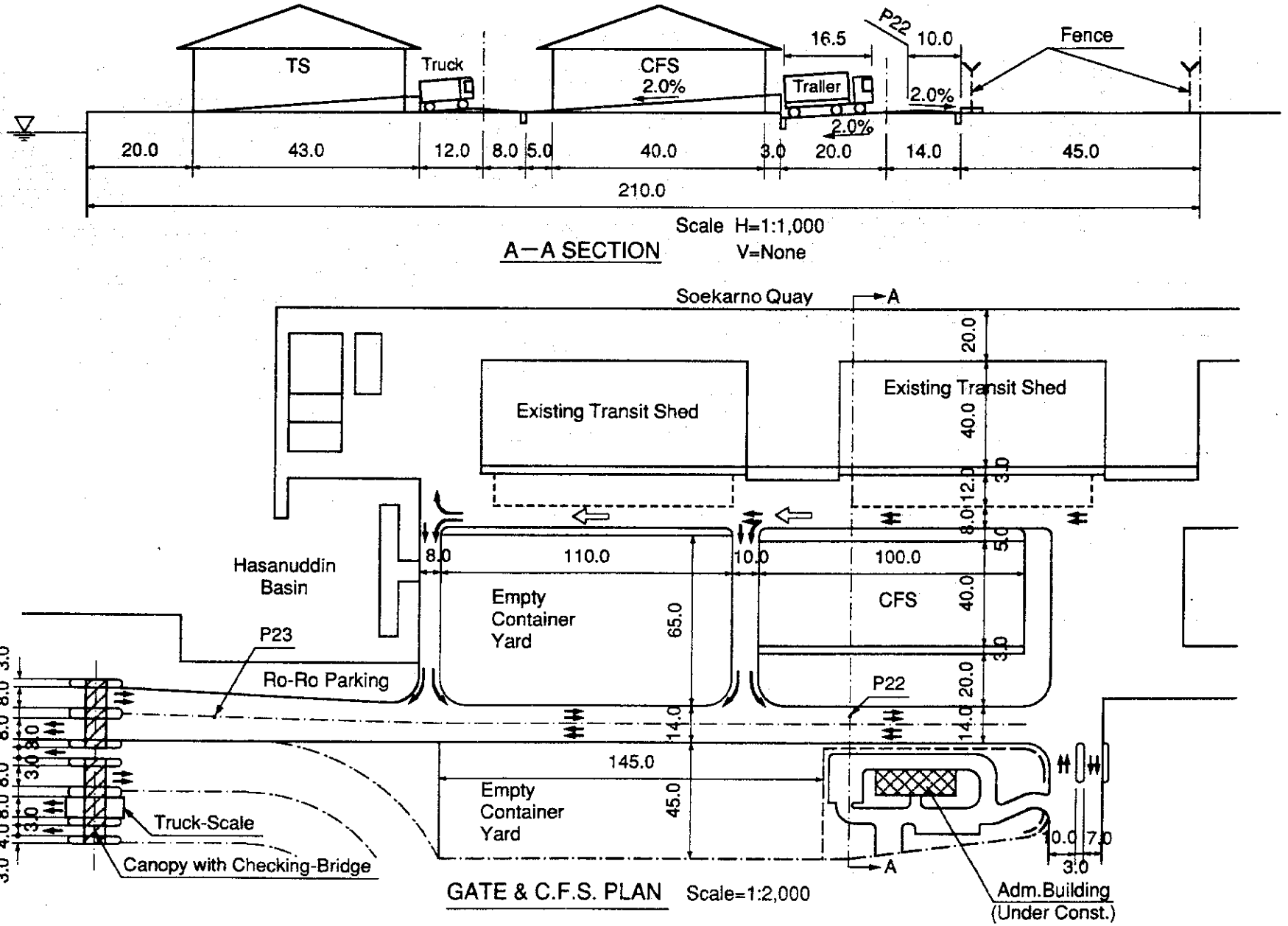


Fig. 4.7 Layout Plan of CFS (Alternative 1)

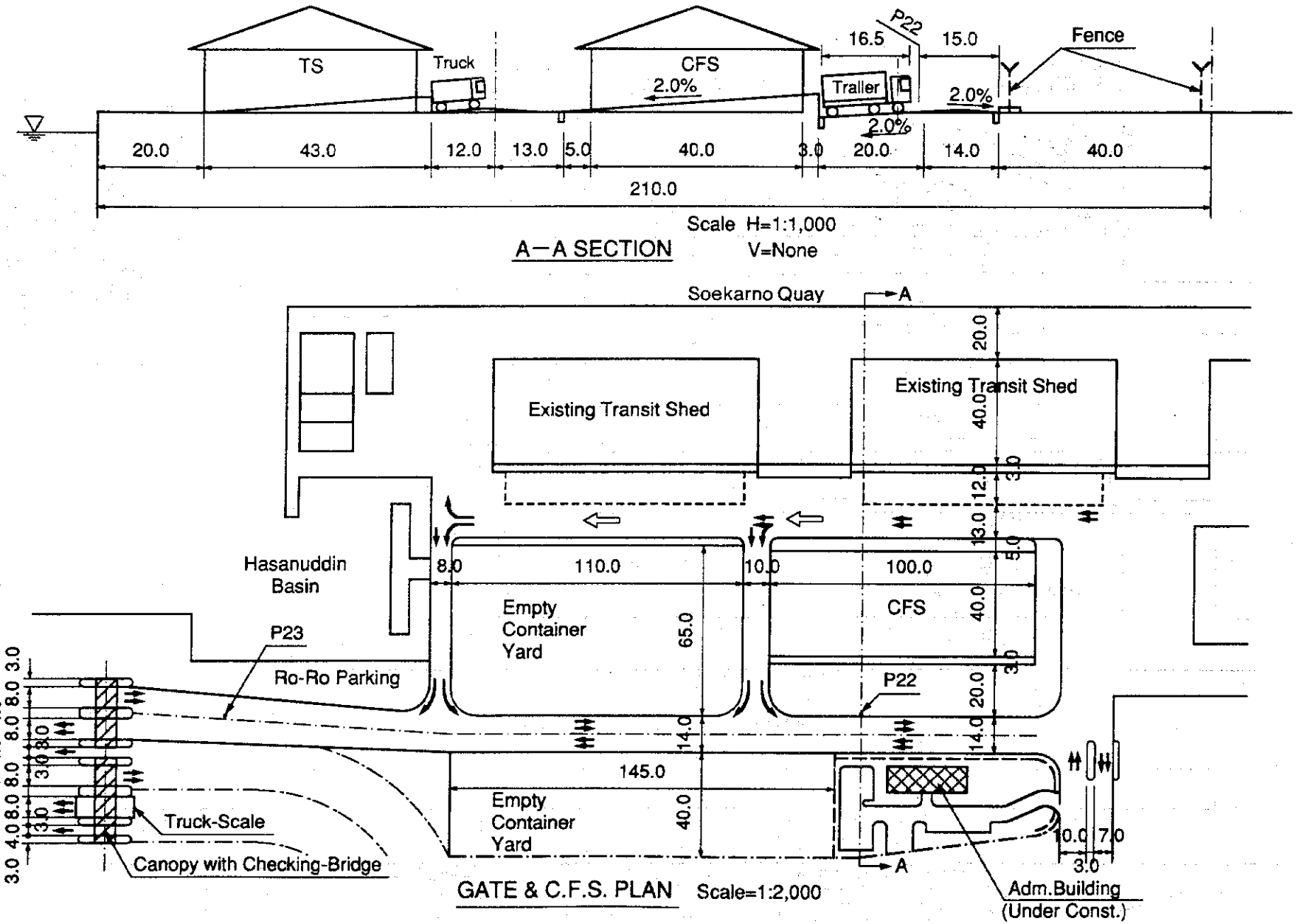


Fig. 4.8 Layout Plan of CFS (Alternative 2)

(3) Inland Container Terminal (INCT)

68. As explained in Chapter 4 "Master Plan of Ujung Pandang Port", required area of the CFS sheds and container yard in Inland Container Terminal (INCT) is about 8.5 ha excluding common space and terminal road. The total space of the inland container terminal therefore requires approximately 15 ha. As a result of the examinations on lands where can be secured, four (4) locations for the inland container terminal are proposed as shown below and in **Fig. 4.9**.

69. Location No.1 (Kel. Tallo Area) is located 3 km on the north-eastern side of the Ujung Pandang Port and within the premises of the port Corporation IV. The proposed land is in the sea, and it will be necessary to reclaim up to +3m from +0.9m.

70. Location No.2 (Kawasan Industrial Makassar : KIMA) is located 11 km on the eastern side of the Ujung Pandang Port and within the Kawasan Industrial Makassar. Thus, the land will be taken on lease from the KIMA for 30 years.

71. Location No.3 (A land along existing highway) is located 5 km east of the Ujung Pandang Port. The land is required for a land acquisition fee in addition to land reclamation.

72. Location No.4 (City cargo terminal) is located 5 km east of Ujung Pandang Port and within the City Cargo Terminal. The terminal facilities for the cargo such as transit sheds, open storage yard and utilities has been provided with capital funds provided by the city government. Thus, the operation of the inland container terminal will be controlled by a joint venture with the city. Each location is compared by following items as shown in **Table 4.10**

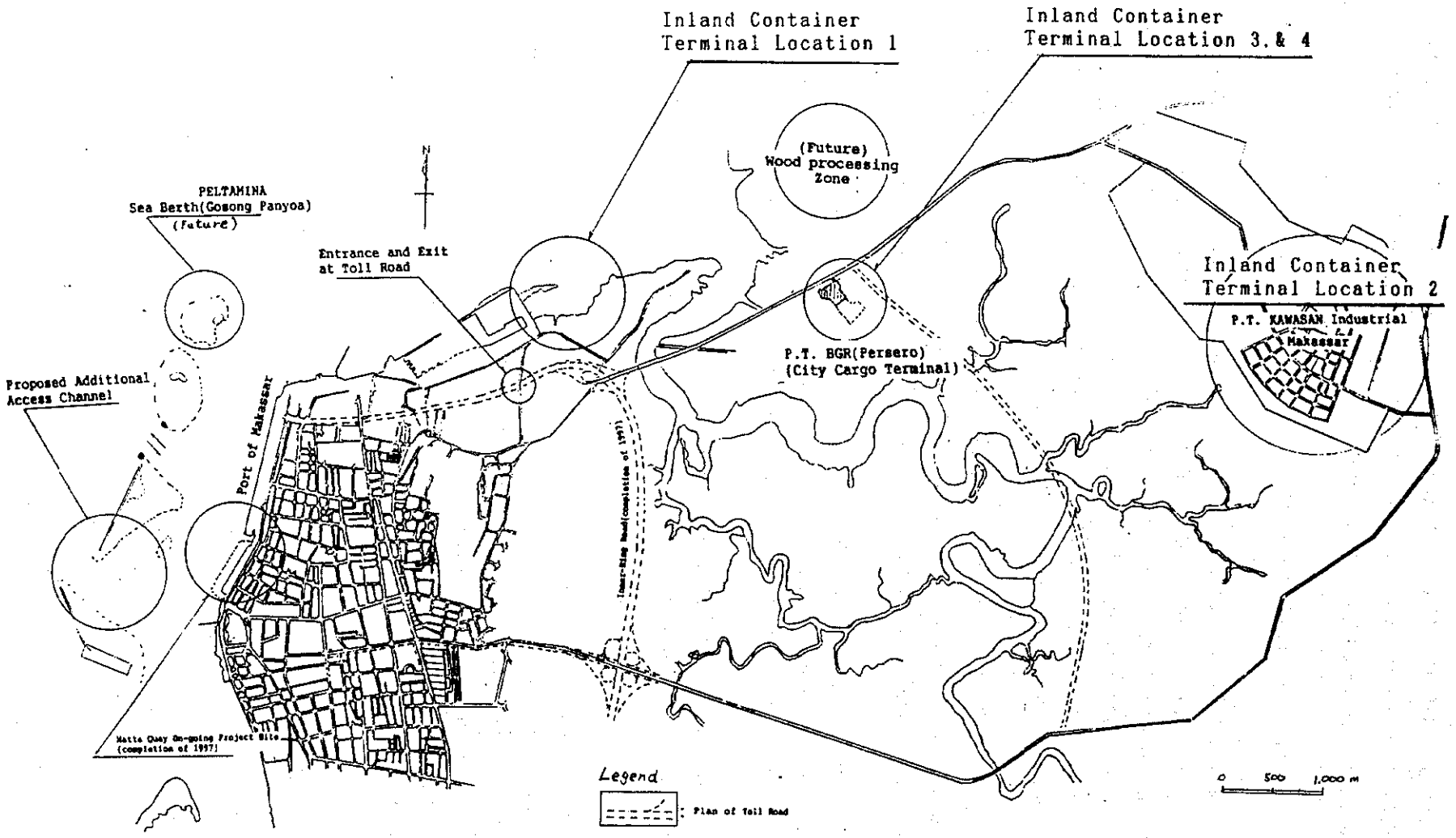


Fig. 4.9 Location Plan of Inland Container Terminal

Table 4.10 Comparison of Location for the Inland Container Terminal

Location	Distance from the port	Construction Cost(Million.Rp) Excluding Handling Equipment	Access to the main roads	Management & Operation	Land Property
Location 1 (KEL Tallo)	3km	43,400	Necessary	By Ujung Pandang Port	Ujung Pandang Port
Location 2 (Pt.KAWASAN Industrial)	11km	39,200	Not necessary	By Ujung Pandang Port	P.T Kawasan Leased 30 Year
Location 3 (Nearby City Cargo Terminal)	5Km	45,200	Not Necessary	By Ujung pandang Port	Ujung Pandang Port
Location 4 (PT.BGR City Cargo Terminal)	5km	Necessary to invest for Equipment & Expansion.	Not Necessary	Joint Venture with City	City Government

Note : Access Road of Location 3 & 4
(Overpass to/from the opposite lane of toll way will be needed upon completion additional lanes of tollway.)

73. Locations (1) to (3) are not so different for the project cost. Location (4) is anticipatad to face difficulties to control for the operation with the city, because the inland container terminal will be operated to function with Hatta quay operations. Thus, location (1) is recommended for the inland container terminal site, because the area has no issue for the land acquisition and terminal operation.

4.2.2 Stage plan for the projects

74. It is necessary to implement the entire project proposed in the Master Plan according to phase plans. The first phase project is that proposed in the Short-Term Plan with the target year 2003. The remaining project will be realized in the second phase plan with the target year 2010 same as the Master Plan. The main construction items and implementation phase plan are presented in **Fig.4.10**.

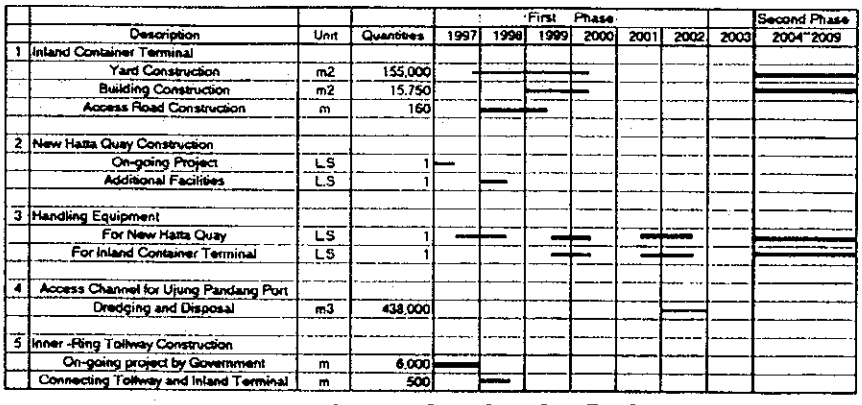


Fig. 4.10 Stage Plan for the Project

4.2.3 Rough design of port facilities

75. Considering the aforementioned examination on the facility layout and stage plan for the project, rough design was made for the proposed port facilities including inland container terminal and related facilities.

(1) Design standards

76. The study was carried out considering following design standards, code or reference data:

a. Standard Design Criteria for Ports in Indonesia,
Maritime Sector Development Program,
Directorate General of Sea Communications : Jan. 1984

b. Technical Standards for Port and Harbour Facilities in Japan, New Edition 1991

c. Highway Bridge Loading Specification,
Departmen Pekerjaan Umum Direktorat Jenderal Bina Marga

d. Indonesia Reinforced Concrete Code 1971

e. Design Code and Commentary for Reinforced Concrete Structures (JASS)

f. Japanese Industrial Standards (JIS)

g. Others

(2) Design conditions

77. Based on the data collected through the site investigations and related study activities, design conditions for the Study were examined and summarized hereunder:

a. Natural Conditions

i) Tide level
High Water Spring (H.W.S.) + 1.75 m

Mean Sea Level (M.S.L.) + 0.89 m
Low Water Spring (L.W.S.)DL 0.00 m

ii) Maximum Current : 0.5 m/sec (approx. 1 knot)

iii) Wave at Ujung Pandang Port Basin
Height : $H_{1/3}$ 1.1 m
Period : $T_{1/3}$ 6 sec
(Data source: Final Survey Report, PCI, Jan. 1989)

iv) Maximum Wind : 25 m/sec (approx. 50 knots)
(Data source : Meteorology & Geophysics Boards)

v) Rainfall intensity : 80 mm/hour

vi) Seismic Coefficient:
Horizontal direction Kh = 0.05
Vertical direction Kv = 0.00

b. Design ship size: (Container ship)

Table 4.11 Design Container Ship Size

Type	TEU	DWT	LOA(m)	Beam(m)	Draft(m)	Term
A-2	1,500	25,000	195	28	10.3	Long
A-3	750	15,000	162	24	8.7	Long & Short
B-2	500	10,000	137.5	21	7.5	Short

c. Load

i) Live load
Wheel load of transtainer(RTG): 20 t/wheel
Surcharge: (at container yard)
Normal condition: 3.0 t/m^2
Seismic condition: 1.5 t/m^2

ii) Dead load

d. Sub-soil conditions

Data shown in Section 2.2.6. Natural conditions, were applied.

(3) Inland Container Terminal

78. Following the aforementioned discussion, an Inland Container Terminal (INCT) was proposed at Kel. Tallo area beside the P.T.IKI (Indonesian Ship Industry Co.). The major purpose of this INCT are enumerated hereunder:

a. To supplement the lacking container yard space at New Hatta Quay, the functions of CFS and container yard are given to INCT.

b. To moderate the concentration of container and general cargo traffic which will be delivered out of or carried into CFS mainly as LCL cargoes.

79. The scale of proposed INCT consists of reclaimed yard CFS and other buildings and access roads connecting to Inner Ring Road tollway as summarized in Table 4.12. The general layout plan of INCT for the year 2010 is given in **Fig. 4.11.**

(4) Access Road

80. The future vehicle traffic in Ujung Pandang City was estimated in a previous JICA study prepared in 1989 in which the on-going Inner Ring Road construction project and existing toll way were determined. The future external vehicle traffic in Ujung Pandang City was estimated as shown in Table 4.13.

Table 4.12 Scale of proposed INCT

Facilities	Year2003 (Short term)	Year2010 (Long term)
Reclamation	8.5 ha	15.5 ha
Revetment	635 m	930 m
Container yard	2.7 ha	6.6 ha
Road	1.9 ha	3.1 ha
CFS	9,000 m^2	15,750 m^2
Administration building	400 m^2	400 m^2
Utilities	1 lot	1 lot
Fence/gate	1,680m/1 gate	3,080 m/1 gate
Access road	150 m	150 m
Access to tollway	650 m	650 m

Table 4.13 Future External Vehicle Traffic in Ujung Pandang City

(vehicle trips/day)

Vehicle Type	1994	2009
Motor cycle	5,540	12,450
Passenger Car	4,560	14,660
Pick-up/Truck	5,600	15,740
Mini bus/Bus	6,930	9,930
Total	22,630	52,780

Data source:Ujung Pandang Area Highway Development Study,1989

81. The forecasted traffic volume and capacity of the highway were also estimated in the same report as shown in Table 4.14.

Table 4.14 Traffic Volume and Required Lane Numbers of Toll way

Road	Segment	Capacity /lane	Forecasted Traffic Volume		RequiredLanes		Remarks
			1994	2004	1994	2004	
Inner Ring Road	Seg. 1	13,000	13,000	58,000	2	4	Note.1
	Seg. 2	13,000	25,000	61,000	4	4	Note.2
Existing Toll Way	Seg.17	13,000	13,000	63,000	2	4	

Notes 1. Segment 1: Between Ujung Pandang Port and existing toll way.
2. Segment 2: From existing toll way going to south.
3. Unit: Vehicle trips/day
4. Data source: Ujung Pnadang Area Highway Development Study, 1989

82. While, the traffic volume to be generated by INCT was estimated in the range of approx.1,000 in year 2003, to 2,900 vehicle trips/day in year 2010 including container on chassis and other general cargo trucks as shown in **Table 4.15** which is less than 10 % of abovementioned estimated traffic volume of toll-ways and, therefore, can be managed by above tollways networks.

Table 4.15 Estimated Traffic Volumes generated by ICT

(vehicle trip/day)

Year	Container (in/out)	Cargo trucks and Passenger cars (in/out)	Total (in/out)
2003	256	768	1,024
2010	735	2,205	2,904

83. The location plan of access roads between the tollway (Inner Ring Road) and INCT are shown in **Fig.4.12** where two(2) sections were considered, i.e:

a. Access from existing IKI road to proposed reclamation yard:

Four (4) lanes access road was proposed for this section to avoid traffic congestions by queuing trucks and chassis in front of the main gate of INCT.

b. Inter-changes from Inner Ring Road to existing IKI road:

This access to/from Inner Ring Road should manage the traffic flow of:

i) from Ujung Pandang Port to INCT.
ii) from INCT to Ujung Pandang Port
iii) from Maros, Biringkanaya where KIMA(Makassar Industrial Estate) Hasanuddin Air Port and city cargo terminal (Pusat Pergudangan Kota) are located, to INCT through existing toll way and Inner Ring Road and vice-versa.
iv) from Panakukang, Tamalate and other southern part of Ujung Pandag City area to INCT through Inner Ring Road and vice-versa.

One lane access was considered for each of the above traffic flow.

(5) Navigation Channel of Ujung Pandang Port

a. Present conditions of channel navigation

84. The ocean going ships arriving or departing Ujung Pandang Port are using an exiting navigation channel with a water depth of 11 m located in between Kayangan Island at Gosong Boni(Boni reef) and Lae Lae Kecil Island on the course of 125 degree for two way navigation.(see **Fig.4.13**) Due to this existing navigation system of Ujung Pandang Port, the port basin is being used as multi purpose basin, i.e:

i. For berthing alongside quays
ii. For port navigation channel for shifting ships
iii. For mooring basin
iv. For turning basin

b. Congestion of navigation channel and port basin

85. In addition to the above, the navigation channel and port basin are utilized by many types of ship, which can be classified in general as shown below:

i. Container ships of foreign and domestic lines which will berth at New Hatta

Quay: The present ship size of 3000 to 4000 GT is expected to be increased to 15,000 to 25,000DWT.

ii. General cargo ships mainly for domestic lines with maximum draft of 8m are berthing at Soekarno Quay.

iii. Passenger ships operated by P.T. PELNI are berthing at Soekarno Quay or will be shifted to New Hatta Quay upon completion of the Quay. 12 passenger ships with tonnage of 1650 to 3400 DWT are plying between Ujung Pandang and other Indonesian ports. According to the information of Port Corporation IV, a passenger ship of 14,600 GRT will be utilized for these lines.

iv. Dry bulk carriers with tonnage of 32,000DWT owned by P.T.Bogasari flour mill company are berthing at the northern end of Soekarno Quay but, due to the limit of berth water depth, the actual draft are adjusted to be less than 8m by unloading cargoes at Surabaya on the way coming from Australia.

v. Cement barges and bagged cement carriers of P.T. Cement Tonosa will be berthing at Soekarno Quay.

vi. Liquid bulk carriers of PERTAMINA are berthing at PERTAMINA pier: PERTAMINA intends to construct a new oil sea berth at Gosong Panyua which will be connected to existing PERTAMINA oil pier with submarine oil pipes. This new berth will accomodate oil tankers with maximum tonnage of 18,000 DWT.

vii. Naval ships are berthing at Naval base at the northern end of Ujung Pnadang Port.

viii. Traditional sailing vessels (Rakyat boats) are berthing at Paotere Port: Since the size of sailing vessels are small, they are also using the northern channels around Trabanusa reef.

c. Number of ship calls

The number of ship calls by individual type of ships are estimated in Table 4.16.

Table 4.16 Estimation of number of ship calls

Type of ships	1991	1992	1993	2003	2010
1.Ocean-going/container	289	250	292	740	880
2.Domestic	1289	1202	1388	1490	2350
3.Passenger	466	430	440	500	500
4.Dry bulk	40	27	38	48	63
5.Liquid bulk	N.A.	N.A.	407	537	696
1. to 5. Sub total	2084	1909	2565	3315	4489
6.Traditional(Rakyat)	3030	3207	2730	3000	3000
1. to 6. Total	5114	5116	5295	6315	7489

Data source: i) For 1991 to 1993, Statistics by Port Corp.IV
ii) For 2003 to 2010, estimated by Study Team

d. Additional navigation channel

86. Above present condition is deemed not appropriate for future demand of ship calls particularly for the drastic increment of large size vessels in the aspects of port safety and efficient operation. In order to solve the future issues, an additional navigation channel in between Lae Lae Kecil Island and Lae Lae Besar Island is recommended as shown in **Fig 4.13**.
By utilizing the additional navigation channel, the following advantages are anticipated:

i) To secure safety and efficiency of port navigation by adopting one way traffic in the navigation channels and port basin.
ii) At the same time the passenger/container ships and dangerous cargoes carried by oil tankers can be segregated by south and north bound channels as shown in **Fig 4.13**.
iii) To minimize the time on port entrance and departure.
iv) The dredging works of the additional channel can be done with minimal marginal dredging, since the proposed channel area already has a depth of -9 to -10 m

87. Taking the above circumstances into consideration, the individual ship size and required water depth concerned for individual type of ships are determined as shown in **Table 4.17.**

Table 4.17 Required dimension of navigation channel

Type of ship	Tonnage	LOA (m)	Draft (m)	Water depth (m)	Remarks
Container (2010)	25,000 DWT	195	10.3	-12.0	Note 1
Container (2003)	15,000 DWT	162	8.7	-11.0	Note 1
General cargo	9,000 DWT	139	8.0	-9.0	Note 2
Passenger ship	14,600 GT	181	8.8	-11.0	Notes 2&3
Dry bulk carrier	32,000 DWT	200	8.0	-9.0	Note 4
Liquid bulk carrier	18,000 DWT	156	9.5	-11.0	Note 2

Notes 1. Ship size as stated in design conditions. The water depth was decided considering the ship trim and movement of hulls by wave action.
2. Ship size: "Standard design criteria for ports in Indonesia"
3. Tonnage: Port Corporation IV
4. Draft: limited by existing water depth of quay

88. Based on above required size of navigation channel, the water depth and width of the channel are concluded hereunder:

e. Width of navigation channel

89. The width of navigation channel was determined based on two design standards:

i) "Standard Design Criteria for Ports in Indonesia" called for {(4B ~ 7B)+30 m, where B = Beam of ship} which makes 142 m to 226 m wide of channel for A-2 type container ships (25,000 DWT).

ii) While, "Technical Standards for Ports and Harbour Facilities in Japan" calls for {(1.0L ~ 1.5L), where L = Length of ship} which makes 195m to 293 m wide of channel for A-2 type container ship.

90. The size of passenger boats and dry bulk carrier were also taken into

consideration and the width of proposed navigation channel was concluded to be 200 m.

f. Depth of navigation channel

91. Based on the above Table, the water depth was concluded to be -11 m and -12 m for the year 2003 and 2010 respectively.

4.2.4 Implementation plan

92. The main components of the first phase project (short term development: 2003) are summarized as follows:

(1) Additional facilities for the new Hatta Quay
:Power supply for the gantry cranes and reefer containers.
:Terminal control building construction
:Additional yard fence for empty containers
:Information and control system for container terminal

(2) Inland container terminal construction
:Yard reclamation (8.5 ha)
:CFS sheds construction (total area =9,000m2)
:Open yard storage (total area =2.7ha)
:Terminal office building construction
:Work shop construction
:Utilities

(3) Access entrance construction for inland container terminal
:Road embankment and pavement
:Gate construction
:Box culvert construction
:Utilities

(4) Connecting toll road for inland container terminal
:Road embankment and pavement
:Guard rails and utilities

(5) Access channel construction
:Navigation aids installation

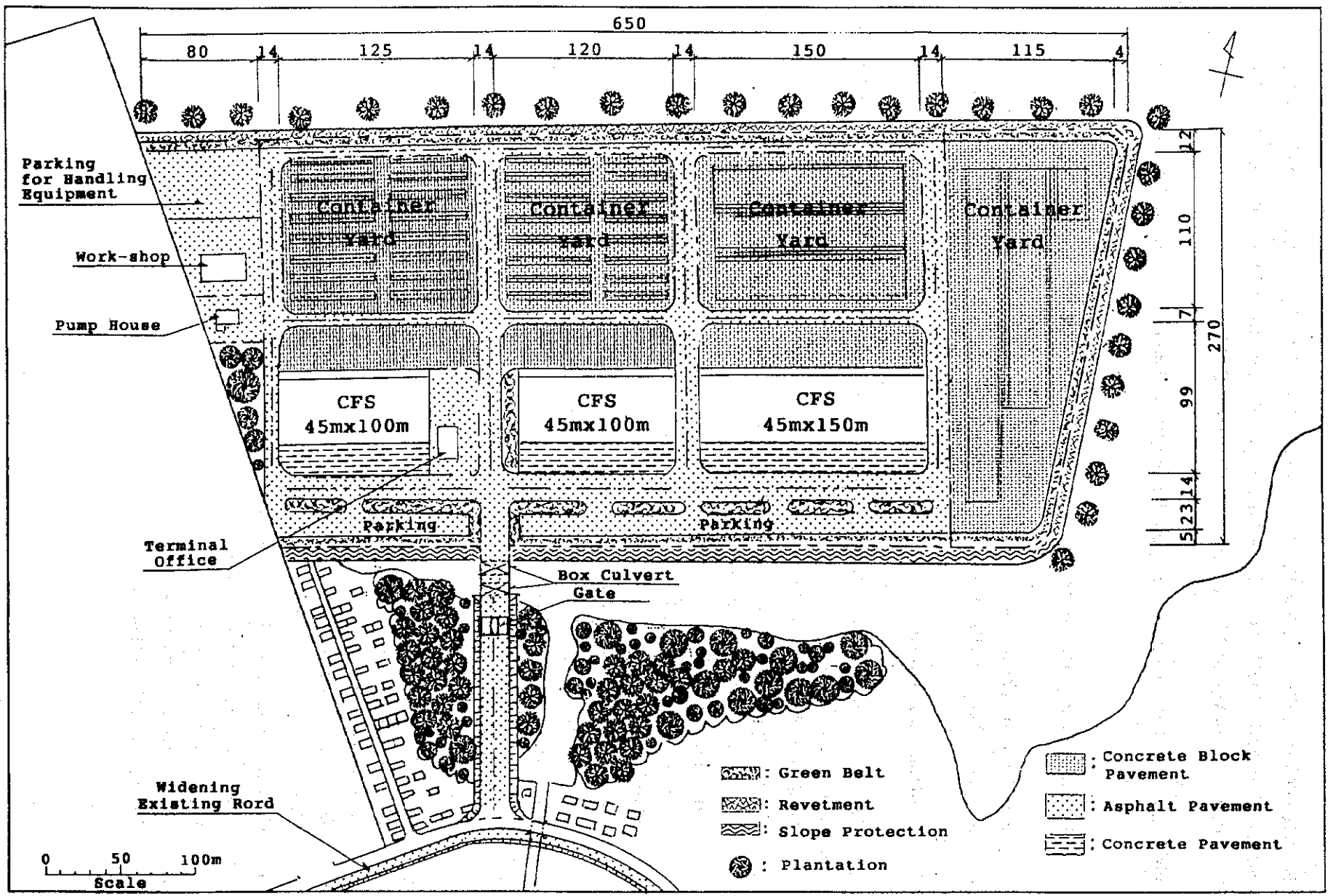


Fig. 4.11 General Layout of Inland Container Terminal (2010 Year)

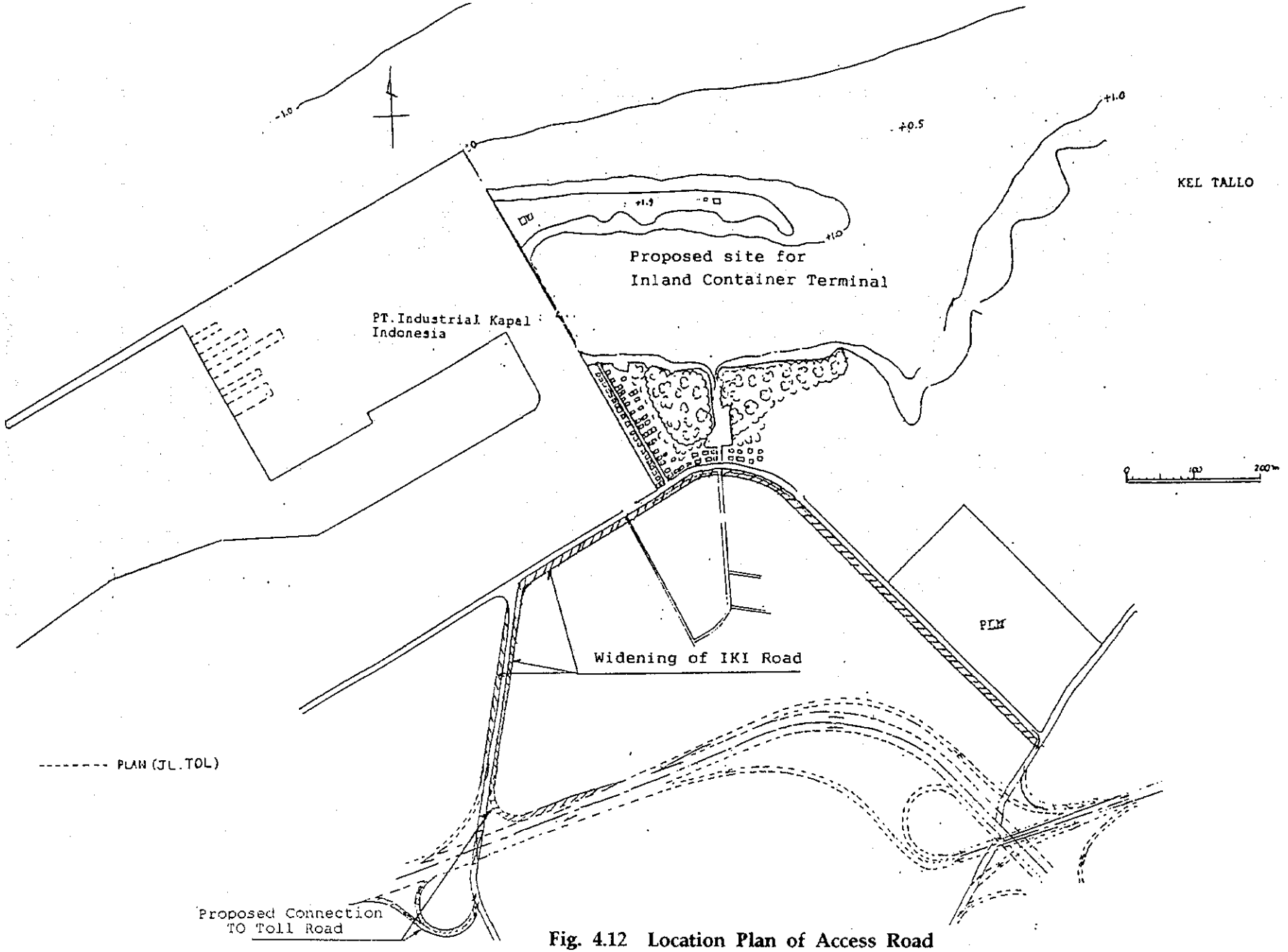


Fig. 4.12 Location Plan of Access Road

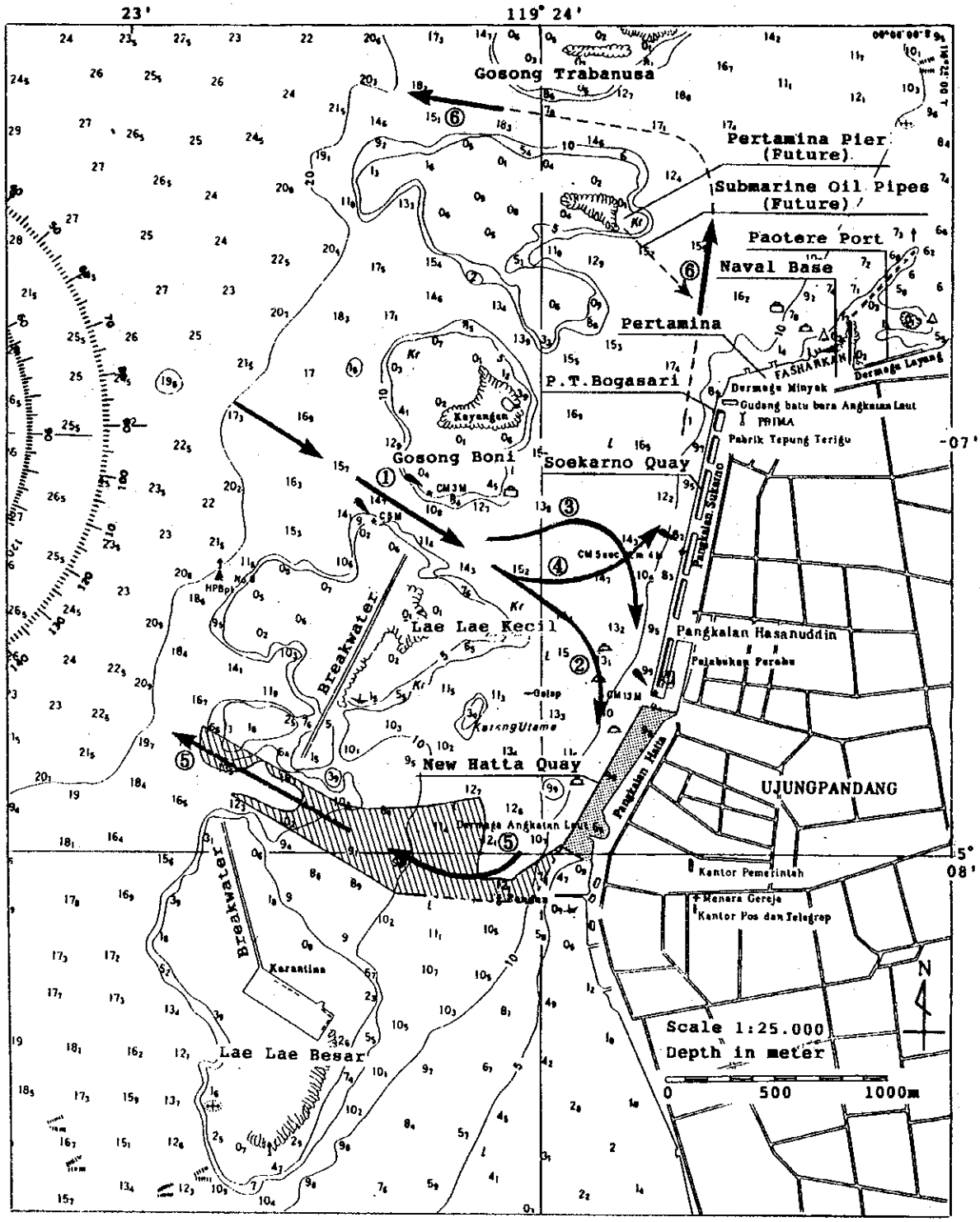


Fig. 4.13 Navigation Channel of Uj. Pandang Port

:Channel dredging (-11m) and disposal

(6) Container handling equipment and information system facilities
:Rail mounted gantry cranes 3 units
:Rubber tired gantry cranes 9 units
:Fork-lifts 7 units/7 ton, 9 units/3.5 ton
:Reach-stacker (45ton) 2 units
:Tractor-heads 27 units and chassis 54 units
:Generator 150KVA 1 unit/ in Inland Container terminal
:Generator 400KVA 2 Units/ in Hatta Quay
:Terminal computer 10 units and Package soft-ware 1 set

93. The main components of the second phase project (long term development: 2010) are summarized as follows:

(1) Expansion of inland container terminal
:Yard reclamation (7 ha)
:CFS construction (6,750 m^2)
:Open storage yard (3.9 ha)
:Utilities

(2) Widening of IKI Road
:Road embankment and pavement
:Utilities

(3) Additional Dredging of access channel of dredged spoils
:Dredging -12 m and disposal of dredged spoils

(4) Container handling equipment and information system facilities
:Rubber tired gantry cranes 5 units
:Fork-lift 7 units/7 ton, 3 units/3.5 ton
:Reach-stacker (45ton) 4 units
:Tractor-heads 27 units and chassis 54 units
:Generator 150KVA 1 units for Inland Container Terminal
:computer 1unit in Inland Container Terminal

4.2.5 Cost Estimate

94. The project cost for the Ujung Pandang Port is estimated based on the long-term development plan.

(1) Unit price and exchange rate

95. The project costs are estimated based on the market price as of 1994 and foreign exchange rate of 1.0 US$ =2,134 Rupiah = 105.85 Yen.

(2) Construction cost

96. Construction cost of the Master Plan mainly consists of the cost for the construction of the inland container terminal additional facilities of Hatta Quay and access channel dredging. The construction costs do not include the development plan after 2010 and rehabilitation of the Soekarno Quay for the general cargo and bulk cargo.

(3) Procurement cost

97. The procurement unit prices are determined based on the imported CIF Jakarta prices, and indonesian tax and duties are not included.

(4) Project cost

98. In addition to the construction cost and the procurement cost, the engineering fee, the physical contingency, and VAT (value added tax) are estimated as follows.

Engineering fee for the construction : 10 % of construction cost
Engineering fee for the procurement : 3 % of procurement cost
Physical contingency of construction : 10 % of construction cost
Physical contingency of procurement : 0 % of procurement cost
VAT (value added tax) : 10 % of total cost

The contingency for the price escalation is not included. The cost estimation of the Master Plan is shown in **Table 4.18**.

Table 4.18 Cost Estimation of the Master Plan

	Project Cost for Ujung Pandang Port				
No	Description	Unit	Quantities	Unit Price	Cost
1	Inland Container Terminal (Yard Construction)				Million Rp
	Reclamation	m3	375,000	23,000	8,625
	Compaction	m3	375,000	3,000	1,125
	Concrete Block Pavement	m2	81,500	60,000	4,890
	Asphalt Concrete Pavement	m2	31,500	50,000	1,575
	Concrete Pavement	m2	7,000	60,000	420
	Revetment and Slope Protection	L.S	1		1,407
	Utilities	L.S	1		3,700
	Fence	m	3,080	170,000	524
	Green Belt and Plant Mangrove	L.S	1		300
	Sub-Total				22,566
2	Inland Container Terminal (Building Construction)				
	CFS Construction	m2	15,750	550,000	8,663
	Work shop Construction	m2	600	600,000	360
	Terminal Office Building	m2	400	600,000	240
	Terminal Gate	L.S	1	80,000,000	80
	Utilities	L.S	1		300
	Sub-Total				9,643
3	Access Road Construction for Inland Terminal				
	Terminal Access Reclamation	m3	7,600	26,000	198
	Asphalt Concrete Pavement	m2	2,100	50,000	105
	Walk way Pavement	m2	420	20,000	8
	Slope Protection	m2	2,000	8,000	16
	Box Culvert	set	2	50,000,000	100
	Utilities	L.S	1		40
	Sub-Total				467
4	Connecting Toll Road for Inland Terminal				
	Road Embankment	m3	14,600	26,000	380
	Road Pavement	m2	6,660	50,000	333
	Slope Protection	m2	5,300	8,000	42
	Utilities	L.S	1		250
	Boundary Fence	m	300	170,000	51
	Sub-Total				1,056
5	Additional Access Channel				
	Navigation Light Beacon	set	2	140,000,000	280
	Navigation Light Buoy	set	2	85,000,000	170
	Dredging Depth-12.0m and Disposal	m3	685,000	11,000	7,535
	Sub-Total				7,985
6	Hatta Quay Additional Facilities				
	Terminal Control Building	m2	600	600,000	360
	Additional Power Supply System	L.S	1		1,000
	Additional Fence	m	270	170,000	46
	Yard Control Communication System	L.S	1		200
	Reefer Container Outlet	set	40	750,000	30
	Sub-Total				1,636
	Total Cost .				43,352
	Physical Contingency	%	10		4,335
	Engineering Fee	%	10		4,335
	VAT	%	10		5,202
	Total Construction Cost				57,224

No	Description	Unit	Quantities	Unit Price	Cost
1	Procurement				Million Rp
	Rail Mounted Gantry Crane(35ton)	No	3	11,500,000,000	34,500
	Rubber Tired Gantry Crane(6+1)	No	14	3,800,000,000	53,200
	Fork-Lift and Side Lifter(7ton)	No	14	141,000,000	1,974
	Reach Stacker 45t	No	6	1,250,000,000	7,500
	Tractor Head	No	54	200,000,000	10,800
	Chassis	No	108	50,000,000	5,400
	Fork-Lift (3.5t)	No	12	90,000,000	1,080
	Generator(150KVA)	No	2	110,000,000	220
	Generator (400KVA)	No	2	400,000,000	800
	Computer (Terminal)	No	11	20,000,000	220
	Package Soft-ware	set	1	1,450,000,000	1,450
	Sub-Total				117,144
	Physical Contingency	%	0		0
	Engineering Fee	%	3		3,514
	VAT	%	10		12,066
	Procurement Cost Total				132,724
1	Land Acquisition and Others				
		m2	0	0	0
	Access Road Land Acquisition	m2	4,960	20,000	99
	Connecting Road Land Acquisition	m2	0	50,000	0
	Compensation Expense	L.S	1		50
	Other Expense		0	0	0
	Sub-Total				149
	VAT	%	10		15
	Land Acquisition Total				164
	Total Project Cost				190,112

4.2.6 Initial Environmental Examination (IEE)

(1) General

99. 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.

100. 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).

101. In case of feasibily study on "Master plan of container cargo handling ports, dry ports and connecting railways", IEE was carried out for the activities of dredging of navigation channel and dumping the dredge spoils outside Ujung Pandang port and for the inland container terminal in Ujung pandang.

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

- The water pollution at the dredging works.
- The water pollution and soil contamination by disposal of dredging spoils.
- The water pollution by 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.

a. Object of IEE

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

104. Initial environmental examination has the following functions.

- Identification of environmental impact, which 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

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

(b) Methodology of IEE

106. 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.

(c) Environmental components and the items

107. Three environmental components and its items in the matrix (**Table 4.19**) are as follows:

- Physical/Chemical component

· Climate	· Slope stabilities
· Land subsidence	· Soil erosion
· Soil contamination	· Coastal erosion
· Coastal sedimentation	· Hydrology
· Water quality	· Ground water use

· Ground water quality
· Noise
· Offensive odor
· Aesthetic
· 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

(2) IEE for dreging activity and construction of inland container terminal for Ujung Pandang port

Type of works : i) Dredging of (685,000) m^3 for navigation channel between breakwaters, dumping of the dredging material.

ii) Construction of new inland container terminal

Table 4.19 Environment impacts and countermeasures

i) 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	

ii) 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 soils	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 route course

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

108. 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.

4.3 Management and operation of container terminal

4.3.1 Management and Operation system

(1) Appropriateness of the direct management system

109. For a container terminal to start operation, a considerable amount of investment in base materials and personnel is necessary at the initial stage. In the long term, privatization of terminal duties is desirable for efficient management of harbor facilities, particularly container terminals. However, in view of the current state of Ujung Pandang Port Port, it would be impossible for a private enterprise to take over the management and operation of the terminal duties immediately.

110. Port Corporation IV is itself a powerful cargo-handling company. The corporation has financial strength, including qualifications for obtaining loans, and a wealth of skilled workers. Port Corporation IV sufficiently satisfies the conditions for managing container terminals anew.

111. Container terminals at other ports have been operated by the same state-run port authorities since before privatization. Port Corporation IV was born out of privatization. Container terminals represent a high-profit business that is expected to remain central to the corporation. In light of these factors, it seems most appropriate for Port Corporation IV to continue managing and operating the terminals directly for the time being.

(2) Adequate management and operation of port area

112. In line with increase of international container ship calls, it is suggested that a new berth allocation system like 'window system' in stead of 'first come, first served' system, should be studied to keep container ship sailing on schedule.

113. Considering the development of the new entrance channel and tanker docking facilities of PURTAMINA, it will be necessary to obtain more safety navigation around the port area. The special navigation traffic rules should be set up immediately.

(3) Possibility of phased privatization

114. Last year, the DGSC called on foreign firms and private enterprises in Indonesia to take part actively in harbor projects. The action was aimed at reducing harbor costs, improving efficiency, and contributing to the effort to better the management of the state-run port authorities.

115. Ujung Pandang Port is expected to become a representative Indonesian container port in the future. Judging from the growing volumes of container cargos on specific routes, it is highly likely that mother ships will call at Ujung Pandang Port after 2010, the target year in the master plan. Therefore, complete or partial commissioning or joint execution of the management and operation of container terminals should be investigated and put into practice at an appropriate time. There are chances for leasing newly built berths for specific shipping companies and BOT, as well as other management and operation methods to become better suited options.

116. In consideration of the efficiency of container terminals, Ujung Pandang Port should be privatized in a move led by the public sector. For container terminals for internal trade, there is a particular need to investigate at an early stage the joint handling of cargos with private operators, and the commissioning of terminal management and operation duties to private parties on a limited scale on a contractual basis.

4.3.2 Introduction of Container System

117. (1) Phased introduction of computer systems

118. Generally speaking, computerization or automation of container terminals occurs in the following four stages as the annual volume of containers handled increases.

Table 4.20 Developing steps of Computerization and Automatization

Step	Number of Container Handling Volume	Planning/Management /Documentation	Loading/ Unloading
1	- about 60,000 TEU	manual	manual
2	about 60,000 TEU-	computerized	manual
3	about 150,000 TEU-	computerized	manual
			automatic
4	about 150,000 TEU-	computerized	automatic

119. The majority of container terminals in the world are in the second stage, while some of the advanced container terminals in Europe, North America, and Japan have already entered the third stage.

120. The demand for containers to be handled at Ujung Pandang Port is predicted to reach 239,000 TEU in 2003 and 366,000 TEU in 2010. Containers for external trade are anticipated to total 36,000 TEU in 2003 and 49,000 in 2010. Therefore, computerization of container terminals at Ujung Pandang Port should begin in the second stage.

(2) Systems for introduction

121. There are three systems for computerization in the second stage: the terminal management system, terminal planning system, and terminal document system.

122. In addition to the computerization of container terminals, the computerization of general office duties is also necessary. However, explanations for this process are omitted here because they are not peculiar to container terminals. Detailed accounts of the three systems are to be provided in the Part.1- 4.3.

123. Some of the advanced container terminals are built with a system that links them with the external parties concerned. Those in the network include the customs office, the port director's office (PAO), quarantine stations, customs clearance and other agents, major shipping companies, and consignors.

(3) Preceding Cases

124. One example of a system that connects container terminals with external parties is SHIPNETS. It was recently introduced in parts of Japan. This system networks shipping companies, cargo handling companies, and number- and volume-confirmation agents around container terminals that lie in the center. The system functions to process data related to export containers. The objectives of this system are as follows:

(i) Acceleration of information distribution and reduction of data-handling work

(ii) Reduction of data input work and prevention of duplication errors

(iii) Avoidance of overlapping investment in system development

(iv) Reduction of the document production volume

125. Introduction of SHIPNETS causes work execution changes in various industries. Consequently, the reforms are anticipated to progress in a multilateral manner at points where the flows of information and materials meet.

4.3.3. Maintenance of Container Handling Equipment

(1) Maintenance Shop

126. The maintenance shop is where container handling equipment used in the container terminal is maintained, inspected and repaired. Dedicated maintenance shops are necessary because there are various types of container handling equipment that are too large to be hauled over roads. Also, maintenance shops are indispensable for the improvement of the handling efficiency of container terminals.

127. There are single-, two-, three-storied or even higher maintenance shops, containing offices, tool rooms, parts stock and transformer rooms. They are equipped with overhead cranes, air compressors, welding machines, electric-chargers, reefer container receptacles, vehicle inspection pits, and other facilities.

128. The size and capacity of a maintenance shop vary with the type and quantity of

container handling equipment used in the container terminal and the number of containers handled.

129. Maintenance shops in typical Japanese container terminals range between 50 and 80 meters in frontage and between 20 and 30 m in depth. Many maintenance shops first built on a small-scale are enlarged afterwards. Open spaces in their front and rear are often used as temporary yards to place the containers and vehicles to be inspected and serviced. When building a new maintenance shop, accordingly, it is preferable to keep adequate space for future expansion.

(2) Maintenance of Empty Containers

130. In Japan, inspection and repair of empty containers are usually done at container terminals in port areas as they are operated by shipping companies. In Indonesia, by comparison, many container terminals are operated by the Port Corporation. Thus, inspection and repair are done at shipping companies' inland container depots located away from container terminals. Therefore, this aspect will not be discussed here.

131. To determine where the responsibility for damages lies, it is necessary to inspect containers at the gate of the container terminal when they are carried in or out.

(3) Organization and Staff for Maintenance

132. **Fig. 4.14** shows the present organization and job-type personnel assignment for the maintenance of container handling equipment at Makassar Port.

133. The equipment this organization handles including mobile cranes, forklifts, top lifers, tractors and trailer chassis. Because many of these equipment apparatus are also used for the handling of general cargoes at Makassar Port, the organization constitutes a part of the technical division of the port authority.

134. **Fig. 4.15** shows a typical container handling equipment servicing organization and personnel assignment at a Japanese container terminal.

135. This organization handles container cranes (three), transfer cranes (twelve), forklifts and top loaders. Scheduled inspections and repairs of tractors, trailer chassis and other

vehicles that can run over roads are performed by their manufacturers or outside repairers.

136. Approximately equal numbers of mechanics and electricians, seven technician men in total, are now working at this terminal which handles 250,000 TEU per year of containers. As very few shutdowns due to malfunctions have occurred, this terminal will continue servicing without increasing the number of technician.

(4) Experience Level of Mechanics and Electricians

137. **Fig. 4.16** compares the ages and the length of service of the container handling equipment servicemen working at Makassar Port and a typical container terminal in Japan.

138. Ujung Pandang Port has two problems: one is a lack of electricians and the other is that more than half of the mechanics do not have more than one to two years of experience. By contrast, the mechanics and electricians working at Japanese container terminals have adequate experience, with most of the electricians being graduates of technical colleges or universities.

139. For efficient operation of container terminals, as is obvious from the above comparison, it is essential to have servicemen having different specialties and adequate skill and experience in balanced proportions.

(5) Maintenance Done by Outside Repairers

140. Most of the Japanese container terminals attach much importance to preventive maintenance. Therefore, their maintenance people spend much time performing scheduled inspections.

Table 4.21 Maintenance Servicing

Machine Type / Service	Container Crane	Transfer Crane	Forklift
Routine servicing	When not used or during downtime	When not used or during downtime	When not used or during downtime
Monthly inspection and servicing	Once a month/one day	Once a month/one day	Once a month/one day
Annual inspection and servicing	Once a year/six days	Once a year/six days	Once a year/three days
Overhauling main parts	As required	As required	As required

141. The servicemen of the terminal do other minor servicing and repairs than the scheduled inspections listed above, such as replacement and repair of hydraulic pumps, brake parts and motor brushes.

142. Major servicing and repairs, such as the repair and overhaul of motors, engines and other power systems are performed by their manufacturers or outside repairers. The fees paid to them are approximately 50 % of the total cost of repair.

143. It is recommended that Ujung Pandang Port adopt essentially the same servicing system as that in Japan. The adoption of such a system necessitates assigning mechanics and electricians having adequate skill and experience in balanced proportions and training them systematically.

(6) Training of Maintenance People

144. The ratio of downtime to operating time at the Tangung Priok No. 1 container terminal is 70 % for transfer cars and 40 % for top lifters and forklifts (in 1997). This inefficiency makes it necessary to provide much more machines than are actually necessary, thus impairing the cost effectiveness of investment.

145. As the container terminal at Ujung Pandang port is not completely free from the same risk, it is necessary to introduce effective servicing systems and technologies when purchasing new equipment. Some examples of such systems and technologies are as

follows:

1) Standards for startup inspection
2) Standards for daily inspection
3) Networking outside repairers
4) Standards for parts replacement and supply methods
5) Spare parts purchase decision-making system
6) Maintenance cost reviewing method
7) Maintenance budget planning method etc.

146. To establish an efficient servicing system, it is necessary for the new container terminal at Ujung Pandang port to select a team of sufficiently skilled service men and managing staff, to send the team to an appropriate overseas container terminal(NOt machine manufacturers) for training, and to maintain a personnel control system to ensure that the skills and experience acquired by them are properly passed down.

147. This scheme will produce a longer lasting effect if managers and planning staff are also sent abroad for training.

4.3.4 Trainings

148. It goes without saying that periodic and continuous trainings are necessary for staff members to master duties and acquire new knowledge and information. In addition to regular job trainings, introduction of such trainings that prompt staff members to change their ways of thinking will be necessary to meet the challenge of improving the efficiency of container terminals.

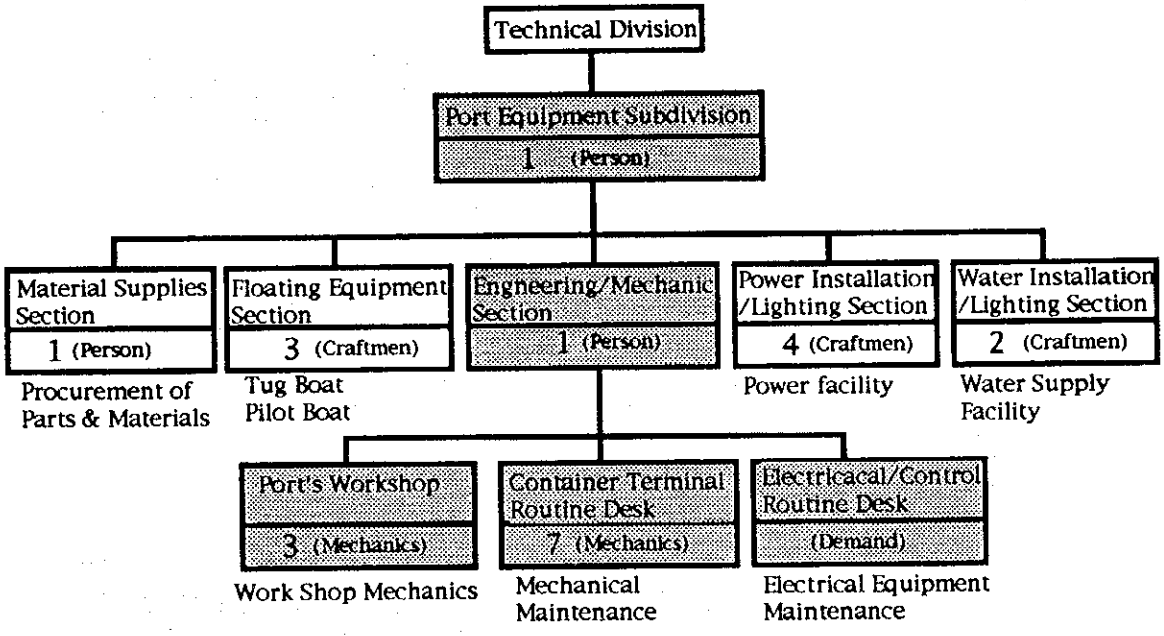


Fig. 4.14 Organization of Technical Division Uj. Pandang Port

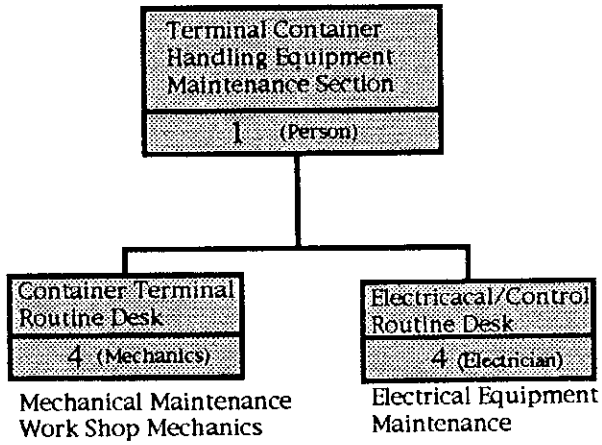


Fig. 4.15 Organization of Container Handling Equipments (A Typical Container Terminal in Japan)

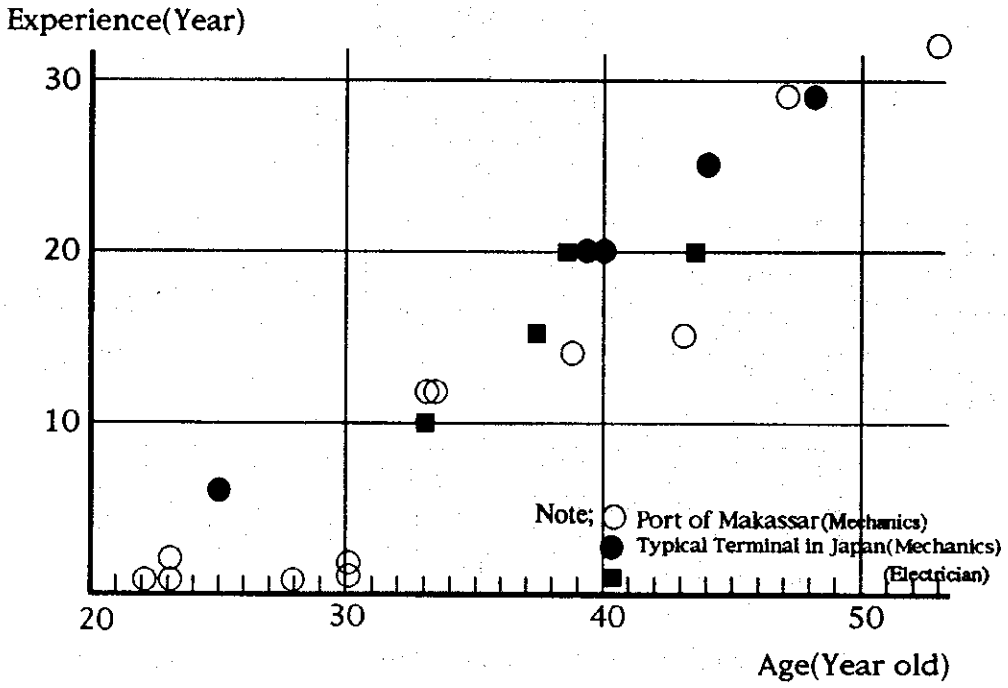


Fig. 4.16 Experience Level of Mechanics and Electricians (Uj. Pandang Port)

149. In order to accommodate a modern container cargo system, the skills of operators must be improved. One effective way to achieve this is for Port Corporation IV to establish on its own or jointly with major private businesses a public training center designed for acquiring skills and licenses.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

5.1.1 Socioeconomic Profile of South Sulawesi

1. South Sulawesi, one of four provinces in Sulawesi, is located in the south-west of Sulawesi Island, and had a population of 7.0 million in 1990. The GRDP per capita was Rp. 434,000, which was 102 % of the Sulawesi average and 66 % of the national average in 1991, and its annual growth rate from 1983 to 1991 was 5.7 % while the Sulawesi average showed 5.3 % and the national average 5.1 % during the same period. Thus, South Sulawesi was on a average development level compared to other Sulawesi provinces but one of the economically stagnated areas in Indonesia. However the growth rate of per capita GDRP in Sulawesi was a little higher than that of all Indonesia during the period from 1983 to 1991.

2. Agriculture was the single most important sub-sector in South Sulawesi, and had a 41.0 % share of the provincial GRDP in 1993. Several sub-sectors in the tertiary sector also played important roles in the provincial economies. On the other hand, contribution of manufacturing industry sub-sector to the provincial economy was minimal, having only a 6.3 % share in 1988.

5.1.2 Potential for Development

3. This area has the largest population concentration in the Eastern Indonesia. Ujung Pandang port and Ujung Pandang city are located in this region. The area has comparatively well developed infrastructure including deep water port, air port, water supply, and human resources. Roads are also developed in the vicinity of Ujung Pandang but less developed inland, especially in the north.

4. The port of Ujung Pandang is located on the west coast of South Sulawesi along the coast of Makassar strait, an international sea lane. Thus, the location of Ujung

Pandang is quite advantageous to serve Eastern Indonesia including Kalimantan. However the shipping route is not much different in distance and time of sailing to Surabaya from Eastern Indonesia, so that Surabaya partly plays a role of distribution center for Eastern Indonesia. Therefore, the role of Ujung Pandang is currently limited to serve for Central and South Sulawesi and a part of East Kalimantan.

5. The construction of a six (6) km toll road between Ujung Pandang Airport (Hasanudin Airport) and the Uj. Pandang Port is on-going, and scheduled to be completed in 1997.

6. The municipal government completed an inland cargo terminal located near the toll road under construction and 6 km away from the Uj. Pandang Port in 1991. However the terminal is not functioning well because the container trailers are restricted to run on the ordinary highways.

7. Kawasan Industrial Makassar (KIMA), a state owned enterprise and established in 1988, started its operation with 203 ha and its expansion plan up to 703 ha has been conducted since 1992. In 1993, an Export Processing Zone, which is a bonded zone having 34 ha was established in KIMA.

5.1.3 Port of Uj. Pandang

8. Public port facilities at Ujung Pandang Port are managed by the branch office which ranks in the highest level within managing areas of Port Corporation IV. PAO office under direct control of MOC supervises the navigation safety and ship allocation of berths as governmental coordinator.

9. The Port accommodated 4.078 million tons of cargo and 0.8 millions passengers in 1993. Rgarding the cargo movement, increase rate between 5 years was 118 % and average annual increase rate was 3.4 %. In 1993, 20 % of total cargo volume was imported or exported and the remaining 80 % was domestic cargo.

10. The export cargo volume has been gradually increasing since 1990 and reached 441,000 tons in 1993. The import cargo volume, however, has been leveling off at around 350,000 tons. Major export commodities are cocoa, animal food, plywood, molasses and tapioca, while major import commodities are wheat and fertilizer.

11. The domestic cargo increased to 2.3 millions tons of unloading and 1.0 millions tons of loading in 1993. Major unloading commodities were fuel, fertilizer, vehicle and logs, while major loading commodities fuel, rice and flour.

12. Container handling at the Port has been rapidly increasing since 1988 and reached 405,000 tons (47,325 TEU) in 1993. The container traffic increased to 23 times over the 1988 figure during the period from 1988 to 1993 and is expected to keep its high growth rate even in future.

13. The major existing port facilities along the coast line are, from north to south:

1. Ship repair yard
2. Paotere Port (for traditional sailing boats)
3. Naval base
4. Pertamina oil base
5. Port of Ujung Pandang
   i) Seokarno Quay
   ii) Hasanuddin Basin
   iii) Hatta Quay

14. Income/outgoing ships uses only a channel between Gosong Boni and Laelae Kecil.

15. Berthing facilities at the port of Ujung Pandang are summarized below:

Name of Quay	Length	Water Depth Nominal	Water Depth Actual	Usage
		m m	m m	
Seokarno Quay	1,360	6 to 8	8.1 to 8.9	Ocean Vessel Inter insular Passenger Boa
Hatta Quay	550	6 to 8	7.9 to 9.1	Inter insular
Hasanuddin Basin	70	3 to 6	2.0 to 7.0	Pilot Boat
Paotere Port	820	3 to 6		

16. In order to meet the future demand of the year 1997, the rehabilitation of the Old Hatta Quay was decided and implementation was started in 1994 as "Ujung Pandang Port Urgent Rehabilitation Project" under the assistance of OECF Loan. The major scope of the project is listed below:

a) Demolition of the existing Hatta Quay and other related facilities,
b) Construction of 670 m long new Hatta Quay including a passenger terminal,
c) Dredging of 1.4 million m3 and reclamation of 1.85 million m^3,
d) Buildings covering transit shed, container freight station (CFS), administration building and others,
e) Road/Pavement of about 125,000 m^2.

5.1.4 Master Plan of Uj. Pandang Port

17. The total cargo throughput at the year 2010 is estimated at 10.9 million ton (2.7 times over the 1993 figure) including 3.1 million tons of container cargo (7.7 times over the 1993 figure). While the traffic volumes of bagged cargoes, dry bulk and liquid bulk cargoes increase about 2.3 to 2.6 times, that of general cargoes decrease to a level of 82 % of the 1993 volume as a result of the cargo shift from general cargo to container cargo.

18. Based on the cargo traffic estimation and cargo handling capacity of the existing facilities, zoning of the utilization of port area is examined for the target year of 2010. Soekarno quay will be mainly used for general cargo terminals and the north of the quay will be used for dry bulk and liquid bulk terminals. Hatta quay, now under construction, will be exclusively used as container and passenger terminals. The south of the Hatta quay should be preserved as it is as an urban leisure water-front of Uj. Pandang City.

19. Long-term development plan of container terminal for Uj. Pandang Port has been examined. The following development policies are set:

a) Uj. Pandang Port will be developed as one of the major container ports in Indonesia, designated in "The Development Strategy for National Container Port Network ofIndonesia" proposed in the Master Plan of Container Handling Ports, Dry Ports and Connecting Railways (Part 1).

b) The Port will achieve not only the role of gateway for South Sulawesi but also the distribution function of containers for East Indonesia including East Kalimantan.

c) Hatta quay will be exclusively used for container terminal and the on-going plan should be basically followed by the Study.

20. The capacity of the new container terminal to be completed in 1997 is estimated at 145,000 TEU (116,000 Box) /Year and will be saturated in 1999 - 2002. The saturation will come from the shortage of container yard area as well as handling equipment. Thus, an additional container yard including CFS area should be provided outside the Port as an inland depot prior to the saturation, because there is no available space near the container terminal or at any place inside the Port.

21. As the handling system for the container terminal, the Team selected the transfer crane system compared to the four basic system, chassis system, forklift system, straddle carrier system and transfer crane system.

22. The site next to the existing ship yard at Kel Tallo north of the Port is proposed for the location of the inland container terminal. Equipment for handling containers is also proposed for procurement together with the development of additional access channels and terminal facilities. Development of access roads are further proposed to keep smooth connection with the regular and toll roads around the inland terminal.

23. Cost estimation is carried out based on the preliminary design of the major facilities and the implementation program. Total construction cost including infrastructure, superstructure, and equipment of both the port and inland terminals amounts to 190,112 million Rp.

24. Initial environmental examination (IEE) was carried out for the examination of environmental impacts that may be created at the outset of the development project planning stage. According to the 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.

5.2 RECOMMENDATIONS

25. On the basis of the Master Plan, it is recommended that the Government of Indonesia implement the long-term development plan of Uj. Pandang Port for the target year of 2010 as follows:

1) Inland Container Terminal

- Project site : Kel Tallo
- Dimensions : Terminal area 15.5 ha
- Reclamation : 375,000 m^3
- Main facilities :

Container yard	;	66,000	m^2
CFS	;	15,750	m^2
Work shop	;	600	m^2

Terminal office ; 400 m^2
Fence ; 3,080 m

- Road:

Access road for inland terminal
Connecting road to toll road

2) New Hatta Quay (Additional Facilities)

- Control building ; 600 m^2
- Power supply ; 1 L.S
- Fence ; 270 m
- Com'cation system ; 1 unit
- Reefer outlet ; 40 set

3) Additional Navigation Channel

- Dimensions ; Width 200 m Depth -12 m
- Dredging ; 685,000 m^3
- Light beacon ; 2 set
- Light buoy ; 2 set

4) Equipment Procurement

- Rail mounted gantry crane (35ton) ; 3 unit
- Rubber tired gantry crane (6+1) ; 14
- Fork-lift & side-lifter ; 14
- Reach stacker (45ton) ; 6
- Tractor head ; 54
- Chassis ; 108
- Folk-lift ; 12
- Computer (Terminal) ; 11
- Pakage soft-ware ; 1

5) Land Acquisition and Others

- Access road	;	4,960 m^2
- Connecting road	;	-
- Compensation	;	1 unit

26. In order to compensate for the shortage of container yard space including CFS area, an additional inland terminal should be developed outside the Port to coordinate operation with the port terminal. In view of the limited CFS area inside the Port, it is recommended that an additional CFS be installed in the inland terminal in 1997 when the container terminal is inaugurated.

27. The Team suggests that the on-going terminal plan partially implemented should be modified to some extent taking into consideration the linkage between the new inland terminal and the on-going plan. The planned construction works related to the proposed modification should be soon postponed and then implemented based on the short-term development plan which is to be proposed in Part 2.

28. The on-going project excludes the procurement of handling equipment for containers, but it is clear that the container cargo loaded/unloaded in 1997 when the terminal is completed will not be able to be handled without installation of container gantry cranes, judging from the efficiency of ship gears for container handling. Therefore it is recommended that two gantry cranes with other related equipment be provided upon completion of the proposed container terminal.

29. To raise efficiency in terminal operation and service, it is preferable to introduce computerization when the gantry cranes are installed in the terminal. Further, the computer systems should be expanded to the inland terminal to operate the container terminal including the inland terminal as one body when it is used as a container yard other than CFS area.

30. The inland terminal should be smoothly connected to the toll road in each

direction. According to the original development plan of the toll road, it is unlikely that the connecting road from the terminal will easily join the proposed toll road southwards because of the steep slope of the planned toll road. Therefore it is suggested that coordination should be made to connect both roads with other for smooth joining between port and road sides.

6. FUTURE DEVELOPMENT PLAN BEYOND 2010

6.1 REVIEW OF ON-GOING AND PROPOSED DEVELOPMENT PLANS

(1) Master plan and Feasibility study by PRC Engineering, Inc. and PT. Soilens, 1984

1. This study was intended to review the original master plan which was carried out in 1980 and develop a master plan on the basis of up-dated cargo projection from the year 1982 to the year 2000.

a. Master plan (Target year 2000)

2. Basic concepts proposed are:
   i) Full container terminal facilities are required for the ocean going and inter-island container vessels. The container terminal will need to be developed at the a new location,
   ii) Ocean going and inter island break bulk berths can be accommodated at the existing quays (either Soekarno, the north quay, or Hatta, the south quay), and
   iii) The bulk berths for wheat and for fertilizers, and the passenger berth continue to occupy the present locations.

3. In the light of this concept, 11 alternative sites for the new container terminal were examined from the viewpoint of vessel operation, port operation and future expansion possibility. Of the 11 alternative plans, nine (9) alternatives included the construction of new man-made islands near existing quays, while remaining two alternatives were the conversion of either a portion of Soekarno Quay or Hatta quay into full container berth (See **Fig. 6.1**).

4. The 11 alternative plans, which are called N-1 through 4, S-1 through 4, W-1 E-1 and 2 as shown in **Fig. 6.1**, are fall on the following three concepts of expansion:
   i) an artificial island near Paotere Port, which is the port for traditional sailing boats; N-1 through N-4.
   ii) an artificial island behind the breakwaters; S-1 and W-1, and

iii) an expansion of Hatta Quay; S-2 through 4 and E-2, or Soekarno Quay; E-1.

The on-going New Hatta Quay is a realization of the concept iii).

5. However, the study declined to recommended any single alternative, because it was expected the new container terminal would not be required until 1993.

b. Medium term plan

6. The report discussed and recommended the development policy and strategy of Makassar Port. The study also proposed the medium-term plan, which is called Phase I Development Plan. The Phase I Development Plan comprises the following construction works:

i) rehabilitation of Hatta Quay,
ii) cargo storage area improvement at southern Soekarno berths,
iii) restructuring of the port maintenance area,
iv) provision of a port road connecting the Hatta and the Soekarno Quays.

7. The Phase I Plan proposed to replace the existing 530 m long and 28 m wide Hatta Quays by a 360 m long and 100 m wide quay having 25 m wide apron, 10,400 m^2 transit shed and 8,100 m^2 open storage and 4-lane inter-port road. It is also recommended to open a container terminal in Soekarno Quay next to existing bulk berth at the north end of the Quay, which is presently used as the container terminal as proposed in this study.

(2) Ujung Pandang Port Urgent Rehabilitation Project

8. The Detailed design for the Ujung Pandang Port Urgent Rehabilitation Project was conducted by PELABINDO IV and was completed in 1989. This study first reviewed the Phase I Plan proposed by the previous study. As the result of review, the original development concepts were revised:

a) Container cargos shall be handled in the new Hatta Quay other than inter-island cargo ships,
b) Passenger vessels shall also be accommodated in Hatta Quay, and
c) The port area is expanded.

9. Thus, finally the Hatta Quay rehabilitation plan was modified to comprises:
   a) Demolition of the existing Hatta Quay and other related facilities,
   b) Construction of 670 m long new Hatta Quay,
   c) Dredging of 1.4 million m^3 and reclamation of 1.85 million m^3,
   d) Building covering transit shed, container freight station (CFS), administration building and others,
   e) Road/Pavement about 125,000 m^2.

10. The construction started in May, 1994, and scheduled to complete in 1997.

6.2 DISCUSSION ON THE FUTURE EXPANSION PLAN

(1) Concepts of expansion

11. As discussed in **Chapter 4**, towards the year 2010, the cargo traffic and the passenger traffic volume is expected to reach the handling capacity of the existing Soekarno Quay and New Hatta Quay. On the other hand, there are several elements which make the expansion of these quays difficult. Some of these elements are:

   i) The coastal area to the south of New Hatta Quay is reserved as tourism and residential zones in the urban plan of the city. Therefore the extension of New Hatta Quay toward the south is limited.
   ii) to the north of Soekarno Quay, there are various facilities related to port activities. Some of these facilities are owned and run by other entities such as Navy, Other government corporation and private companies. Therefore, the expansion to the north is not easy either, unless the zoning plan is entirely modified.
   iii) The water area in the port area is surrounded by several isles, reefs and shoals. In addition the distance between the existing breakwaters and the quays is less than one kilometer. Therefore, the expansion of Soekarno Quay by reclaiming towards off shore may results in the sacrifice of the safe maneuvering ships.

12. Therefore, except for the relocation of entire port of Uj. Pandang, possible alternative plans are the construction of man-made island either in the north of the port, which is called the Conceptual Plan 1 hereafter, or behind the breakwaters, which is

called the Conceptual Plan 2 hereafter: these two concepts has been already proposed in the previous Master Plan Study, as described above.

13. To identify the more advantageous alternative concept between these two and identify a specific location of the artificial island would need further study. The following discussion focuses the advantage and disadvantage of the two alternative concepts for the future expansion.

14. The rough layout plan on the basis of these two concepts are schematically shown in **Fig. 6.2 (the Conceptual Plan 1) and 6.3 (the Conceptual Plan 2).**

(2) Brief evaluation of the conceptual plans

a. Conceptual Plan 1 (**Fig. 6.2**)

i) General description

15. The concept of this conceptual plan is to construct a new container berth at the nearest site of the INCT, which has been proposed as the Short-term development Plan in this study. Since the INCT has a potential for further expansion offshore, the container yard space can be provided by reclaiming. The offshore container berths can be constructed near the navigation channel as shown in the figure. This formation is quite similar to the International Container Terminal II (ICT-II) in Tg. Perak.

ii) Advantage

a) The construction does not require a large scale deep sea reclamation, because the container yard space is provided separately near the shore.

b) The INCT, which is proposed in this study, will remain as the core of the container yard and can be expanded easily without large cost in accordance with the growth of traffic volume.

c) The berthing facilities can be a deck-on-pile type structure. Such structure causes less impact on the hydraulic environment in the surrounding water area than an artificial island.

b) The container traffic does not bother the commercial zone behind the existing Uj. Pandang Port, because tall highways are available for both to the north and to the south.

ii) Disadvantage
- a) Need additional dredging of access to the container berth.
- b) Additional breakwater might be needed to secure the tranquility of the water area near the berth.

b. Conceptual Plan 2 (**Fig. 6.3**)

i) General description

16. The concept of this plan is the expansion of Uj. Pandang Port toward offshore. An artificial island is constructed over the two natural islands in front of Hatta Quay, where the breakwaters already exist. By the artificial island, quite a large space will be provided for various activities of the city as well as port related activities.

ii) Advantage
- a) The wharf area can be expanded to about twice as large as the existing one.
- b) The tranquility of the water area in the port will be improved.
- c) The artificial island can accommodate not only port facilities, container handling facilities and others, but also other facilities of socioeconomic activities of the city.

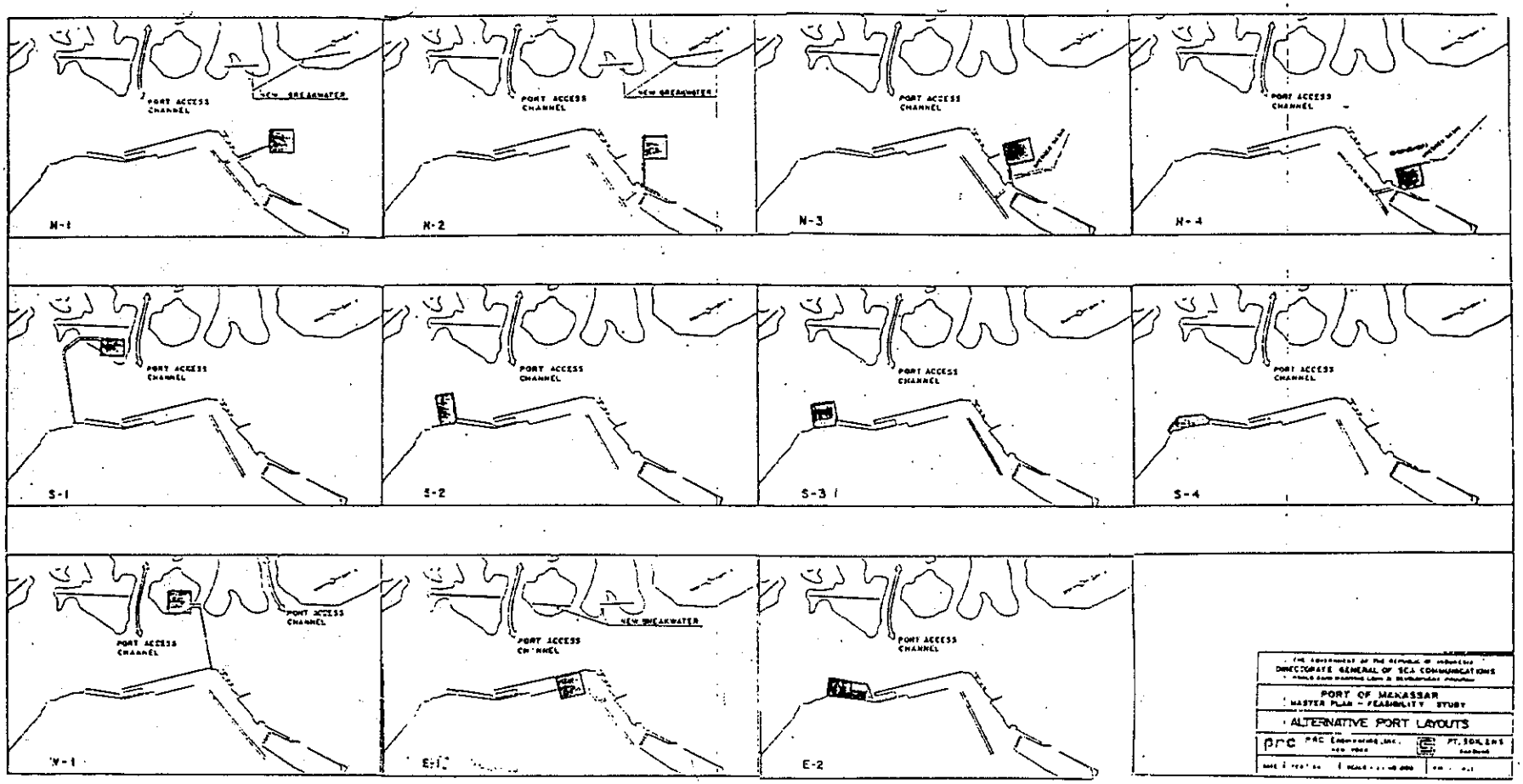
iii) Disadvantage
- a) The new access channel, which is proposed in the study, will be closed, and another channel should be opened in the north of the Uj. Pandang Port.
- b) The access road to the new artificial island should be constructed so that the traffic to and from the port can be separated from urban traffic.

(3) Recommendations

17. On the basis above discussion, the Conceptual Plan 1 is recommended for such case that the expansion of the container terminal is conducted under the port sector only. On the other hand, the Conceptual Plan 2 is recommended for such case that the urban development plan of the Uj. Pandang City is also integrated in the port expansion plan.

18. After the container terminal is relocated to the new site either, Plan 1 or Plan 2,

Hatta Quay will be fully utilized for other port activities. Passenger terminal would be one of the best choice, because the large size Ro/Ro ship will probably be employed for the passenger traffic in the future and this requires quite a large space for car parking.



Souce : master Plan and Feasibility study,1984,PRC

Fig. 6.1 Alternative Layout Plans Proposed in the master Plan Study 1984

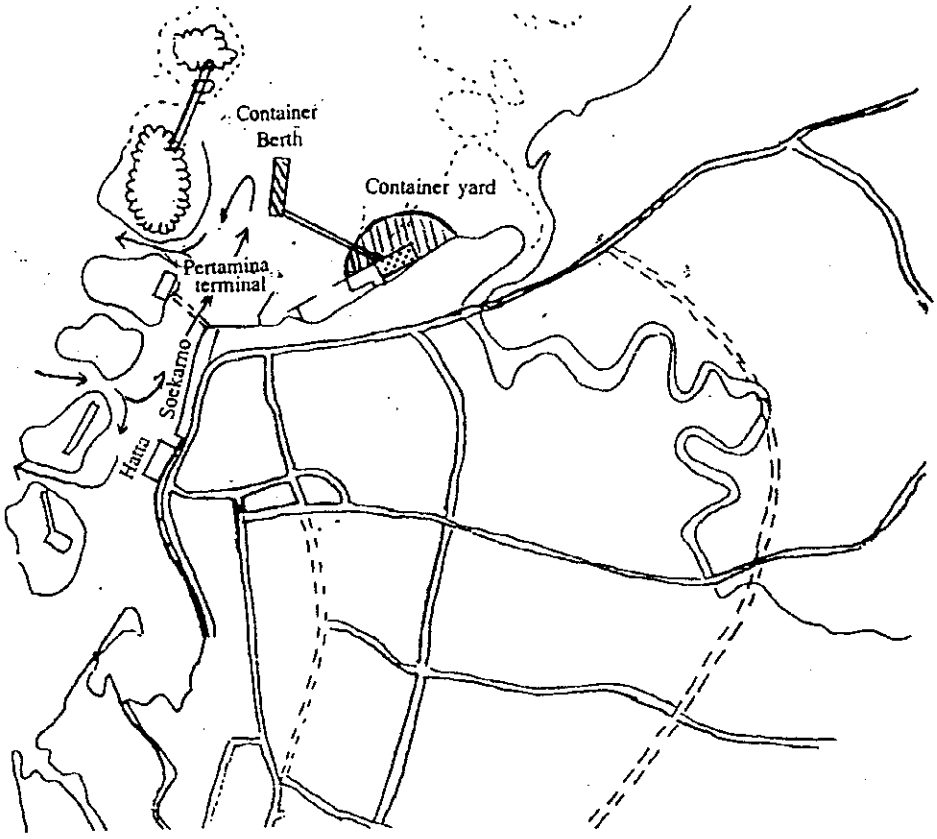


Fig. 6.2 Future Expansion Plan (Alternative I)

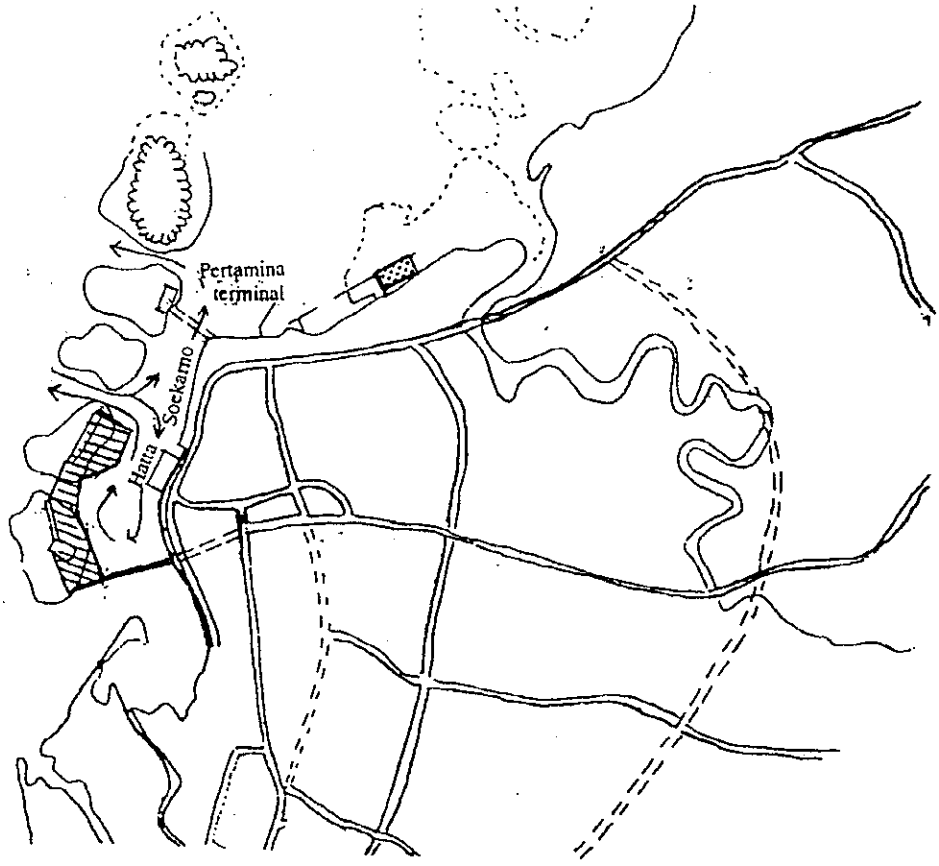


Fig. 6.2 Future Expansion Plan (Alternative I)