= 1.6(crane/berth) ; 2 quay cranes are installed at the bert
= 2.1(crane/berth) ; 3 quay cranes are installed at the berth

Container handling efficiency of cranes
= 25(units/hour/crane) ; Wharf container cranes
= 9(units/hour/crane) ; Jib cranes

28. **Table** 5.2 shows the berth productivity of the standard container terminal model as calculated by the relational expressions presented above and the various factors that constitute the basis for this calculation.

5.1.3 Container yard

(1) Marshalling yard and container storage yard

29. The container yard usually consists of a marshalling yard and a container storage yard.

30. A marshalling yard is a space arranged immediately behind the apron for the efficient loading and unloading of containers to or from container ships. This loading and unloading space comprises two areas, one for keeping containers arranged in the order of in which they will be loaded prior to the arrival of a container ship, and the other for receiving containers as they are unloaded from an incoming container ship. In the latter case, the unloaded containers are temporarily stored in this receiving area of the marshalling yard, whence they are transferred for storage to the container storage yard. After a certain period for customs inspection, etc. , they are hauled out from the gate of the yard for delivery.

31. Recently there are pressing requirements are to avoid the double handling of containers in container yards and to use the yards as efficiently as possible. To this end, many container terminals have been designed which are not provided with a marshalling yard. In this case, containers to be loaded aboard are first transferred to the gate, at which time they are assigned their storage space in the container storage yard in compliance with a storage plan, which is formulated beforehand according to the name of the ship, the type of containers, the container weight, etc. After the deadline for receiving the containers for loading, they are assigned their shipping

program and loading sequence, in accordance with which they are then directly loaded from the container storage yard. Under this system, unloaded containers are directly transferred for storage in the container storage yard, whence they are delivered at the gate after a certain period of custody.

32. With the latter case in mind, in this paper, unless otherwise specified, the container yard is to be used in the same sense as a container storage yard.

(2) Container handling capacity of the container yard and the area of container yard

33. The amount of containers that the container yard can handle in a year, that is, the container yard's annual ability to handle containers, is mainly determined by the area of the container yard. The factors that influence the relationship between the handling capacity of the container yard and its area include the container handling system used, the container yard storage period (dwelling time), and the composition of the containers handled, i.e. import or export and loaded or empty.

34. The relationship between the container handling capacity of container yard and the area of the container yard can be roughly expressed by the following equation

$$(\textit{Container handling capacity})\ \Sigma\left(\frac{(\textit{Percent composition})i \times (\textit{Dwelling time})i \times (\textit{Peak ratio})}{365 \times (\textit{Container stacking height})i}\right) = (\textit{Ground slots})$$

$$(\textit{Ground slots})\left(\frac{1}{\textit{Ratio of land use}}\right) = (\textit{Area of container yard})$$

$$(\textit{Container yard area: Ha})\left(\frac{1}{\textit{Yard area ratio}}\right) = (\textit{Container terminal area; Ha})$$

35. In the above relational expressions, its factors are set based on the following concepts.

1) Percent composition

36. Dwelling time in the container yard, stacking height and other container yard operation indices vary with the type of containers to be stored (loaded containers, empty containers) and the type of cargoes (imports, exports, routes, etc.). Accordingly, the ratios of different type of containers and cargoes to the total volume of cargoes are set as percent compositions, based on the result of the container cargo demand forecast. (**Table** 5.3)

2) Dwelling time (days)

37. Dwelling time in the container yard is set based on assumptions made in consideration of the performance records at Tg Priok Port and at Japanese container terminals. (**Table** 5.3)

3) Stacking height

38. Stacking height differs with the type of container handling equipment used at container yards. Generally, for loaded containers, the stacking height of yard cranes (transtainers) (RTG) is set at an average of about 75 to 80 percent of the maximum number of tiers, which is determined from the equipment specifications. In the case of top lifters (TLT), the average stacking height is set at about two tiers. By contrast, in both cases, the average stacking height for empty containers is set about four tiers. (**Table** 5.3)

4) Peak ratio

39. The quantity of containers stored in the container yard peaks at the completion of container unloading, and decreases as they are hauled out the gate for delivery. The range of this input/output variation changes with the intervals at which container ships call at the port, the volumes of loading and unloading per ship, etc. In the planning of container yard facilities, a peak rate is adopted as a safety factor for absorbing this variation. Generally, a peak ratio of 1.3 or thereabouts in employed.

40. The ratio of the number of containers actually stored to the maximum capacity of the container yard is what is called the yard occupancy ratio (YOR), which is

controlled as an index of reserve capacity of the container yard. Given that containers are stored (stacked) to an average stacking height, the YOR is bound to range between 58 and 62 percent.

5) Ratio of land use (TEU/Ha)

41. The ratio of land use is expressed by the number of ground slots per hectare (Ha) of the container yard. It differs with the container handling system. **Table 5.4** shows the result of investigation based on three systems of OCS, SCS and RTG.

6) Ratio of yard area

42. The yard area ratio is expressed by the proportion of the container yard area (including container handling passages) to the total area of the container terminal. According to conventional performance surveys, the yard area ratio ranges from 0.5 to 0.7 when a CFS (container freight station) is installed in the container terminal, and between 0.6 and 0.8 when there is no CFS in the terminal. Accordingly, it is possible to use the yard area ratio given in **Table 5.5** as a simplified method of calculating the total area of the container terminal from the area of the container storage yard.

(3) Relationship between the container handling capacity of berth and the area of container yard

43. At container terminals serving recent large-size container ships, the number of containers which are loaded or unloaded at each port call increases. As a result, the container handling capacity of berths also increase. To meet this trend, there are mounting demands to increase the handling capacity of container yards and to design larger container yards.

44. This, however, is anything but a proposition that the container yard area is the better, the larger it is. Practically, container terminals are also limited in terms of the amount of handling equipment which can be deployed in the yard. This is why the aspect ratio (the ratio of the depth of the terminal to the length of the berths) and depth of the terminal is kept within a certain range. In the design of this standard terminal, the depth is maximized between 350m and 400m, and the upper limit of the aspect ratio is set at 1.5.

45. **Table 5.3** shows the container yard area of the standard container terminal model as calculated by the relational expressions presented above and the various factors that constitute the basis for this calculation.

5.1.4 Container freight station (CFS)

46. A container freight station (CFS) is a facility where cargoes are consolidated into containers for shipment and where LCL cargoes are de-vanned for delivery. Conventionally, in many cases, the CFS was located inside the container terminal, but recently the CFS is frequently provided outside the terminal, because of the increasing ratio of LCL cargoes in recent years and with an eye to improved efficiency of the terminal compound.

(1) Scale of the CFS

47. The scale of the CFS is set based on one of the following two methods. In the first method, similar to the case of a transit shed, the necessary area of CFS is calculated based on the volume of cargoes to be stored. Hence the calculation is based on the period of cargo accumulation (congestion) and the coefficient of utilization of the storage space. The other method is a procedure whereby the CFS is considered as a kind of terminal to transfer cargoes between container and trucks. On this basis, the width of the CFS is calculated based on its transshipment capacity, and the depth of the CFS is determined based on its storage capacity. For the present purpose, the former method is employed as a simplified procedure to determine the required scale of the CFS.

Under this method, the storage space area of the CFS can be expressed by the following equation.

$$(\textit{Numbert of loaded contaer}) \times \left(\Sigma\left(\frac{(\textit{Percent composition})i \quad (\textit{LCL ratio})i \quad (\textit{Dwelling time})i \quad (\textit{Peak rate})}{(\textit{Amount of Cargoes stored per unit area}) \quad (\textit{Area efficiency})}\right)\right) = (\textit{Area of CFS Storage space})$$

48. **Table 5.6** shows the CFS storage space area of the standard container terminal model as calculated from the above relational expression and the various factors that constitute the basis for this calculation.

5.1.5 Inland container depots

49. Today, an inland container depots can be broadly classified into two main types.

50. One is what is described as a van pool. Located close to the container terminal, the van pool is designed for the custody, cleaning and repairing of empty containers and delivering and receiving empty containers to and from shippers (consignors). Thus van pools are characterized by their supplementary role in keeping empty containers in custody, which is one of the functions of container terminals. Generally, these van pools are operated by shipping agents or their consignees.

51. The other type of inland container depot may be termed as an inland container freight station (inland CFS), where container cargoes are collected, delivered, held in custody, consolidated into containers or stripped from them. In a sense, this partially complements the container terminal's function of taking loaded containers into custody, but essentially it comprises an independent inland transportation function, which lies outside the category of container terminal criteria.

(1) Scale of van pools

52. The scale of van pools can be set based on the same concept as that of used to determine the scale of container yards. The gross amount of empty containers handled in a van pool equals the gross amount of containers loaded and unloaded at wharf. Compared to container yards, the retention period (dwelling time) at the van pool is two to four weeks long, so here it is possible to stack containers in four or five tiers at the limit of the stacking height within the reach of the container handling equipment.

53. The area of a van pool can be expressed by the following equation.

$$(\textit{Number of containers handled; TEU/Y}) \times \left(\Sigma \frac{(\textit{Dwelling time ; day}) \times (\textit{Peak ratio})}{365 \times (\textit{Average stacking height})}\right) = (\textit{The number of ground slots})$$

$$(\textit{Number of ground slots ; TEU}) \times \left(\frac{1}{\textit{Ratio of yard use}}\right) = (\textit{Gross area Ha of van pool})$$

54. **Table 5.6** gives the gross van pool area of the standard container terminal model as calculated from the above relational expression and the various elements that constitute the base of this calculation.

5.1.6 Container handling equipment

55. The container crane plays major role in the loading and unloading of container ships. The container cranes must be backed up by the provision of sufficient container handling and transportation equipment in the terminal.

56. In the RTG system, containers unloaded are transported by trailers (tractor heads and chassis) from the wharf to the container yard. In this case, loaded containers are lifted on and lifted off using yard transfer cranes between yard and trailer, whereas, for empty containers, their lifting on and lifting off between yard and trailer are generally executed by fork lift tracks(side lifters).

57. Under the SC system, the transportation of containers between wharf and yard and the lifting on and lifting off at the yard are all performed by a single type of straddle carrier.

58. At the terminals where alongside the wharf containers are handed by ship crane, the TLT system is mainly employed. At this time, transportation between wharf and container yard is carried out by trailers, and the loading and unloading at the yard being done by top lifter in the case of loaded containers and, for empty containers by side lifters or other fork lifts.

59. The hauling out of containers from the container yard and their hauling in to the yard are invariable performed by outside trailers, the loading and unloading of which with containers being accomplished by the handling equipment (yard transfer cranes, straddle carriers, fork lifts) provided at the yard.

(1) Yard transfer cranes

60. The yard transfer cranes (transtainers) must have sufficient capacity to correspond with the handling efficiency of the container cranes on the sea-side. Similarly, the yard transfer cranes must also have sufficient capacity to handle the containers brought out

for the land-side. Moreover, in Indonesia, handling equipment downtime is high at many terminals, which is why it is necessary to install spare cranes in numbers sufficient to make up for cranes which are not operating because of mechanical difficulties, repairs, maintenance inspections, etc.

61. The number of yard transfer cranes necessary to be possessed can be calculated from the following relational expressions.

$$\begin{aligned}&(\textit{Necessary number of yard transfer cranes})\\&\quad=[(\textit{Necessary number at peak on the sea-side})\\&\quad+(\textit{Average necessary number on the land-side})\\&\quad+(\textit{Nonoperating cranes})]\end{aligned}$$

$$(\textit{Necessary number at peak on the sea-side}) = \frac{(\textit{Handling efficiency of quay cranes: Boxes/hr}) \times (\textit{Number of effective opetation cranes}) \times (\textit{Peak ratio})}{(\textit{Handling efficiency of transtainers; Boxes/hr})}$$

$$(\textit{Average necessary number on the sea-side}) = \frac{(\textit{Loaded containers annually received into the yard; Boxes/yr})}{(\textit{Handling efficiency of transtainers})\ (\textit{Container yard operating time; Hrs/yr})}$$

$$(\textit{Average necessary number on the land-side}) = \frac{(\textit{Loaded containers annually discharged the yard; Boxes/yr})}{(\textit{Handling efficiency of transtainers})\ (\textit{Container yard operating time; Hrs/yr})}$$

$$\begin{aligned}&(\textit{Nonoperating cranes})\\&=(\textit{Downtime ratio}) \times ((\textit{Average necessary number on the sea side})\\&\qquad+(\textit{Average necessary numbre on the land-side}))\end{aligned}$$

62. **Table** 5.7 shows the necessary number of yard transfer cranes in the standard container terminal model as calculated from the above relational expressions, and from

the various elements that constitute the base of this calculation.

(2) Heavy-duty forklift trucks

63. The heavy-duty forklift trucks which are used at container terminals consist of top lifters, mainly employed to handle loaded containers, and side lifters that handle empty containers.

64. With a load capacity of 30 to 45 tons, top lifters can generally stack containers in 3 tiers. Side lifters, on the other hand, have a load rating of 5 to 15 tons and are generally capable of stacking up to five tiers.

65. It is possible to apply the above equation for calculating the necessary number of transtainers for calculating the necessary number of fork lift trucks as well. In this case it is possible to calculate the necessary number of top lifters based on the quantity of loaded containers annually received by the container yard and the quantity annually discharged from it. However, the necessary number of side lifters should be calculated from the quantity of empty containers annually received by the container yard and the quantity annually discharged therefrom. In addition, the handling efficiency of transtainers (yard transfer cranes) must be substituted for that of forklifts.

66. **Tables 5.7** and **5.8** show the necessary number of forklifts in the standard container terminal model as calculated from the above relational expressions and from the various factors that constitute the basis for this calculation.

(3) Tractor head and trailer chassis

67. The delivery of containers on the land-side is executed by outside highway trailers. Thus, yard tractor heads must primarily have the capacity to respond to the movement of containers on the sea-side. Further, similar to the requirements for yard transfer cranes, for tractor heads and chassis it is also imperative to provide spare units in sufficient numbers to compensate for nonoperating cranes due to mechanical difficulties, maintenance and inspection shutdowns, etc.

68. The requisite number of trailer chassis is generally about two times the number of tractor heads.

69. The necessary number of trailer heads and chassis can be obtained from the following relational expressions.

(Necessary number of tractor heads)
=[(Necessary number of trailers at peak on the sea-side)+(Nonoperating cranes)]

$$\textit{(Necessary numbers of trailers at peak on the sea-side)} = \frac{\textit{(Container handling efficiency of the berth; Boxes/hr) (Peak ratio)}}{\textit{(Transportation efficiency of trailers; Boxes/hr)}}$$

$$\textit{(Average necessary number of trailers on the sea-side)} = \frac{\textit{(Annual gross number handed at container terminal; Boxes/yr)}}{\textit{(Transportation efficiency of trailers) x (Container yard operating time; Hrs/yr)}}$$

(Nonoperating trailers)
= (Downtime ratio) x (Avrg necessary nmbrs of trlr on the s-side)

70. **Table** 5.9 shows the necessary number in yard tractor heads and chassis of the standard container terminal model as calculated from the above relational expressions, and the various factors that constitute the basis for this calculation.

5.1.7 Continer Handling Capacity of Existing Contianer Terminal at the six Main Ports

71. The present master plan needs to sedign a standard container terminal model, establish the size of the facilities and the container handling capacity for such a model terminal, amd at the same time to evaluate the container handling capacities (productivity) of the existing container terminals.

72. Table 5.10 summarizes the results of the evaluation of the berth and yard productivities at the existing container terminals at six main ports, including those terminals under construction, applying the criteria presented above. The performance

record at the existing terminals in 1993, which was used as a basis for the calculation, is shown in Table 5.11 and Appendix 5.1.2.

73. The productivity of the Gabion spesial container terminal at Belawan port is about 184,000 TEU/yr. The present bottleneck in the berth capacity, and this can be resolved by installing one additional quay crne. This will increase the terminal capacity up to about 228,000 TEU/yr, which is consedered to be the maximum limit of the container yard.

74. The productivity of Panjang Port will reach zbout 145,000 TEU/yr when the new D2 container terminal now under construction is completed. The container yard of the terminal under construction has an area of 6.55 ha. Tpgether with the extisting container yard area of 3.5 ha, the total yard capacity will be sufficient.

75. The total productivity of Tg. Priok port container terminal canbe increas at the No. 2 terminal. There will be a total of six berths: four at the No.1 terminal and two at the No. 2 terminal. In this case, the berth and container yard capacities will be more or less well balanced.

76. The productivity of Tg. Emas port, with the completion of the new container terminal now under construction, will reach about 172,000TEU/yr. The dwelling times at the new container terminal needs to be which is the level at the Tg. Priok No.1 terminal. Even then, the yard storage capacity willl remain a bottleneck.

77. The 500 m-long berth at the Tg.Perak port No.2 terminal is used as two 250m berths. Ther are three container cranes, of which one is allotted to each berth. As a result, the operating rate of these container cranes will be able to be veru high in operation. The total berth capacity of the No.2 terminal is about 368,000 TEU/yr. One of the characteristics of this terminal is its high ratio of empty containers for export of 45%. If these empty containers are stored at an outside container depot instead of storing them in the container yard for a long time, the dwelling time can be greatly redused. With this practice, the 12.47-ha yard will have sufficient surplus capacity and can fully cope with the high berth productivity.

78. The productivity of the new container terminal under construction qt makassar port hata Quay is about 145,000 TEU/yr. As a result, the berth capasity will constitute

a bottleneck. If the 490m-long berth is divided into two 245 m berths and additional cranes are installed, a berth productivity of 278,000 TEU/yr will be realized. In this case, the bottleneck willl be the 184,000-TEU/yr yard capacitu. If the berth capacity is to be fully utilized, outside storage space such as a container yard or CFS needs to be provided.

Table 5.1 CONTAINER TERMINAL STANDARD MODEL

TYPE of TERMINAL	SHIP CAPACITY	Calling Ship Specifications				Berth		NUMBER OF BOX LD/ULD (Box/vssl)	NUMBER SHIP CALLS per YEAR	Container Crane			PRDCTVTY of TERMINAL (TEU/Yr)	Container Yard						
		MAX SHIP LENGTH (m)	MAX SHIP DRAUGHT (m)	MAX SHIP BREADTH (m)	MAX SHIP CPCTY (TEU)	BERTH LENGTH (m)	BERTH DEPTH (m)			AVERAG BOX/Hr (BOX/ Hr/Cr)	NUMBER of UNITS (Unit)	OUT REACH (m)		YARD HANDLING SYSTEM	CONTAINER FREIGHT STATION	TRFR CRANE CPCTY	TRMNL AREA (Ha)	STORAGE YARD AREA (Ha)	YARD AREA (Ha)	CFS AREA (Ha)
INTERNATIONAL																				
A－1	8,000TEU, 40,000 DWT (3rd GENERATION) JAPAN, KOREA-INDONESIA	250	11.6	32	3,000	300	13.5	800	276	25	3	40.0	332,000	TRANSFER CRANE	ON-DOCK	1 ovr 4	12.3	7.4	10.5	1.8
A－2	1,500TEU, 25,000 DWT (2nd GENERATION) INTRA ASIA FEEDER	195	10.3	28	1,500	250	12.0	650 1,000	281	25 25	2	36.0	274,000	TRANSFER CRANE	ON-DOCK	1 ovr 4	9.9	6.0	8.5	1.4
A－3	750TEU, 15,000 DWT (1st GENERATION) SINGAPORE FEEDER	160	8.7	24	750	200	10.0	400 600	304	25 25	2	32.0	183,000	TRANSFER CRANE	ON-DOCK	1 ovr 4	6.9	4.2	5.9	1.0
		160	8.7	24	750	200	10.0	400 600	351	25 25	2	32.0	211,000	TRANSFER CRANE	ON-DOCK	1 ovr 4	8.0	4.8	6.9	1.1
DOMESTIC																				
B－1	500TEU FULL CONTAINER BERTH	137.5	7.5	21	500	170	9.0	400 600	324	25 25	2	32.0	162,000	TRANSFER CRANE	ON-DOCK	1 ovr 4	5.4	3.2	4.6	0.8
B－2	500TEU MULTI PURPOSE BERTH	137.5	7.5	21	500	170	9.0	200 300	254	(SHIP Cr) 9 9	2	-	64,000	TOP LIFTER FORKLIFT	ON-DOCK	3-HIGH	4.7	2.8	4.0	0.7

VAN POOL TOTAL AREA (Ha)	TRANSFER CRANE NECSSRY NUMBER (SET)	YARD TRACTOR NECSSRY NUMBER (SET)	YARD CHASSIS NECSSRY NUMBER (SET)	SIDE LIFTER NECSSRY NUMBER (SET)
31.0	9	12	24	3
25.6	7	10	20	3
17.1	5	7	14	2
19.7	6	9	17	3
15.1	5	8	15	3
5.9	4 (TOP-LIFTER)	3	5	2

Table 5.2 BERTH PRODUCTIVITY OF THE STANDARD CONTAINER TERMINAL

TYPE OF TERMINAL	SHIP CAPACITY	Calling Ship Specifications: MAX SHIP LENGTH (m)	MAX SHIP DRAUGHT (m)	MAX SHIP BREADTH (m)	MAX SHIP CPCTY (TEU)	Berth: BERTH LENGTH (m)	BERTH DEPTH (m)	NUMBER OF BOX LD/ULD (Box/vssl)	Container Crane: HOUR PRODUCTIVITY (BOX/Hr/Cr)	UNITS INSTALLED (Unit)	UNITS EFFECTIVELY WORKING	BOR	Berthing Time: NOT per VSSL (Hr)	ET per VSSL (Hr)	IT per VSSL (Hr)	BT per VSSL (Hr)	ET RATIO (%)	NO of SHIP CALLS per YEAR	40' CNTNR RATIO (%)	Berth Prdctvty: BOX/Yr (1,000 Box/Yr /Berth)	TEU/Yr (1,000 TEU/Yr /Berth)	BERTH EFFCENCY per LENGTH (TEU/m)
INTERNATIONAL																						
A－1	3,000TEU, 40,000 DWT (3rd GENERATION) JAPAN, KOREA-INDONESIA	250	11.6	32	3,000	300	13.5	800 1,200 (Peak)	25 25	3	1.93 2.10	0.70	4.0 4.0	16.6 22.9	1.6 1.6	22.2 28.5	0.75	276	50	221	332	1106
A－2	1,500TEU, 25,000 DWT (2nd GENERATION) INTRA ASIA FEEDER	195	10.3	28	1,500	250	12.0	650 1,000 (Peak)	25 25	2	1.60 1.60	0.70	4.0 4.0	16.3 25.0	1.6 1.6	21.9 30.6	0.74	281	50	182	274	1094
A－3	750TEU, 15,000 DWT (1st GENERATION) SINGAPORE FEEDER	160	8.7	24	750	200	10.0	400 600 (Peak)	25 25	2	1.10 1.60	0.70	4.0 4.0	14.5 15.0	1.6 1.6	20.1 20.6	0.72	304	50	122	183	913
		160	8.7	24	750	200	10.0	400 600 (Peak)	25 25	2	1.35 1.60	0.70	4.0 4.0	11.9 15.0	1.6 1.6	17.5 20.6	0.68	351	50	141	211	1054
DOMESTIC																						
B－1	500TEU FULL CONTAINER BERTH	137.5	7.5	21	500	170	9.0	400 600 (Peak)	25 25	2	1.20 1.60	0.70	4.0 4.0	13.3 15.0	1.6 1.6	18.9 20.6	0.70	324	25	130	162	953
B－2	500TEU MULTI PURPOSE BERTH	137.5	7.5	21	500	170	9.0	200 300 (Peak)	(SHIP Cr) 9 9	2	1.20 1.60	0.70	4.0 4.0	18.5 20.8	1.6 1.6	24.1 26.4	0.77	254	25	51	64	374

Table 5.3 CONTAINER TERMINAL AND STORAGE YARD AREA OF THE STANDARD CONTAINER TERMINAL

TYPE OF TERMINAL	Container Storage Yard: CONTAINER HANDLING SYSTEM	PROPORTION		(%)	THROUGH-PUT (1,000 TEU/Yr)	DWLNG TIME (Day)	NUMBER OF STORGE CNTNR (1,000 TEU)	Stacking Hight: 1 ovr 3 (Box)	Stacking Hight: 1 ovr 4 (Box)	Ground Slot: 1 ovr 3 (TEU)	Ground Slot: 1 ovr 4 (TEU)	CNTNR FRGHT STATION	STACKING HEIGHT (BLOCK)	GROUND SLOT TOTAL (TEU)	GROUND SLOT per Ha (TEU/Ha)	STORAGE YARD AREA (Ha)	Container Terminal Area: YARD AREA RATIO	TERMINAL AREA (Ha)	TERMINAL WIDTH (W) (m)	TERMNL DEPTH (D) (m)	(D)/(W)	TRMNL AREA EFFNCY (1000 TEU/ (Ha/Yr)
INTERNATIONAL																						
A－1	TRANSFER CRANE SYSTEM	Import	Loaded	0.45	149.3	7	3.72	2.3	3.0	1,654	1,241	On-Dock	1 ovr 3	2,575	267	9.64	0.6	16.07	300	536	1.8	21
			Empty	0.05	16.6	3	0.18	4.0	4.0	44	44		1 ovr 4	1,964	267	7.36	0.6	12.26	300	409	1.4	27
		Export	Loaded	0.40	132.7	4	1.89	2.4	3.2	788	591	Off-Dock	1 ovr 3	2,575	267	9.64	0.7	13.78	300	459	1.5	24
			Empty	0.10	33.2	3	0.35	4.0	4.0	89	89		1 ovr 4	1,964	267	7.36	0.7	10.51	300	350	1.2	32
					331.8		6.14	2.4	3.1	2,575	1,964											
A－2	TRANSFER CRANE SYSTEM	Import	Loaded	0.45	123.1	7	3.07	2.3	3.0	1,364	1,023	On-Dock	1 ovr 3	2,124	272	7.81	0.6	13.01	250	521	2.1	21
			Empty	0.05	13.7	3	0.15	4.0	4.0	37	37		1 ovr 4	1,620	272	5.96	0.6	9.93	250	397	1.6	28
		Export	Loaded	0.40	109.4	4	1.56	2.4	3.2	650	487	Off-Dock	1 ovr 3	2,124	272	7.81	0.7	11.15	250	446	1.8	25
			Empty	0.10	27.4	3	0.29	4.0	4.0	73	73		1 ovr 4	1,620	272	5.96	0.7	8.51	250	340	1.4	32
					273.6		5.07	2.4	3.1	2,124	1,620											
A－3	TRANSFER CRANE SYSTEM	Import	Loaded	0.45	82.2	7	2.05	2.3	3.0	911	683	On-Dock	1 ovr 3	1,417	260	5.45	0.6	9.09	200	454	2.3	20
			Empty	0.05	9.1	3	0.10	4.0	4.0	24	24		1 ovr 4	1,081	260	4.16	0.6	6.93	200	347	1.7	26
		Export	Loaded	0.40	73.1	4	1.04	2.4	3.2	434	325	Off-Dock	1 ovr 3	1,417	260	5.45	0.7	7.79	200	389	1.9	23
			Empty	0.10	18.3	3	0.20	4.0	4.0	49	49		1 ovr 4	1,081	260	4.16	0.7	5.94	200	297	1.5	31
					182.6		3.38	2.4	3.1	1,417	1,081											
	TRANSFER CRANE SYSTEM	Import	Loaded	0.45	94.9	7	2.37	2.3	3.0	1,051	788	On-Dock	1 ovr 3	1,636	260	6.29	0.6	10.49	200	524	2.6	20
			Empty	0.05	10.5	3	0.11	4.0	4.0	28	28		1 ovr 4	1,248	260	4.80	0.6	8.00	200	400	2.0	26
		Export	Loaded	0.40	84.3	4	1.20	2.4	3.2	501	375	Off-Dock	1 ovr 3	1,636	260	6.29	0.7	8.99	200	450	2.2	23
			Empty	0.10	21.1	3	0.23	4.0	4.0	56	56		1 ovr 4	1,248	260	4.80	0.7	6.86	200	343	1.7	31
					210.8		3.90	2.4	3.1	1,636	1,248											
DOMESTIC																						
B－1	TRANSFER CRANE SYSTEM	Unlding	Loaded	0.30	48.6	7	1.21	2.3	3.0	538	404	On-Dock	1 ovr 3	1,079	260	4.15	0.6	6.92	170	407	2.4	23
			Empty	0.20	32.4	3	0.35	4.0	4.0	87	87		1 ovr 4	836	260	3.22	0.6	5.36	170	315	1.9	30
		Loading	Loaded	0.45	72.9	4	1.04	2.4	3.2	433	324	Off-Dock	1 ovr 3	1,079	260	4.15	0.7	5.93	170	349	2.1	27
			Empty	0.05	8.1	3	0.09	4.0	4.0	22	22		1 ovr 4	836	260	3.22	0.7	4.60	170	270	1.6	35
					161.9		2.68	2.5	3.2	1,079	836											
B－2	TOP LIFTER FORKLIFT SYSTEM	Unlding	Loaded	0.45	28.6	7	0.71	2.0	2.0	357	357	On-Dock	3 HIGH	535	190	2.81	0.6	4.69	170	276	1.6	14
			Empty	0.05	3.2	3	0.03	4.0	4.0	8	8											
		Loading	Loaded	0.30	19.1	4	0.27	2.0	2.0	136	136	Off-Dock	3 HIGH	535	190	2.81	0.7	4.02	170	237	1.4	16
			Empty	0.20	12.7	3	0.14	4.0	4.0	34	34											
					63.6		1.15	2.2	2.2	535	535											

Table 5.4 RATIO OF LAND USE FOR GROUND SLOTS

Container Handling System	Container Yard Layout (Against wharf line)	Items	Length of Wharf (m)				Max	Min	Average
			200	250	300	350			
OCS	Perpendicular	Ground Slots(TEU/Ha)	214.7	218.9	224.6	226.2	226.2	214.7	221.1
		Ratio of Passages	0.108	0.090	0.067	0.060	0.108	0.060	0.081
	Parallel	Ground Slots(TEU/Ha)	228.6	228.6	228.6	228.6	228.6	228.6	228.6
		Ratio of Passages	0.050	0.052	0.050	0.050	0.052	0.050	0.051
RTG	Parallel	Ground Slots(TEU/Ha)	260.7	272.2	272.2	259.1	272.2	259.1	266.0
		Ratio of Passages	0.270	0.239	0.239	0.276	0.276	0.239	0.256
SCS	Perpendicular	Ground Slots Max	331.4	347.2	331.4	342.7	347.2	331.4	338.2
		(TEU/Ha) Min	256.3	268.5	256.3	265.0	268.5	256.3	261.5
		Ratio of Passages	0.194	0.156	0.194	0.167	0.194	0.156	0.178
	Parallel	Ground Slots(TEU/Ha)	274.6	302.2	286.6	305.2	305.2	274.6	292.2
		Ratio of Passages	0.335	0.265	0.304	0.258	0.335	0.258	0.291

Source: Investigation report on existing container terminals (1993, Ministry of Transportation of Japan)

Table 5.5 AREA ALLOCATION OF THE TERMINAL

		Container Terminal with CFS					Container Terminal with CFS			
Ports		KOBE	KOBE	YOKOHAMA	TOKYO	KAOHSIUNG	KOBE	KOBE	YOKOHAMA	NAGOYA
Terminals		PC-1	PC-2	Honmoku A-7	Ohi No1-2	No. 3CT No. 69	PC-3, 4	PC-12	Daikoku C-2	West 4-ku NCB
Total Container Terminal Area	(%)	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Apron	(%)	11.6	11.4	12.4	13.0	4.8	11.4	17.4	11.4	9.7
Contaier Srorage Yard & Marshalling Yard	(%)	60.0	60.6	64.3	51.4	71.8	79.8	55.4	74.4	78.9
CFS	(%)	10.5	6.5	7.4	8.8	6.1	-	-	-	-
Other	(%)	17.9	21.5	15.9	26.8	17.3	8.8	27.2	14.2	11.4
Container handling System		OCS	RTG	SCS	RTG	RTG	SCS	RTG	SCS	SCS

Source: Investigation report on existing container terminals (1993, Ministry of Transportation of Japan)

Table 5.6 CONTAINER FREIGHT STATION AND VAN POOL, AREA OF THE STANDARD CONTAINER TERMINAL

TYPE OF TERMINAL		Container Freight Station									CFS	Van Pool (Inland Container Depot)						
		LOADED CONTAINER VOLUME (1000TEU)	CONTAINER UNIT WEIGHT (Ton/TEU)	CARGO VOLUME (1000Ton)	LCL CARGO RATIO (%)	LCL CARGO VOLUME (Ton/Yr)	LCL DWLNG TIME (Day)	STORGE CARGO VOLUME (Ton)	CFS YARD EFFICNCY (T/m×m)	CFS EFFECTIVE AREA RATIO	STORAGE AREA NECCRY (m×m)	EMP CNTNR THRGHPUT (1000 TEU/Yr)	DWLNG TIME (Day)	NUMBER OF STORGE CNTNRS (1,000 TEU)	STACK-ING HEIGHT (Box)	GROUND SLOTS (TEU)	YARD AREA RATIO (TEU/Ha)	VAN POOL TOTAL AREA (Ha)
INTERNATIONAL																		
A－1	IMPORT	149.3	12.5	1,866.1	5.0	93,306	4	1,329	1.0	0.6	2,200	331.8	21	24,813	4	6,203	200	31.0
	EXPORT	132.7	12.5	1,658.8	5.0	82,938	4	1,182	1.0	0.6	2,000		″					
	TOTAL	282.0		3,524.9		176,244		2,511			(SUM) 4,200							
A－2	IMPORT	123.1	12.5	1,539.1	5.0	76,957	4	1,096	1.0	0.6	1,800	273.6	21	20,466	4	5,116	200	25.6
	EXPORT	109.4	12.5	1,368.1	5.0	68,406	4	975	1.0	0.6	1,600		″					
	TOTAL	232.6		2,907.3		145,363		2,071			(SUM) 3,400							
A－3	IMPORT	82.2	12.5	1,027.3	5.0	51,365	4	732	1.0	0.6	1,200	182.6	21	13,660	4	3,415	200	17.1
	EXPORT	73.1	12.5	913.2	5.0	45,658	4	650	1.0	0.6	1,100		″					
	TOTAL	155.2		1,940.5		97,023		1,382			(SUM) 2,300							
	IMPORT	94.9	12.5	1,185.9	5.0	59,293	4	845	1.0	0.6	1,400	210.8	21	15,768	4	3,942	200	19.7
	EXPORT	84.3	12.5	1,054.1	5.0	52,705	4	751	1.0	0.6	1,300		″					
	TOTAL	179.2		2,240.0		111,998		1,596			(SUM) 2,700							
DOMESTIC																		
B－1	IMPORT	48.6	12.5	607.3	5.0	30,363	6	649	1.0	0.6	1,100	161.9	21	12,112	4	3,028	200	15.1
	EXPORT	72.9	12.5	910.9	5.0	45,545	6	973	1.0	0.6	1,600		″					
	TOTAL	121.5		1,518.2		75,908		1,622			(SUM) 2,700							
B－2	IMPORT	28.6	12.5	357.5	10.0	35,753	6	764	1.0	0.6	1,300	63.6	21	4,754	4	1,189	200	5.9
	EXPORT	19.1	12.5	238.4	10.0	23,835	6	509	1.0	0.6	800		″					
	TOTAL	47.7		595.9		59,589		1,273			(SUM) 2,100							

Table 5.7 NECESSARY CONTAINER TRANSFER CRANE UNITS AT THE STANDARD CONTAINER TERMINAL

TYPE OF TERMINAL	Yard Transfer Crane (R2:Top Lifter) CONTAINER CARGO THROUGHPUT per YEAR (1000BOX)	LOADED CONTAINER THROUGHPUT per YEAR (1000BOX)		SEA-SIDE HOUR PRODUCTIVITY OF QUAY CRANE (BOX/Hr/GC)	QUAY CRANE UNIT EFFECTVE WORKING	HOUR PRODCTVTY OF BERTH (BOX/Hr)	TRANSFER CRANE EFFICIENCY (GROSS) (BOX/HrCr)	TRSTNR SHIFT RATIO (%)	TRANSFER CRANE EFFICIENCY (NET) (BOX/HrCr)	REQUIRED HANDLING VOLUME per Day (BOX/DAY)	NECESSARY UNIT of CR SEASIDE	LAND-SIDE LOADED CONTAINER THROUGHPUT per DAY (1000BOX)	NECESSARY UNITS of CR LANDSIDE	TOTAL NECESSARY UNITS of CR for OPE.	DOWN TIME RATIO (%)	UNITS of CR NOT OPE.	NECESSARY UNITS of TRNSF. Cr TOTAL	TRANSFER CRANE UNIT PRDCTVTY (BOX/Yr)	UNITS OF TRANSFER CRANE per QUAY CRANE
INTERNATIONAL																			
A－1	221.2	188.0	Average At Peak	37.5	1.9	72.4	18 18	20 20	15.0 15.0	515.1	1.4 4.8	515.1 772.6	1.4 2.1	2.9 7.0	70	2.0 2.0	9.0	24,645	3.0
A－2	182.4	155.1	Average At Peak	31.9	1.6	51.0	18 18	20 20	15.0 15.0	424.8	1.2 3.4	424.8 552.2	1.2 1.5	2.4 4.9	70	1.7 1.7	6.6	27,697	3.3
A－3	121.8	103.5	Average At Peak	31.9	1.1	35.1	18 18	20 20	15.0 15.0	283.5	0.8 2.3	283.5 368.6	0.8 1.0	1.6 3.4	70	1.1 1.1	4.5	27,275	2.2
	140.5	119.5	Average At Peak	31.9	1.4	43.0	18 18	20 20	15.0 15.0	327.3	0.9 2.9	327.3 425.5	0.9 1.2	1.8 4.1	70	1.3 1.3	5.3	26,401	2.7
DOMESTIC																			
B－1	129.5	97.2	Average At Peak	28.1	1.2	33.8	18 18	20 20	15.0 15.0	266.2	0.7 2.3	266.2 346.1	0.7 1.0	1.5 3.2	70	1.0 1.0	4.2	30,507	2.1
B－2	50.8	38.1	Average At Peak	13.5	1.2	16.2	10 10	20 20	8.3 8.3	104.5	0.5 1.9	104.5 135.8	0.5 0.7	TOP LOADER 1.0 2.6	70	0.7 0.7	3.4	15,158	1.7

Table 5.8 NECESSARY SIDE LIFTER UNITS AT THE STANDARD CONTAINER TERMINAL

TYPE OF TERMINAL	Side Lifters for Empty Container				SEA-SIDE						LAND-SIDE		TOTAL			
		Empty CONTAINER THROUGHPUT per YEAR (1000TEU)	Empty CONTAINER THROUGHPUT per YEAR (1000BOX)		HOUR EMPTY CONTNR HANDLING VOL. by CUAY Cr. (BOX/Hr/CC)	QUAY CRANE UNIT EFFECTVE WORKING	HOUR EMPTY CONTNR HANDLING VOLUME (BOX/Hr)	SIDE LIFTER EFFICIENCY (BOX/Hr)	REQUIRED HANDLING VOLUME per Day (BOX/DAY)	NECESSARY UNIT of SIDE LFTR SEA-SIDE	EMPTY CONTAINER THROUGHPUT per DAY (1000BOX)	NECESSARY UNITS of SIDE LFTR LAND-SIDE	NECESSARY UNITS of SIDE LFTR for OPE.	DOWN TIME RATIO (%)	NUMBER of UNITS NOT OPRTION	NECESSARY UNITS of SIDE LIFTER TOTAL
INTERNATIONAL																
A－1	Import	16.59	11.06	Average	5.6	1.9	10.9	10.0	90.9	0.4	90.9	0.4	0.8	70.0	0.5	2.2
	Export	33.18	22.12	At Peak				10.0		1.1	136.3	0.6	1.7		0.5	
	TOTAL	49.76	33.18													3.0
A－2	Import	13.68	9.12	Average	5.6	1.6	9.0	10.0	75.0	0.3	75.0	0.3	0.6	70.0	0.4	1.8
	Export	27.36	18.24	At Peak				10.0		0.9	112.4	0.5	1.4		0.4	
	TOTAL	41.04	27.36													3.0
A－3	Import	9.13	6.09	Average	5.6	1.1	6.2	10.0	50.0	0.2	50.0	0.2	0.4	70.0	0.3	1.2
	Export	18.26	12.18	At Peak				10.0		0.6	75.1	0.3	0.9		0.3	
	TOTAL	27.39	18.26													2.0
	Import	10.54	7.03	Average	5.6	1.4	7.6	10.0	57.8	0.2	57.8	0.2	0.5	70.0	0.3	1.5
	Export	21.08	14.05	At Peak				10.0		0.8	86.6	0.4	1.1		0.3	
	TOTAL	31.62	21.08													3.0
DOMESTIC																
B－1	Unloading	32.39	25.91	Average	9.4	1.2	11.3	10.0	88.7	0.4	88.7	0.4	0.7	70.0	0.5	2.2
	Loading	8.10	6.48	At Peak				10.0		1.1	133.1	0.6	1.7		0.5	
	TOTAL	40.48	32.39													3.0
B－2	Unloading	3.18	2.54	Average	3.4	1.2	4.1	10.0	34.8	0.1	34.8	0.1	0.3	70.0	0.2	0.8
	Loading	12.71	10.17	At Peak				10.0		0.4	52.2	0.2	0.6		0.2	
	TOTAL	15.89	12.71													2.0

Table 5.9 NECESSARY TRACTOR HEAD AND TRAILER CHASSIS UNITS AT THE STANDARD CONTAINER TERMINAL

TYPE OF TERMINAL	Tractor Head and chassis CONTAINER CARGO THROUGHPUT per YEAR (1000BOX)		HOUR PRODUCTIVIT OF QUAY CRANE (BOX/Hr/CC)	QUAY CRANE UNIT EFFECTVE WORKING	HOUR PRDCTVTY OF BERTH (BOX/Hr)	TRAILER CRANE EFFICIENCY (BOX/HR)	REQUIRED HANDLING VOLUME per Day (BOX/DAY)	NECESSARY UNITS of TRACTOR for OPRTION	DOWN TIME RATIO (%)	NUMBER of UNITS NOT OPRTION	NECESSARY UNITS of TRACTOR TOTAL	NECESSARY UNITS of CHASSIS TOTAL	TRACTOR UNIT YEAR PRDCTVTY (BOX/UT/Y)	UNITS OF TRACTOR per QUAY CHANE
INTERNATIONAL														
A − 1	221.2	Average At Peak	37.5	1.93	72.375	7.0 7.0	605.9	3.6 10.3	40	1.4 1.4	11.8	23.6	18.772	3.9
A − 2	182.1	Average At Peak	37.5	1.6	60	7.0 7.0	499.8	3.0 8.6	40	1.2 1.2	9.8	19.5	18.688	4.9
A − 3	121.8	Average At Peak	37.5	1.1	41.25	7.0 7.0	333.6	2.0 5.9	40	0.8 0.8	6.7	13.4	18.207	3.3
	140.5	Average At Peak	37.5	1.35	50.625	7.0 7.0	385.1	2.3 7.2	40	0.9 0.9	8.1	16.3	17.247	4.1
DOMESTIC														
B − 1	129.5	Average At Peak	37.5	1.2	45	7.0 7.0	354.9	2.1 6.4	40	0.8 0.8	7.3	14.5	17.811	3.6
B − 2	50.8	Average At Peak	13.5	1.2	16.2	7.0 7.0	139.3	0.8 2.3	40	0.3 0.3	2.6	5.3	19.217	1.3

Table 5.10 CONTAINER HANDLING CAPACITY OF EXISTING CONTAINER TERMINALS IN THE MAIN SIX PORTS

- INCLUDING TERMINALS UNDER CONSTRUCTION -

PORT NAME			BELAWAN	PANJANG		TG PRIOK/JAKARTA		TG EMAS/SEMARANG		TG PERAK/SURABAYA		MAKASSAR/UG PANDANG	
TERMINAL			GABION (SPECIAL CONTAINER BERTH)	D1 WARF (GENERAL CARGO BERTH)	D2 NEW CONTAINER TERMINAL (ONGG PLN)	I	II	SAMDERA (GENERAL CARGO BERTH)	NEW CONTAINER BERTH (ONGG PLN)	I	II	SOEKARNO (GENERAL CARGO BERTH)	NEW CONTAINER BERTH (ONGG PLN)
YEAR OF CONSTRUCTION OF ONGOING PLAN					-1995				-1997				-1997
PROPORTION of CONTAINER	L/D/EMP, IMP/EXP Proportion												
	Import-Loaded	%	15	5	5	45	45	35	35	30	30	45	45
	Import-Empty	%	35	45	45	5	5	15	15	20	20	5	5
	Export-Loaded	%	49	45	45	40	40	45	45	5	5	20	20
	Export-Empty	%	1	5	5	10	10	5	5	45	45	30	30
	40' Container Proportion	%	45.0	25.0	25.0	40.0	32.0	40.0	40.0	45.0	45.0	25.0	25.0
BERTH	Length	m	500	486	300	820	360	605	345	420	500	1,360	490
	Depth	m	10	12	12	11	8	9	12(10)	8	11	8	12(10)
	Number of Berth	UNIT	1	-	1	4	2	-	1	-	2	-	1
	Box per Vessel	Box/Vssl	300	200	200	500	300	300	300	300	300	200	200
	BOR	%	70	70	70	70	70	70	70	70	70	70	70
	Berthing Time	Hr	14.5	-	10.6	21.2	14.1	-	13.1	-	14.5	-	10.6
	NOT(Not Operation Time)	Hr	4.0	-	4.0	4.0	4.0	-	4.0	-	4.0	-	4.0
	ET(Effective Time)	Hr	8.9	-	5.0	15.6	8.5	-	7.5	-	8.9	-	5.0
	IT(Idle Time)	Hr	1.6	-	1.6	1.6	1.6	-	1.6	-	1.6	-	1.6
	ETR	%	61.4	-	47.2	73.6	60.3	-	57.3	-	61.4	-	47.2
	Number of Ship Call	Vessl/Yr	423	-	578	1157	870	-	468	-	846	-	578
CNTNR CRANE	Number of Unit Installed	unit	2	-	2	8	4	-	2	-	3	-	2
	Number of Unit Effective working	unit	1.6	-	1.6	6.4	3.2	-	1.6	-	2.94	-	1.6
	Hour Productivity	Box/Hr	21	-	25	20.0	22.0	SHIP CR=9	25.0	-	23.0	SHIP CR=9	25.0
PRODUCTIVITY	Berth Productivity	Box/Yr	127,000	-	116,000	578,000	261,000	-	140,000	-	254,000	-	116,000
		TEU/Yr	184,000	-	145,000	809,000	344,000	0	196,000	0	368,000	0	145,000
	Berth Efficiency	TEU/m/Yr	368	-	483	987	956	-	568	-	736	-	296
MARSHLNG YARD	Area	Ha	9.46	3.50	6.55	19.50	8.42	2.94	5.40	-	12.47	-	5.02
	Ground Slot Capacity	TEU	1,580	665	1,740	6,547	3,025	560	1,398	336	3,136	-	1,420
	Ground Slot/Ha	TEU/Ha	167	190	266	336	359	190	259	-	251	-	283
	Storage Capacity	TEU	4,108	1,330	5,046	18,436	5,232	1,682	4,404	-	9,408	-	4,970
	Height	Box-High	2.6	2.0	2.9	2.8	2.4	3.0	3.2		3.0	-	3.5
	Dwelling Time	Day	4.40	10.20	8.00	5.03	4.48	-	5.60		3.64	-	5.90
	Import-Loaded	Day	9.0	14.0	8.0	9.0-7.0	7.0	-	9.0		4.3	-	9.0
	Import-Empty	Day	3.0	14.0	8.0	3.0	3.0	-	3.0		3.0	-	3.0
	Export-Loaded	Day	4.0	3.5	8.0	4.0	3.0-4.0	-	4.0		7.8	-	4.0
	Export-Empty	Day	3.0	3.5	8.0	3.0	3.0	-	3.0		3.0	-	3.0
	YOR	%	67.0	77.0	65.0	60.0	60.0	-	60.0		50.0	-	60.0
	Storage Capacity/Ha	TEU/Ha	434	380	770	945	621	572	815		754	-	990
PRODUCTIVITY	Yard Productivity	TEU/Yr	228,000	36,000	149,000	802,000	354,000	-	172,000	-	472,000	-	184,000
	Yard Efficiency	TEU/Ha/Yr	24,101	10,286	22,748	41,128	42,043	-	31,852	-	37,851	-	36,653
PRODUCTIVITY(HANDLING CAPACITY)		TEU/Yr	184,000	-	145,000	802,000	344,000	-	172,000	-	368,000	-	145,000

Note: Bald figures are design parameters and Productivity

Table 5.11 ACTIVITY OF CONTAINER TERMINALS AT MAIN SIX PORTS

(1)EXISTING TEMINALS; ACTIVITY RECORD IN 1993

(2)TERMINALS UNDER CONSTRUCTION;4ACTIVITY IN THE ONGOING PLAN

PORT NAME			BELAWAN	PANJANG		TG PRIOK/JAKARTA		TG EMAS/SEMARANG		TG PERAK/SURABAYA		MAKASSAR/UG PANDANG	
TERMINAL			GABION (SPECIAL CONTAINER BERTH)	D1 WARF (GENERAL CARGO BERTH)	D2 NEW CONTAINER TERMINAL (ONGG PLN)	I	II	SAMDERA (GENERAL CARGO BERTH)	NEW CONTAINER BERTH (ONGG PLN)	I	II	SOEKARNO (GENERAL CARGO BERTH)	NEW CONTAINER BERTH (ONGG PLN)
YEAR OF CONSTRUCTION OF ONGOING PLAN					-1995				-1997				-1997
CONTAINER THROUGHPUT	Container Throughput	BOX	104,696	34,810	120,000	514,540	193,261	56,486	85,700	12,199	203,218	46,291	
		TEU	152,514	39,876	150,000	723,122	255,183	78,861	120,000	17,977	305,529	47,352	
	LD/EMP, IMP/EXP Proportion												
	Import-Loaded	%	15	5	(5)	45	45	35	(35)	30	30	45	(45)
	Import-Empty	%	35	45	(45)	5	5	15	(15)	20	20	5	(5)
	Export-Loaded	%	49	45	(45)	40	40	45	(45)	5	5	30	(30)
	Export-Empty	%	1	5	(5)	10	10	5	(5)	45	45	20	(20)
	40' Container Proportion	%	45.7	14.6	25.0	40.5	32.0	39.6	40.0	47.4	50.3	2.3	25.0
	Number of Ship Calls		524	200		1161	844	447	447		713	287	
	Boxes per Vessel		200	174	(200)	443	229	126	192		285	161	
BERTH	Length	m	500	486	300	820	360	605	345	420	500	1,360	490
	Depth	m	10	12	12	11	8	9	12(10)	8	11	8	12(10)
	Number of Berth	UNIT	1	-	1	4	2	-	1	-	2	-	1
	BOR	%	28.4	-	-	70.5	61.5			5.4	50.9		
	Berth Efficiency	TEU/m/Yr	305.0	82.0	500.0	881.9	708.8	130.3	347.8	42.8	611.1	34.8	
	Berth Productivity (Planned)	TEU/Yr			150,000	1,000,000	200,000				120,000		
CNTNR CRANE	Number of Unit(40Ton/35Ton)	unit	2	-	2	8	(4)	-	2	-	3	-	-
	Hour Productivity	Box/Hr	21	-	(25)	18.0	22.0	SHIP CR=9		-	23.0	SHIP CR=9	-
MARSHLNG YARD	Area	Ha	9.46	3.50	6.55	19.50	8.42	2.94	5.40	-	12.47		5.02
	Ground Slot Capacity	TEU	1,582	665	1,740	6,547	3,025	560	1,398	336	3,136		1,420
	Storage Capacity	TEU	4,113	1,330	5,046	18,436	5,232	1,682	4,474	-	9,408		5,112
	Reefer Plug	Box	96	-	-	102	31	-	60	56	380		
	Height	Box-High	2.6	2.0	2.9	2.8	1.7	3.0	3.2		3.0		3.6
	Ground Slot/Ha	TEU/Ha	167	190	266	336	359	190	259		251		283
	Unit Area Storage Capacity	TEU/Ha	435	380	770	945	621	572	828		754		1018
	Yard Efficiency	TEU/Ha/Yr	16,122	11,393	22,901	37,083	30,307	26,823	22,222		24,501		
	Dwelling Time	Day	6.60	10.20	8.00	5.03	4.49	-	12.00		6.07		
	Dwelling Time by each element	Day	4.4	8.8	8.0	6.1	6.1	-	12.0		6.0		12.8-9.8
	Import-Loaded	Day	9.0	14.0	8.0	9.0	9.0	-	12.0		4.3		12-8
	Import-Empty	Day	3.0	14.0	9.0	3.0	3.0	-	12.0		4.3		15
	Export-Loaded	Day	4.0	3.5	8.0	4.0	4.0	-	12.0		7.8		12-8
	Export-Empty	Day	3.0	3.5	8.0	3.0	3.0	-	12.0		7.8		15
	YOR	%	67.0	77.0	60.0	54.0	60.0	-	75.0		54.0		60.0
CFS	Area	m2	6,240	21,600	2,800	-	-	14,000	3,600	4,400	10,000		4,000
	Storage Capacity	Ton	15,600	7,200	-	-	-	-		8,580	19,500		
	Productivity	Ton/Yr				-	-	-		269,000	593,000		

Note: Bold figures are estimated

Table 5.12 ACTIVITY OF CONTAINER TERMINALS IN MAIN SIX PORTS (II)

(1)EXISTING TEMINALS; ACTIVITY RECORD IN 1993

(2)TERMINALS UNDER CONSTRUCTION;ACTIVITY IN THE ONGOING PLAN

PORT NAME			BELAWAN	PANJANG		TG PRIOK/JAKARTA		TG EMAS/SEMARANG		TG PERAK/SURABAYA		MAKASSAH/UJG PANDANG	
TERMINAL			GABION (SPECIAL CONTAINER BERTH)	D1 WARF (GENERAL CARGO BERTH)	D2 NEW CONTAINER TERMINAL (ONGG PLN)	I	II	SAMDERA (GENERAL CARGO BERTH)	NEW CONTAINER BERTH (ONGG PLN)	I	II	SOEKARNO (GENERAL CARGO BERTH)	NEW CONTAINER BERTH (ONGG PLN)
YEAR OF CONSTRUCTION OF ONGOING PLAN					-1995				-1997				-1997
TRANSTAINER	40Ton	unit	-	-	na	9	7	-	3	-	9		-
	25Ton				na	25		-					-
TRAVELLIFT		unit	4	-	na	-	-	-		-			-
HEAD TRUCK	40Ton	unit	8	8	na	45	10	6	10	-	18		-
	SET/CC		4.0	-	na	5.6	19-	-	-	-	16.0	-	-
					na					-			
TRLR CHASSIS	10'/40Ton	unit	17	16	na	81	19	8	20	-	90		-
	20'/23Ton	unit	4	4	na			2		-	13		-
	SET/HEAD TRK		2.6	2.5	na	1.8	1.9	1.7			2.1		-
										-			
TOP LOADER	36Ton	unit			na			0		-	3		-
	30.5Ton	unit	5	3	na	1	2	1		-			-
REACH STCKR	40Ton	unit			na			1		-	1		-
FORKLIFT	25Ton	unit			na	2	0	0		-			-
	15Ton	unit		2	na	4	1	0		-	1		-
					na								
SIDE LOADER	7.5Ton	unit			na	0	0	0		-	2		-
FORKLIFT	10Ton	unit		1	na	0	0	1	2	-	1		-
	3.5Ton	unit			na	0	0	2		-	1		-
	3.0Ton	unit	1		na		0	0		-			-
	2.5Ton	unit	6		na		0	9		-	24		-
	2.0Ton	unit		6	na	4	4	2	6	-	10		-

5.2 LONG-TERM IMPROVEMENT PLAN OF THE PORT FACILITIES

5.2.1 Criteria of berth and terminal

79. The criteria regarding the container handling facilities examined in 5.1 is summarized in **Table 5.13.**

Table 5.13 Criteria of yard area and CFS

Type	Ship Capacity	Berth		Handl. Capa. at berth (1,000TEU/Y)	Terminal area (ha)	Yard area (ha)	CFS Area (sqm)
		Length(m)	Depth(m)				
International							
A-1	3000 TEU, 40,000 DWT Japan-Indonesia	300	-13.5	332	12.3	10.5	18,000
A-2	1500 TEU, 25,000 DWT Intra Asia feeder	250	-12.0	274	9.9	8.5	14,000
A-3	750 TEU, 15,000 DWT Singapore feeder	200	-10.0	183(1 berth only) 211(2 or more)	6.9 8.0	5.9 6.9	10,000 11,000
Domestic							
B-1	500 TEU Full Container	170	- 9.0	162	5.4	4.6	8,000
B-2	500 TEU Multi purpose berth	170	- 9.0	64	4.7	4.0	7,000

Upper row: International Container berth
Lower Row: Domestic Container Berth

There criteria are schematically shown in **Fig. 5.1.**

5.2.2 Number of berths and Container yard required in 2010

80. The number of berths and the areas of container terminal required at each port are estimated on the basis of the container traffic demand forecast (Chapter 3), the berth criteria(Chapter 5., 5.1, and **Table 5.13**) and the cargo share among various ship sized (4.1.2.(3)). The results are listed in **Table 5.14** for the Principal Container Ports and the Major Container Ports, and **Table 5.17** for the Local Container Ports.

81. **Tables 5.15 and .16** shows the new berths and container terminal areas which will be required to be constructed in addition to the existing facilities.

82. Regarding Tanjung Priok Port, four alternative plans are proposed:

Alternative 1; Necessary number of new berths will be constructed outside of the existing North Breakwater. (see **Fig. 5.2**)

Alternative 2; Necessary number of new berths will be constructed outside of the existing West Breakwater. (see **Fig. 5.3**)

Alternative 3; 70 % of container cargos are handled at Tanjung Priok and the rest (30%) is handles at Bojonegara Port.

Alternative 4; Expansion of Tanjung Priok is terminated after the completion of Container Terminal III. The required number of berths and terminals are constructed at Bojonegara Port. (see **Fig. 5.4 and 5.5**)

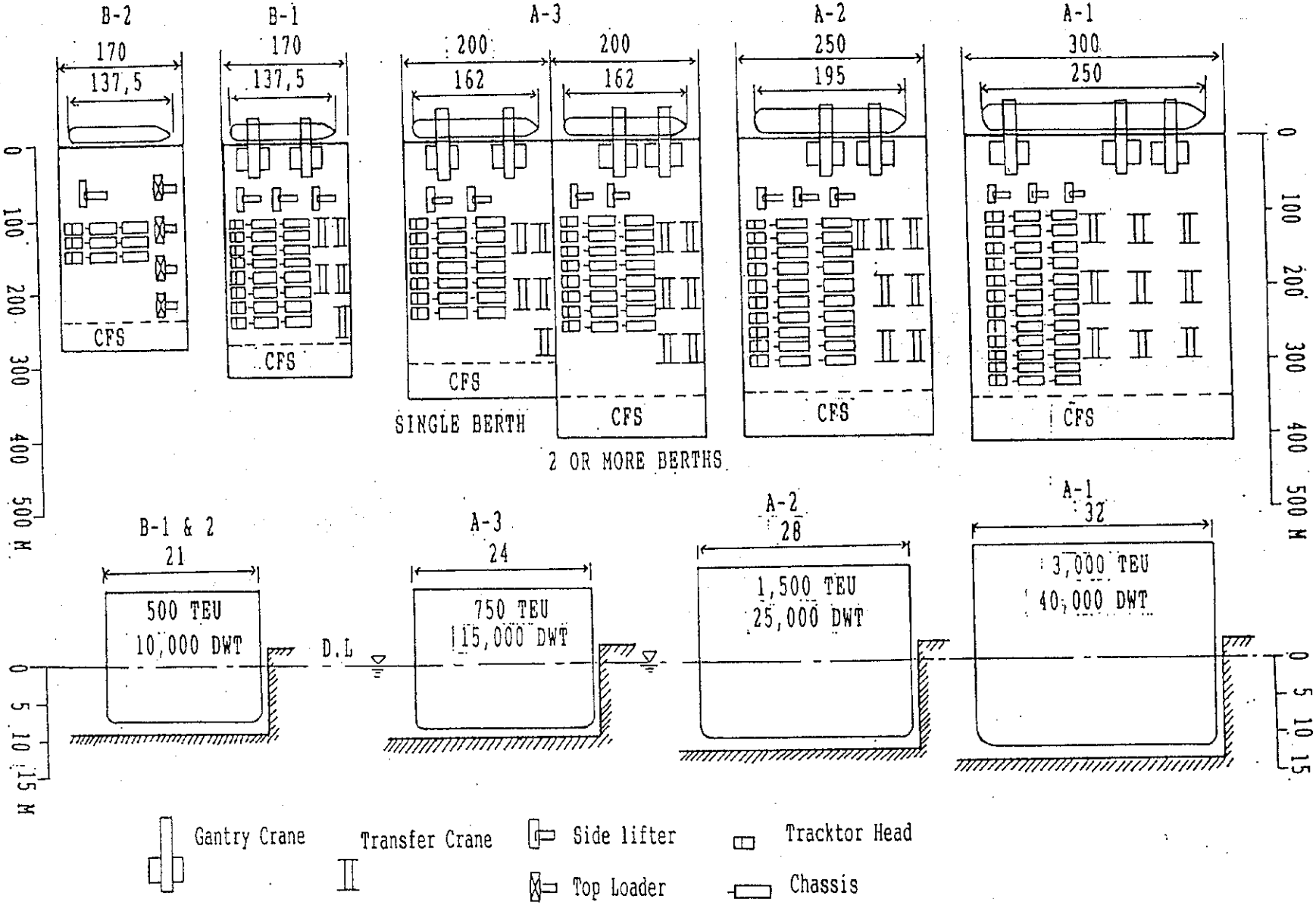


Fig. 5.1 Criteria of Berth, Container Yard and Handling Equipment Used for Master Plan

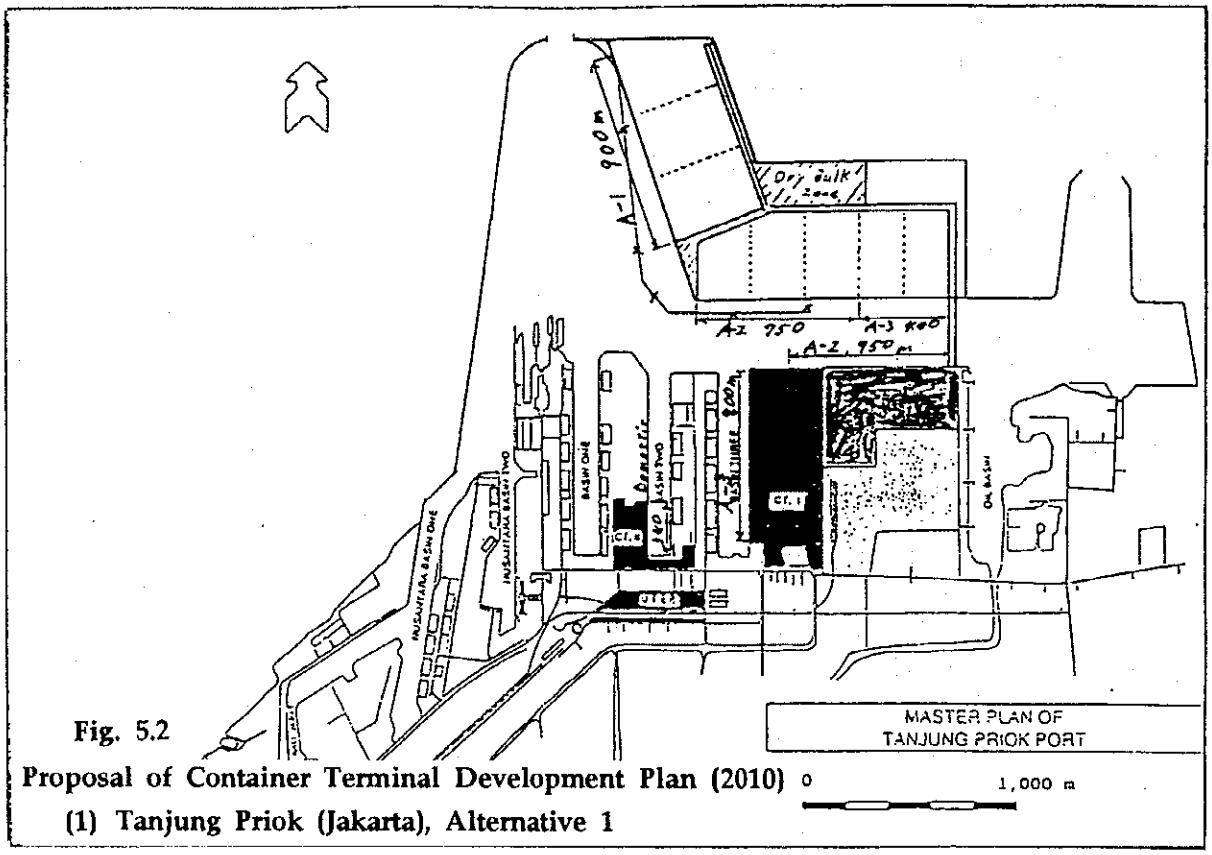


Fig. 5.2 Proposal of Container Terminal Development Plan (2010)
(1) Tanjung Priok (Jakarta), Alternative 1

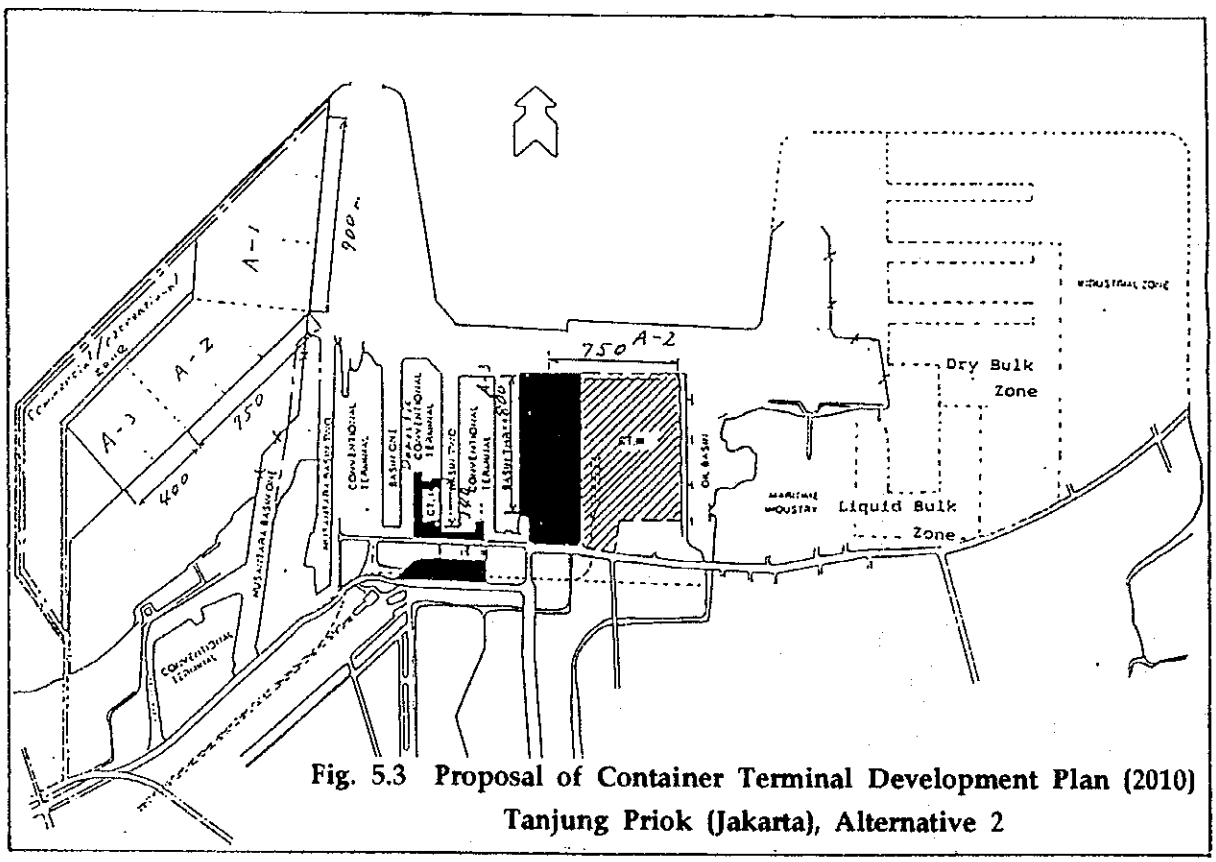


Fig. 5.3 Proposal of Container Terminal Development Plan (2010)
Tanjung Priok (Jakarta), Alternative 2

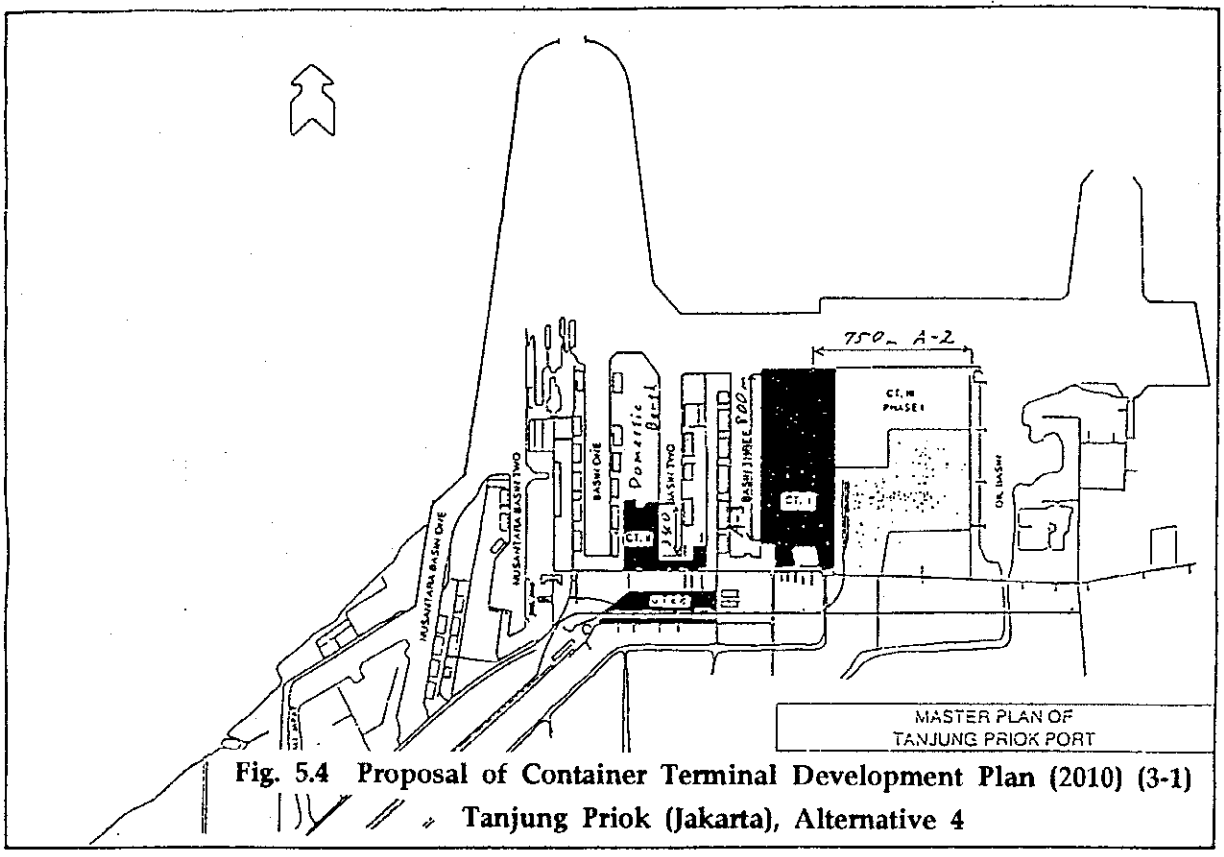


Fig. 5.4 Proposal of Container Terminal Development Plan (2010) (3-1) Tanjung Priok (Jakarta), Alternative 4

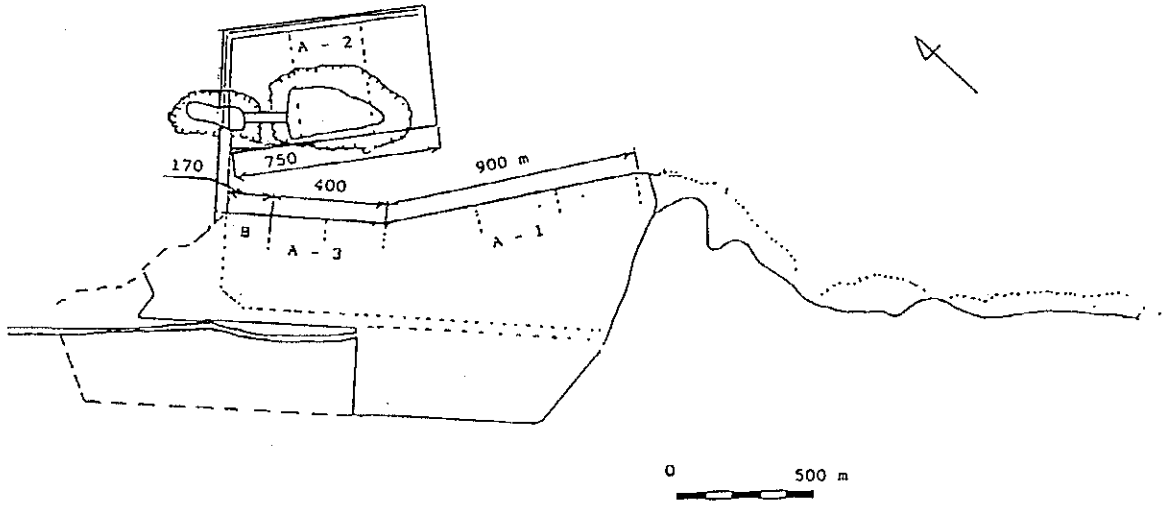


Fig. 5.5 Proposal of Container Terminal Development Plan (2010) (3-2) Tanjung Priok (Jakarta), Alternative 4

Table 5.14 Necessary number of berths, Yard and CFS Area

Ports	Berth number, Yard, CFS area and total terminal area															
	1993				1998				2003				2010			
	Berth Type:No	Yard (ha)	CFS 1000 sqm	Total ha	Berth Type: No	Yard ha	CFS 1000 sqm	Total ha	Berth Type: No	Yard ha	CFS 1000 sqm	Total ha	Berth Type: No	Yard ha	CFS 1000 sqm	Total ha
Belawan International	A-3:1	5.9	10	9.9	A-3:2	13.8	22	16.0	A-2:1 A-3:1 Total 2	8.5 5.9 14.4	14 10 24	9.9 6.9 16.8	A-2:2 A-3:1 Total 3	17.0 5.9 22.9	28 10 38	19.8 6.9 26.7
Domestic	-				-				Conv. 1				B-1:1 B-2:1 Total 2	4.6 4.0 8.6	8 7 15	5.4 4.7 10.1
Panjang International	B-2:1	4.0	7	4.7	A-3:1	5.9	10	6.9	A-3:1	5.9	10	6.9	A-2:1	8.5	14	9.9
Domestic	-				-				B-2:1	4.0	7	4.7	B-1:1	4.6	8	5.4
Tanjung Priok Alternative 1 & 2 International	A-2:2 A-3:3 Total 5	17.0 20.7 37.7	28 33 61	19.8 24.0 43.8	A-2:4 A-3:4 Total 8	34.0 27.6 61.6	56 44 100	39.6 32.0 71.6	A-1:2 A-2:4 A-3:4 Totl 10	21.0 34.0 27.6 82.6	36 56 44 136	24.6 39.6 32.0 96.2	A-1:3 A-2:6 A-3:6 Totl 15	31.5 51.0 41.4 123.5	54 84 66 204	36.9 59.4 48.0 144.3
Domestic	Conv. 1				B-2:1	4.0	7	4.7	B-2:2	8.0	14	9.4	B-1: 2	9.2	16	10.8
Tanjung Priok Alternative 3 International	A-2:2 A-3:3 Total 5	17.0 20.7 37.7	28 33 61	19.8 24.0 43.8	A-2:4 A-3:4 Total 8	34.0 27.6 61.6	56 44 100	39.6 32.0 71.6	A-2:3 A-3:4 Total 7	25.5 27.6 53.1	42 44 86	29.7 32.0 61.7	A-2:3 A-3:4 Total 7	25.5 27.6 53.1	42 44 86	29.7 32.0 61.7
Domestic	Conv. 1				B-2:1	4.0	7	4.7	B-1:1	4.6	8	5.4	B-1:1 B-2:1 Total 2	4.6 4.0 8.6	8 7 15	5.4 4.7 10.1
Bojonegara InterNational	-				A-3:2	13.8	22	19.8	A-2:3 A-3:2 Total 5	25.5 13.8 39.3	42 22 64	29.7 19.8 49.5	A-1:3 A-2:3 A-3:2 Total 8	31.5 25.5 13.8 70.8	54 42 22 118	36.9 29.7 19.8 86.4
Domestic	-				B-2:1	4.0	7	4.7	B-2:1	4.0	7	4.7	B-1:1	4.6	8	5.4
Tanjung Priok Alternative 4 International	A-2:2 A-3:3 Total 5								A-2:5 A-3:2 Total 7	42.5 13.8 56.3	70 22 92	49.5 19.8 69.3	A-2:7 A-3:4 Totl 11	59.5 27.6 87.1	98 44 142	69.3 32 101.4
Domestic	-				-				B-1:1	4.6	8	5.4	B-1:1 B-2:1 Total 2	4.6 4.0 8.6	8 7 15	5.4 4.7 10.1
Bojonegara International	-				-				A-2:2 A-3:2 Total 4	17.0 13.8 30.8	28 22 50	19.8 16.0 35.8	A-1:3 A-2:1 Total 4	31.5 8.5 40.0	24 14 38	36.9 9.9 46.8
Domestic									B-2:1	4.0	7	4.7	B-1:1	4.6	8	5.4
Tg. Emas International	B-2:1	4.0	7	4.7	A-3:1	5.9	10	8.0	A-2:1	8.5	14	9.9	A-2:1 A-3:1 Total 2	8.5 5.9 14.4	14 10 24	9.9 6.9 16.8
Domestic	-				Conv. 1				B-2:1	4.0	7	4.7	B-1:1	4.6	8	5.4
Tg. Perak International	A-3:2	13.8	22	16.0	A-2:1 A-3:2 Total 3	8.5 13.8 22.3	14 22 36	9.9 16.0 27.9	A-2:2 A-3:3 Total 5	17.0 20.7 37.7	28 33 61	19.8 24.0 43.8	A-1:1 A-2:4 A-3:3 Total 8	10.5 34.0 20.7 62.5	18 56 33 107	12.3 39.6 24.0 75.9
Domestic	B-2:1	4.0	7	4.7	B-2:2	8.0	14	9.4	B-1:2	9.2	16	10.8	B-1:3	13.8	24	16.2
Uj. Pandang, International & Domestic	B-2:1	4.0	7	4.7	A-3:1	5.9	10	6.9	A-3:1 B-2:1 Total 2	5.9 4.0 9.9	10 7 17	6.9 4.7 11.6	A-2:1 A-3:1 Total 2	8.5 5.9 14.4	14 10 24	9.9 6.9 16.8

Table 5.15 Berth requirement

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

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

Table 5.16 Requirement of yard and CFS area

Port	Existing (Completed by 2003)		2003			2010		
	Yard		Required		Need	Required		Need
	Yard (ha)	CFS (sqm)	Yard (ha)	CFS (sqm)		Yard (ha)	CFS (sqm)	
Belawan	9.46 -	6,240 -	14.4 -	24,000 -	Yard expansion 4.94ha	22.9 8.6	38,000 15,000	Yard expansion 13.44 ha and 8.6 ha for Domestic yard
Panjang	10.05 -	24,400 -	5.9 4.0	10,000 7,000	enough area is available both for yard and CFS	8.5 4.6	14,000 8,000	need 3.05 ha for domestic yard
Tg Priok Alternative 1 & 2	28 -		82.6 8.0	136,000 14,000	Yard expansion 54.6 ha and domestic yard 8.0 ha	123.5 9.2	204,000 16,000	Yard expansion 95.5 ha domestic yard 9.2 ha
Tg. Priok Alternative 4	28 -		53.1 4.6	86,000 8,000	Yard expansion: 25.1 ha Domestic yard 4.6 ha	53.1 8.6	86,000 15,000	Yard expansion 25.1 ha Domestic yard 8.6 ha
Bojonegara	- -	- -	39.3 4.0	64,000 7,000	Yard construction 39.3 ha Domestic yard 4.0 ha	70.8 4.6	118,000 8,000	Yard expansion to 70.8 ha Domestic yard 4.6 ha
Tg Priok Alternative 3 Tg. Priok	28 -		56.3 4.6	92,000 8,000	Yard expansion 28.3 ha domestic yard 4.6 ha	87.1 8.6	142,000 15,000	Yard expansion 59.1 ha, and domestic yard 8.6 ha
Bojonegara	-	-	30.8 4.0	50,000 7,000	Total 34.8 ha is needed	40.0 4.6	38,000 8,000	Total 44.6 ha is needed
Tg. Emas	8.34 -		8.5 4.0	14,000 7,000	Yard expansion 4.16 ha for Domestic yard	14.4 4.6	24,000 8,000	Yard expansion 6.06ha and domestic yard 4.6 ha
Tg Perak	15.4 -		37.7 9.2	61,000 16,000	Yard expansion 22.3 ha and domestic yard 9.2 ha	62.5 13.8	107,000 24,000	Yard expansion 47.1 ha and domestic yard 13.8 ha
Uj Pandang	5.02		9.9	17,000	Yard expansion 4.88 ha	14.4	24,000	Yard expansion 9.38 ha

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

Table 5.17 Container cargo Traffic and required berths in 2010 in other port

Region	Port	Container Traffic Vol. (TEU/Y)	Required Berths & Yard(ha), CFS(1,000 sqm) area and Total Terminal area(ha)			
			Berth	Yard (ha)	CFS 1000 sqm	Total (ha)
Sumatra	Palembang	87,864	B-2:1	4.0	7	4.7
	Dumai Teluk Bay	202,680	B-2:3	12.0	21	16.0
	Jambi Benkulu	60,322	B-2:1 Conv.	4.0	7	4.7
Java	Cilacap Cirebon	14,224	Conv.			
Kalimantan	Banjarmasin Balikupapan Samarinda	388,168	B-2:5	23.5	35	20.0
	Pontianak	81.399	B-2:2	8.0	14	9.4
Sulawesi	Parepare Pantroan Kendar	108,096	B-2:2	8.0	14	9.4
	Bitung	33,470	Conv.			
Nusa Tenggara	Lamber Kupang Dili	110,268	B-2:2	8.0	14	9.4
Maluku & Irian Jaya	Ternate Ambon Solong Biak Jayapura	47,338	Conv.			

83. **Table 5.18 and 5.19** are prepared to exhibit the necessary number of container berths for the Scenario II and III of the economic growth of Indonesia. The numbers in the parentheses denote the difference with the case of Scenario I.

Table 5.18 Neccessary number of berths Scenario II

Ports	1993	2003	2010
Belawan International	A-3: 1	A-2: 1 A-3: 2 (+1)	A-2: 2 A-3: 2 (+1)
Domestic	-	B-2: 1	B-1:1 B-2:2(+1)
Panjang International	B-2: 1 -	A-3: 1	A-2: 1
Domestic		B-2: 1	B-1: 1 B-2: 1 (+1)
Tanjung Priok International	A-2: 2 A-3: 3	A-1:3 (+1) A-2:5 (+1) A-3:4	A-1: 4 (+1) A-2: 8 (+2) A-3: 9 (+3)
Domestic	Conv. 1	B-2: 2	B-1: 3 (+1)
Tg. Emas International	B-2: 1	A-2: 1	A-2: 1 A-3: 1
Domestic		B-2: 2 (+1)	B-1: 2 (+1)
Tg. Perak International	A-3: 2	A-1: 1 (+1) A-2: 3 (+1) A-3: 2 (-1)	A-1: 2 (+1) A-2: 4 A-3: 5 (+2)
Domestic	B-2: 1	B-1: 2	B-1: 4 (+1) B-2: 0
Uj. Pandang, Both International & Domestic	B-2: 1	A-3: 1 B-2: 1	A-2: 1 A-3: 1 B-1: 1 (+1)

Table 5.19 Neccessary number of berths Scenario III

Ports	1993	2003	2010
Belawan International	A-3: 1	A-2: 1 A-3: 1	A-2: 2 A-3: 0 (-1)
Domestic	-	B-2: 1	B-1:1 B-2:1
Panjang International	B-2: 1	A-3: 1	A-2: 1
Domestic		B-2: 1	B-1: 1
Tanjung Priok International	A-2: 2 A-3: 3	A-1:2 A-2:4 A-3:4	A-1: 3 A-2: 6 A-3: 5 (-1)
Domestic	Conv. 1	B-2: 2	B-1: 2
Tg. Emas International	B-2: 1	A-2: 1	A-2: 1 A-3: 1
Domestic		B-2: 2	B-1: 1
Tg. Perak International	A-3: 2	A-2: 2 A-3: 3	A-1: 1 A-2: 3 (-1) A-3: 3
Domestic	B-2: 1	B-1: 2 B-2:	B-1: 3 B-2: 1 (+1)
Uj. Pandang, Both International & Domestic	B-2: 1	A-3: 1 B-2: 1	A-2: 0 A-3: 2

5.2.3 Construction schedule

84. The phased construction schedule should be introduced in accordance with the growth of the traffic. **Figures 5.6 - 5.14.** show the proposed construction schedule for respective port drawn for the case of Scenario I.

85. For the case of Ujung Pandang, it is assumed that both international and domestic containers are handled at the same terminal, because the volume of International container cargoes is smaller than that of domestic and it seems to be more efficient to handle these containers together in the same terminal.

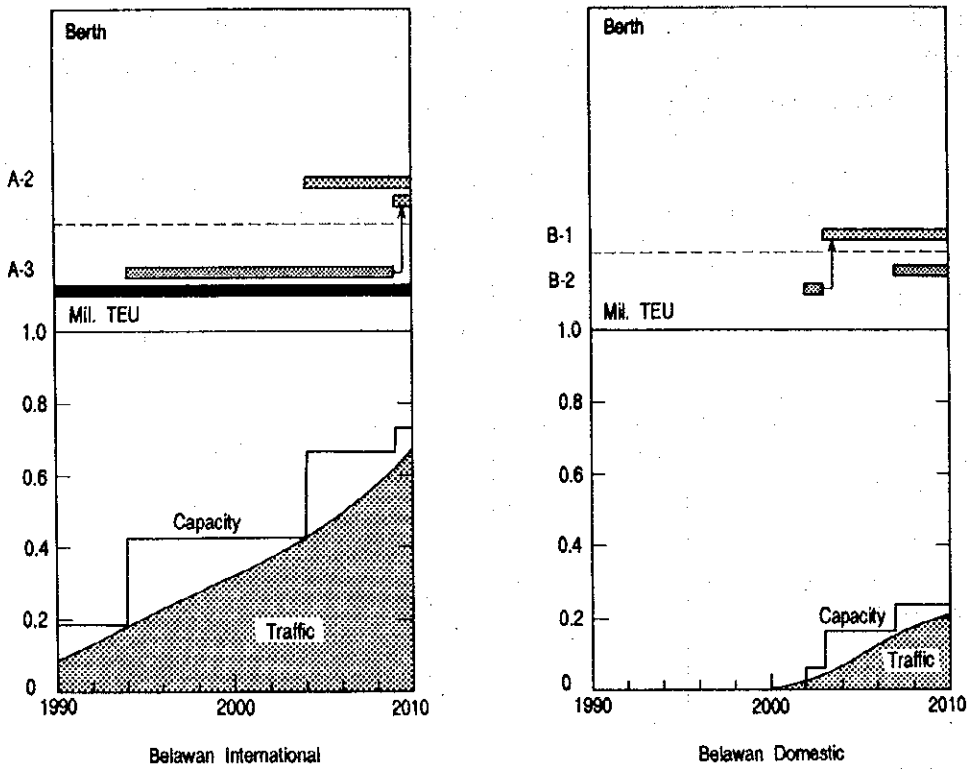


Fig. 5.6 Container Cargo Traffic and Container Wharf Construction Plan (1): Belawan

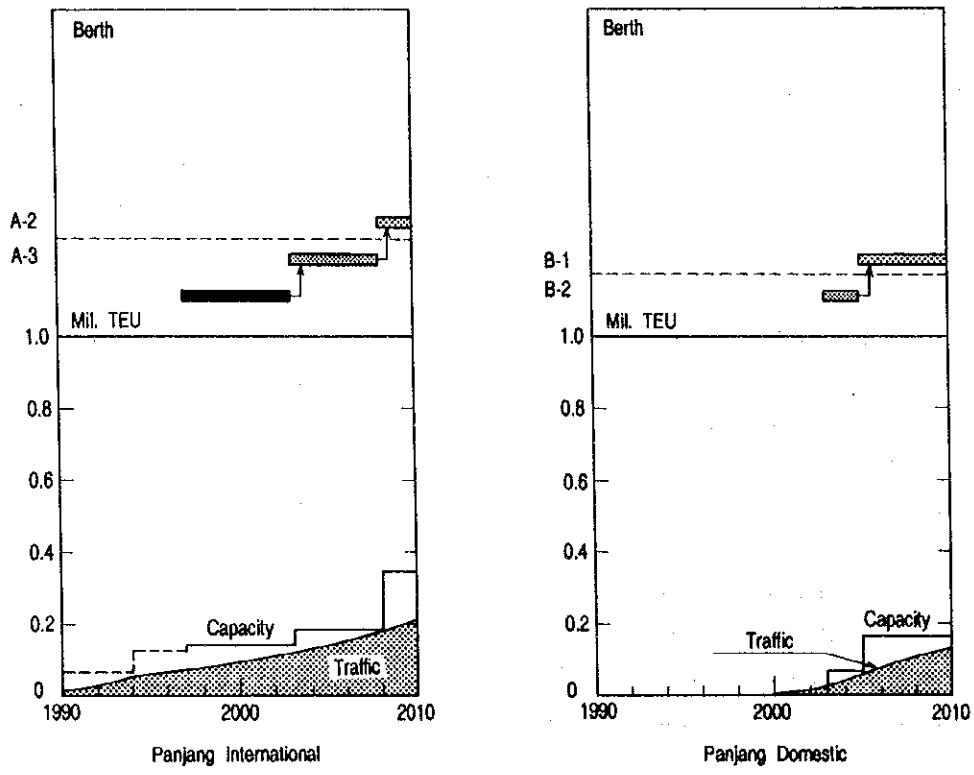


Fig. 5.7 Container Cargo Traffic and Container Wharf Construction Plan (2): Panjang

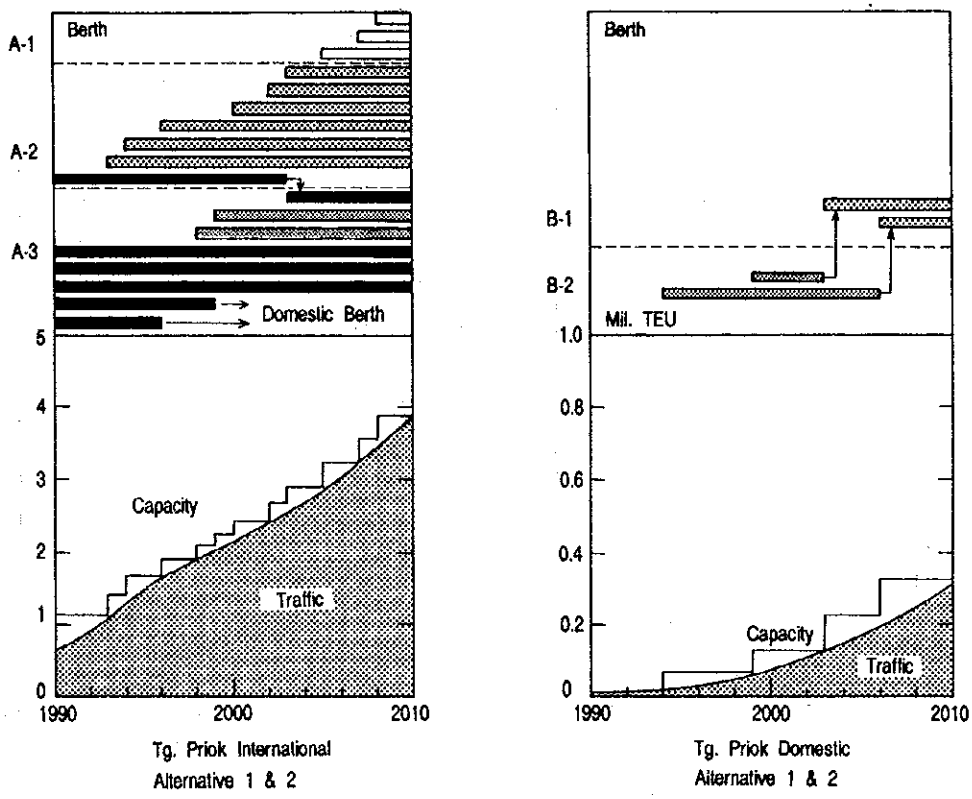


Fig. 5.8 Container Cargo Traffic and Container Wharf Construction Plan (3-1) : Tanjung Priok

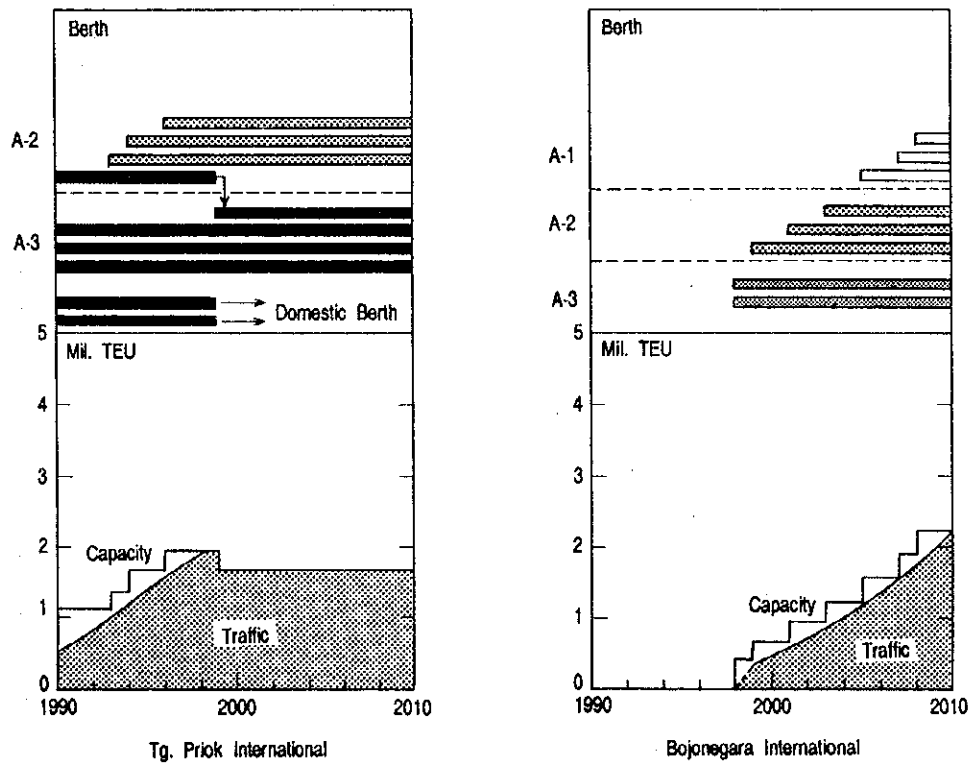


Fig. 5.9 Container Cargo Traffic and Container Wharf Construction Plan (3-2) : Tanjung Priok (Alternative 3) in combination with Bojonegara Port

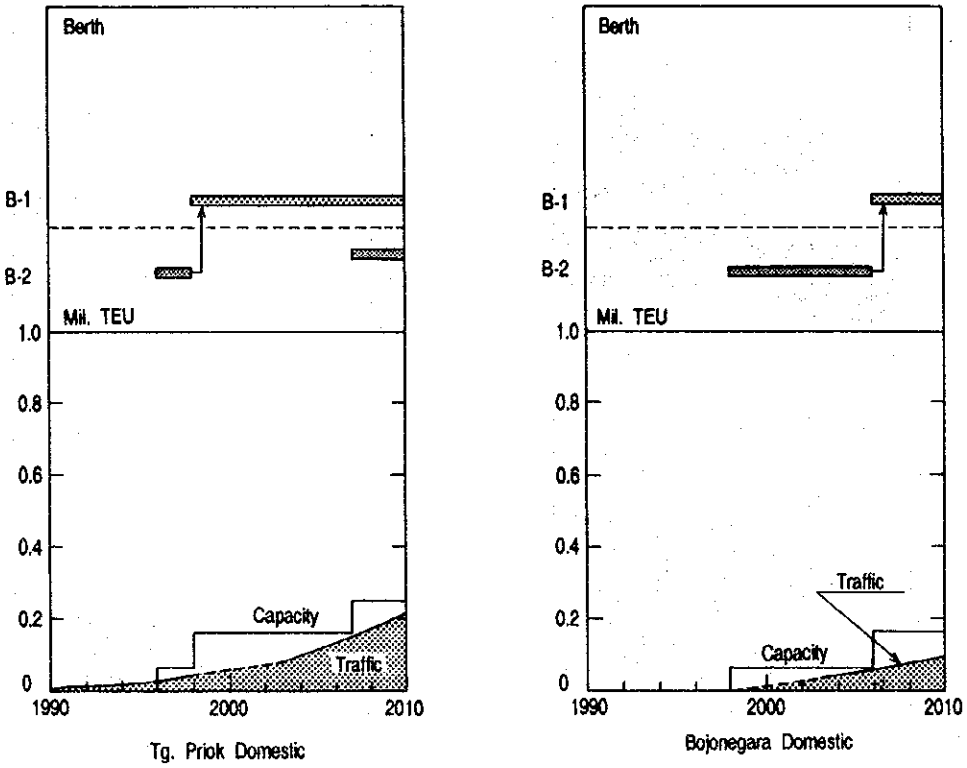


Fig. 5.10 Container Cargo Traffic and Container Wharf Construction Plan Tanjung Priok (Alternative 4) in combination with Bojonegara Port (Domestic Berth)

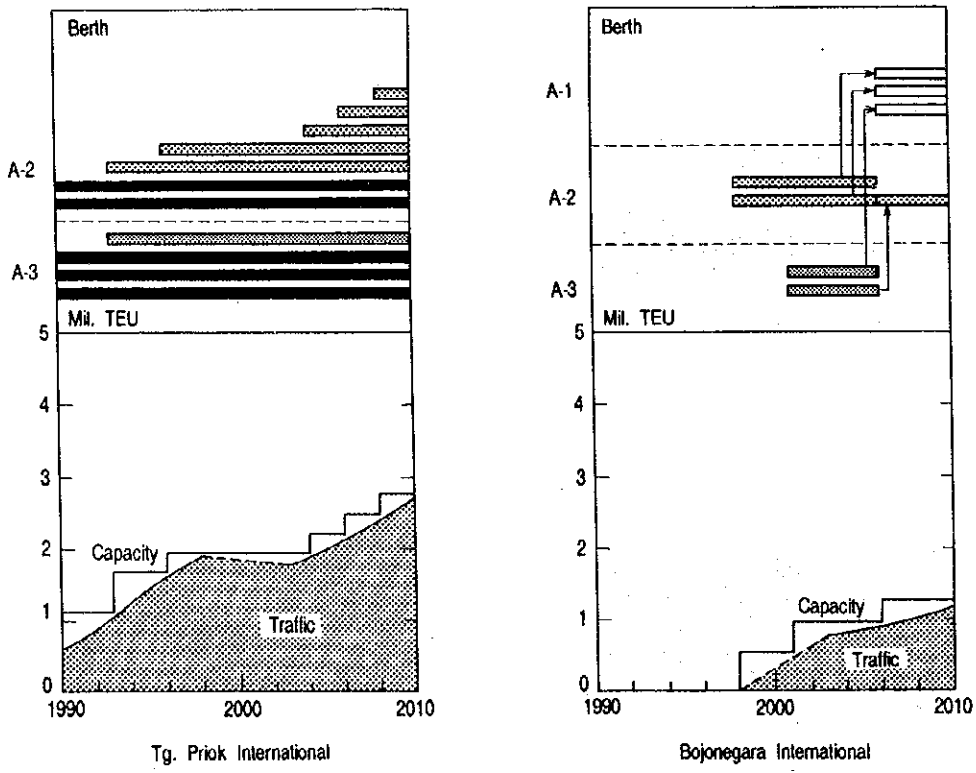


Fig. 5.11 Container Cargo Traffic and Container Wharf Construction Plan Tanjung Priok (Alternative 4) in combination with Bojonegara Port

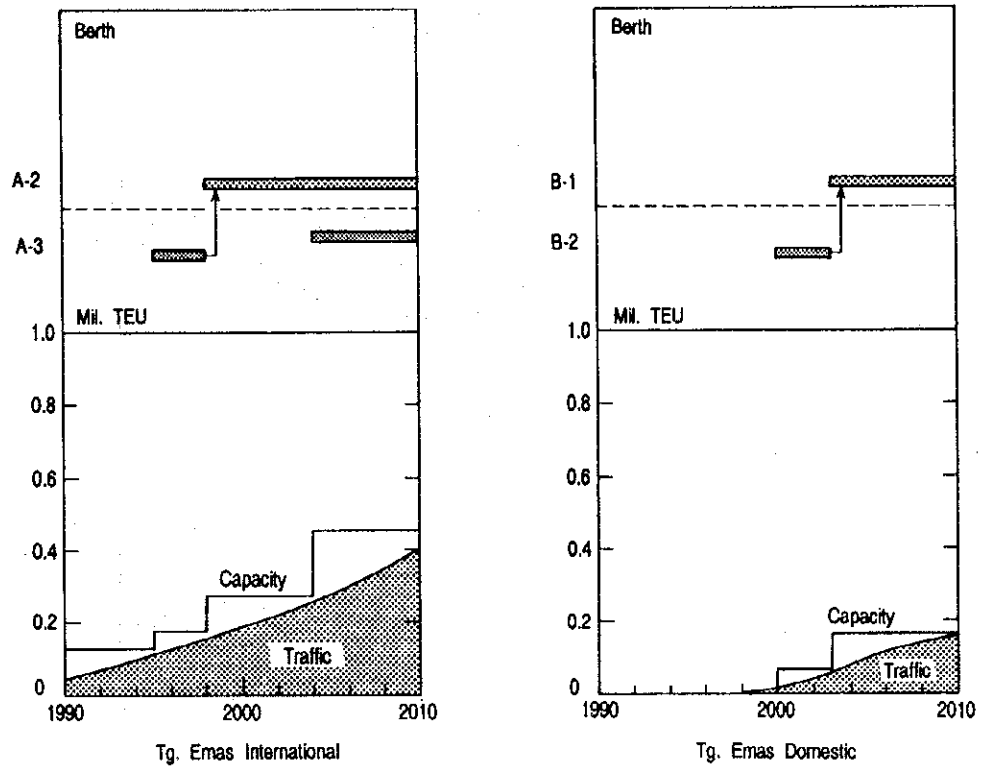


Fig. 5.12 Container Cargo Traffice and Container Wharf Construction Plan (4) : Tanjung Emas

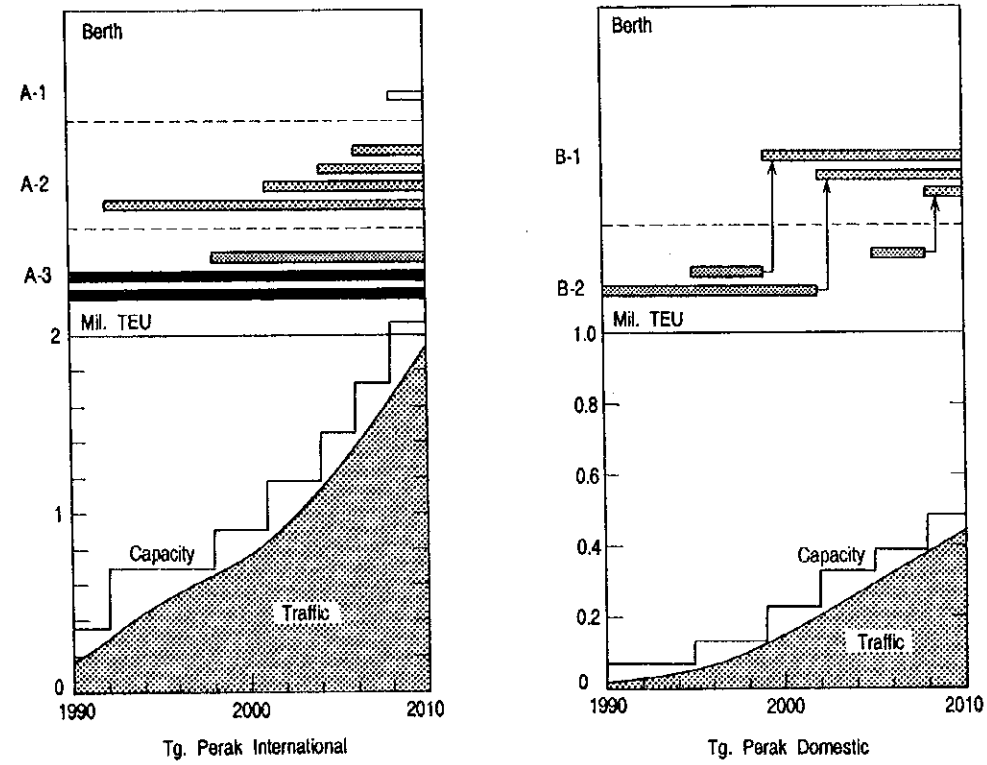


Fig. 5.13 Container Cargo Traffice and Container Wharf Construction Plan (5) : Tanjung Perak

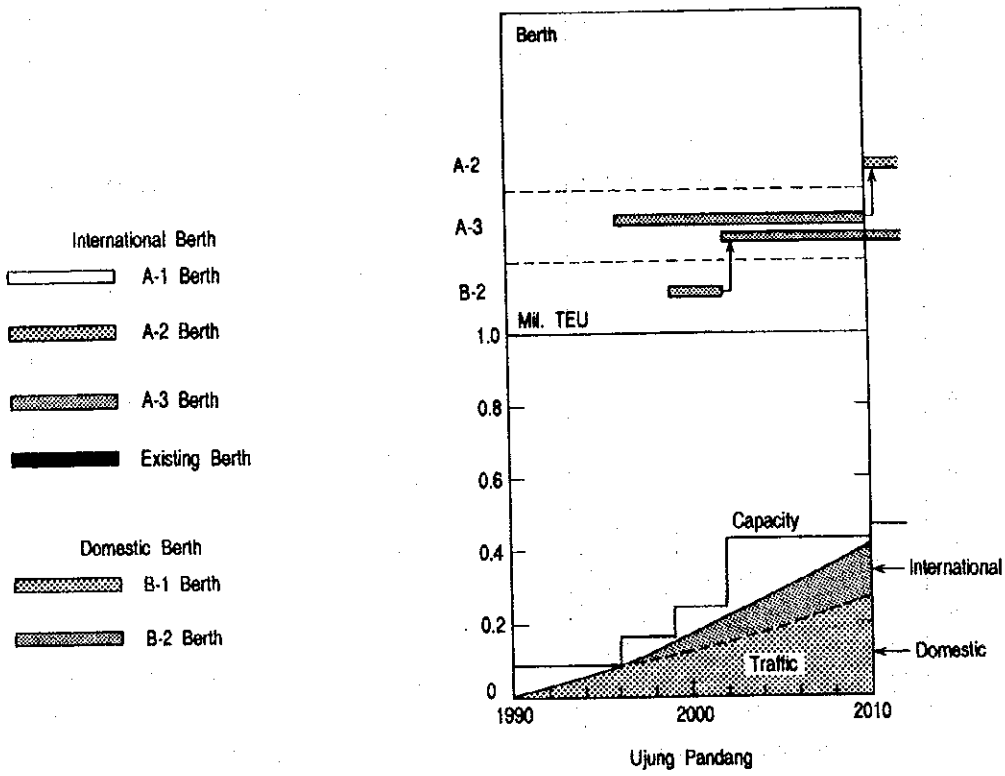


Fig. 5.14 Container Cargo Traffice and Container Wharf Construction Plan (6)

5.3 LONG-TERM IMPROVEMENT PLAN OF MANAGEMENT AND OPERATION OF CONTAINER CARGO HANDLING PORTS

5.3.1 Cope for Modernization of Management and Operation in Ports

(1) Existing situation of Management and Operation

1) Existing situation of Port Corporations

a) Employee

86. **Table 5.20** shows numbers of employee, classified by class, of each 4 Port Corporations. In 1993, the 4 Port Corporations have 11,855 employee in total. Since they manage 110 commercial ports, each port is managed by 108 persons in average. Ports in the lower ranks are actually managed by 10 to 20 persons, so that it can be observed that large number of employee is concentrated on the main ports.

87. The breakdown of the employee classified by head office and branches, functions, school career and age brackets are shown in **Table5.21-5.25.**

b) Scope of business

88. Port Corporations established at present are shown in **Table 2.11.** Port corporation was shifted to stock corporation from the public corporation (PERUMPEL) in December 1992 on governmental regulations No.56-59, October 1991.

89. The public corporation is established in 1983 as one of the governmental basic policy which is founded on "Integrated Sea Transport Study : ISTS". The public corporation was hoped that it was managed financially independent adapting corporation accounting system in order to simplify and rationalize port management and operations in Indonesia and to achieve the efficient port management which keeps international competitive power.

90. But there still remained public spirits and they could not maximize to seek a profit. In order to make the port management more flexible, the Governmental regulation No.56-59,1991 regulates that a corporation can establish a joint company with private

corporations aiming at increase of revenue.

91. The governmental regulation also regulates that PT carries out the following items concretely as for the port management.

(1) Preparation for navigation route and wharf.

(2) Service for navigation.

(3) Preparation for loading/unloading facility.

(4) Preparation for transit sheds, yard, and cargo handling equipment.

(5) provision of buildings and land which contribute to maritime and land transportation.

(6) Preparation for road, drainage and electricity facilities.

(7) Terminal services.

(8) The other services to accomplish the purposes of the projects.

c) Business performance

92. In 1993, the total business performances of Port Corporations is, as shown in **Table 5.25**. The revenues and profits of Port Corporations are 546.5 billion rupiah and 187.0 billion rupiah. Its average operation ratio is 66%. The business condition can be said good relatively.

93. As for Port Corporation III, the surplus amount have decreased from 1992 due to the start of repayment of loan.

94. As for Port Corporation IV, the surplus amount is very small as compared with Port Corporation II, and it seems to be due to the fact that Port Corporation IV handles less cargo volume especially container cargo which is most profitable and didn't have such a large and profitable port as Tanjung Priok in Port Corporation II, and Tanjung TPerak in Port Corporation III.

Table 5.20 Employee of Port Corporations by Class

1993

Class	I	II	III	IV	Total
I	284	1,008	785	264	2,341
II	915	3,589	1,957	839	7,300
III	390	656	405	240	1,691
IV	27	33	22	19	101
Others	0	0	313	109	422
Total	1,616	5,286	3,482	1,471	11,855

Source: Port Corpolation I~IV

Table 5.21 Employee of Port Corporations by Head Office & Branches

1993

Port Corporation	I	II	III	IV	Total
Total	1,616	5,286	3,482	1,471	11,855
a. Port					
Number	24	29	33	24	110
Employee by port	67	182	106	61	108
b. Head Office					
Employee	276	455	279	148	1,158
%	17.1	8.6	8.0	10.1	9.8
c. Highest Port	Belawan	Tg. Priok	Tg. Perak	Makassar	Total
Employee	638	2,845	1,132	288	4,903
%	39.5%	53.8%	32.5%	19.6%	41.3%
Cargo Volume ooot	10,940	23,800	17,220	4,080	56,040
(per employe)	17.1	8.6	15.2	14.2	11.4
d. Main Port		Panjang	Tg. Emas		
Employee		275	440		
%		5.2%	12.6%		
Cargo Volume ooot		7,670	3,850		
(per employe)		27.8%	8.7%		

Source: Port Corpolation I~IV

Table 5.22 Employee of Port Corporations by Function

1993

Class	I	II	III	IV	Total
Staff	666	1,891	1,602	731	4,890
	,41.2%	,35.8%	,46.0%	,49.7%	,41.2%
Branch Staff	255	530	329	120	1,234
	,15.8%	,10.0%	,9.5%	,8.2%	,10.4%
Assistant Staff	417	1,944	1,124	472	3,957
	,25.8%	,36.8%	,32.3%	,32.1%	,33.4%
Management Staff	270	447	273	148	1,138
	,16.7%	,8.4%	,7.8%	,10.0%	,9.6%
Others	8	474	154	0	636
	,0.5%	,9.0%	,4.4%	,0%	,5.4%
Total	1,516	5,286	3,482	1,471	11,855

Source: Port Corpolation I~IV

Table 5.23 Employee of Port Corporations by School Career

1993

Education	I	II	III	IV	Total
University & Graduate School	145	386	211	153	895
	,9.0%	,7.3%	,6.0%	,10.4%	,7.5%
Technical College	122	345	185	115	767
	,7.6%	,6.5%	,5.3%	,7.8%	,6.5%
UpperSecondary	854	2,969	1,682	765	6,270
	,52.8%	,56.2%	,48.3%	,52.0%	,52.9%
Secondary	275	858	789	240	2,162
	,17.0%	,16.2%	,22.7%	,16.3%	,18.2%
Elementary	220	728	615	198	1,761
	,13.6%	,13.8%	,17.7%	,13.5%	,14.9%
Total	1,616	5,286	3,482	1,471	11,855

Source: Port Corpolation I~IV

Table 5.24 Employee of Port Corporations by Age

1993

Age	I	II	III	IV	Total
< 25	12	338		41	
26 ~ 35	309	1,117	,(703)	196	,(2,716)
36 ~ 45	809	2,354	2,019	747	5,929
46 ~ 55	409	1,371	,(760)	449	,(3,210)
> 56	77	106		38	
Total	1,616	5,286	3,482	1,471	11,855

Source: Port Corpolation I~IV

Note: Port Corporation III <30 174
31~35 529
46~50 459
>50 301

95. In financial aspects, three head offices except Port Corporation I has deficit in 1993 as shown in **Table 5.26-5.29.** It can be commonly said in all four Port Corporations that many ports in lower ranks also show a loss. Those losses are made up for by the considerable profits which they earn at main ports.

96. The business performance of Port Corporation I in 1993 is shown **Table 5.26.** The operating profit is less than 37.8 billions rupiah which increased about 10% compared with the last year. Operating ratio (expense/revenue) is 51.75%. The operation condition can be said relatively good.

97. The business performance of Port Corporation II in 1993 is shown in **Table 5.27.** The revenue and profit of the year are 286.0 billion and 109.8 billion rupiah respectively. This figure is the biggest among four Port Corporations. Particularly, about 80 % of the total profit is brought about that of 2 branch offices in Tanjung Priok port.

98. The head office and 10 branches (Offices) have deficits. The total loss of 18.83 billion rupiah is made up by profits of the branch offices in Tanjung Priok. Its operation ratio is 62% and the operating ratio is considered to be not so bad on the whole.

99. As for the business performance of Port Corporation III in 1993, the revenues and the profit are 137.2 billion rupiah and 25.75 billion rupiah respectively (see **Table 5.28**), which are the second largest among four Port Corporations. The share of revenues from Tanjung Perak, Tanjung Emas and 3 branches is 80% of all revenues of Port Corporation III. Among Port Corporation III, the head office and 19 branches have deficits. Total loss reaches 6.05 billion rupiah, but it is covered by the above revenues. Since its operating ratio exceeds 80%, it is difficult to say that the operating condition is good.

100. As for the business performance of Port Corporation IV in 1993, the revenue and the profit count 45.1 billion rupiah and 13.6 billion rupiah respectively (see **Table 5.29**). This figure is the smallest among 4 Port Corporations. Macassar (Ujung Pandang) Port and Balikpapan Port earn almost a half of the whole revenue. The head office and 3 branches of PT IV have deficits but 15% of the surplus is used to make up for the deficit. The operating ratio is 70%. The operating condition is considered not so serious but far from desirable.

2) Existing situation of Main Ports

a) Belawan port

101. Belawan port branch is in the highest ranking and has 638 employees. The port is one of the only three commercial ports that have full container terminals in Indonesia. But the port is different from the other two ports, namely Tanjung Priok and Tanjung Perak, because the management and operation of container terminals are carried out combined with those of conventional wharves.

102. The revenue and profit of Belawan port is 40.8 billion rupiah and 17.1 billion rupiah in 1993. (show **Table 5.30**) The revenue and operating profit of the port is 52% and 45% of total Port Corporation I respective.

b) Pangjang port

103. Panjang port branch is affiliated Port Corporation II, and makes much profit following branches in Tanjung Priok port, its Container terminal and Banten port. The branch has 275 employees. This figure is the smallest of 6 main ports in this study. And also this figure is less than numbers of employee in Macassar port whose cargo handling volume is a half of that of Panjang port or smaller port. This port don't have exclusive container berths and terminals, so containers are handled at the conventional wharves.

c) Tanjung Priok port

104. In Tanjung Priok port, there are two branch offices. One manages conventional wharves handling mainly general cargoes, and the other manages container terminals. Both of them are affiliated by Port Corporation II. Two branches have 2,845 employee in total. Container terminal branch earns twice in revenue, three times in profit, compared with Tg. Priok branch which manages conventional wharves.

105. In 1993, The revenue and profit of the two branches are 217.4 billion rupiah (76 % of total Port Corporation II) and 117.6 billion rupiah (107 % of total Port Corporation II) respectively (see **Table 5.30**). The operating condition of Tanjung Priok port branch is considered to be fair, judging from the fact that its operation ratio is 62%. Whereas,

operation condition of container terminal branch can be said good since its operating ratio is 37%.

d) Tanjung Emas port

106. Tanjung Emas branch is managed by Port Corporation III. In managing areas of Port Corporation III, it makes the third largest profit following Tanjung Perak branch and its container terminal branch. Port Corporation III has 454 employee. Since it doesn't have facilities for a full container terminal, container cargoes are handles mixed with general cargoes at conventional wharves. Its operating ratio is about 80%. The operation condition can not be said so good (see **Table 5.30**).

e) Tanjung Perak port

107. In Tanjung Perak, there are 2 branches which manages conventional wharves and container terminal respectively and both of them are belong to Port Corporation III. The revenues earned by the two branches are almost same. However, their profits are different by four times because as for expense, costs of container terminal branch is more than that of the other.

108. The total number of employee of the two branches is 1,122. Its operating ratio is shown 57%(see **Table 5.30**). On the whole, the operating condition is considered to be good. However, operating ratio of container terminal branch in 1993 is 89% and it can not be said it is in good condition.

f) Macassar (Ujung Pandng) Port

109. Macassar (Ujung Pandang) Port branch is the branch which ranks in the highest level within managing areas of Port Corporation IV and has 288 employee. The share of its revenue and operating profit in 1993 are 23% and 32% of total those of Port Corporation IV respectively(see **Table** 5.25 and 5.30). Its revenue is slightly less than that of Balikpapan Port branch which is in the first rank and its profit counts two thirds of that of Balikpapan Port branch. However, the operation ratio of the branch is 57% and it is not in so bad condition.

(2) Existing issues of Management and Operation

110. In financial aspects, the three head offices except Port Corporation I have deficit in 1993 as shown in **Table 5.20-5.23.** It can be commonly said in all four Port Corpolations that many ports in lower ranks also show a loss. Those losses are made up for by the considerable profits which they earn at main ports.

111. The number of employee at head office of Port Corporation I is twice as many employee as those of the other 3 Port Corporations.

112. The delays in official procedures such as disposal of properties inherited from the public corporation (the forerunner of Port Corporation I) and payments of income tax etc. can be seen in Port Corporation I.

113. The number of employee of Port Corporation II is largest among four Port Corporations. Many branches of Port Corporation II including the HEAD office show a loss.

114. Port Corporation III has large number of employee followed by Port Corporation II and also many branches show a loss.

115. As shown in the **Table 5.21**, cargo handling volume per one employee at Panjang port is the largest among the main ports. Although number of persons required for handling of a certain volume of cargoes is difficult to decide simply because of various conditions, it can be said that compared with other ports, Panjang Port are in the condition that more sufficient port management and operation are difficult to be done at least.

(3) Possible Coutermeasures of Management and Operation

116. From the management point of view, reduction of personnel is considered to be necessary. However, the conclusion of this subject should be drawn after sufficient examinations of necessary matters such as national conditions, or labor problems, social customs etc..

117. As a course of actions that should be taken, a determination of the desirable

organization necessary for effective management, a study of streamlining plans of branches, a review of volume of jobs at each division and section and determination of a reorganization plan and a proper number of personnel should be carried out as the first step.

118. As a next step, a proper plans for reshuffling of personnel and for personnel reduction should be made and implemented. For corporation management, it is important to keep a organization slender as much as possible. This will contribute to reduction of operating expenses (personnel cost and official expenditure).

119. On the other hand, it is also required to improve the ability of employee through improvement of training systems. For more stable management with a favorable financial condition, the most essential thing is to control expenditure of Port Corporations at first and then to increase profits.

120. It is commonly said in four Port Corporations that necessity for the port promotion is not well recognized. A positive port sale is proposed to acquire new port users engaged in foreign trade and to increase handling volumes of cargoes and port revenues.

121. Another way to increase revenue is to conduct new businesses related to port activities from the multiple management point of view. That is, the investment to related new businesses (according to the governmental ordinary) which is the main peculiarity of the shift from public corporation to joint-stock corporation of Port Corporations is to be considered positively.

122. The above mentioned matters are considered to be applied to four Port Corporations and all branches.

123. Port Corporation I is required to reduce staff of the head office balancing with the average staff ratio belonging to head office of four Port Corporations. The head office which does not make profit directly should be a small organization with a limited number of competent personnel as much as possible.

124. Considering an increase of amount of container cargoes in the future, it should be examined to make a proper container management and operation system in Belawan

Port. Namely, whether it is good or not to promote its container terminal to a branch office as in the Tanjung Priok and Tanjung Perak and to manage and operate the terminal with more clear purposes and problem consciousness to increase demand of container cargoes is the point that should be examined.

125. The plans for a proper management and operation system should be decided and implemented based on opening of new container terminals in the near future and the personnel plan of the whole Port Corporation II.

Table 5.25 Profit & Loss Statement by Port Corporations in 1993

(000RP)

Port Corporation	I	II	III	IV	Total
a. Total Revenue					
(1) Budget	79,585,359	283,007,129	123,696,796	45,192,847	531,482,131
(2) Realization	78,183,208	286,011,206	137,198,965	45,091,179	546,484,558
(3) Implement Ratio	98.2%	101.1%	110.9%	99.8%	102.8%
b. Total Expence					
(4) Budget	45,295,914	161,600,426	94,730,762	33,032,680	334,659,782
(5) Realization	40,426,486	176,172,952	111,445,237	31,447,237	359,491,912
(6) Implement Ratio	90.2%	109.0%	117.6%	95.2%	107.4%
c. Profit(Loss)					
(7) Budget	34,289,445	121,406,703	28,966,034	12,160,167	196,822,349
(8) Realization	37,756,722	109,838,254	25,753,728	13,643,942	186,992,646
(9) Implement Ratio	110.1%	90.5%	88.9%	112.2%	95.0%
d. Operation Ratio	51.7%	61.6%	81.2%	69.7%	65.8%

Source : Port Corporation I ~ IV

Table 5.26 Profit and Loss Statement in 1993

Port Corporation I (000RP)

Head Office & Branch	Revenue	Cost	Profit or Loss	Operating Ratio
Head Ofiice	11,078,607	378,236	10,700,371	3.4%
Belawan	40,773,470	23,711,131	17,062,339	58.2%
Dumai	9,971,088	7,638,896	2,332,192	76.6%
Lhokseunave	6,782,208	1,903,252	4,878,956	28.1%
Tg. Pinang	4,538,756	2,139,238	2,399,518	47.1%
Pekanbaru	2,436,997	1,578,794	858,203	64.8%
Tengilanan	554,175	324,419	229,756	58.5%
Tg. Balai Asanan	366,266	347,238	19,028	94.8%
Sibolga	413,576	479,038	-65,462	115.8%
Nalanayati	399,320	737,328	-338,008	184.6%
Meulaoh	49,085	169,522	-120,437	345.4%
Kuala Langsa	212,785	180,442	32,343	84.8%
Guhung Sitoli	164,763	187,967	-23,204	114.1%
Selat Panjang	171,416	250,020	-78,604	151.7%
Bengkalis	140,365	196,707	-56,342	140.1%
Rengat	130,331	204,258	-73,927	156.7%
Total	78,183,208	40,426,486	37,756,722	51.7%

Source : Port Corporation I

Table 5.27 Profit and Loss Statement in 1993

Port Corporation II (000RP)

Head Office & Branch	Revenue	Cost	Profit or Loss	Operating Ratio
Head Office	11,010,395	22,997,712	-11,987,317	208.8%
Tg. Priok	74,602,384	46,337,766	28,264,618	62.1%
UTPK	142,822,504	53,446,732	89,375,772	37.4%
Panjang	9,945,432	7,329,219	2,616,213	73.7%
Palenbang	7,766,278	7,898,277	-131,999	101.7%
Tejuk Bayur	4,580,808	7,990,251	-3,409,443	174.4%
Pontianak	2,858,639	3,413,855	-555,216	119.4%
Cirebon	4,146,662	4,177,387	-30,725	100.7%
Banten	13,845,447	6,378,909	7,466,538	46.1%
Sunda Kelapa	3,540,150	2,678,996	851,154	75.6%
Jambi	1,498,088	1,413,807	84,281	94.4%
Bengkulu	1,462,015	3,056,413	-1,594,398	209.1%
Pangkal Balan	571,396	648,670	-77,274	113.5%
Tg. Pandan	638,302	666,055	-27,753	104.3%
Sintete	131,448	260,104	-128,656	197.9%
RSI	6,394,423	6,796,986	-402,563	106.3%
BPDL	196,835	681,813	-484,978	346.4%
Total	286,011,206	176,172,952	109,838,254	61.6%

Source : Port Corporation II

Table 5.28 Profit and Loss Statement in 1993

Port Corporation III (000RP)

Head Office & Branch	Revenue	Cost	Profit or Loss	Operating Ratio
Head Office	3.074.150	8.843.391	-774.241	109.6%
Tg. Perak	45.107.469	25.541.968	19.565.501	56.6%
LTPK	45.490.653	40.322.025	5.168.628	88.7%
Tg. Emas	15.120.074	12.023.020	3.097.054	79.5%
Gresik	3.319.850	957.737	2.362.053	28.9%
Probolinggo	929.507	884.278	45.229	95.1%
Meneng/Banyuwangi	1.317.697	992.712	324.985	75.3%
Benoa	2.031.996	1.199.033	832.953	59.0%
Sampit	645.718	635.507	11.211	98.3%
Kota Baru	1.228.465	831.698	396.767	67.7%
Banjarmasin	5.680.535	9.115.912	-3.435.377	160.5%
Cilacap	2.831.022	2.896.765	-65.743	102.3%
Lember	408.329	461.920	-53.591	113.1%
Tenau/Kupang	635.944	842.915	-206.971	132.5%
Pasuruan	145.938	199.682	-53.694	136.8%
Katianget	60.841	188.440	-127.599	309.7%
Tegal	357.247	491.351	-134.104	137.5%
Celukan Bawang	167.416	209.485	-42.069	125.1%
Badas	126.057	170.210	-44.153	135.0%
Bima	181.193	231.176	-99.983	155.2%
Waingapu	139.862	218.353	-78.491	156.1%
Ende	131.126	254.738	-123.612	194.3%
Maumere	134.857	199.656	-64.799	148.1%
Kalabahi	93.068	199.441	-106.373	214.3%
Dilli	604.589	652.737	-48.148	108.0%
Pangkalan Bun	269.457	427.869	-158.412	158.9%
Kuala Kapuas	304.633	425.379	-121.746	140.0%
RSP	1.660.222	1.971.781	-311.559	118.8%
Total	137.198.955	111.445.234	25.753.731	81.2%

Source : Port Corporation III

Table 5.29 Profit and Loss Statement in 1993

Port Corporation IV (000RP)

Head Office & Branch	Revenue	Cost	Profit or Loss	Operating Ratio
Head Office	4.509.357	6.974.821	-2.465.464	152.0%
Makassar	10.141.682	5.795.565	4.346.117	57.2%
Balikpapan	10.716.077	3.888.531	6.827.546	36.3%
Samarinda	3.586.648	2.172.109	1.414.539	60.6%
Bitung	3.670.348	2.762.967	907.381	75.3%
Ambon	3.362.053	2.132.285	1.229.768	63.4%
Sorong	1.244.344	1.180.603	63.741	94.9%
Jayapura	956.943	686.284	270.659	71.7%
Tarakan	1.489.134	1.283.378	205.756	86.2%
Pantoloan	1.524.194	1.196.625	327.569	78.5%
Ternate	1.120.637	936.996	183.641	83.6%
Kendari	429.011	344.579	84.432	80.3%
Pare-Pare	533.434	427.849	105.635	80.2%
Biak	617.193	536.323	80.870	86.9%
Merauke	267.106	287.560	-20.454	107.7%
Manokwari	269.444	279.877	-10.433	103.9%
Fak-Fak	243.177	244.239	-1.062	100.4%
Gorontalo	329.347	316.646	12.701	96.1%
Total	45.010.179	31.447.237	13.562.942	69.9%

Source : Port Corporation IV

Table 5.30 Profit and Loss Statement by Main Ports in 1993

(000RP)

	Belawang	Panjang	Tg. Priok	Tg. Emas	Tg. Perak	Uj. Pandang	Total
a. Total							
(1) Revenue	40,773,470	9,945,432	217,424,888	15,120,074	90,598,121	10,141,662	384,003,647
(2) Expenses	23,711,131	7,329,219	99,784,489	12,023,020	65,734,129	5,795,662	214,377,650
(3) Profit (Loss)	17,062,339	2,616,213	117,640,390	3,079,054	24,734,129	4,346,117	169,478,242
(4) Operating ratio	58.2%	73.7%	45.9%	79.5%	72.7%	57.2%	64.5%
b. Total of Cargo (000 t)	10,940	7,670	23,800	3,850	17,220	4,080	67,560
c. Container Terminal							
(5) Revenue			142,822,504	-	45,490,653	-	(188,313,157)
(6) Expenses	-	-	53,446,732	-	40,322,025	-	(93,768,757)
(7) Profit	-	-	89,375,772		5,168,628		(945,444,000)
(8) Operating ratio	-	-	37.4%		88.6%		
d. Total of Container Cargo (000 t)	1,350	330	9,650	707	-	405	(12,442)
e. Total of Container (000 TEU)	152	40	1,060	79	324	47	1,702

Source: Port Corporation I～IV

5.3.2 A Bout for Privatization in Management and Operation of Container Terminal

(1) Significance of Privatization

1) The Forms of Privatization in Port sector

126. "Privatization" is really a generic term, which can encompass anything from, on the one hand, a complete sell-off of the port assets to the private sector, as was envisaged in the 1981 privatization of the National Transport Docks Board, all the way, on the other hand, to a management contract. The following **Table 5.31** illustrates progressively increasing degrees of private participation:

Table 5.31 Degrees of Private Participation

No.	Owned and Operation
1	Publicly Ownde and Operated Port
2	Private Stevedoring in Publicly Owned Facility
3	Private Shoe-side Cargo-Handling and Stevedoring in Public Facility
4	Private Operating Concession in Public Facility
5	Privately Owned an Operated Terminal

127. To conclude therefore, based on experience in the industralised countries to-date, port reforms may include:

a) outright privatization as in the U.K
b) the granting of concessions or leases to private sector operators, as in most U.S. and many European ports
c) the establishment of mixed public/private commercial enterprises for port operations as in New Zealand since 1988
d) simulated competitive behavior, based on contract-plans, etc

128. Near the center of such a continuum would be a lease or concession to a

terminal operator, the most common (and successful) from of private participation which is currently practiced in most ports of the U.S.A and Western Europe.
Namely, in the industralised countries to-date, Cargo-handling is undertaken almost exclusively by private commercial companies

129. Conversely, responsibility for dredging, the provision of navigational aids and the regulation of shipping movements are almost always the responsibility of public authorities who are also, usually, mainly responsible for the provision of the cargo-handling infrastructure-quays, jetties etc.

130. Central or local government have constructed port infrastructure for which are not always required to show any financial recovery, as the economic benefits (though not always calculated) are seen as largely external to just the port, and assumed to exceed the investment costs.

131. The operation on the quays however, and not just on board the ship is left entirely to private concessionaires or lessees, with the public interest protected, where there is little or no competition, by the nature of the concessionary agreement which precludes long-term exclusivity and thus makes the service contestable by others.

132. Given the problems inherent in a private company being responsible for certain functions of a harbor authority and the current position as respects the administration of harbors in developed countries there do seem to be grounds for caution before seeking to persuade the governments of developing countries that their major harbors, including the navigational safety functions and the integration of port area, should generally be managed by private companies.

133. At the same time, it seems clear that governments of developing countries should be advised that cargo-handling activities and terminal operation that is required the special knowledge should always be undertaken by private commercial companies, although appropriate mechanisms for the protection of the public interest need to be developed in such cases, especially where competition is limited.

2) Successful instances of privatization in developed countries

134. The way that adopted by the Thailand government is a good instance of the

privatization. Namely, the government owns the basic infrastructure and provides dredging navaids and pilotage through its harbor department concessions the operation of the ports by tender to private operators decides on upper and lower limits within which the operator may charge tariffs and is paid a fixed concession charge and a part of the revenue to recover public investment. It also has a Management Committee to monitor compliance of the port operating company.

135. Many developing countries whose ports are controlled and operated by public authorities and whose governments were concerned about their inefficiency, began to take a keen interest in the concept of greater private involvement, not only as a way of rendering operations more efficient, but also as a way of mobilizing investment capital from the private sector, thus freeing government resources for other purposes. Several developing countries have begun by concessioning certain port operations to the private sector.

136. The Malaysian government has contracted with an mixed consortium the operation of the container terminal in port Kelang, as has the Philippine government in Manila. Other countries, such as Argentina and Panama, are also preparing amendments to their laws which will permit the private operation of their ports.

3) Private participate for port operation

137. One of the tried methods of making ports more market oriented, is by increasing private participation in operational activities. Although over all responsibility for the operation of the ports should be that of such an authority, most operations within the ports themselves are best left to commercial companies, be they private, mixed or public, operating on a market-oriented basis.

138. There are a number of port functions, however, that have remained, and apparently need to remain, in the public domain. These mainly concern navigational safety, i.e. buoys, lights, vessel traffic control, dredging of access channels, and environmental matters. They are issues of strategic or social consequence that the private sector would ignore if left unregulated.

139. It is recommended, at the ports level that treat the high public qualitied general cargoes, that the ownership of the fixed assets, and particularly the land and basic

infrastructure, remain in the public sector (either the local or national government).

140. The easiest route to greater private participation in the ports is that of leasing or granting operating concessions to interested private parties.

141. 1.29 the operators in the ports do so on the basis of negotiated leases and/or concessions (Annex 2) which are annexed) which may be either long-term, where the lessee makes substantial investments in a terminal, or short-term, where the traffic seems conjectural. Short-term concessions, renewable under agreed conditions, make for a more contestable situation and are therefore a means of regulating potential monopoly excesses. 4.5 Legislative or regulatory measures may be needed to change the status or the individual ports to that of autonomous enterprises or even companies with appropriate public accountability. 4.5 c. Commercial flexibility and Private Participation: This consists of letting individual port managements market their services and make agreements with port users e.g., leasing, concessions,special discounts and other agreements which affect prices and port costs. Port managements would have the choice of rendering services directly and/or through third parties, thus becoming essentially landlords. Efforts should continue to be made to involve the private sector in progressively more operations-through concessions, contracts for appropriated berths (where capacity suffices), management or maintenance contracts, etc., while ownership and control of the infrastructure and its proper use remain in the public domain. Ports, or concessionaires within the ports, are thus free to set their own tariffs and charges differentially to reflect actual costs or to incentivate desirable user reaction, in keeping with an overall pricing policy determined by the ministry or the relevant authority. The extent of regulation needed is essentially a function of the whether competition exists in the port services market, be it in the from of current actual competition or contestability for giving a service. The contestability principle depends, however, on limiting the contractual period and removing most entry barriers. Examples of leasing and concession agreements are given in Annex 2. 4.5 d. Local participation: In similar fashion, efforts should continue to be made to decentralize the control of ports by giving municipalities or regional authorities and/or Chambers of Commerce more involvement in the decision making process, or even an economic stake in the port. This is particularly relevant to smaller ports which, although of little national importance may have important local development functions.

6) PROS AND CONS OF PRIVATE OPERATIONS

"PROS"

a. Competition. Where there is more than one port giving similar services, or several stevedoring companies in the same port, the competition generated will generally lead to more efficient service (e.g., Antwerp and Rotterdam).

b. Lower Prices. As part of such competition, each of the competing units will make efforts to reduce its costs and prices, thus diverting traffic from the less to the more efficient prices, thus diverting traffic from the less to the more efficient installations, e.g., Seattle-Tacoma, Los Angeles-Long Beach.

c. Market Signals for further investment. The more successful competitors should generate funds further investments through their profit-maximizing behavior. Better utilization of capacity should ensue form marginal cost pricing, thus postponing the need for new investments.

d. Commercial Flexibility. Deregulated pricing will allow direct agreements to be made with users assuring guaranteed throughput on the one hand and reliable service and high productivity on the other.

e. Government Funding Saved. Private investment in port facilities means government capital spending can be reduced or fiscal resources can be used directly for other purposes. Also, profitable private port operations will not require government subsidies.

f. Speed of Reaction. The private sector reacts much faster than the public one to changes in technology.

"COST"

a. Monopoly or Cartel. Where natural monopoly conditions pertain, a private monopoly is often harder to regulate than a public one. Both in the U.K. and in the U.S. price regulation mechanisms designed to curb monopolistic excess are proving difficult to apply.

b. Short-term horizon of private sector. The private sector's time horizon is usually less

than twenty years, whereas most port infrastructure investment recovery periods are much longer.

c. Unavailability of sufficient capital. Port installations and heavy equipment, usually require large, indivisible investments, a-typical of private in vestment interests The problem is particularly evident in developing countries.

d. Discrimination. A private (or even concessioned) facility, will usually favor its own owners at the expense of outsiders. It is also subject to take overs, e.g., Felixstowe's acquisition by P. and O.

e. Coordination. The coordination of private and public investments in complementary parts of the transport chain, i.e., railway, highway access to a private installation, can be somewhat more problematic than when all are in the public domain.

f. Profit Maximization. Unless otherwise regulated, private sector ports will branch out to other activities which bring it higher financial returns, e.g. Associated British Ports.

(2) Course for Privatization

1) General

142. There is marked trend forwards privatization in ports throughout the world, and yet it is very difficult to define and evaluate this so-called "privatization" because of peculiarities among individual ports and countries. In addition, each port in the south-east Asia authority has its own jurisdiction and duties. In **Table 5.32**, the range of duties of several representative port authorities is presented. It can be seen that there are many differences among them. And thus it should be recognized that the definition of "privatization" is a relative matter. That notwithstanding, many port authorities have already adopted privatization or are considering its adoption. The privatization scheme to be adopted depends upon the degree of remaining duties in the public sector.

2) Aim of Privatization

143. If the privatized area is confined to cargo handling, it can be said that Indonesian main public ports have been privatized from the beginning. The PT. PELABIND is a

public trust and a business enterprise simultaneously. Therefore 'Privatization' in the Indonesian means the promotion of private sector participation in the public port operations in consideration of the following:

a) Lightening the burden of government capital expenditure for newly constructed terminals and/or expansion of existing berths
b) Rapid decision making of the private sector
c) Eliminating bureaucratic system and promoting efficiency
d) Easy fund acquisition and no budget restraints

144. The problem confronting a public port's management and operation from the short-term prospective is how to decide priorities on the adoption of privatized schemes that harmonize with a long-term economic target.

145. An additional problem is how the PT. PELABINDO, which is the entity not only as a regulator of the Indonesia but also as an owner of the public ports and an operator, would be placed in relation to the development of privatization.

3) Privatization of the Container-Terminal Management and Operation

146. DGSC adopte and promote a privatization strategy, mentioned later, in 1994. The privatization of small and medium sized public ports of the Indonesia which are not suitable for comprehensive privatization will be confined to the cargo handling as at the present. But comprehensive privatization of the Container-terminals of main ports of should be promoted though the public interests must be maintained.

147. Compared to conventional terminals, a container-terminal differs the following respects.

a) Construction costs are higher
b) Efficient operation is needed to keep the scheduled time of container vessels
c) A large amount of compensation for damages is required in case of an operating accident

148. In order to construct and operate the container terminal considering the above mentioned points, it is hoped that the suitable privatization scheme will be adopted to

maximize the private sector's efficiency, mobility and flexibility while lightening the governmental capital expenditure.

4) Privatization Scheme

149. The following privatization schemes can be taken as examples even though the responsibilities of port authorities may differ from one another.

1) Lease & Concession

150. The public sector constructs a terminal and leases it to the private sector on a contract. The private sector manages and operates it and turns over a percentage of the revenue. There are several types of leases used by the port authorities: flat rate, mini-max or shared revenue etc.. There is no best type: it depends on the nature of the port and its targets.

2) BOT

151. The private sector constructs a terminal and operates it for a certain period. During that period, the private sector recovers its initial investment and transfers the terminal to the public sector.

3) Private

152. The private sector constructs a terminal and operates it by itself.
This scheme is only adopted in the case of a special terminal, for instance, an exclusive terminal for coal, iron ore and so on.

153. Among the above mentioned schemes, many authorities in the U.S.A. and European countries have adopted 1) Lease & Concession scheme. Main container berths and ferry wharves in Japan are also operated by the same scheme.

154. However, a port & harbor, as strategic infrastructure, is so important to a nation that exclusive usage by a single company should be avoided if possible other than in special cases. Ports not only bring about direct benefits, but they contribute to the development of hinterland cities and to their economies.

Table 5.32 Practice Body of Port Services in Southeast Asian Countries

Country & Port / Section	Indonesia Tg. Priok	Malaysia Port Kelang	Malaysia Penang	Thailand Bangkok	Thailand Laem Chabang	Philippinces Manila(South)
Management of Port Facilities	P.A	P.A	P.A	P.A	P.A	P.A
Berth allocation	A (& P.A)	P.V	P.A	P.A	L(PA control)	P.A
Levy of Fee	P.A	P.V	P.A	P.A	L	P.A
Port Statistics	P.A	P.A	P.A	P.A	P.A	P.A
Customs Clearance	G	G	G	G	G	G
Quarantine	G	G	G	G	G	G
Immigration	G	G	G	G	G	G
Traffic Safety	A	P.A	P.A	G	G	P.A
Police / Fire Fighting	A	P.V	P.A	P.A	P.A	P.C
Shed and Yard Permission	P.A	P.V	P.A	P.A	L	P.A
CY Operation	P.A	P.V	P.A	P.A	L	P.A
CFS Operation	P.A	P.V	P.A	P.A	L	P.A
Stevedoring	P.A & P.V	P.V	P.V	P.V	L	P.V
Arrastre	P.A & P.V	P.V	P.V	P.A	L	P.V
Warehouse	P.A	P.V	P.A	P.A	P.A	P.A
Truck	P.V	P.V	P.V	P.V	P.V	P.A
Towage	P.A	P.V	P.A	P.A	P.A	P.A
Line Handling	P.A	P.V	S	P.A	P.A	P.A
Lubrication and Water Supply	P.A	P.V	P.V & P.A	P.A	P.A	P.A
Pilotage	P.A	P.V	P.A	G	G	P.A
Tally Services	P.V	P.V	P.V	P.A & P.V	L	P.A
Port Environment Integrity	A	P.A	P.A	P.A	P.A	P.C

Note: P.A : Port Authority, P.V : Private Company, A : Port Administrator, G : Government
P.C : Public Corporation, L : Leeseer, S : Ship Company

(3) The Current Port Privatization Situation

1) What neighboring countries are doing and have done to privatize ports.

a) Privatization of the Container Terminal at the port of Kelang (Malaysia)

i) Establishment of KCT

155. Kelang port Container Terminal (KCT) was established in 1986 as the first privately operated company in Malaysia. The company was established jointly by KTK, a joint company established by Container National, a truck transporter in Malaysia, and P&O, a shipping company in Australia, and the Kelan Port Authority (KPA).

156. When KCT was established, KPA assumed a 49% share of the company, while KTK assumed a share of 51%. Moreover, the management of KCT business was entrusted to KTK.

ii) Contents of the lease contract

157. KCT signed a 21-year lease to rentthe port facilities from KPA. At its option, KCT may renew the contract for another 21 years after the first term expires.
The lease fee consists of a fixed charge and a variable rate, which is applicable only to the period from 1986 to 1994.

158. KCT must pay an additional fixed amount per TEU as the variable lease fee when the number of containers handled exceeds a fixed quantity. The variable lease fee is mainly intended to make up for the revulsion of investments by KPA before privatization. It is therefore only a temporary measure.

iii) KPA's position

159. As part of the Federal Government's privatization policy, set forth in 1983, KPA conducted a feasibility study on prvatizing the container terminal at the port of Kelan while keeping the following conditions in mind:

160. Privatization would not lead to dismissals or wage reductions for workers.

161. A newly established private enterprise would take responsibility for the maintenance of cargo-handling machines.

162. The responsibilities of a newly established private enterprise and those of KPA would be clearly divided andidentified.

163. The feasibility study concluded that:
A new organization, KCT, would be established under KPA.
A lease contract covering the port facilities would be concluded between KPA and KCT.

164. Stocks owned by KCT would be sold to the private sector.

165. Stocks held by KCT would start to be sold within two years after establishment of the company.

166. The main roles of KPA after privatization would be to promote the use and advancement of the port, participate in policy-making related to the improvement of stevedoring efficiency, navigation safety, and fares, and work as a coordinator to make the port attractive and ensure its sound growth and development.

iv) Evaluation of the privately operated container terminal at the port of Kelang

167. Eight years have passed since the Kelan container terminal fell into private hands. The facts indicate that it has produced concrete results with regard to its efficiency and financial condition as detailed below, and that it has not encountered any major problems. It can therefore be concluded that it is doing well.

168. The number of containers handled per hour has increased, indicating an improvement instevedoringefficiency. Improvement in stevedoring efficiency has led to a reduction in mooring time. The placement of workers has changed as a result of improvement in the methods used to load and unload cargoes, as well as a review of the formation of gangs. As a result, productivity per worker has increased.

169. Privatization has accelerated decision-making on managerial matters, and has enabled flexible dealing based on user needs and international trade trends. Introduction

of wages based on performance or an incentive wage system has helped to change the consciousness of the staff, thereby making them more active. Lease fees and rentals paid by KCT are sound income sources contributing to the finances of KPA.

170. The reasons for KCT's success are:
Privatization was realized thanks to the strong leadership of the government.
KPA has reserved ownership of the land and other immovables to ensure that they remain in the public domain.
KCT has operated under the supervision of KPA.
Planning and adjustment of the port as a whole have remained under the control of KPA.
A large number of containers are being handled, thereby generating profits.

b) Container terminal at the port of Manila (MICT) (the Philippines)

i) Operation by ICTS

171. The Philippine Port Authority (PPA) is promoting a plan to privatize ports within its jurisdiction under four schemes -- the MICT scheme, the management contract scheme, the BOT scheme, and the port property scheme. Which scheme is adopted depends on the conditions of each port. However, none of these schemes call for transferring the control of port facilities to the private sector. The reason for this is that the government considers the control of port facilities to be vital for control of the national economy and national security.

172. The MICT scheme was adopted when the container terminal at the port of Manila was privatized in 1988. The MICT scheme grants the right to develop and manage the port or terminal for 25 years to the private enterprise that has presented the most lucrative bid. The selected private enterprise invests in port facilities and machinery, controls the maintenance thereof, runs the terminal with optimum efficiency, and collects port dues. The same enterprise, as collateral for these rights, pays PPA a pre-determined amount as a fixed charge and a variable charge that is determined by the income generated.

ii) Contract contents

173. PPA entered into a contract with ICTS for the control, operation, and development of the MICT. ICTS is a consortium including Sea-Land Orient Ltd., Anscor Container Corp., and E. Razon, Inc. ICTS exclusively handles the control and operation of the terminal, and at the same time, develops the terminal under the direct supervision of PPA in accordance with the provisions of the contract.

174. The charge for use varies, and is calculated by multiplying all the income generated from operation of the terminal, excluding the fixed charge for use for 25 years and interest receipts, by a fixed credit rate. (Thecredit rate is subjected to incremental increases from one year to the next.)

175. ICTS can collect port dues, such as stevedoring charges and port use chargers. Revisions to these charges are limited to the extent that they must be in agreement with the policies of PPA or the government.

176. If ICTS so desires, the consortium will, at its own cost and under the supervision of PPA, carry out second-phase expansion of the MICT facilities, maintain and dredge the berths and moorings within the terminal, and introduce computer systems to help streamline documentary procedures.

177. PPA demands that ICTS should try to increase the amount of cargo to be handled. If the number of foreign transit shipments ICTS handles decreases by 20% of a fixed quantity, PPA has the right to cancel the contract.

iii) Evaluation

178. Since its privatization, the MITC has substantially increased the amount of cargo it handles. Moreover, mean mooring time has decreased. Furthermore, this privately owned enterprise has made a great deal of effort, for instance, to ensure so that ship owners are guaranteed secure service, and that arrivals and departures remain on schedule.

179. Besides a few problems that remain to be solved, such as claims for accessibility to land and the need to complete the computerization of facilities, it can be said that

all in all the MITC has been faithfully implementing the contract with PPA. Since privatization, the volume of MITC business has been progressively increasing, which is good.

c) Container terminals at the port of Leamchabang (Thailand)

i) Details of privatization

180. The Thai government is trying to privatize various industrial sectors in order to cut down government spending, improve management and operation efficiency, and utilize private knowhow effectively. With its seventh five-year economic and social development program, the Thai government has just started to aggressively push ahead with the participation of the private sector in managing and operating the marine transport sector.

181. The private management system, in which facilities are leased to private enterprises and which replaced direct management system by the Thai Port Authority (PAT), was introduced to operate the port of Ramuchaban, which opened in 1991, based on government policy. The main managerial workers, however, remained under the control of PAT because of the labor union and other reasons. After discussions with the laborunion, it was first decided that PAT would manage the No.2 terminal and the multipurpose terminals, while private enterprises would take over management of all other terminals.

182. Later, however, it was decided that the private sector would also take control of the No.2 terminal as part of the lease. At present, each container terminal is managed in the following manner.

ii) No.3 and No.4 terminals

183. The contract for these terminals calls for a contract work system (contracting out). The facilities to be contracted out include the wharfs, cranes, yards, and sheds. The contractors are required to own their own transporters and truck trailers.

184. The contracting parties are a consortium consisting of one Thai shipping company and two Japanese shipping companies (TIPS) for the No.3 terminal, and a consortium

consisting of one Thai stevedoring company and three Japanese stevedoring companies (ESCO) for the No.4 terminal.

185. The contract period is 12 years in both cases, with an option to renew for another five years. The contractor is to pay PAT 33% of the total terminal income as real rental, and keep the ramining 67%. Moreover, the contractor must pay a minimum of guarantee money.

186. As preconditions for letting contractors use the terminals, PAT requires that each contractor handle goods equivalent to 150,000 TEU a year, to use 40% of the berth, and to handle a quantity of goods equivalent to 17 TEU per hour. PAT is to check the situation after five years, and may cancel the contract if the contractors have not met these requirements.

187. PAT has also set charges for terminal use. Considering that the terminals were opened only a few years ago, PAT is now giving a discount of 50%.

iii) No.2 terminal

188. The contract is in the form of a lease. The facilities to be leased out include wharfs, cranes, yards, and sheds. Transporters and computer systems are included as well. The lease period is 12 years. The minimum rental has been set based on the minimum quantity of goods to be handled. Only Evergreen in Taiwan submitted a request to lease the No.2 terminal; however, no contract has yet been concluded as of October 1992.

iv) Tasks remaining to be carried out

189. The container terminals at the port of Leamchabang have only recently been opened, so statistics are limited. It is necessary to closely watch the changes the port will undergo from now on. The managerial workers at the port are still work for PAT in the same way as they do at the port of Bangkok. The functions of both ports are being divided; however, they are still competing each other.

190. Therefore, considering the role the port of Leamchabang will play as a large-scale international trading port in Thailand in the years to come, establishing a management

style different from that of PAT, and working out measures to promote and develop the port are the principal tasks that have to be carried out.

2) Current Situation in Indonesia

a) Precedents in which the private sector has taken part

191. Indonesia is now in the middle of its sixth five-year development plan (Leperita VI). The plan emphasizes assistance to the private sector for the purpose of generating economic development and employment.

192. Private enterprises and foreign corporations have taken part in the running of ports and other infrastructure in Indonesia in the following ways:

193. Engagement of the private sector in harbor loading and unloading.

194. Private enterprises in Indonesia have provided loading and unloading services at public ports for many years.

195. In 1993, an experiment was carried out in which private enterprises were allowed to contract for taking over all loading and unloading operations within the specified business zones of the container terminals at the port of Tanjung Priok.

196. Contracting out the development of the container terminal III at the port of Tanjung Priok to a private enterprise on the basis of the BOT scheme.

197. P.T. Pelabuhan Indonesia II has concluded a contract with a private enterprise for the development of the container terminal III at the port of Tanjung Priok.

198. The Paiton power station project (phase II) in East Java

199. Private enterprises and foreign corporations are jointly advancing the development of the Paiton power station for the state-owned electric power company.

200. Planning of toll roads

201. The planning of toll roads in and around Jakarta has been advanced by many foreign corporations.

ii) Policies of the DGSC

202. In August 1994, the DGSC made public its policies to promote the privatization of port business and ease investments regulations. As a result, it issued a circular notice to private companies both at home and abroad to appeal to them to participate in port works in Indonesia.

203. Details of the circular notice are as follows:

a) Intentions (purposes) of the DGSC

204. The broad intention of the DGSC and the Public Port Company is to promote the development of the infrastructure of ports to provide what is necessary for the nation's economic growth.

205. In other words, they intend to develop a framework to secure legal and business certainty for foreign and domestic private enterprizes investing in ports.
The following criteria are used to select private participants:

206. A prospective private party should serve to decrease portoperating costs and improve the efficiency of port works.

207. A prospective private party should be selected through a competitive bidding process or based on a competitive pricing system.

208. A prospective private party should contribute to the improvement of the general financial condition of the Public Port Company.

209. A prospective private party should have port-related capabilities.

b) Scope of private operations

210. It is the basic understanding that all facilities and port activities, except for the facilities required to ensure the safe ship traffic, are potentially open to private investment. To put it concretely, container terminal-related operations (including the CFS), passenger ship terminal operations, reclamation, pilotage and ship towing, collection of fees, and information processing are included.

c) Responsibilities of the Public Port Company

211. The Public Port Company will:
Establish project plans, conduct feasibility studies, and provide the results thereof.
Give required assistance until business agreements are finalized.
Provide preferential tax treatment, such as the deferment of tax payments.

212. In determining port charges, the Public Port Company will apply the principle of "public interest first", and also make adjustments to avoid creating a situation that would lead monopolization by considering competing conditions as they stand now with regard to port services.

d) The forms of the business agreements between the Public Port Company and Indoensian private companies are as follows:

i) Joint undertaking

213. The Public Port Company and a private company invest capital and jointly manage certain segments of the port business.

ii) Management contract

214. The Public Port Company places in part, for a certain period of time, the enterprise and assets of the corporation under the management of a private company, which in return receives a fixed amount of compensation from the Public Port Company.

iii) Joint venture

215. The Public Port Company and a private company jointly establish a corporation, and that corporation conducts the port's business for an indefinite period of time. Build operation transfer formula,

216. The Public Port Company grants concessions for certain business segments to a private company, which invests money in developing and managing those segments for a certain period of time. The private company pays remuneration to the Public Port Company in the form of counter value, royalties, profit-sharing, or a rental fee. Upon

expiration of the period, the private company transfers all the assets to the Public Port Company.

e) Procedural conditions

217. A foreign corporation and an Indonesian company will jointly establish an affiliated firm in Indonesia (private company). The foreign corporation will be one that is engaged in marine transport business at ports. The affiliated firm in Indonesia will conclude a business agreement with the Public Port Company. The affiliated firm in Indonesia will be accountable for more than 30% of the investment. The private company can obtain a 30-year business permit, with an option to renew for another 30 years.

ii) Evaluation of policies and others

218. The policies or regulations for promoting privatization are not specified in detail, since they are rather flexible. A clause or clauses preventing any and all possible abuses resulting from a monopolization of ports should be added to a contract.

219. A business permit is good for 30 years. This is a much longer period than that granted by similar permits in neighboring countries. The permit period should be set flexibly and properly by considering the port, business form, business conditions, and the amount of cargo to be handled.

220. It will be necessary to set tariffs at a level that will not interfere with the ability of a private enterprise to conduct business effectively.

221. The Public Port Company's policy of preserving ownership or the right to manage the land, port, and surrounding water, even when money is invested by a private enterprise, is proper given the overriding need to ensure that all ports remain public property.

5.3.3 Long-term Improvement plan of management and operation of container cargo handling ports

(1) Key points for containerization in the Ports of Indonesia

222. In order to cope with containerization, key points for terminal operation are the following;

1) Establishment of adequate set-up and operational procedures for container terminal
2) Build-up of container information system
3) Improvement of container handling fee and mechanical repair and maintenance skill

(2) Establishment of adequate set-up and operational procedures for container terminal

1) Adequate set-up for container terminal
(Restriction of exclusive usage)

223. From the view point of initial investment, it is clearly preferable for the port authority that container terminal is constructed and operated by the private sector. Both construction cost of modern terminal and purchase cost of expensive facilities will be supplied by the private sector. The port authority does not need to issue bonds or get a loan.
In this scheme, the important thing is that the port authority should prepare for the effective preventive measures against the monopolistic usage by the particular private entity.

224. Container berths of the Ports administered by Port Corporations should be used rationally by all ships regardless of which shipping companies then belong to.

2) Adequate operational procedures for container terminal
(Simplification of all forms)

225. Streamlined procedures are needed. The complex documentation procedures have to be eliminated. Excessively strict observance of regulations leads to the low roductivity.

226. Forinstance, cargo storage procedures of a port administrative body including billing and cargo delivery in a port area have to be simplified as much as possible because the necessity of simplified cargo-delivery procedure is indispensable to

containerization.

227. When it comes to the containerization in Indonesian ports, the terminal operating bodies of the Ports in Indonesia will need to implement streamlining of documentation and processing procedures in conjunction with the Port authlities of Customs and Port Corporations.

(3) The Introduction of Computers into the Container Terminal Operations

1) Developing steps of computerization and automatization

228. Generally speaking, the manual limitation of planning, management and documetation on a container terminal is about 6000 TEU a year.

229. It is indespensable for a terminal which handles over 6000 TEU a berth a year to introduce the computer system in order to improve the efficiency even though container handling by a straddle carrier or a tyre-mounted transfer crane is manual.

Table 5.33 Developing steps of computerization and automatization

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

(Source:'Container Terminal Planning & Automatization System' by Yokohama Port Development Public Corporation)

230. Judging from the uncertainty of safety and reliabily of full-automatic loading/unloading system in a yard, many actual container terminals in the world are in step 2 or 3 excluding several experimental terminals which are in step 4.

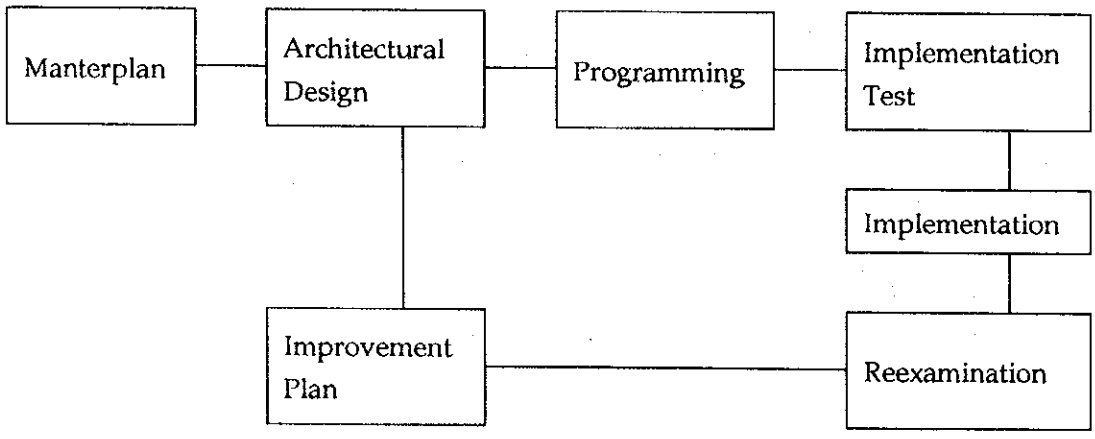
231. Considered the forecast of rapid container increase in the Container-terminals of Indonesian Ports, the Ports and their administrative body need to promote and elaborate their current systems steadily.

232. The computerized system generally brings a container terminal the following effects:

a. easy coutermeasures for increasing container handling
b. prevention of staff increase and effective lay-out of personnel
c. ensuring accurate and timely flow of information
d. mprovement of services for shipping companies or consignees by offering the information
e. effective utilization of a marshaling yard
f. easy access to various analytic and administered statistical materials

2) Key points for utilization of computer system

a. Once the system is installed, it will be operated permanently. That system will be inflexible, unable to keep up with social and technological changes.
Out-of-dating of the system starts from the beginning and improvements must be done continuously as considering the future network system just like EDIFACT (Electronic Data Interchange For Administration, Commerce, and Transport).



b. Perfectly trained staff members, accumulation of accurate statistical information and reliable cost accounting are the preconditions for the introduction of

computer system.

3) Maintenance of Computerization

233. Software technology have been developing rapidly day bay day, the all PT-PI will assign there staffs to study new technology at the college or software company. Realizing the full potential of computing and networking system will require advanced software and people educated and trained to use these tools. The all PT-PI have to maintain a steady progress for educating and training there staffs to adapt computerized port management and operation. Significant improvements in software technology are essential to achieve sustained high levels of computing system performance.

(4) Long-term Improvement plan of management and operation of container handling ports

1) Key points for privatization of container handling ports

234. It is true that the role of privatization is important for a port to become modernized. But privatization has to be carefully coordinated with the public interest and the economic policy of the government. This is because the private sector sometimes pursues individual interests too strongly.

a) Security for public interests

235. It is needles to say that the public sector should retain tariff setting, collection of port charges and regulatory functions. In addition to these matters, there still exist many areas where the government should obtain control. These are mainly safety matters, i.e. buoys, lights, vessel traffic control dredging of access channels, and environmental matters.

b) Further promotion of deregulation

236. In order to promote private sector participation in the projects, further deregulation is needed.

c) Adjustment among neighboring ports

237. In order to avoid useless duplicated investment, the functions among neighboring ports in Port Corporations have to be adjusted. However, this does not mean that competition is unnecessary.

d) Elimination of exclusive usage

238. The Port Corporations "common user" policy is appropriate for the usage of public ports, and conventional berth assignment should be on a "first come first served basis".

239. When it comes to constructing and operating a container terminal by privatization scheme, public interests must be kept by a contract or an act which restricts monopolistic usage by the developer.

240. But these kinds of restrictions should not dampen private sector's enthusiasm for participation in the project.

e) Privatization of a small port

241. In the management and operation of a small port, the terminal is too small to be operated on market-oriented basis by several private companies. In such a case, excess of monopoly must be avoided by an agreement or a contract between the contractor and the administrative body and it is also effective for the local government concerned to take part in the decision-making on management and operation.

f) Fee system

242. The establishment of the fee system for the forthcoming privatization of the Container-terminals in Indonesian Ports has to be considered carefully compared with other systems like 'the mini-max rate lease system', 'the shared revenue lease system' and so on. There is no best system. It depends on the peculiarities of each port.

243. What is important is that the contract must contain a renegotiation clause for its

own fee system.

(5) Management and Operation of Container Terminal

1) Alternative of Container Terminal Operation

a) Study year of Management and Operation

244. In the short-term development plan for the target year of 2003 and the master plan target year of 2010, the form of management and operation of Container Terminal in main six ports should be determined.

b) Combination of Alternative

245. Considering to privatization of a part or all of Container Terminal, there are seven basic alternatives of management and operation, shown in **Table 5.34**, that are combined three items, who construct and own the terminal facilities, who are pvovided cargo handling services, who manage and operate.

2) Management and Operation of Cotainer Terminal of Main six ports

246. Baced on the new construction plan of Container Terminal of main six ports, mentioned above 5.2.2 (show **Table 5.14**), the alternatives of desirable Management and Operation are shown in **Table** 5.35.

247. There are plural alternatives by each port and by term. It should be determined

the appropriate Management and Operation form, considering to the cargo handling volume in future and the situation of each port and each project

248. Container Terminals are better suited to the introduction of an exclusive use terminal system. In this case, it is very important to determine how to select the best entities for appropriate operation of the terminal. Examples of criteria for selection of such companies are shown as follows.

a) Companies which are able to perform efficient container cargo handling to fit customer demand.

b) Companies which can collect an adequate quantity of container cargo while keeping sound financial position.

c) Companies which can provide reliable services throughout their leasing term.

Table 5.34 Case of Container Terminal Management and Operation

No.	Method	Port Facilitities Owned by	Provide Service for	Container Terminal Operated by
1	U.C	Port Authority	Open	Port Authority
2	T	Port Authority	Open	P.A & P.C
3	C	Port Authority	Open	P.A & P.C
4	M.C	Port Authority	Open	Private Company
5	L	Port Authority	Exclusive	Private Company
6	BOT	Private Company	Exclusive	Private Company
7	P	Private Company	Exclusive	Private Company

Note : U.C; Under Control, T; Trust, C; Cooperation,
M.C; Management Contract, L; Lease
BOT; Build Operate Transfer, P; Private

Table 5.35 Alternatives of Container Terminal Management and Operation in Main Ports

Port	Existing 1994	1998	Short-term Development Plan Target year of 2003	Master Plan Target year of 2010
Belawan				
F.T	-		A-2 2,3,4	A-2 2,3,4
		A-3 2,3	A-3 2,3,4	A-3 2,3,4
D.T	-	1,2	2,3	2,3
Panjang				
F.T	-			A-2 2,3
		A-3 2	A-3 2,3	
D.T	1	1,2	2	2
Tg. Priok				
F.T	1 & 2		A-1 2,3,4 & 5,6	A-1 2,3,4 & 5,6
		A-2 2,3,4 & 5,6	A-2 2,3,4 & 5,6	A-2 2,3,4 & 5,6
		A-3 2,3,4	A-3 2,3,4	A-3 2,3,4
D.T	1 & 2	2,3	2,3,4	2,3,4
Tg. Emas				
F.T	-		A-2 2,3,4	A-2 2,3,4
		A-3 2,3		A-3 2,3
D.T	1	1,2	2	2
Tg. Perak				
F.T	1		A-1 2,3,4 & 5,6	A-1 2,3,4 & 5,6
		A-2 2,3,4	A-2 2,3,4 & 5,6	A-2 2,3,4 & 5,6
		A-3 2,3	A-3 2,3,4	A-3 2,3,4
D.T	1	2,3	2,3,4	2,3,4
Uj. Pandang				
F.T	-		A-2 2,3,4	A-2 2,3,4
		A-3 2,3	A-3 2,3,4	A-3 2,3,4
D.T	2	2,3	2,3,4	2,3,4

NOTE: A-1 ; new construction berth type(see Table 5.2.1-(1))
1,2,... ; case number in Table 5.3.3(5)-1

5.4 PRELIMINARY DESIGN AND COST ESTIMATE

5.4.1 General

249. Based on the study on the long-term improvement plan described in previous Sections, preliminary design and relevant cost estimates were made in this Section.

250. In compliance with the scale of the port facilities determined in Sections 5.1 to 5.3 such as required number and type of berths, yard area, container handling equipment and building facilities, further review on the general port layout of individual ports was made herein from the technical points of view and summarized in **Table 5.36.**

Table 5.36 General Description on Proposed Port Layout Plan

Name of Port	Description	Items requiring Special Determination	Plan of Existing	Proposed Master Plan
Belawan	1. Proposed A-2 (-12 m) and B-1 (-9 m) Berths are deployed on same alignment of existing Gabion Base Container Wharf at sea and land side corners respectively so that gantry cranes can be shifted and utilized at any position of berths.	1. Demolition or transfer of existing Pertamina oil pier. 2. Rails and foundations for gantry crane are required at general cargo wharf (-10 m) of Gabion Base. 3. Transfer or additional CFS. 4. Rather big volume of dredging for navigation channel. 5. Extension and connection of railway tracks to Gabion Base. 6. Differential settlement of reclamation soil between new and existing area.	Fig. B-1 Fig. B-2	Fig. 5.15

Name of Port	Description	Items requiring Special Determination	Plan of Existing	Proposed Master Plan
Panjang	1. Proposed B-1 Berth with required water depth -9 m is located seaside and on the alignment of -12 m New Container Wharf (under construction). In order to secure the water depth of navigation channel as a port entrance, where the proposed B-1 Berth is located, the water depth of -9m is adjusted to be -12m. 2. Gantry cranes are interchangeable at both container wharves.	1. Less effects of Panjang Reef as a breakwater, as B-1 berth is located outside of New Container wharf.	Fig. B-3 Fig. B-4 Fig. B-5 Fig. B-6	Fig. 5.16
Tg. Priok (Alternative I)	Required port facilities are located on an artificial island located seaside of existing breakwater connected by access trestle.	1. Due to the existence of the access bridge, the port basin for existing Pertamina, P.T. Bogasari Bulk Pier and P.T. Kodja Bahari shipyard will require alternative port entrance, thus, deepening and extension of East Channel is indispensable, or otherwise the under clearance of the access bridge should be 45 m or more which will require large initial investment. 2. The maintenance dredging of navigation channels, especially for the east channel. 3. Evacuation of Pertamina pier PMB IV for the space of the landslide approach of access bridge. 4. In order to moderate the traffic jam in the vicinity of port area a direct connection of the access road to Harbour Road Highway should be considered (See Fig. 5.4.1-5) 5. Land acquisition for access road and railway extension	Fig. B-7 Fig. B-8 Fig. B-9	Fig. 5.17

Name of Port	Description	Items requiring Special Determination	Plan of Existing	Proposed Master Plan
Tg. Priok (Alternative II)	Required port facilities are located on an artificial land located west side of the Port where no access bridge is required.	1. Access to Pasoso Railway Terminal is far away. 2. Treatment of cooling water discharged by Power Plant (PLTU) located along landslide of proposed site. 3. Relocation of Naval Base along West Breakwater.	Fig. B-7 Fig. B-8 Fig. B-9	Fig. 5.18
Tg. Priok + Bojonegara (Alternative III)	1. Combination plan of Tg. Priok and Bojonegara. 2. Tg. Priok and Bojonegara will be parallely developed. 3. The development of Bojonegara will give an economic impact to West Java Province especially for those recently established industrial zone in the Merak district. 4. Bojonegara faces a natural deep water cove and is well sheltered against offshore waves. Dredging Volume is minimal and no breakwater is required.	1. Considering the existing ground configuration, shallow hard strata of subsoil is anticipated. Further subsoil investigation is recommended. 2. Access road (15 km) and railway (15 km if necessary) are required. 3. All utilities such as electric power supply, water supply, drainage, sewerage, and communications should be newly established.		Figs. 5.19 & 5.21
Tg. Priok + Bojonegara (Alternative IV)	1. Combination plan of Tg. Priok and Bojonegara. 2. The excess demand of Tg. Priok (incl. C.T. III) will be shouldered by Bojonegara. 3. The total initial investment will be less than Alt. III	Same as Alt. III.		Figs. 5.20 & 5.22

Name of Port	Description	Items requiring Special Determination	Plan of Existing	Proposed Master Plan
Tg. Emas (Semarang)	Considering the future development to be a finger pier type port, the proposed wharves A-2 (-12 m) and B-1 (-9 m) are located, detached from existing berths.	1. Consolidation of subsoil. 2. Siltation and maintenance dredging of navigation channel and port basin. 3. Extension and rehabilitation of breakwater.	Fig. B-10 Fig. B-11	Fig. 5.23
Tg. Perak (Surabaya)	1. Proposed Berths are aligned along contour line, so that the dredging volume will be minimal and the direction of current will be parallel to berth face. 2. Adopting one alignment of the berths, container cranes will be transferable among the berths. 3. In order to meet the increment of the traffic volume, additional trestle is proposed which will allow the traffic flow by one way traffic.	1. The longest navigation channel among others will cause large initial and maintenance dredging cost. Careful study on the size of navigation channel (depth, width) to meet the traffic volume is required. 2. Consolidation of subsoil. 3. Safe Navigation System and equipment, such as navigation communication control system, navigation aids.	Fig. B-12 Fig. B-13 Fig. B-14	Fig. 5.24
Uj. Pandang	1. Construction of New Hatta Quay (-12 m) 640 m is now in progress. 2. Inland Container Terminal (15.5 ha) with CFS (15,750 m^2) 3. Additional Access Channel Dredging (432,000 m^3)	1. Countermeasures for overflowed container cargoes after year 2000 required. 2. Sea traffic system for future ship call demand.	Figs. B-15 to B-19	Fig. 2.25

5.4.2 Design Condition

(1) Design Standard

251. For the purpose of the preliminary design of Port Facilities of the Master Plan, following design standards and criteria were applied. To meet, realistic existing conditions, for those discrepancies among several standards, compromised application were made.

1) "Standard Design Criteria for Ports in Indonesia" Jan. 1984
2) "Technical Standards for Port and Harbour Facilities in Japan" 1991.

(2) objective Ships and Berth Dimensions

252. Objective ships and relevant berth dimensions by individual types are summarized in **Table** 5.37.

Table 5.37 Objective Ship and Berth Dimension

Type of Berth	TEU	DWT	Ship			Berth	
			LOA	B	d	Length	Depth
A-1	3,000	40,000	250 m	32 m	11.6 m	300 m	13.5 m
A-2	1,500	25,000	195	28	10.3	250	-12.0
A-3	750	15,000	162	24	8.7	200	-10.0
B-1	500	10,000	137.5	21	7.5	175	-9

Notes, DWT: Dead Weight Ton
LOA: Length Overall
B: Beam
d: Draft (full)

(3) General Design Criteria

253. General design criteria for Master Plan are summarized in **Table 5.38.**

Table 5.38 General Design Criteria

	Belawan	Panjang	Jakarta		Semarang	Surabaya	Uj. Pandang
			Tg. Priok	Bojonegara	Tg. Emas	Tg. Perak	Makassar
Seismic coefficient	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Load, uniform load on wharf	3 t/m^2	3 t/m^2	3 t/m^2	3 t/m^2	3 t/m^2	3 t/m^2	3 t/m^2
Load, uniform load on yard	4 t/m^2	4 t/m^2	4 t/m^2	4 t/m^2	4 t/m^2	4 t/m^2	4 t/m^2
Truck	T-20	T-20	T-20	T-20	T-20	T-20	T-20
Berthing velocity of ship	10 cm/sec	10 cm/sec	10 cm/sec	10 cm/sec	10 cm/sec	10 cm/sec	10 cm/sec
Berth top elevation	(+ 4.55)	(+ 2.75)	(+ 2.50)	(-)	(+ 2.20)	(+ 5.00)	(+ 3.50)
Berth top elevation	+ 4.80	+ 3.20	+ 3.40	+ 3.40	+ 3.40	+ 4.10	+ 3.70
subsoil characteristic	Soft silty clay	SPT 10 to 40	soft clay	coral/sand	clay/silt	soft silty clay	SPT 3 to 5
Depth of hard strata	-45 to -50 m	-25 to -30 m	-20 to -25 m	-20 to -23 m	-30 to -40 m	-40 to -50 m	Approx. -20 m

Note: ( ) show existing

254. For ready reference, the dimensions of existing pier and navigation channels are also summarized in **Table 5.39**

255. The particulars of major design criteria are described hereafter.

Table 5.39 Existing Port Facilities

Name of Port		Pier			Channel			MHWS
		Depth	Length	Struc. Type	Depth	Width	Length	
Belawan		-11 m	500 m	Conc. deck on steel pile	(LWS) -9.5 m	100 m	12 km	(LWS) 2.8 m
Panjang	DII	-11 m	200 m	Conc. deck on pile	-11 m	150 m	0.8 m	1.2 m
	Under const. (2002)	-12 m	300 m	Conc. deck on steel pile				
Tg. Priok	CT I	-11 m	920 m	Conc. deck on pile	-11 m	200 m	3 km	1.4 m
	CT II	-8.6 m	360 m	Caisson + Conc. deck on pile				
(Semarag) Tg. Enas	Samudera	-9 m	605 m	Conc. deck on Steel pile	-9 m	150 m	3.5 km	1.4 m
	Phase II	-10 m	345 m					
(Surabaya) Tg. Perak	ICT	-10.5 m	500 m	Conc. deck on steel pile	-9 m	100 m	46 km	2.1 m
	Berlian West	-9.5 m	700 m	Conc. Caisson				
(Uj. Pandang) Makassar	Soekarno	-8 m	1,360 m	Conc. Caisson	-11 m (Approx.)	220 m (Approx.)	800 m (Approx.)	1.7 m
	Under Const. (1997)	-12 m	670 m	Conc. Caisson				

(4) Seismic Coefficient

256. Based on the "Standard Design Criteria for Ports in Indonesia", seismic coefficient for individual ports are calculated using following formula. (Seismic coefficient "k") = (Regional seismic coefficient) x (Coefficient of Importance).

(5) Berthing Velocity of Ship

257. Considering the objective ship size is over 10,000 DWT, and also the fact that all port adopting compulsory pilot system, berthing velocity of 10 cm/sec is used for the study.

(6) Berth Top Elevation

258. Berth top elevation is determined to be 2.00 m above MHWS.
The existing berth top elevation of individual ports are, however, not uniform as shown in **Table** 5.38. The top elevation of the new port extension should, therefore, be determined the height of the existing pier.

(7) Sub-soil Conditions

259. Except for Panjang, Bojonegara, and Ujung Pandang, all ports consist of cohesive soft layer with thickness of 20m to 50m. The effects of consolidation, sliding and small lateral resistance of the soil were considered in the study.

260. As to Panjang and Bojonegara, the sub-soil consists of stronger sandy soil which will allow both gravity and pile type structures.

5.4.3 Quay Construction Layout

(1) General

261. As explained in the master plan of the ports, new berths are required to be constructed based on the required type of the berth which is divided to four(4) types of the ship, "A-1" type for 3000 TEU, "A-2" type for the 1500 TEU, "A-3" type for the 750 TEU and "B-1" type for the 500 TEU ship.

262. Required Berth extension of each port on basis of the master plan is shown in **Table 5.40** and explanations is as follows.

Table 5.40 Required Berth Extension

Name of Port	Berth Type	Berth Number	Berth Length	Berth Width	Quay Depth	Structure
Belawan	A-2	1	250 m	30 m	-12 m	Deck on Pile
	B-1	1	170 m	25 m	-9 m	Deck on Pile
Panlang	B-1	1	170 m	25 m	-9 m	Deck on Pile
Tanjung Prlok	A-1	3	300 m	30 m	-13.5 m	Deck on Pile
Altemative 1	A-2	6	250 m	30 m	-12 m	Deck on Pile
Altemative 2	A-3	2	200 m	30 m	-10 m	Deck on Pile
Tanjung Priok Altemative 3	A-2	7	250 m	30 m	-12 m	Deck on Pile
and Bojonegara	A-1	3	300 m	30 m	-13.5 m	Deck on Pile
	A-2	1	250 m	30 m	-12 m	Deck on Pile
	B-1	1	170 m	25 m	-9 m	Deck on Pile
Tanjung Priok	A-2	3	250 m	30 m	-12 m	Deck on Pile
Altemative 4	A-1	3	300 m	30 m	-13.5 m	Deck on Pile
	A-2	3	250 m	30 m	-12 m	Deck on Pile
and Bojonegara	A-3	2	200 m	30 m	-10 m	Deck on Pile
	B-1	1	170 m	25 m	-9 m	Deck on Pile
Tanjung Emas	A-2	1	250 m	30 m	-12 m	Deck on Pile
	B-1	1	170 m	25 m	-9 m	Deck on Pile
Tanjung Perak	A-1	1	300 m	30 m	-13.5 m	Deck on Pile
	A-2	2	250 m	30 m	-12 m	Deck on Pile
	A-3	3	200 m	30 m	-10 m	Deck on Pile
	B-1	3	170 m	25 m	-9 m	Deck on Pile

(2) Berth Extension Plan

a. Belawan Port

263. One (1) berth "A-2" type and two (2) domestic berths "B-1" are required to be constructed based on the master plan. However, Belawan (Gabion) port has two cargo berths already, and the general cargo will be shifted to container cargo in future forecast, so that one existing cargo berth will be utilized to the one of required domestic berth. Therefore, one (1) berth of "A-2" type will be required to be constructed by deck on pile structure located on the north-eastern side of existing container berth and one (1) domestic berth of "B-1" type will be required to be constructed located on the south-western side of existing cargo berth, as shown in **Fig. 5.15.**

b. Panjang Port

264. One domestic Container Berth "B-1" type with gantry cranes is required to be constructed based on the master plan. Panjang port has been extending the new container berth on the western side of the Wharf "D-II" instead of the existing container berth. After completion of the new container berth, B-1 container berth is recommended to be extended toward the north-west. In order to secure the water depth of port entrance, the water depth of proposed B-1 berth is recommended to be -12m in depth (See **Fig.5.16**).

c. Tanjung Priok Port (Alternative I)

265. Three (3) container berths type "A-1", six (6) container berths type "A-2" and two (2) container berths type "A-3" are required to be constructed on the basis of the master plan. Three (3) container berth of type "A-2" are planned to be constructed at the CT III area (North Koja Area). Other required berth are planned to be constructed at the north of the existing Container Terminal I which will be reclaimed in the sea area nearby the existing breakwater. The reclaimed area is required for the soil improvement, is connected with CT III area by a trestle. The trestle will cut the way of entrance of east basin for the Pertamina berth and others, so that the additional access channel of the eastern entrance will be dredged and protected for the siltation. The construction plan is shown in **Fig. 5.17.**

d. Tanjung Priok Port (Alternative II)

266. Three (3) container berths type "A-1", three (3) container berths type "A-2" and two (2) container berths type "A-3" are required to be constructed at the western side of existing port. Another three (3) container berths type "A-2" are also required to be constructed at the proposed CT-III area. (See **Fig.5.18**)

e. Tanjung Priok Port and Bojonegara (Alternative III)

267. Seven (7) container berths type "A-2" are required to be constructed at Tanjung Priok Port, three (3) berths at CT III area and four (4) berths at reclaimed area. Three (3) Container berths type "A-1", one (1) container berth type "A-3" and one (1) domestic container berth "B-1" are required to be constructed at Bojonegara area. The construction plan is shown in **Fig. 5.19 and 5.21** respectively.

f. Tanjung Priok Port and Bojonegara (Alternative IV)

268. Three (3) container berths type "A-2" are required to be constructed at CT III area of Tanjung Priok Port. Three (3) container berths type "A-1", three (3) container berths type "A-2" and two (2) container berths type "A-3" are required to be constructed at Bojonegara area. The construction plans are shown in **Fig.5.20** and **Fig. 5.22** respectively.

g. Tanjung Emas Port

269. Tanjung Emas port has been constructing the new container berth extension to the sea side of existing Samdera wharf. Excluding the extension project (Phase II construction), One (1) container berth type "A-2" and one (1) domestic container berth type "B-1" are required to be constructed based on the master plan. The construction plan is shown in **Fig.5.23.**

h. Tanjung Perak Port

270. One (1) container berth type "A-1", two (2) container berths type "A-2", three (3) container berths type "A-3" and three (3) domestic container berths type "B-1" are required to be constructed on the basis of the master plan. One type "A-1", two type "A-2" and three type "A-3" are planned to be extended to the existing container berth

which was connected with the container yard on the land by trestles. Concerning the extension of the berth, another new trestle is required to be constructed for the smooth transportation of containers. Three type "B-1" domestic container berths are planned to be constructed along the existing trestle. The construction plan is shown in **Fig. 5.24.**

i. Ujung Pandang Port

271. As the master plan, berth length of Ujung Pandang port for the containers are sufficient for the requirement after completion of the on-going project. However, the container yard is smaller than the requirement. Therefore, additional container yard and CFS is constructed for the related facilities of the Hatta Quay container terminal.(See **Fig.5.25**)

(3) Quay Structure

272. The three alternative forms of quay construction have been considered as feasible, from the engineering point of view. These are concrete caisson, steel sheet piled and open piled construction.

273. From the three alternatives examined, the preferred scheme is the open piled type (deck on pile structure). This scheme has advantages in terms of cost, construction program and technical suitability for Belawan Port, Panjang Port, Tanjung Priok Port, Bojonegara, Tanjung Emas Port and Tanjung Perak Port.

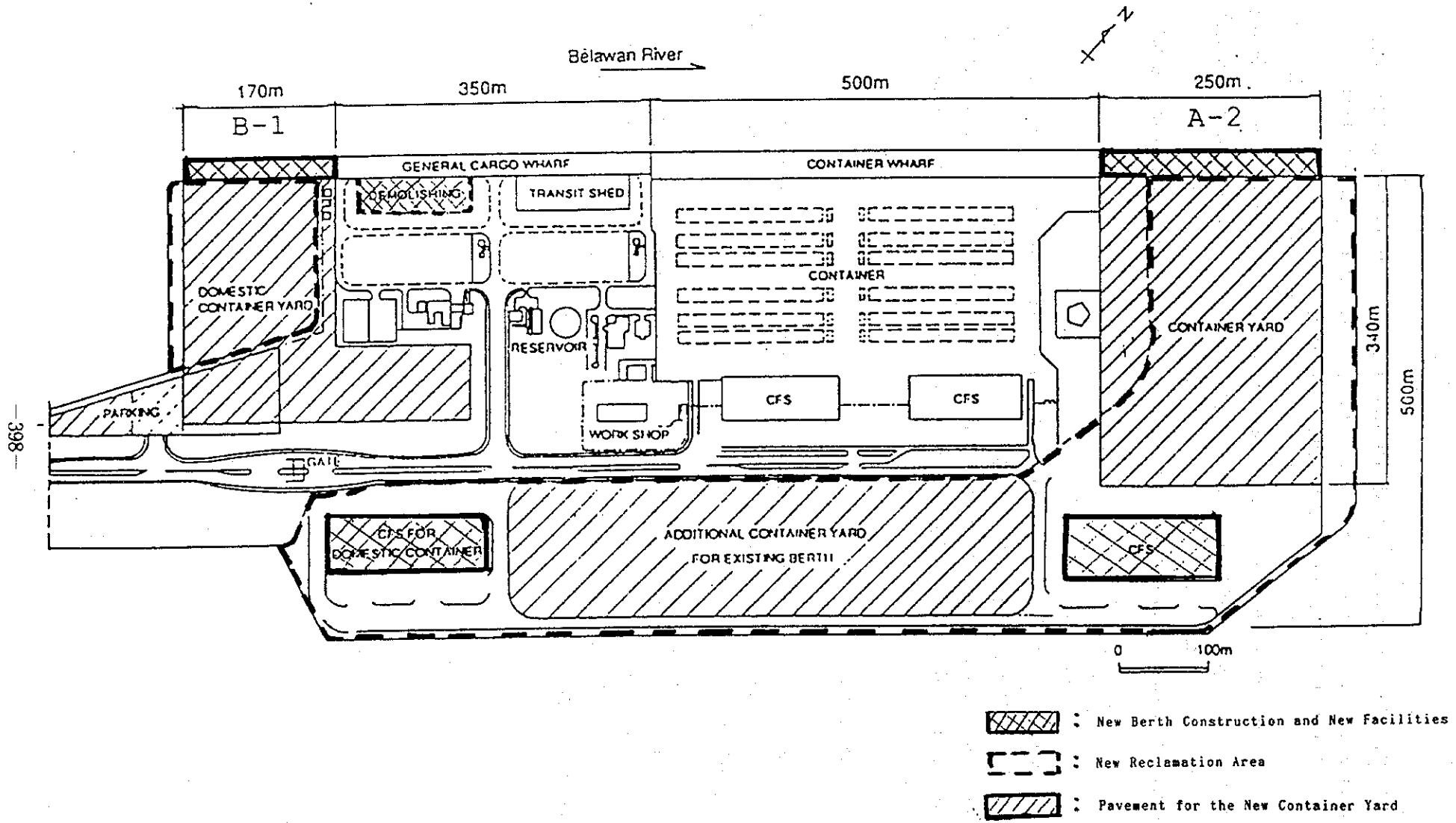


Fig. 5.15 Layout of Master Plan of Belawan Port

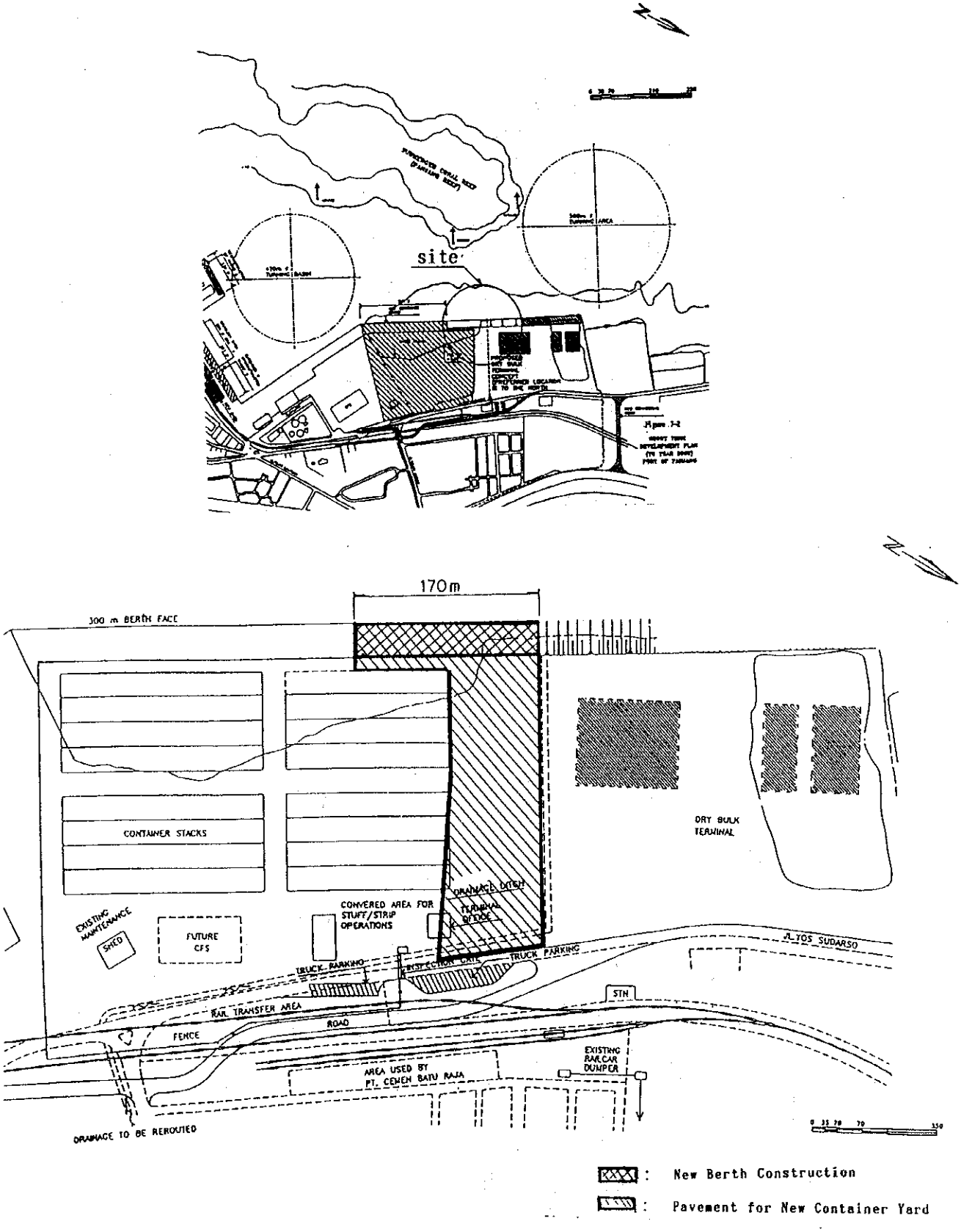


Fig. 5.16 Layout of Panjang Port

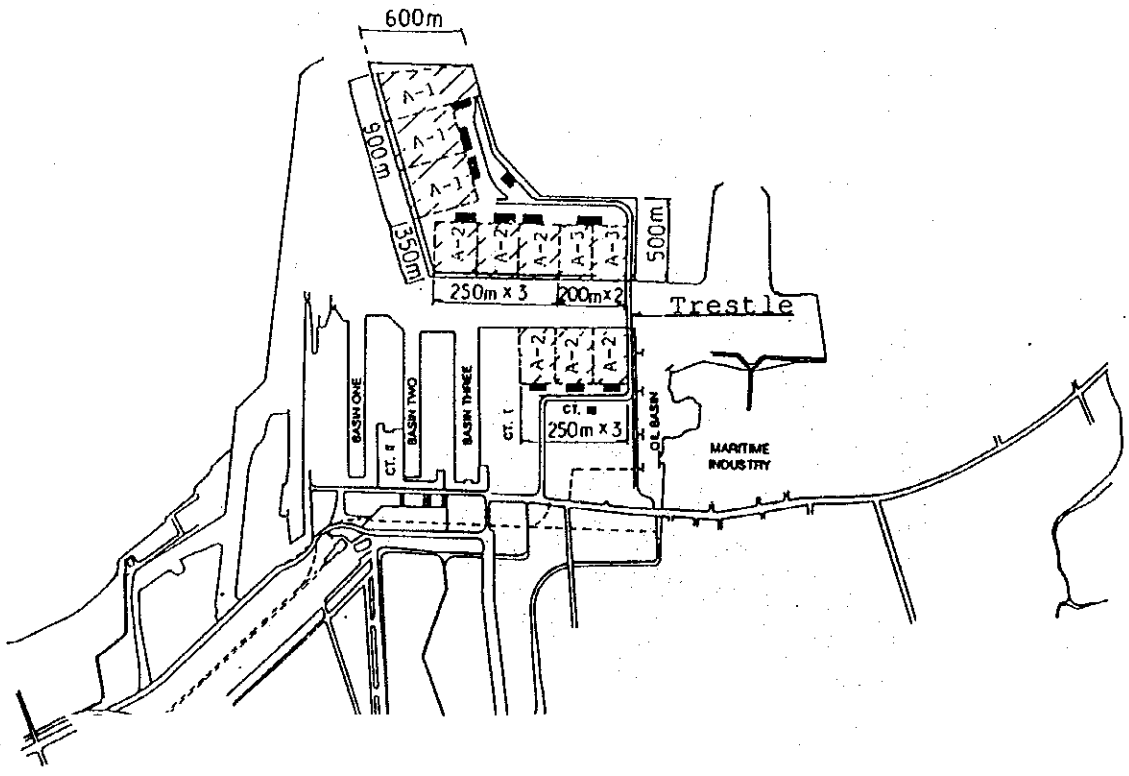


Fig. 5.17 Layout of Tanjung Priok Port (Alternative I)

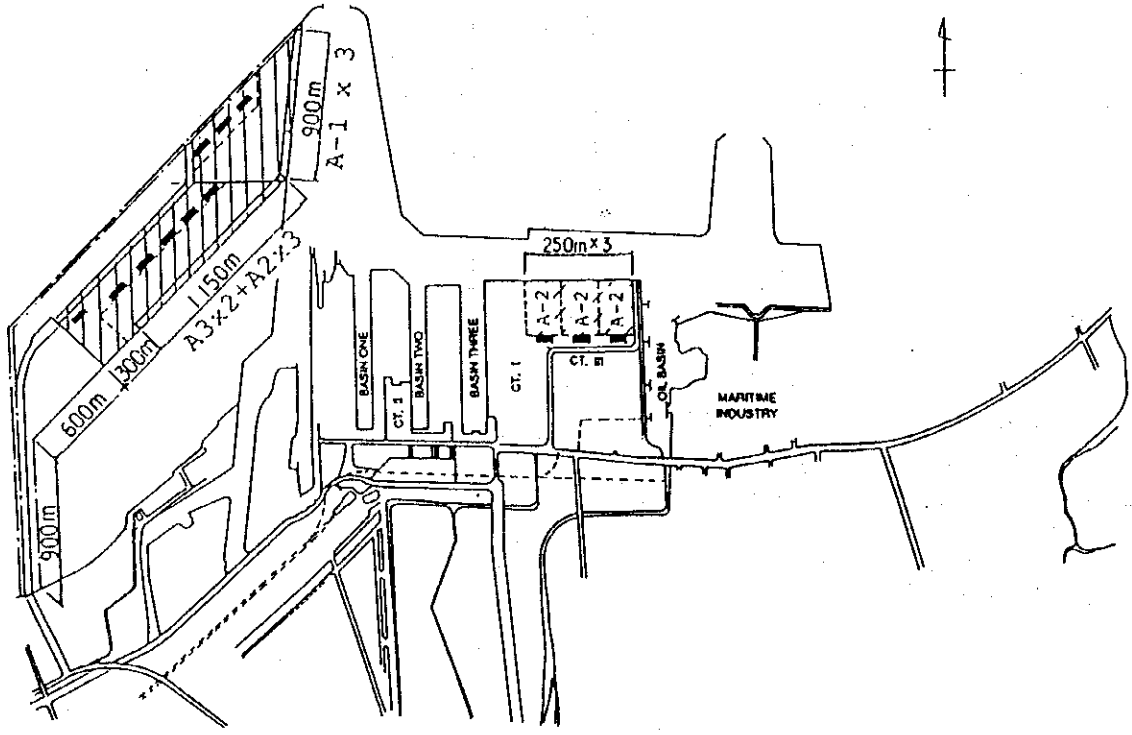


Fig. 5.18 Layout of Tanjung Priok Port (Alternative II)

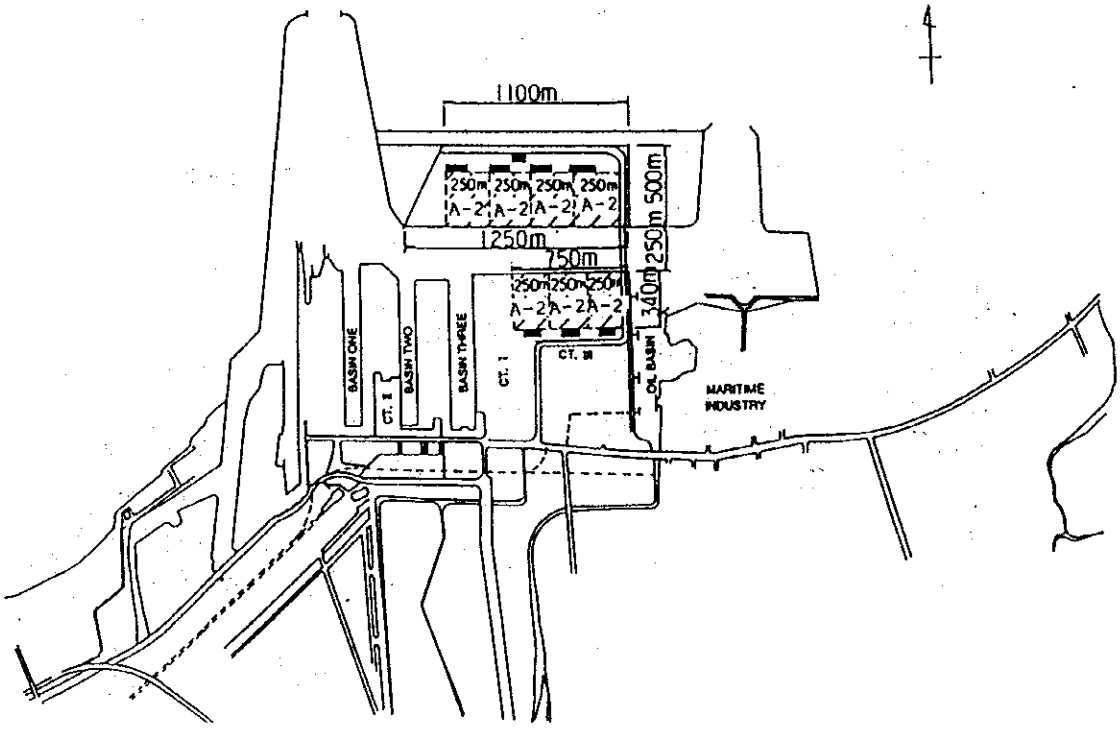


Fig. 5.19 Layout of Tanjung Priok Port (Alternative III)

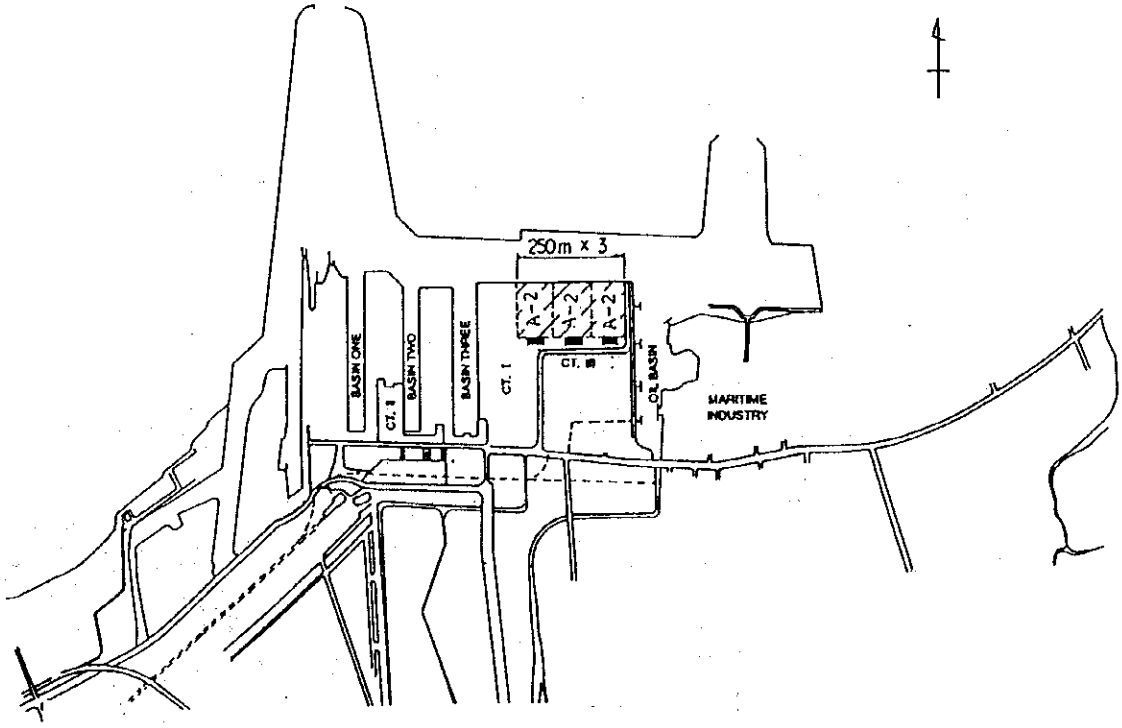


Fig. 5.20 Layout of Tanjung Priok Port (Alternative IV)

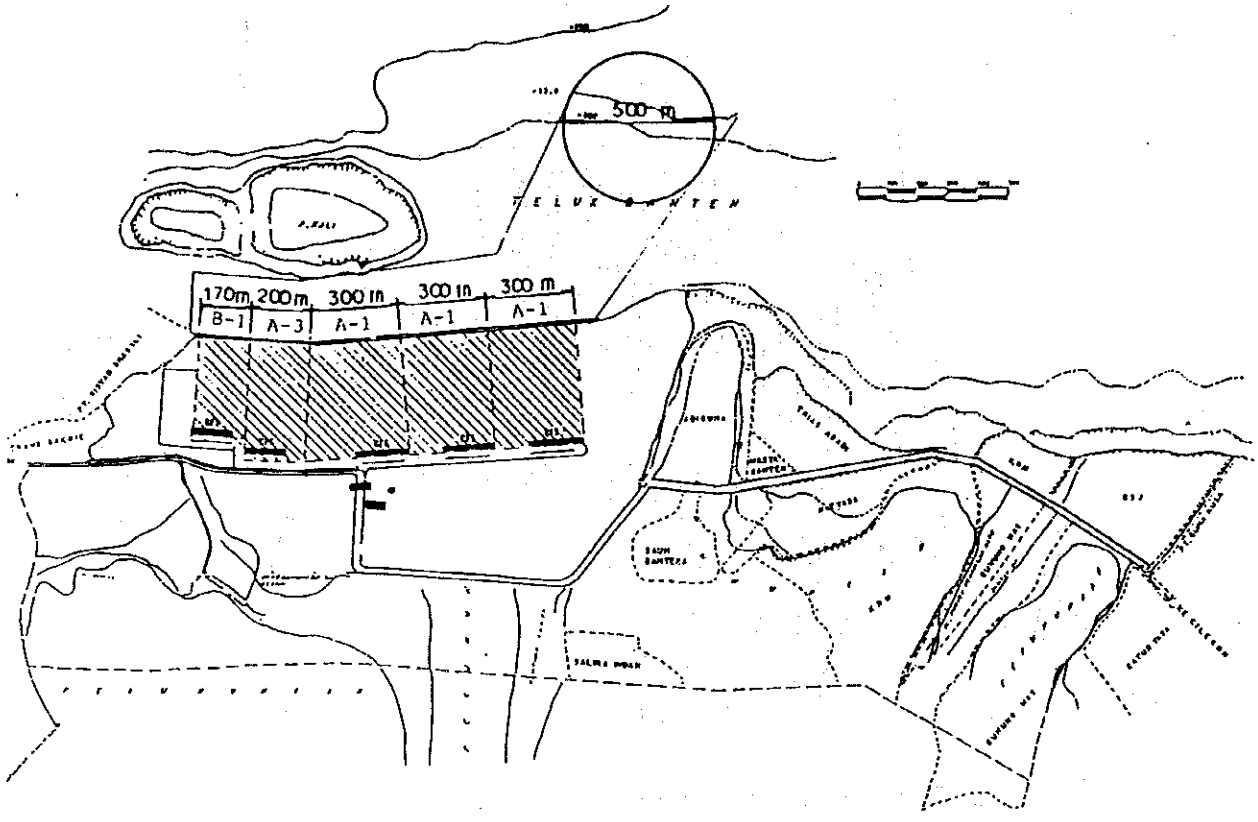


Fig. 5.21 Layout of Bojonegara (Alternative III)

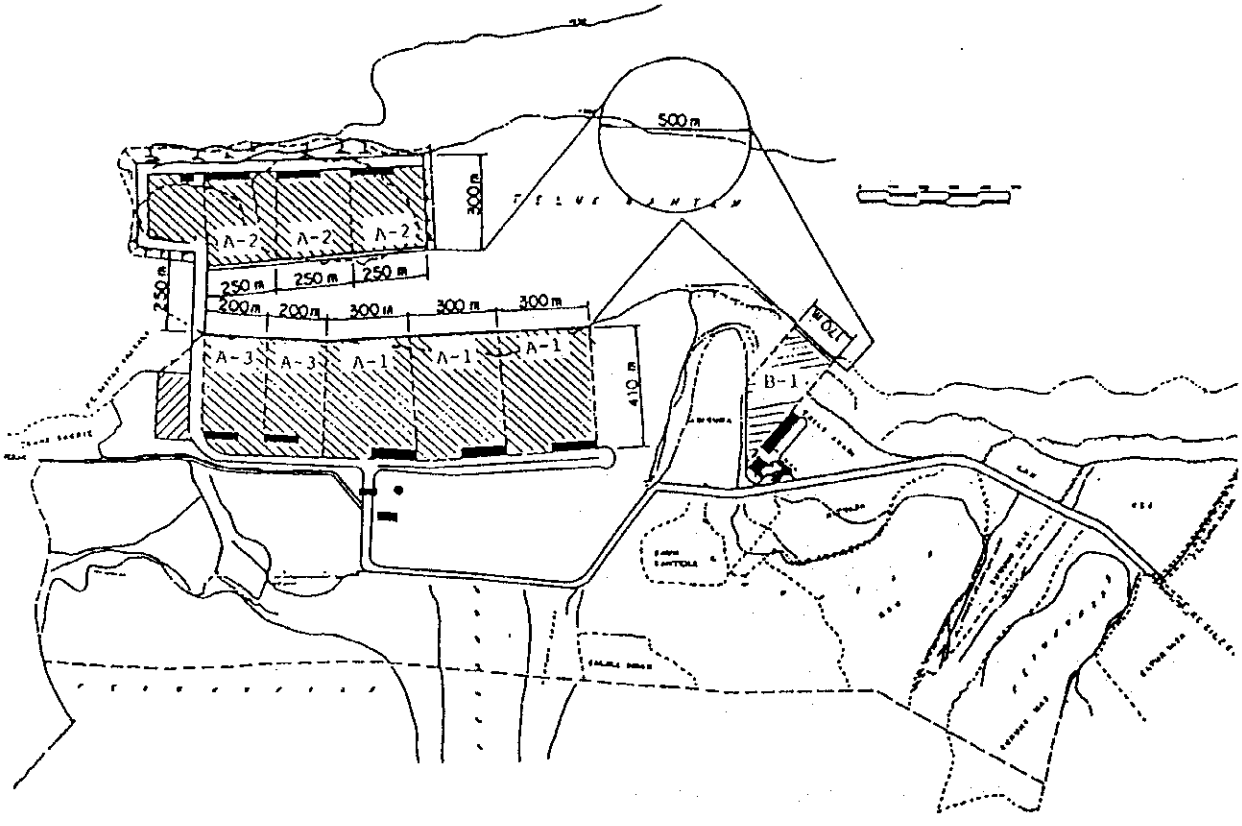


Fig. 5.22 Layout of Bojonegara (Alternative IV)

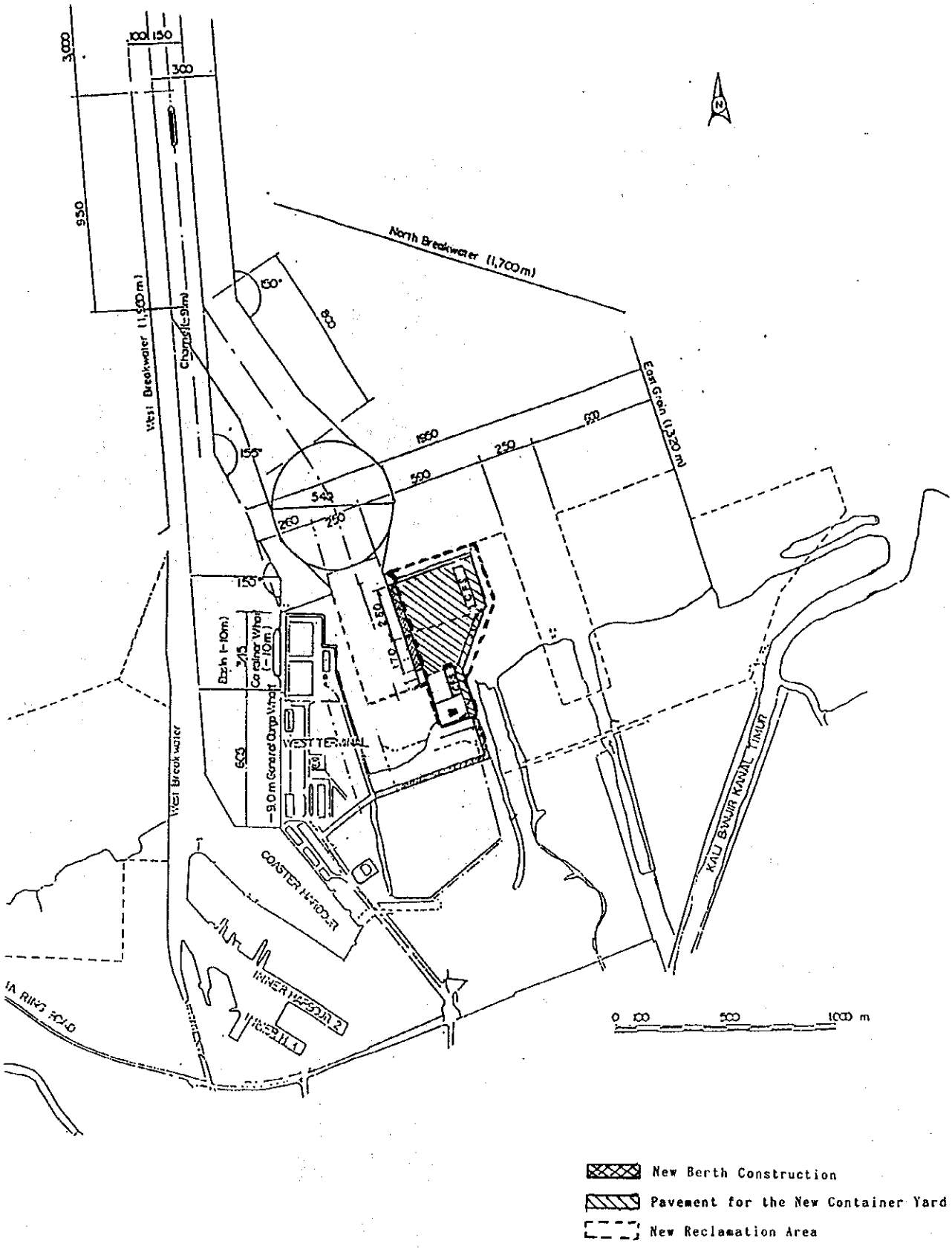


Fig. 5.23 Layout of Tanjung Emas Port

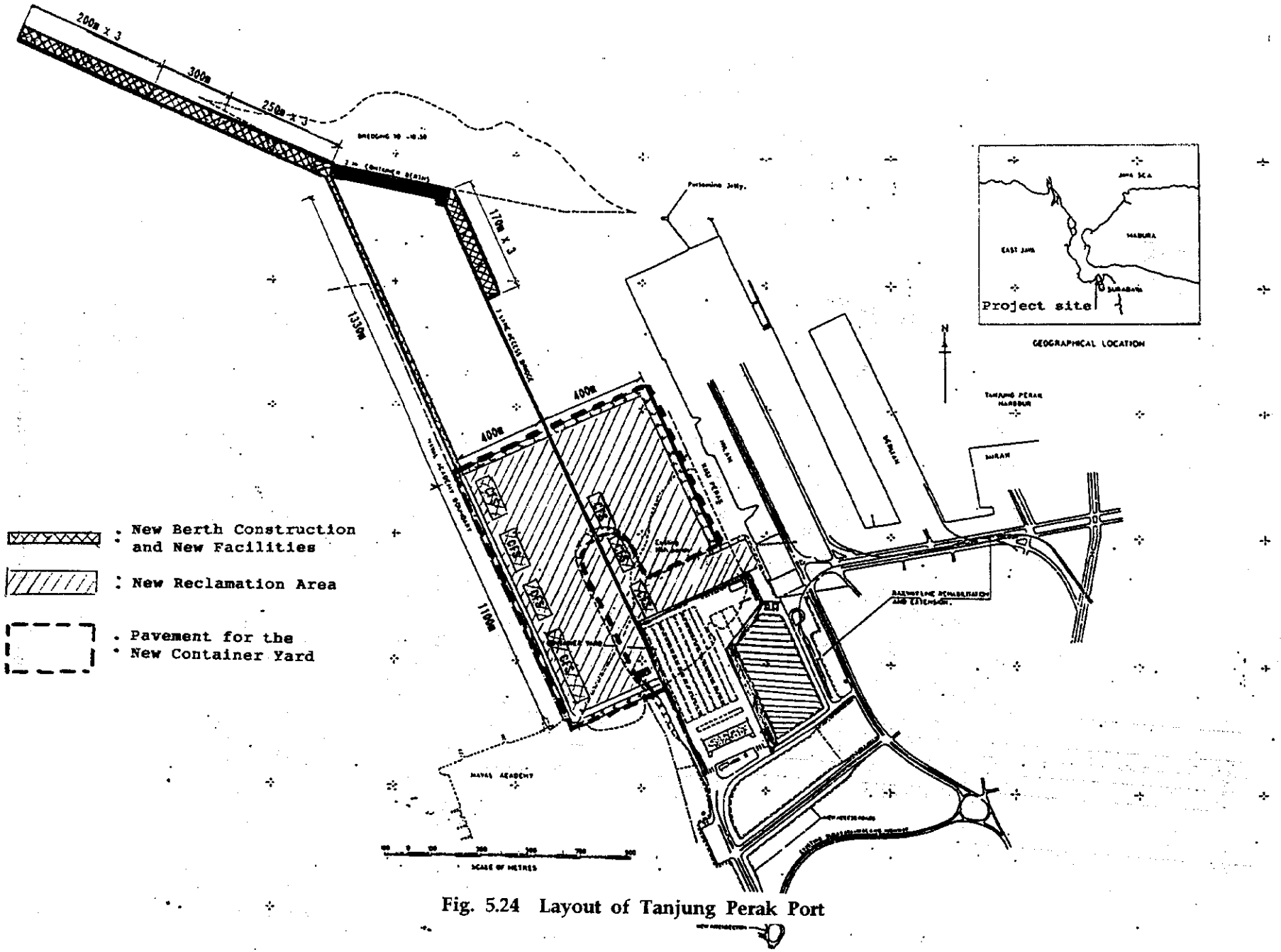


Fig. 5.24 Layout of Tanjung Perak Port

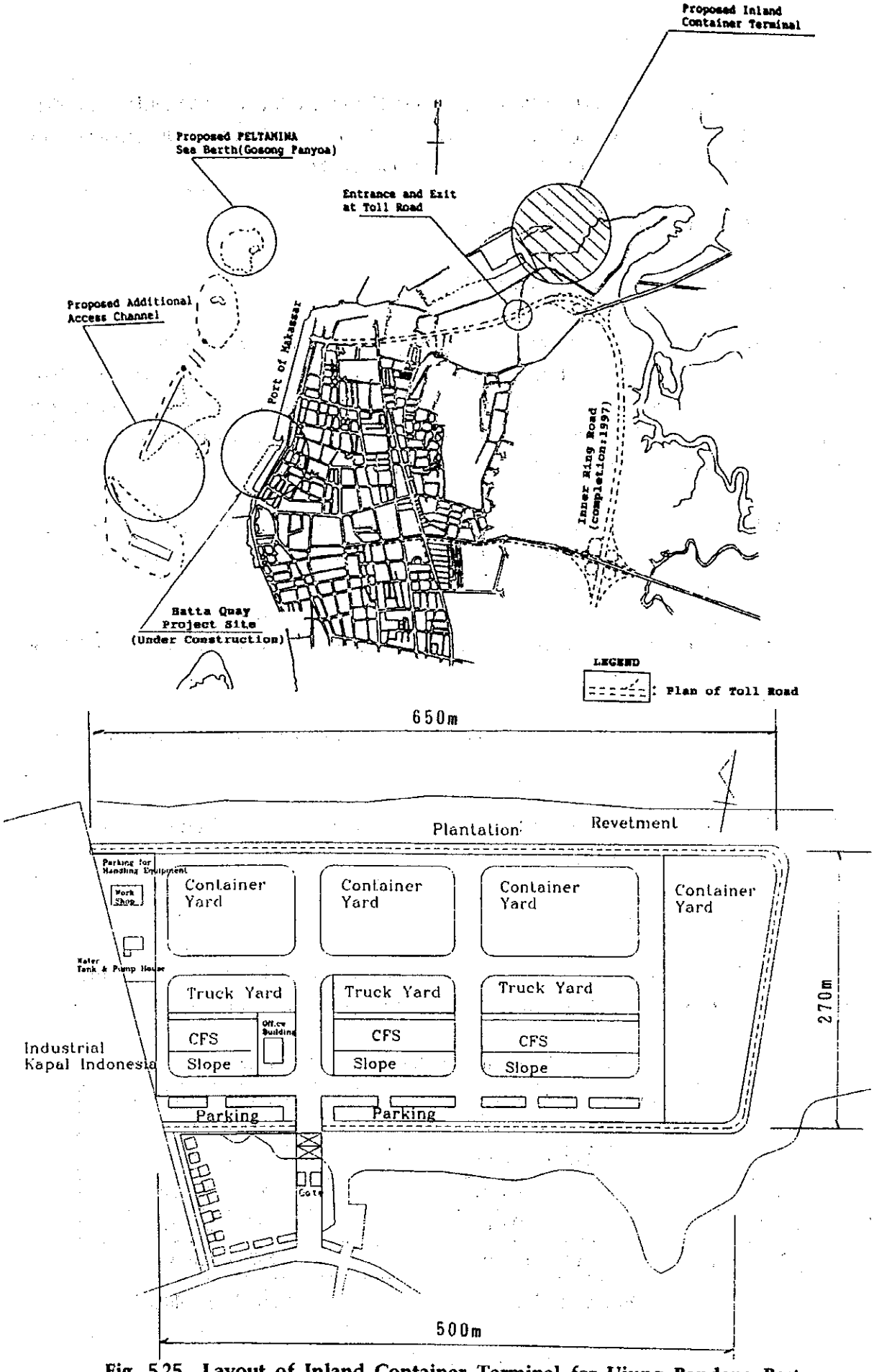


Fig. 5.25 Layout of Inland Container Terminal for Ujung Pandang Port