CHAPTER-8. CAPACITY AND DEVELOPMENT POTENTIAL OF THE PORTS

205. In this chapter, the capacity of the major commercial ports on the northern coast of western Java, i.e., Tanjung Priok, Banten including Ciwandan and Merakmas, and Cirebon, their capacities are evaluated based on the present ship navigation and cargo handling in the ports, inland transport around the ports, and the surrounding environment.

8-A. PORT CAPACITY

8-A-1 Off Shore Capacity (Navigational Capacity) of Tanjung Priok

206. As described in previous chapter, the ship navigational/maneuvering water area is very limited within the port area. Main channel is just for one-way traffic and is overlapped with the ship's turning basin. Each mooring basin is too narrow to secure safe and smooth berthing. Moreover, the port itself has only one entrance gate. Ship traffic has become severely congested recently and the port's capacity to accommodate increasing ship calls and larger-seized vessels seems to be limited.

207. Therefore, it is important to determine the port capacity from navigational point of view. In other words, how many ships are able to enter the port with the existing water area condition? In some cases, the port entrance capacity is more critical than the quay side capacity.

1) Condition of Navigational Capacity Estimate

208. The Study team has acquired the latest pilot data, August, October and November 2002, and analyzed effective 85 days' data. Total records of ship movement are 7,037 and there are 6,742 records excluding berth shifting movements. The outline of the data is as follows:

	Movements				Movements per day			
	In	Out	Shift	Total	In	Out	Shift	Total
JICT-I	242	253	18	513	2.8	3.0	0.2	6.0
JICT-II	106	91		197	1.2	1.1	-	2.3
Koja	160	156	2	318	1.9	1.8	0.0	3.7
MTI	110	113	4	227	1.3	1.3	0.0	2.7
N-CT	2,717	2,794	271	5,782	32.0	32.9	3.2	68.0
Total	3,335	3,407	295	7,037	39.2	40.1	3.5	82.8
	47.4%	48.4%	4.2%	100.0%				

a) Average In/Out Ship Movements per Day (Excluding Movements of Berth Shift)

209. Average daily in/out ship movements excluding berth shift movements is around 80 movements as shown in Figure 8-A-1. The maximum number of movements reaches around 100.

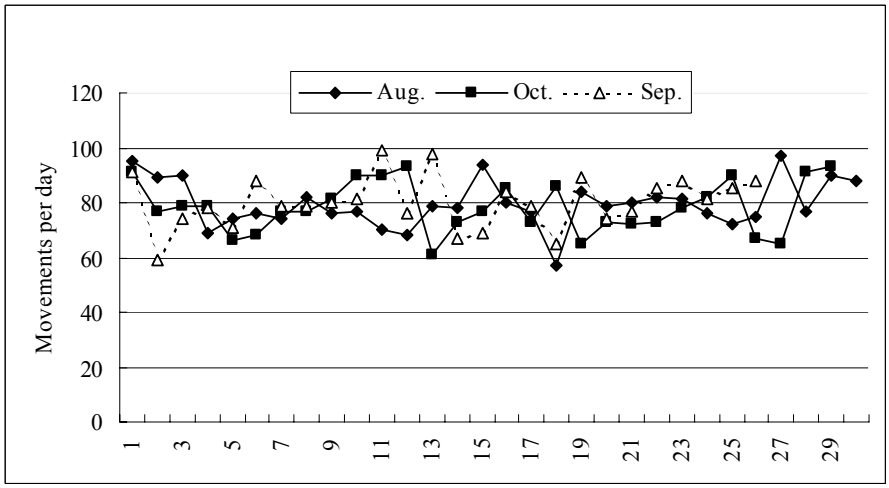


Figure 8-A-1 Average In/Out Ship Movements per Day (Excluding Berth Shift)

b) Hourly In/Out Ship Movements and Their Interval

210. The next Figure 8-A-2 shows number of hourly in/out ship movements. In general, in the morning and evening enjoy high density of ship movements, while in night there few. Average number of movements of all kinds of ship reaches almost 5, which means interval of ship movements is around 12 minutes.

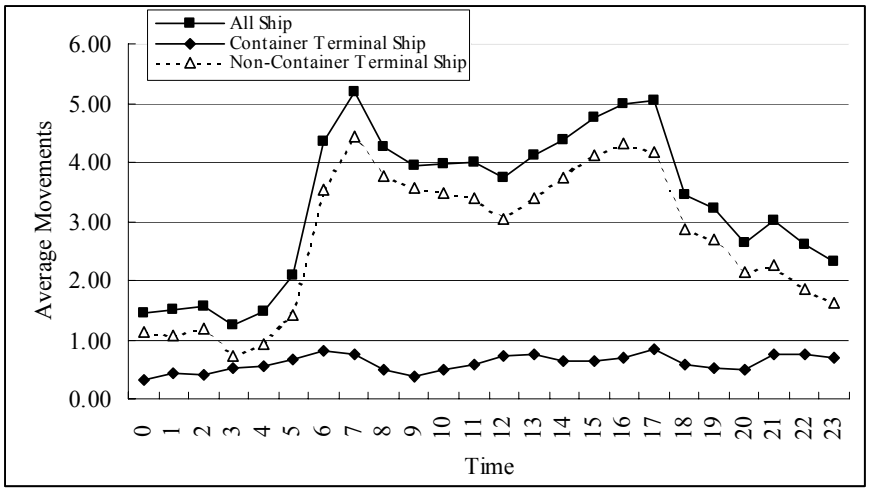


Figure 8-A-2 Hourly In/Out Ship Movement

211. The Table 8-A-1 shows number of hourly in/out ship movements. In general, in the morning and evening enjoy high density of ship movements, while in night there few. Average number of movements

Table 8-A-1 Interval of Ship Movements by Berthing Place

Minites

Time	Container Terminal			N-CT	Total
	JICT & Koja	MTI	Sub Total		
0:00~	188.9	5,100.0	182.1	53.7	41.5
1:00~	145.7	1,700.0	134.2	56.7	39.8
2:00~	164.5	1,700.0	150.0	51.0	38.1
3:00~	127.5	1,275.0	115.9	82.3	48.1
4:00~	113.3	5,100.0	110.9	64.6	40.8
5:00~	102.0	728.6	89.5	42.5	28.8
6:00~	115.9	196.2	72.9	17.0	13.8
7:00~	115.9	242.9	78.5	13.5	11.5
8:00~	188.9	364.3	124.4	15.9	14.1
9:00~	196.2	728.6	154.5	16.9	15.2
10:00~	170.0	425.0	121.4	17.3	15.1
11:00~	137.8	392.3	102.0	17.6	15.0
12:00~	100.0	510.0	83.6	19.8	16.0
13:00~	89.5	850.0	81.0	17.7	14.5
14:00~	121.4	463.6	96.2	16.0	13.7
15:00~	118.6	425.0	92.7	14.6	12.6
16:00~	104.1	566.7	87.9	13.9	12.0
17:00~	86.4	392.3	70.8	14.3	11.9
18:00~	137.8	425.0	104.1	21.0	17.5
19:00~	141.7	637.5	115.9	22.2	18.6
20:00~	137.8	1,275.0	124.4	27.9	22.8
21:00~	87.9	850.0	79.7	26.4	19.8
22:00~	94.4	463.6	78.5	32.5	23.0
23:00~	104.1	566.7	87.9	37.0	26.0

c) Frequency of In/Out Change and Sequential Number of Ships Entering/Going out at One Time

212. At the port entrance, inflow movement and out flow movement are changing frequently to cater ship side request. Figure 8-A-3 shows relation between daily ship movements and frequency of in/out change. In/out change frequency increase in proportion to the number of ship movements. Roughly speaking, the latter is two times of the former, which means 2 ships come in or go out sequentially in average.

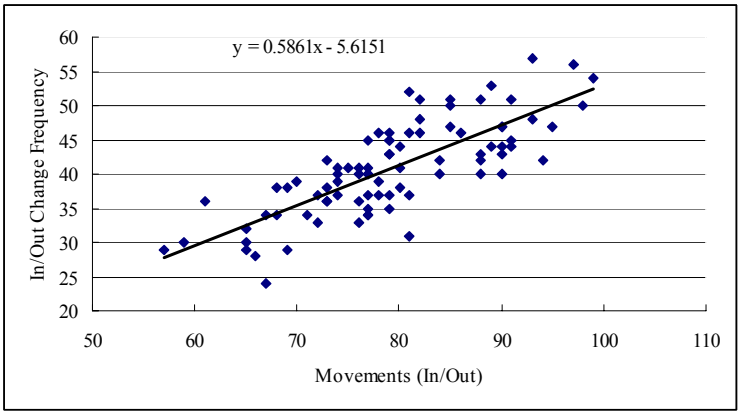


Figure 8-A-3 Relation between Daily Movements and Frequency of In/Out Change

213. Table 8-A-2 shows number of sequential movements in the same direction, in and out movements. This table also shows that average 2 ships come in or go out sequentially.

Table 8-A-2 Number of Sequential Movements in the Same Direction (In/Out)

Number of sequential movements in the same direction				
No.	In movement	Out movement	Total	
1	894	851	1745	50.3%
2	445	457	902	26.0%
3	209	241	450	13.0%
4	109	104	213	6.1%
5	39	39	78	2.2%
6	19	21	40	1.2%
7	7	16	23	0.7%
8	7	5	12	0.3%
9	4	2	6	0.2%
10	1		1	0.0%
12	1	1	2	0.1%

Average number of sequential movements in the same direction		
In movement	Out movement	Average
1.92	1.96	1.94

d) Speed of Vessel within The Port

214. For use in the latter estimate of navigational capacity, the Study team estimated average vessel speed inside the port. In terms of the container terminals, JICT, Koja and MTI, approaching time and average distance (including turn back distance) are as follows. Assuming the time for turning is 10 minutes, the average vessel speed is calculated as in the same table. Based on this, the average vessel speed inside the port is set 3 knot (=5.6km/hr).

	Approching Time (hr)	Time for Turning	Average Distance from Entrance (m)	Average Speed (knot)
JICT-I	1:01	0:10	4,050	2.55
JICT-II	0:55	0:10	2,800	2.01
Koja	1:02	0:10	5,000	3.07
MTI	0:49	0:10	2,700	2.21

2) Estimate of Navigational (Ship Calls) Capacity

a) Estimate from the Possible Interval Time of In/Out Movements

i) Total Ship Calls

215. In case that vessels are entering/going out sequentially, the interval of 2 vessels are set as 1,000m (=5*LOA), which takes 10.8 minutes (=1,000m/3knot) using the average vessel speed. On the other hand, in case that ship movement is changed from “In” to “Out”, the main channel of the entrance (Channel II) with a distance of 1,100m at least should be block section for one vessel, the time needed for changing movement direction would be minimum 23.8 minutes (=1,100m*2/3knot). =23.8 minute. In case of vice versa, changed from “Out” to “In”, the time needed for changing movement direction is assumed as 10.8 minutes the same time of ship interval in sequence.

216. Based on the relation between daily movements and frequency of in/out change as examined in *1)-c)*, as well as based on the above condition for the time of movement change, the cumulative time of ship interval can be calculated according to total ship movements per day. As a result, the number of ship movements has peaked at the level of 102 movements as shown in Figure 8-A-4 due to the limit of time of a day. 102 movements per day means that average time of ship interval is around 14 minutes and annual number of ship calls is **18,615 (=102*365/2)**., which includes non cargo handling vessels such as passenger ship, military ship, docking ship etc., but likely excludes ship for mooring at buoy. Annual calls of these vessels amounts to around 2,500 recently (excluding ships mooring at buoys = 1,000 calls), the capacity of cargo vessels would be limited at the level of around **16,000 ~ 16,500 calls**.

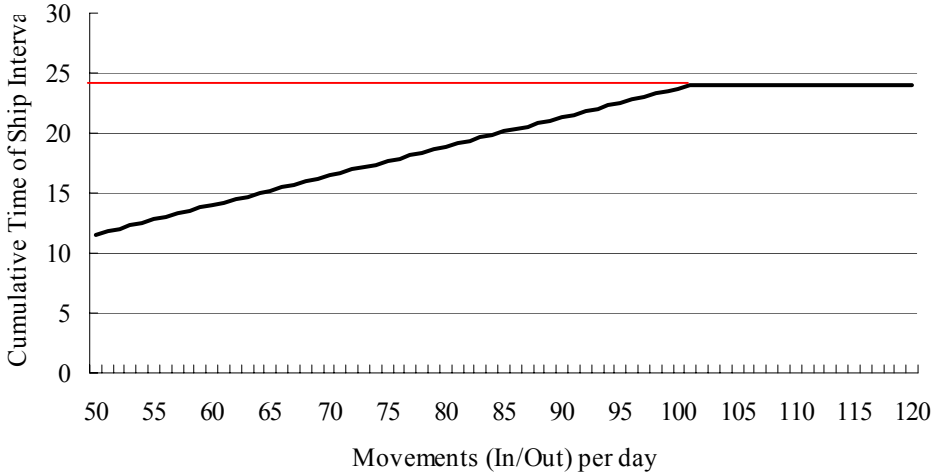


Figure 8-A-4 Relation between Movement and Cumulative Time

217. Average number of ship calls per day in 2001 was 87.4 (excluding berth shift movements, 78.8 in 2000), the allowance is calculated as 14.6 movements, equal to 7.3ship calls per day. However, it should be noted that the calculation is based on the assumption that only the main channel of 1,100m is a block section. In reality, there will be a case that the longer channel should be blocked, the ship movement allowance is likely to be less than 102.

ii) Estimation of Ship Calls Capacity for Container Terminal

218. As examined in *1)-b)*, congestion is occurred in the morning and early evening. In this rush hour, the vessels for container terminal, the minimum interval of ship movement is 86.4 minutes for JICT and Koja. In case of including MTI, 70.8 minutes and 11.5 minutes for all ships. Here, assuming that vessels for container terminal can move in/out with this minimum interval, 16.7 movements are available for JICT and Koja, 20.3 movements for JICT, Koja and MTI. Annual ship calls are calculated 3,048 (=16.7*365/2) and 3,705 (=20.3*365/2) respectively.

219. As average number of ship calls in 2001 was 2,304 for JICT and Koja, 498 for MTI, total 2,802, the allowance of ship calls is calculated as 744 calls and 159 calls respectively, and total is 903 calls. Ship calls per day is calculated as 2.5 in total, which means additional 17 weekly services will be available.

b) Estimation by Computer Vessel Simulation

220. There is a method to simulate ships' waiting and berthing in a port. A series of simulations will show the number of ship calls, ship waiting time, berth occupancy and so on and it is possible to find a certain saturation level from a navigational standpoint. The Study

team prepared and conducted computer simulation for ship waiting and berthing on the following conditions:

- Berthing quay for each vessel is selected in random among the available berths considering terminal operators, cargo type and ship size
- Handling productivity, idling and non-operational time are set based on the actual shipping data.
- Interval of vessel entering the port and average ship speed is set as ten minutes and 3 knots respectively.
- The first priority to come in/out of the port is put on container and passenger ship because of their scheduled service. The second priority is put on outgoing vessels.
- Channels from main entrance to each basin are operated one-way traffic in the present situation and two-way traffic in future situation.

221. Figure 8-A-5 describes the results of simulation for Tanjung Priok under the existing conditions. Conditions such as ship size distribution, cargo handling volume per each ship size class, productivity are set based on 3 months' shipping data, March 2001, September 2001 and March 2002. The simulation has limits to represent real situations precisely, however, the results clearly shows that there is a certain capacity of ship calls at Tanjung Priok. The simulation yields around **20,000 calls** as the maximum number of ships that can enter the port. Since ships in the simulation includes non cargo handling vessels such as passenger ship, military ship, docking ship, ships for mooring at buoys etc., which annual calls amounts to around 3,500 recently, the capacity of cargo vessels would be limited at the level of around **16,500 calls**.

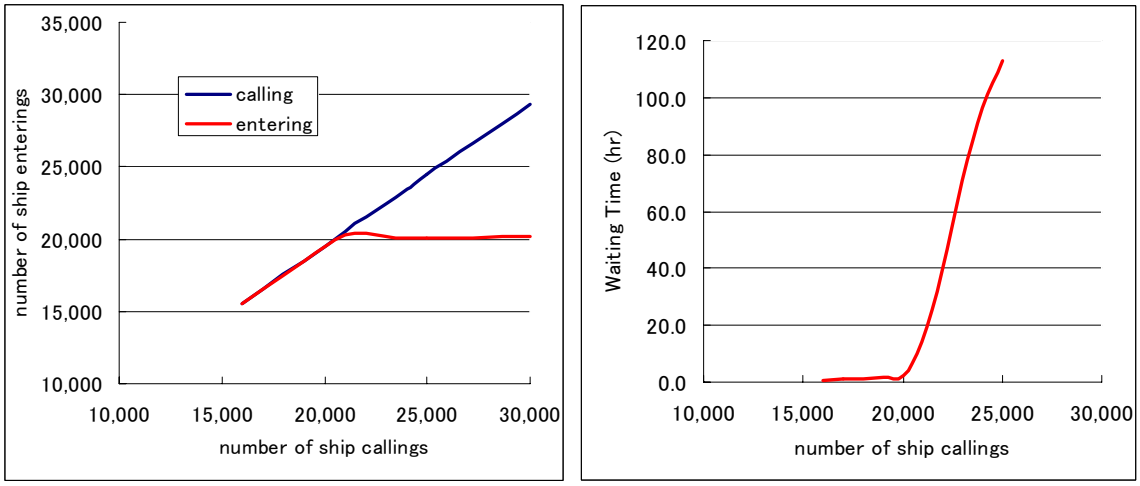


Figure 8-A-5 Result of simulation

222. Generally speaking, the relation between the number of ship calls waiting time and berth occupancy ratio in a port with one-way traffic can be described as in Figure 8-A-6. In case that the number of ship calls of the port is reaching its limit, increasing the number of berths beyond a certain level does not improve the situation. Thus, the development of 3 berths at the existing container terminal does not always improve the situation.

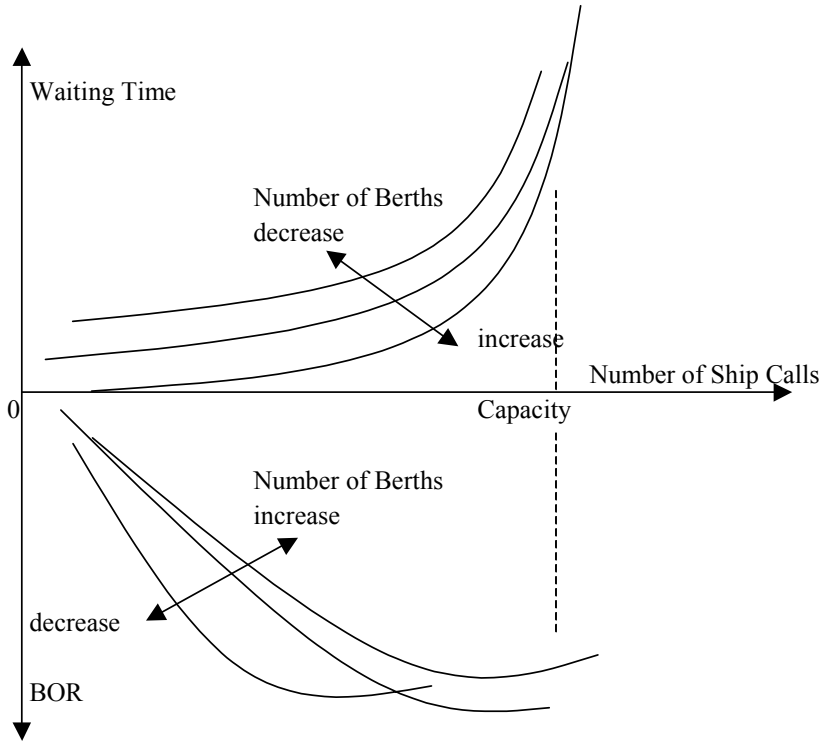


Figure 8-A-6 Relationship number of ship calls waiting time and BOR

223. On the other hand, in case of two-way traffic, the ship call capacity is dependent on the number of berths. Based on the simplified model, 52,560 ship (= 6 ships/hour * 24 hours * 365 days) can enter the port theoretically assuming that all basins will be secured by two-way traffic and the interval of ships in the channel is 10 minutes. In the case of Tanjung Priok, there would be no limit to the number of ship calls.

224. According to the computer simulation on condition that the main channel from west gate to the front of JICT and Koja container terminal will be improved for two-way traffic, there would be almost no limit on number of ship calls and more than 30,000 ship calls can be accommodated annually judging from the simulation result as shown in Figure 8-A-7.

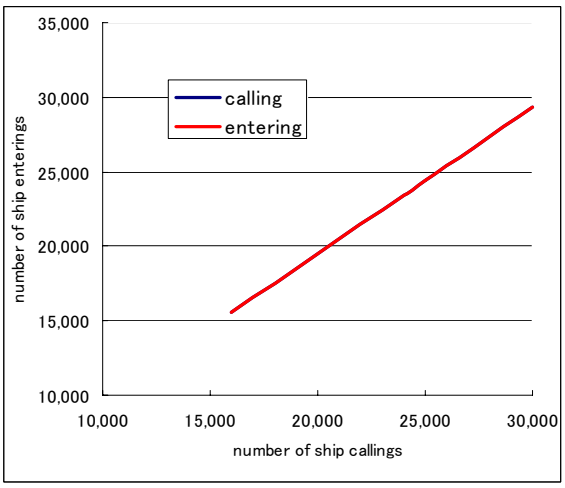


Figure 8-A-7 Result of simulation (two-way)

3) Setting of Ship Calls Capacity for Calculating Quay Side Capacity

225. The above two examinations show almost the same results, that is, around 16,000 ~ 16,500 would be the limit of ship calls for cargo vessels which excludes non-cargo vessels such as passenger ships, vessels for the purpose of docking etc. Therefore, it is assumed here that **16,500 calls** is the maximum capacity for cargo vessels at the existing Tanjung Priok as shown in Table 8-A-3. It is also assumed that there will be no limit on the number of ship calls provided that navigational conditions are improved.

Table 8-A-3 Capacity Setting for Number of Ship Calls at the Existing Tanjung Priok

		All cargo handling ships	JICT & Koja	MTI	Other Terminals
Capacity (A)	Annual	16,500	3,048	657	12,795
	per day	45.2	8.4	1.8	35.1
2001 * (B)	Annual	13,568	2,257	499	10,812
	per day	37.2	6.2	1.4	29.6
Increase Ratio (A/B)		1.22	1.35	1.32	1.18

* 2001 figures under all cargo handling ships are estimated subtracting 3,500 calls of non-cargo vessels from total calls (17,068).

8-A-2 On-shore Capacity (Quay Side & Yard Side Capacity)

226. On-shore capacities which are determined by critical capacity between quay side capacity and yard side capacity are estimated as below.

1) Tanjung Priok

a) Container Cargo

i) Capacity of Existing Facilities

227. Container handling capacities of the existing Tanjung Priok are estimated as in Table 8-A-4, taking into consideration the capacity constraints of ship calls as set in previous section.

228. The quay capacity is calculated with assumption of BOR, ship size distribution, number of unloaded/loaded container, number of cranes used, crane productivity etc properly. The yard capacity is calculated by UNCTAD method with assumption of container handling type, average stacking height, average transit time, empty container ratio etc.

Table 8-A-4 Capacity of Existing Facilities

	Quay side			Yard side	Capacity
	Ship calls	000TEU		000TEU	000TEU
JICT1	1,556	1,504	<	1,741	1,504
JICT2	485	419	<	436	419
Koja	655	644	<	977	644
MTI	657	171	<	263	171
Conv.	1,859	540	>	287	287
JICT&Koja	2,696	2,567		3,154	2,567
MTI&Conv.	2,516	710		550	458
Total	5,212	3,277		3,703	3,025

229. The yard capacity is less than quay side capacity in conventional berth, while vice versa in JICT and Koja. MTI is almost balanced.

ii) Capacity of Future Facilities (Without Navigational Condition Improvement)

230. In the same manner, the capacity in 2005 after completion of JICT and Koja container berths as well as expansion of container yards of JICT, Koja and MTI are calculated as in Table 8-A-5, also taking into consideration the capacity constraints of ship calls as set in previous section III-A-1.

Table 8-A-5 Capacity of Future Facilities (Without Navigational Condition Improvement)

	Quay side			Yard side	Capacity
	Ship calls	000TEU		000TEU	000TEU
JICT1	1,832	1,780	<	3,020	1,780
JICT2	402	347	<	436	347
Koja	814	800	<	1,132	800
MTI	657	171	<	263	171
Conv.	1,859	540	>	287	287
JICT&Koja	3,048	2,927		4,588	2,927
MTI&Conv.	2,516	710		550	458
Total	5,564	3,637		5,138	3,385

231. The result shows that an additional 3 new berths would increase the capacity by only around 400,000 TEU, which means the new berths would not be fully utilized.

iii) Capacity of Future Facilities (With Navigational Condition Improvement)

232. Based on the above results, navigational capacity is critical to increase the container handling capacity. Table 8-A-6 shows the capacity in case that there is almost no constraints of navigational capacity under the condition of two-way traffic navigation for main channel as well as improving access channel to MTI.

Table 8-A-6 Capacity of Future Facilities (With Navigational Condition Improvement)

	Quay side			Yard side	Capacity
	Ship calls	000TEU		000TEU	000TEU
JICT1	2,200	2,203	<	3,020	2,203
JICT2	485	419	<	436	419
Koja	972	1,021	<	1,132	1,021
MTI	764	199	<	263	199
Conv.	2,538	740	>	286	286
JICT&Koja	3,657	3,643		4,588	3,643
MTI&Conv.	3,302	939		549	485
Total	6,959	4,582		5,137	4,128

233. The capacity of JICT & Koja under the above condition will reach around 3.6 million TEU. It is an effect of two-way traffic condition as well as improved capacity of MTI being able to accommodate for larger vessels.

234. Finally, capacity and demand for import/export containers and domestic containers is compared in the Table 8-A-7, Figure 8-A-8 and Figure 8-A-9. It is assumed that the former containers are handled in JICT and Koja while the latter are handled in MTI and conventional berths.

Table 8-A-7 Capacity and Demand (Container, Tanjung Priok)

	Capacity (000'TEU)			Demand (000'TEU) - Basic Case -			
	Existing Facilities (One-way Channel)	Future Facility (One-way Channel)	Future Facility (Two-way Channel)		2,000	2012	2025
JICT&Koja	2,567	2,927	3,643	Im/Export	2,073	4,177	6,530
MTI&Conv.	458	458	485	Domestic	237	754	1,709
(Quay side)	710	710	939				

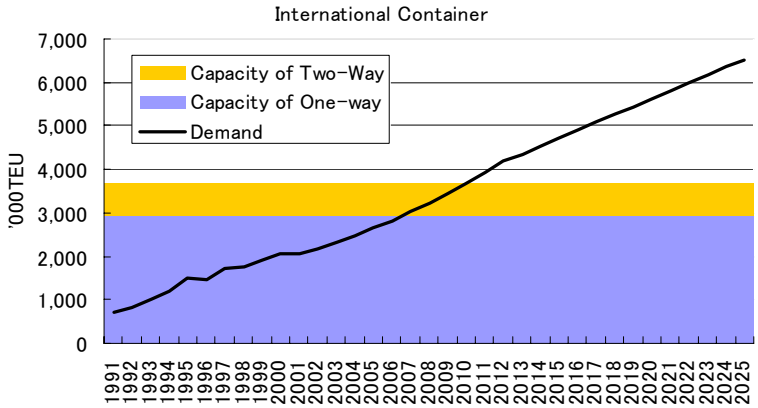


Figure 8-A-8 Quay Side Capacity and Demand (International Container, Tanjung Priok)

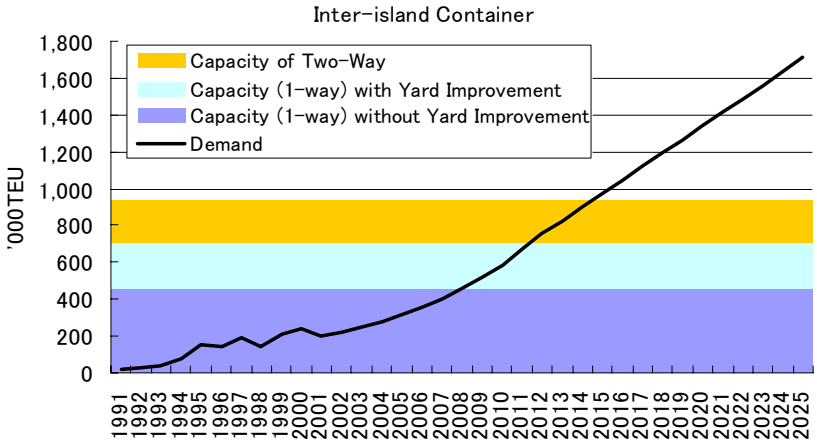


Figure 8-A-9 Quay Side Capacity and Demand (Inter-island Container, Tanjung Priok)

235. In 2012, demand is beyond the capacity for both import/export and domestic container cargo. This means that new container handling facilities are needed at least by 2012 even if operating under maximum capacity.

236. It is also noted that establishment of dedicated domestic container terminals with sufficient yard area is necessary by reorganizing existing conventional wharves. Lack of sufficient yard area behind conventional berths would make it very difficult to increase the capacity of domestic container handling. The capacity of MTI should be also improved by widening the current narrow access channel as well as by improving yard productivity.

b) Conventional Cargo

i) Quay Side Capacity (Without Navigational Condition Improvement)

237. Conventional cargo handling capacities of Tanjung Priok are estimated as in Table 8-A-8, taking into consideration of the capacity constraints of ship calls as set in previous section III-A-1.

238. The quay capacity is calculated with assumption of BOR, handling share of each cargo type such as general cargo, bag, dry bulk and liquid bulk, ship size distribution by cargo type, number of unloaded/loaded cargo tonnage, number of gangs used, gang productivity etc. The yard capacity is calculated by Japanese standard method with assumption of average tonnage for storage, average transit time, and so forth.

239. Actually, conventional public wharves are not always specialized for cargo type and mixed with various cargoes. As for the capacity of existing facilities, the existing shares are used.

240. In terms of BOR, the Study team uses berth length-wise BOR. Because in case of Tanjung Priok, the actual berths can be utilized sequentially so that a ship can be berthed anywhere according to the ship size and several berths are actually grouped and operated by terminal operators.

Table 8-A-8 Quay Side Capacity of Existing Facilities (Without Navigational Condition Improvement)

Unit: '000ton

Type of Wharf	Type of Cargo	Quay Side Capacity	
		Ship calls	Tonnnage
Public	General & Bag	6,897	13,940
	Dry Bulk	1,579	7,126
	Liquid Bulk	1,320	2,435
	Sub Total	9,796	23,501
Special	Dry Bulk	156	3,515
	Liquid Bulk	982	10,080
	Sub Total	1,138	13,595
Total		10,934	37,096

241. Current quay side capacity is sufficient for the current cargo volume, however, there are some imbalances among cargo types. The capacity of general and bag cargo is almost reaching its limit under the current condition. On the contrary, the capacity of dry bulk and liquid bulk cargo in public wharves is much enough for actual volume compared to general and bag cargo. It means that the handling productivity of dry bulk and liquid bulk cargo would be relatively low. This seems to stem partly from narrowness of their back yard area. If they had enough yard, total berth length for dry bulk and liquid bulk could be reduced and converted to general and bag cargo berth.

ii) Quay Side Capacity (With Navigational Condition Improvement)

242. Table 8-A-9shows the capacity in case that there is almost no constraints of navigational capacity under the condition of two-way traffic navigation for main channel. It is clear that the navigational capacity is also critical to increase the conventional cargo handling capacity.

Table 8-A-9 Quay Side Capacity of Existing Facilities (With Navigational Condition Improvement)

Unit: '000ton

Type of Wharf	Type of Cargo	Without Improvement		With Improvement	
		Quay Side Capacity		Quay Side Capacity	
		Ship calls	Tonnnage	Ship calls	Tonnnage
Public	General & Bag	6,897	13,940	8,786	17,758
	Dry Bulk	1,579	7,126	2,012	9,077
	Liquid Bulk	1,320	2,435	1,682	3,102
	Sub Total	9,796	23,501	12,480	29,937
Special	Dry Bulk	156	3,515	199	4,477
	Liquid Bulk	982	10,080	1,251	12,840
	Sub Total	1,138	13,595	1,450	17,317
Total		10,934	37,096	13,930	47,254

243. Table 8-A-10 and Figure 8-A-10 ~ Figure 8-A-12 shows a comparison between capacity and demand which based on the demand analysis and the functional allotment as discussed other section. Two-way channel will increase their capacity dramatically. As for dry bulk cargo at special wharves, the capacity would be short in the future according to the increasing demand.

Table 8-A-10 Capacity and Demand (Conventional Cargo, Tanjung Priok)

	Quay Side Capacity (000'ton)		Demand (000'ton)		
	Without Navigation Improvement	With Navigation Improvement	2001	2012	2025
General & Bag	13,940	17,758	13,190	16,246	20,389
Dry B.	10,641	13,554	7,268	11,004	20,129
Public	7,126	9,077	4,482	6,563	10,720
Special	3,515	4,477	2,786	4,441	9,409
Liquid B.	12,515	15,942	10,094	11,644	14,046
Public	2,435	3,102	1,490	2,386	3,480
Special	10,080	12,840	8,604	9,258	10,566
Total	37,096	47,254	30,552	38,894	54,564

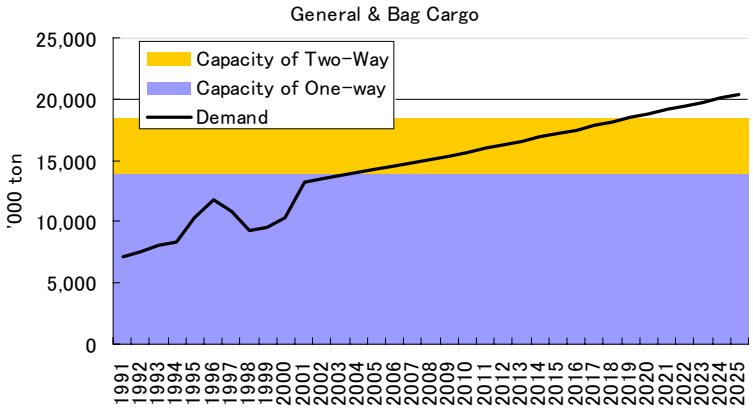


Figure 8-A-10 Quay Side Capacity and Demand (General and Bag Cargo)

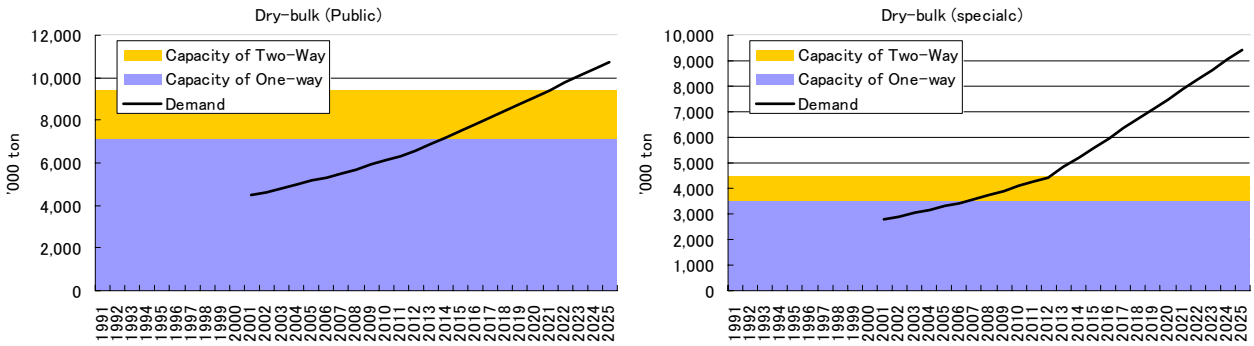


Figure 8-A-11 Quay Side Capacity and Demand (Dry-Bulk Cargo)

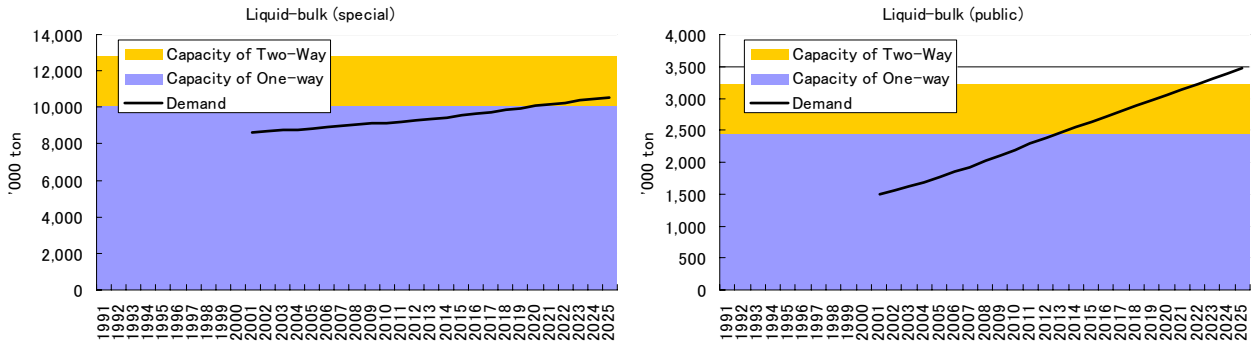


Figure 8-A-12 Quay Side Capacity and Demand (Liquid-Bulk Cargo)

244. As for public cargo, the demand in 2012 and 2025 is far beyond the quay side capacity for general and bag cargo while liquid and dry bulk cargo have allowance. More facilities for general and bag cargo should be developed by re-organizing conventional wharves and/or constructing additional wharves. At the same time, increasing navigational capacity by improving channels is also indispensable to cope with the increase of ship calls in future.

iii) Land Side Capacity at Public Wharf

245. Land side capacities and yard/warehouse capacities at public wharf are calculated as in Table 8-A-11. In the calculation, only yard/warehouse areas located behind and/or belonging to quays are counted.

Table 8-A-11 Yard Capacity

	Yard Side		Actual (2001) ('000ton)		Passage Ration (Assumption)		
	Area (m2)	Capacity ('000ton)	Cargo Volume (GC, Bag & Dry-B (Public))	Necessary Capacity	GC	Bag	Dry-B
Yard	94,700	5,455	17,672	4,596	25%	0%	50%
Warehouse	185,000	5,920	17,672	4,240	25%	50%	0%

246. There will soon be a shortage of yard area, while there is a surplus of warehouse capacity. This means that some warehouses are not utilized fully and can be demolished. Furthermore, a shortage of yard area means that there are lots of direct unloading/loading cargo without being stored in the yard and this would generate increased road traffic. To maximize

berth productivity, some dedicated dry bulk berths with sufficient yard area as well as enhancement of use of storage facilities would be necessary.

c) Relation between Navigational Capacity and Handling Productivity

247. According to the above capacity examination, it has been found solving navigational constraints is critical to increase the quay side capacity for both container and conventional cargo. Constraint of navigational capacity compels ships to wait outside of the port and/or quay side which leads to an increase of waiting time and/or non-operating time. Under this kind of situation, there seems to be no incentive for stevedoring companies to increase the handling productivity. Thus, priority should be put on the improvement of navigation as well as handling productivity.

2) Cirebon

248. Quay side capacity is calculated as in Table 8-A-12 in the same manner of Tanjung Priok. There are enough capacity for the future demand for the moment.

Table 8-A-12 Quay Side Capacity of Cirebon

Unit: 000'ton

Type of Cargo	Capacity		Demand			
	Existing	Future	Actual (2001)	2005	2012	2025
General	1,217	1,391	228	275	300	300
Bag	691	771	576	500	500	500
Dry Bulk	6,135	6,135	1,002	1,334	1,887	4,203
Liquid Bulk	3,228	3,228	156	150	150	150
Container (ton)			-	-	-	-
(000'TEU)	86	129	-	-	-	-
Total	11,271	11,525	1,962	2,259	2,837	5,153

3) Banten (Ciwandan & Merakmas)

249. Quay side capacity is calculated as shown in Table 8-A-13 and Table 8-A-14 in the same manner of Tanjung Priok. It is not clear whether the capacity is enough or not as the demand includes special wharves' cargo. As far as general and bag cargo which are handled in public wharf, their capacity seems to be enough against the future demand. As for container, Merakmas has sufficient capacity.

Table 8-A-13 Quay Side Capacity of Ciwandan

Unit: 000'ton

Type of Cargo	Capacity (Ciwandan)		Demand (Whole Banten)			
	Existing	Future	Actual (2001)	2005	2012	2025
General	1,099	1,657	660	1,400	1,400	1,400
Bag	319	864	69	200	200	200
Dry Bulk *	3,068	3,068	7,589	15,334	16,838	30,720
Liquid Bulk *	1,614	1,614	10,804	12,191	18,472	43,870
Container (ton) *			297	-	-	-
(000'TEU)	82	258	24	-	-	-
Others			84	72	80	12
Total	6,099	7,202	19,503	29,197	36,990	76,202

*Figures in the demand columns include special wharves' cargo.

Table 8-A-14 Quay Side Capacity of Merakmas

Unit: 000'TEU

Type of Cargo	Capacity	Demand (Whole Banten)			
	Existing	Actual (2001)	2005	2012	2025
Container (ton) *	344	24	-	-	-

*Actual figure covers whole Banten.

4) Bojonegara

250. At the moment, there is no port facility in Bojonegara site. There is enough space to develop a new port and necessary facilities can be planed in freehand, however, breakwater and land reclamation is needed. It should be also noted that the sheltered area by natural land, i.e., Pulau Kali is rather narrow for developing new port.

8-B. LAND TRANSPORT CAPACITY

8-B-1 Tanjung Priok

1) Procedure of Checking the Road Capacity

251. The inland transport capacity to the Tanjung Priok Port depends on the access road capacity, which is assessed the following procedures.

- The present traffic conditions through the major access roads are checked and analyzed directional flows and daily traffic volume by traffic counting surveys and O/D survey. The access roads are namely from western area through JL. Laks. R.E. Martadinata from Ancol to the Tanjung Priok, from eastern area through Jl. Jampea and Cilincing from the JORR northern extension, from southern area through Jl. Laks. Yos Sudarso, Jl. Sulawesi and Tanjung Priok Interchange are considered.
- The daily traffic volume (called as DTV) counted at 8 locations is classified directional flows from the Tg. Priok port area.
- The port related traffic volume (PRT) is estimated based on the traffic counting survey data at 6 gates of the port. The daily traffic volume coming to the port from east through Jl. Jampea, from west through Jl. Laks. R.E. Martadinata and from south through Jl. Laks. Yos Sudarso are classified. The balance of total daily directional traffic volume from 3 directions minus port related traffic volume through 6 gates would be considered as the through traffic around the port.
- The correlation of the vehicle volume counted by the survey at 6 gates and port related cargo volume is established based on the 2001 port throughput volume and traffic volume of 2002.
- Based on the cargo demands forecast through the port of 2012 and 2025, the respective type of vehicle volume of port related traffic (PRT) of such target year is forecasted in corresponding the volume of commodities.
- The forecast of through traffic volume (TTV) is estimated by applying the growth trends rate of vehicles used for the Jakarta Outer Ring Road Project based on the traffic of 2002. The total daily traffic volume around the port (DTV) would be summed up with the PRT and TTV.
- The daily traffic forecast volume (DTV) is allocated to 3 respective directions of access roads based on the proportion of directional traffic flow delivered from the traffic

counting survey and O/D survey results.

- It is checked whether the present and future traffic volume (DTV) of each road concerned is within the design capacity of the existing road.
- In case the design capacity of the present road condition can not accommodate the future vehicle traffic demands by port related traffic, the considerable development plan of the 3 directional access roads is studied to cope with the additional road traffic volume from the Tanjung Priok Port.

2) Present Road Conditions

a) Present Conditions of the Access Road around the Tanjung Priok Port

i) Present Conditions of Jl. Jampea

252. Based on site observations, Jl. Jampea and Jl. Cakung, which together form the Cilincing Access Road, have very different characteristics. Jl. Jampea is a heavily congested, 4 lanes divided arterial road located within a 30 m wide Right of Way (ROW) and has intensive roadside development over entire length thereof.

253. The intersection with Jl. Sulawesi and main gate of JICT 1 and of the Port is a vast expanse of asphalt-paved road with no proper road marking and traffic signal lighting, as a result traffic moves in a totally uncontrolled manner.

254. At the Sunter River bridge where the Pertamina oil tank yard is located, the width of the roadway is 11.10m in both directions. Although there is no road marking, traffic typically forms three lanes. In general, this section has an 8.30 m wide, unpaved verge on each side of the road. The road from the gate of JICT 1 to intersection of Jl. Cakung has 9.4m wide and traffic lanes are generally marked. The intersection of Jl. Jampea and Jl. Cakung with Jl. Cilincing is controlled by traffic signals but the geometric layout and physical conditions are poor.

ii) Present Conditions of Jl. Cakung

255. The road which was once planned to be developed as parts of the Jakarta outer ring road northern extension road but the construction of road was suspended due to the economic crisis of 1997 still consists of a 4-lane divided arterial road but is referred to as Jl. Cakung.

256. This road was planned to connect the Jakarta Outer Ring Road for going to Bekasi, Cikampek, other regions in eastern parts of the Java. In general, the roadway width in each direction is 7.5 m with 3.0 m wide tapers at U-turn locations. The median is raised and wide, with a maximum width of 31.5m. A 100m wide ROW was established in 1974 and the fence line has been installed along the limits of ROW where industries have been established. However illegal roadside development has sprung up in many areas, so that the full width of ROW is not always apparent.

iii) Present Conditions of Jl.Laks. R.E. Martadinata

257. Jl. RE Martadinata is stretching from the east, Pluit to the west, Tanjung Priok port and is located along the coast of the canal in northern part of the Capital City Jakarta in Penjaringan district of north Jakarta.

258. The road has 2,455 m long and 12.5 m wide. This road has 4 lanes with two lanes for each direction. This road accommodate traffic flow from Senen to Tanjung Priok or Pluit area (Central parts of Jakarta city) and opposite direction from Kemayoran to Tanjung Priok port.

This road is an important roadway connecting Pluit where many coastal industries are located and Tanjung Priok port.

259. To minimize the traffic congestion of this roadway, the viaduct toll way (called harbor road) was developed in 1995-6 in parallel with this road. Through this viaduct toll way connecting to Jakarta –Merak Toll way destination can be reached to Tangerang, Banten and Merak.

260. The road is heavily congested with various vehicle types, i.e. public transport, private vehicles and heavy vehicles of port orient traffic and container transport. During the rush hours, congestion usually takes place at Jl. Gunung Sahari-Jl. RE Martadinata junction while traffic is dominated by heavy vehicles such trucks, container trailers of port orient traffic during the rest of time a day. Length of queue can reach 1.5 km with an average queuing time of 30 minutes. On public and school holidays, the traffic flow intensifies due to Java Ancol visitors.

iv) Summarized Constraints surrounding the existing access road to Port

261. The problems can be observed through length and intensity of queue all day long. The observation has revealed that an average length of queue is 600 to 1,200 m at Jl. RE. Martadinata segment with a significant intensity compared with the daily normal traffic. The main causes of the congested problems are:

- Unavailability of access to toll way from the east (Tanjung Priok port) from the arterial road in that vehicles have to pass through Jl. RE. Martadinata-Jl. Gunung Sahari to enter the toll way road network.
- To the opposite direction, direct access from toll road to the port area is unavailable either that vehicles have to exit the toll road and pass through Jl. RE. Martadinata-Jl. Gunung Sahari junction.
- Existence of warehouses facilities and fishery ports, public ports activities at the west of Jl. RE. Martadinata, which caused the high intensity of heavy vehicle movement along the road.
- There are some physical constraints which will also limit the options for solving the problems, like some utilities pipe lines (Pertain oil pipelines, irrigation control channel) across Ancol River, railway on the southern side of Jl. RE. Martadinata.

262. The road has number of junctions with public roads to and from Kemayoran including 3 gates of Tanjung Priok port and connecting to the Pelabuhan Raya (main road inside of the Tanjung Priok port stretching east side of the port to west side of JICT 1 gate).

b) Directional Classified Vehicle Counting Survey

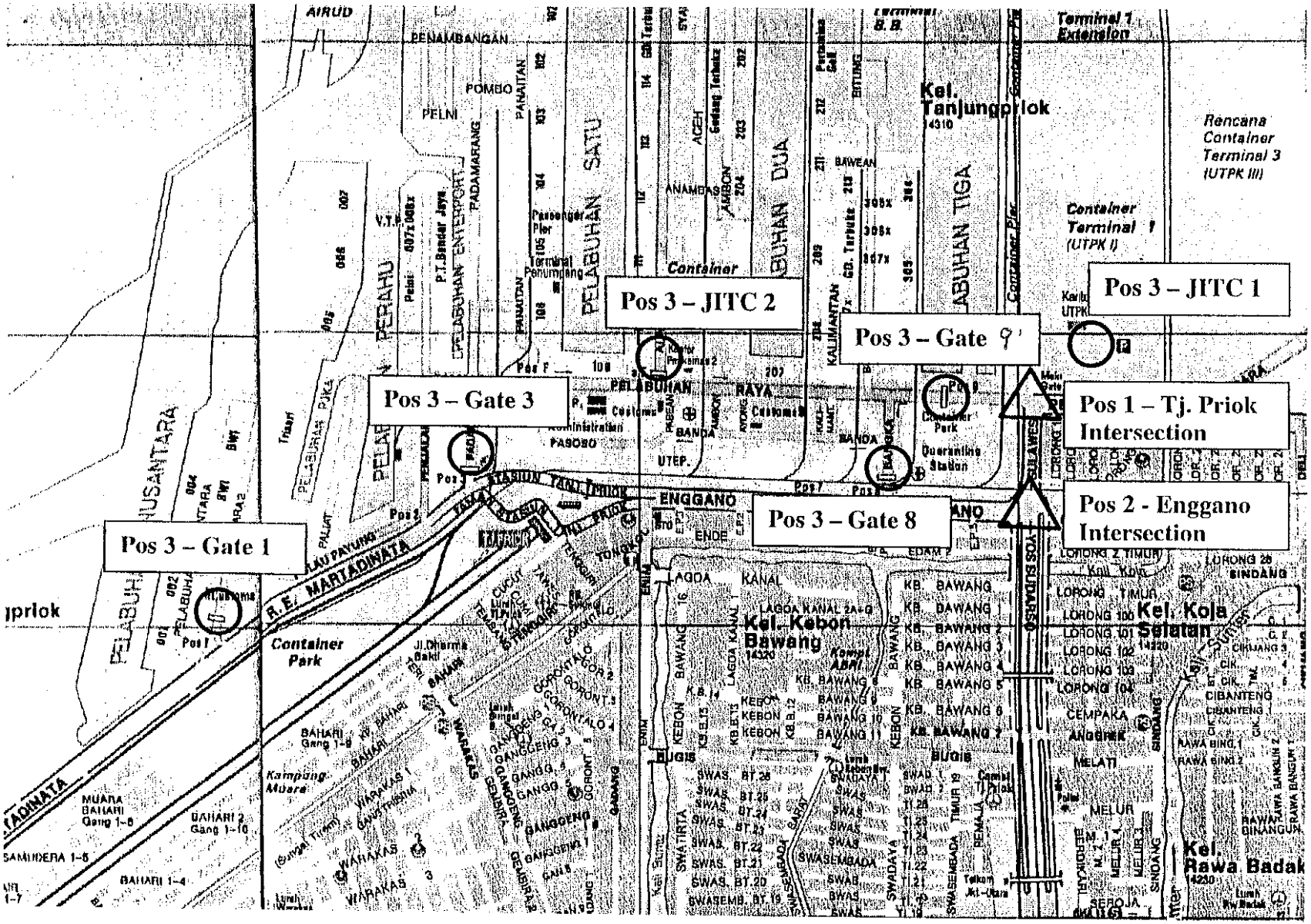
i) Traffic Flow

263. The directional classified 10 types of vehicle counting survey were carried out during July 14 to 16 2002 at 6 gates of Tanjung Priok port and 2 intersections. The location of gates and intersections of survey is shown in Figure 8-B-1.

Figure 8-B-1 Location of Gates and Intersection of Survey

264. Based on the results of counting survey, the directional traffic flows of each survey day with each category of vehicles at two intersections namely Pos-1 Tanjung Priok -JICT –1

LOCATION MAP TANJUNG PRIOK



intersection and Pos-2 Enggano intersection are illustrated in the drawing of Figure 8-B-2 and Figure 8-B-3 respectively.

Figure 8-B-2 JICT 1 Intersection

Figure 8-B-3 Enggano Intersection

265. The conceptual traffic flows around the Tanjung Priok Port area are summarized in the diagram below.

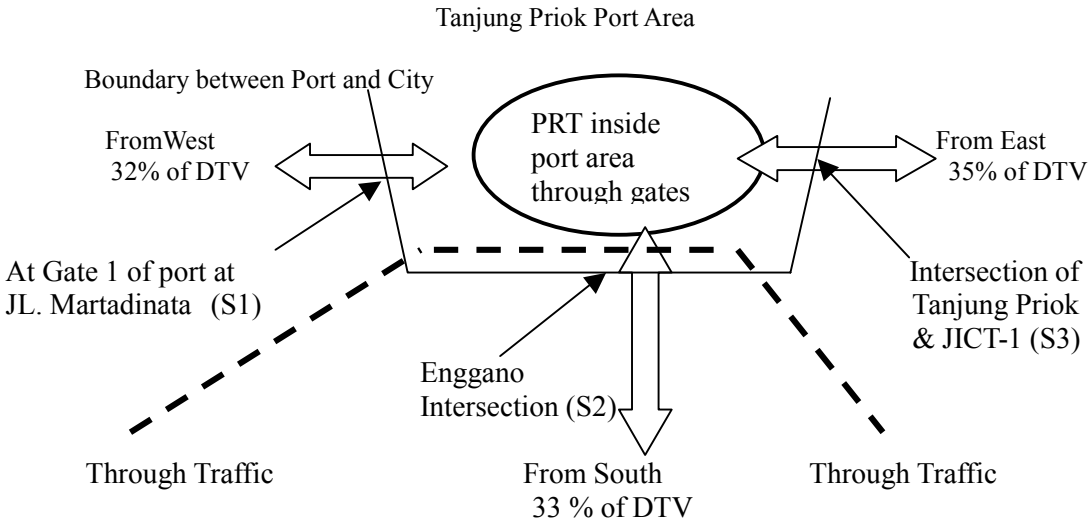


Figure 8-B-4 Traffic Flow Diagram around Tanjung Priok Port Area

ii) Daily Traffic Volume (DTV) from 3 Directions around the Port

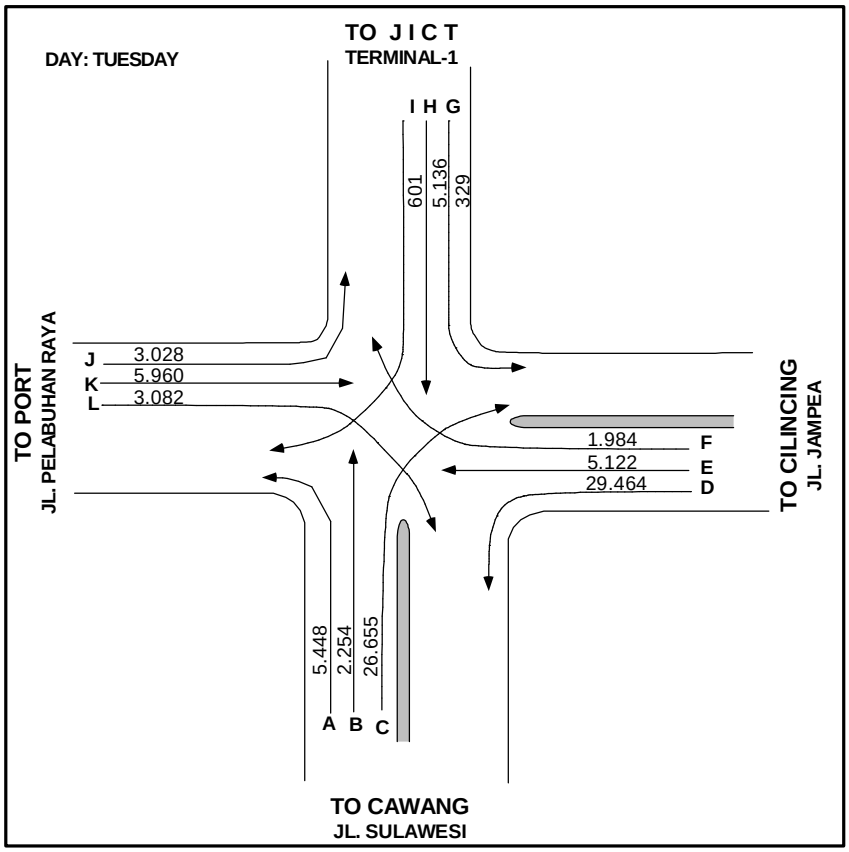
266. The sectional road traffic of S1, S2 and S3 was counted as the total daily traffic volume around the Port area.

Table 8-B-1 Sectional Road Traffic Volume (veh/day)

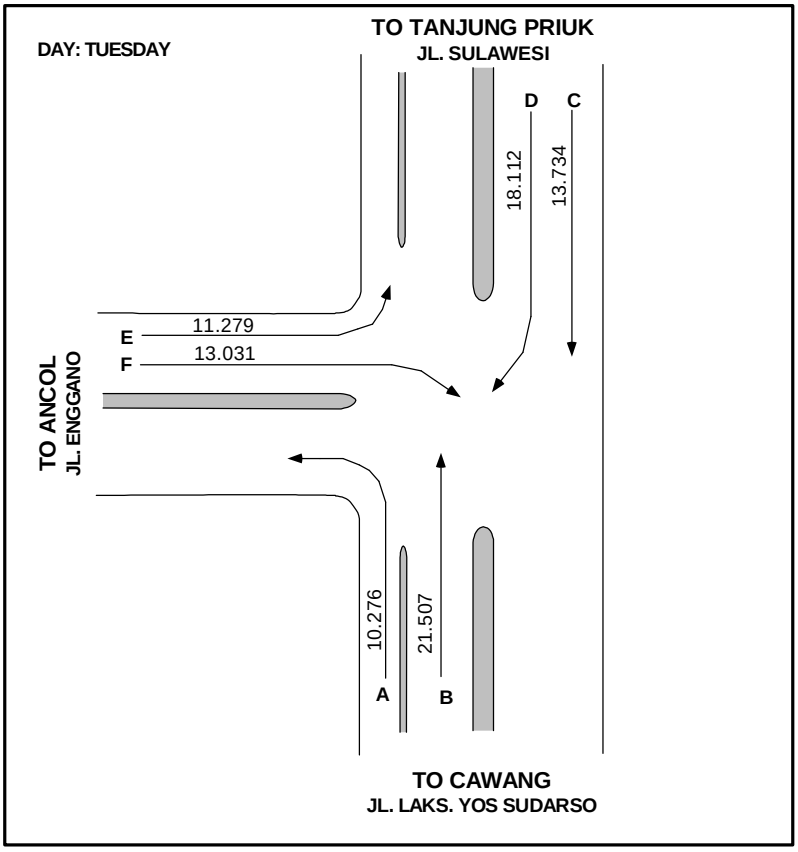
Type of Vehicle	From East	From West	From South	Total Traffic Around Port
Sedan	16,747	14,204	19,281	50,232
Van	4,917	3,339	2,500	10,756
Small (Mini) Bus	7,276	6,887	2,164	16,327
Medium/Large Bus	5,550	1,721	3,992	11,263
Pick up	3,200	2,311	2,016	7,527
Medium Truck	2,868	3,762	2,827	9,457
Large Truck	5,397	11,646	9,887	26,930
Total	45,955	43,870	42,667	132,492
Ratio	34.7%	33.1%	32.2%	100.0%

iii) Port Related Traffic Volume (PRT) and Through Traffic Volume (TTV)

267. The traffic moving in and out of the port at the 6 gates is considered as the port related traffic. The total traffic volume through the gates per day was 40,815 units, equivalent to 31% of the daily traffic volume.



POS - 1 TANJUNG PRIOK INTERSECTION



POS - 2 ENGGANO INTERSECTION

Table 8-B-2 Traffic Volume Through gates of Tanjung Priok Port

	Gate 1	Gate 3	Gate 8	Gate 9	JICT 1	JICT 2	Total
Passenger car	4,881	2,880	1,848	7,840	301	104	17,854
Sedan	2,795	2,215	1,627	6,742	263	73	13,715
Van	2,086	665	221	1,098	38	31	4,139
Small Bus	25	22	1	30	0	0	78
Medium/Large Bus	44	20	14	81	24	11	194
Pick up	632	336	280	1,062	6	47	2,363
Medium Truck (Truck 2Ax)	883	262	294	1,590	0	11	3,040
Large Truck	2,283	221	796	8,700	4,373	913	17,286
Truck 3Ax	908	133	409	1,584	0	2	3,036
Truck with Trailer	5	2	9	67	28	0	111
Trailer	1,370	86	378	7,049	4,345	911	14,139
Total	8,748	3,741	3,233	19,303	4,704	1,086	40,815

268. The through traffic from/to the port area unrelated to port activities is estimated from the balance between the total daily traffic around the port and port related traffic through the gates as follow.

Table 8-B-3 Daily Traffic Volume of Port Related and Through Traffic in 2002

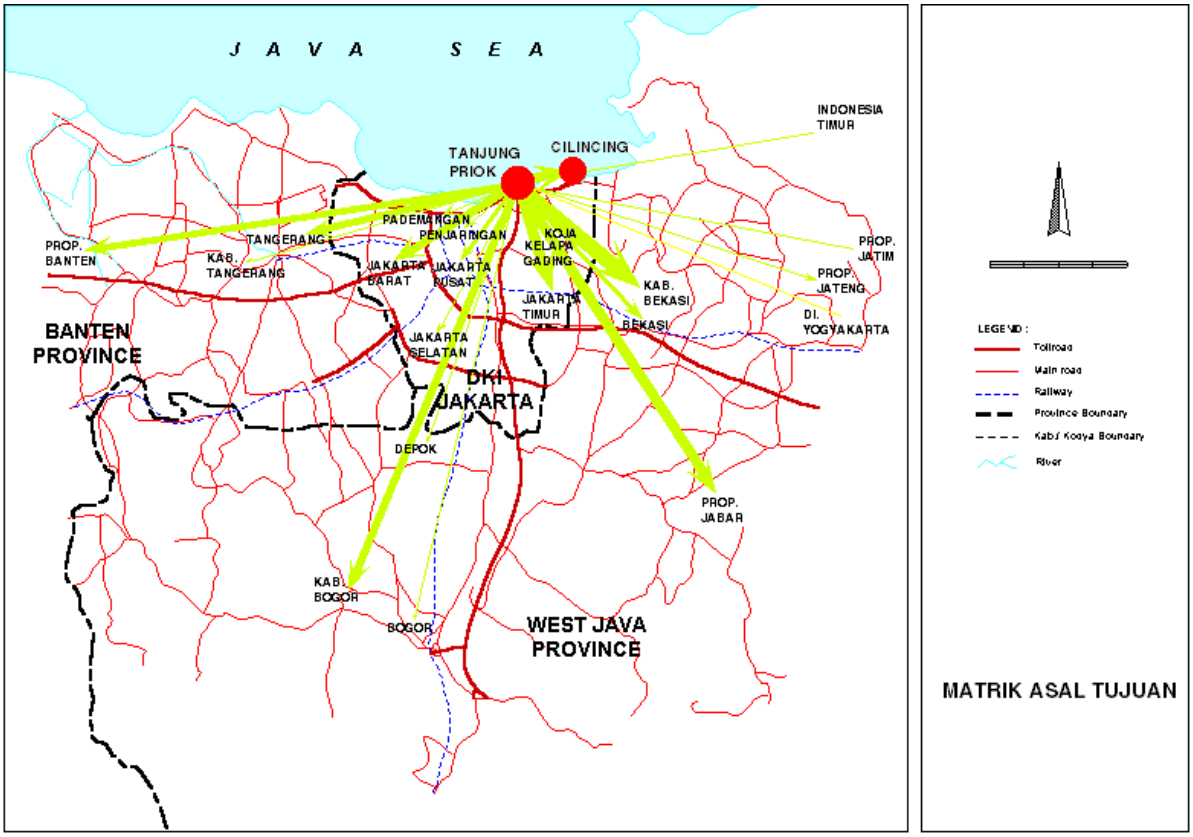
Type of Vehicle	Port Related Traffic Volume (PRT)	Through Traffic Volume around Port (TTV)	Total
Passenger Car	17,854	43,134	60,988
Sedan	13,715	36,517	50,232
Van	4,139	6,617	10,756
Mini (small) Bus	78	16,249	16,327
Medium/large Bus	194	11,069	11,263
Pick up	2,363	5,164	7,527
Medium Truck	3,040	6,417	9,457
Large Truck	17,286	9,644	26,930
Total	40,815	91,677	132,492
Ratio	30.8%	69.2%	100.0%

iv) Daily Traffic Volume of Trailer Truck by O/D survey

269. The O/D survey was carried out of the container trailers only at the same location as carried out the traffic counting survey (6 gates and 2 intersections). The O/D samples collected from the trailer trucks were about 64 % of the counted traffic volume.

270. The results of the O/D survey enable the traffic counts to be assigned to one of the following directional flows: The 23 locations of origin /destination of trailers indicated by drivers are classified respective directions by using the main roads from the Tanjung Priok port as in Table 8-B-4. The O/D diagram of trailer trucks from the Tanjung Priok port and Cilincing container depots are shown in Figure 8-B-5.

Figure 8-B-5 O/D Diagram of Trailer Trucks from Tanjung Priok Port and Cilincing Container Depots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PADEMANGAN PENJARINGAN
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KOJA KELAPA GADING
PROP. BANTEN
KAB. TANGERANG
JAKARTA BARAT
JAKARTA PUSAT
PROP. JATIM
PROP. JATENG
KAB. BEKASI
JAKARTA TIMUR
DI. YOGYAKARTA
BEKASI
BANTEN PROVINCE
JAKARTA SELATAN
DKI JAKARTA
DEPOK
PROP. JABAR
KAB. BOGOR
BOGOR
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LEGEND :
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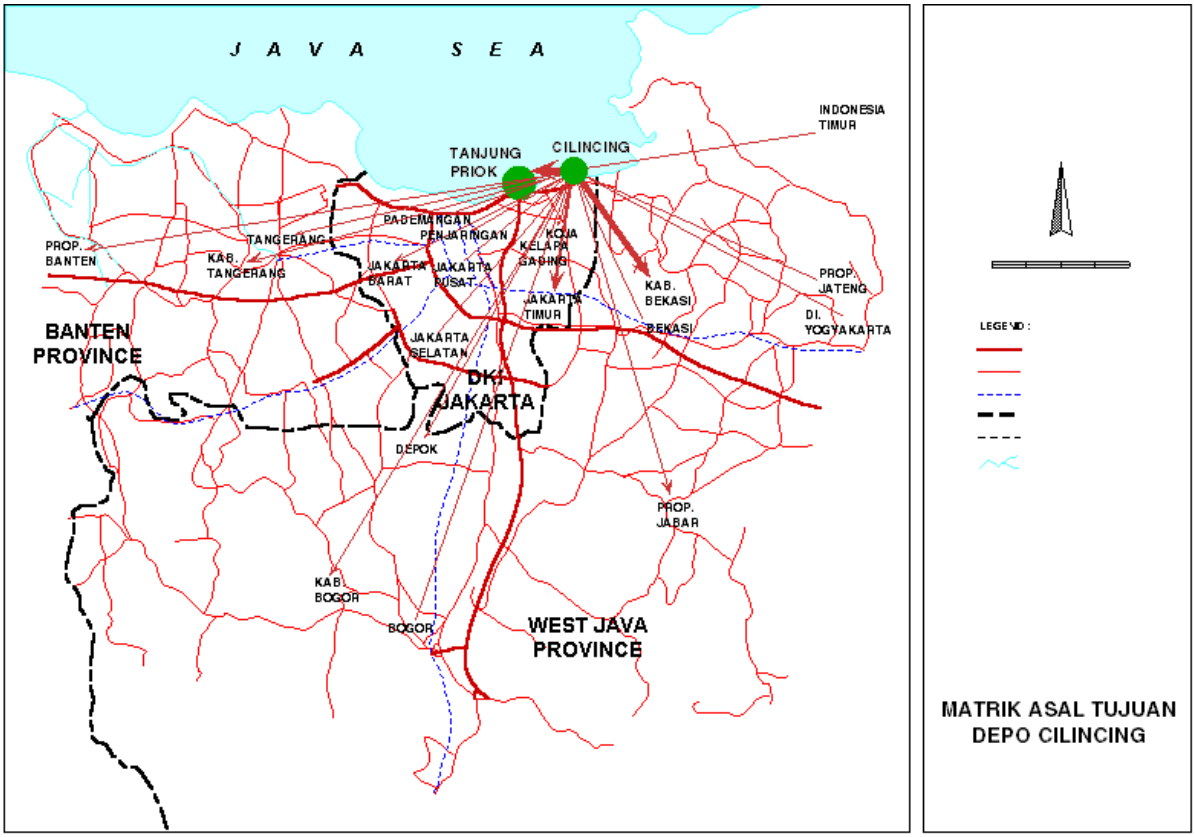
Main road
Railway
Province Boundary
Kabs/ Kodya Boundary
River
MATRIK ASAL TUJUAN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JAKARTA PUSAT
PROP. JATENG
KAB. BEKASI
JAKARTA TIMUR
DI. YOGYAKARTA
BEKASI
BANTEN PROVINCE
JAKARTA SELATAN
DKI JAKARTA
DEPOK
PROP. JABAR
KAB. BOGOR
BOGOR
WEST JAVA PROVINCE
LEGEND :
MATRIK ASAL TUJUAN DEPO CILINCING

Table 8-B-4 Directional Classification

Direction	Origin /Destination of cargo through major road
To East	Through Jl. Laks. R.E. Martadinata, Jl. Enggano, to Cilincing area, Bekasi, Eastern Java Provinces, Eastern Jakarta, Eastern Indonesia,
To West	Through Jl. Jampea and Cilincing Access road Western Jakarta, Penjaringan, Pedemariggan, Tangerang city, Banten Province
To South	Through Jl.Laks. Yos Sudarso, Fly over Tollway, Jl. Sulawesi Southern Jakarta, Central Jakarta, Kelapa Gading, Depok city, Bogor City,
Local container depots in north Jakarta	Tanjung Priok-Koja, Trailers moving between Tanjung Priok port area and container depots in the Koja and Cilincing area.

271. The results of O/D survey of trailer trucks as directional daily traffic volume are tabulated below:

Table 8-B-5 Trailer Trucks Directional Traffic Volume (veh/day)

Direction	From/to Tanjung Priok	From/to Cilincing Container depot	Total	
			Volume	Share (%)
To/from West,	1,133	269	1,402	12.66
To/from Central Jakarta	528	73	601	5.43
To/from South Jakarta	1,648	402	2,050	18.51
To/from East	1,803	873	2,676	24.17
Within Port area	3,903	441	4,344	39.23
Total	9,015	2,058	11,073	100

v) Directional Traffic Flows (veh/day) of Trailer /Container

272. Based on the results of O/D survey the directional daily traffic flow of trailer trucks is illustrated below. The number as indicated means the number of trailers counted to both directions coming/going Tg Priok and Cilincing container depots:

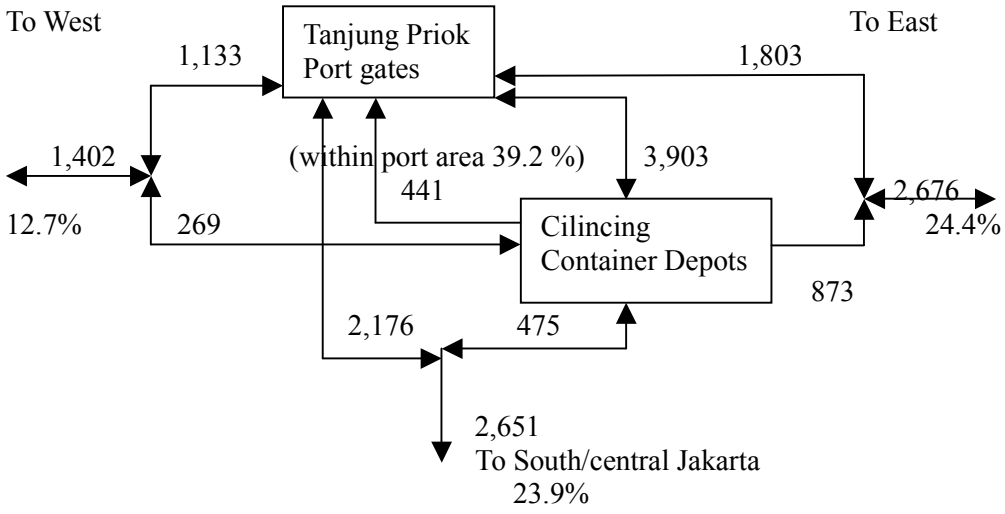


Figure 8-B-6 Tractor Trucks Directional Traffic Flow Diagram

273. From the above directional traffic flows the traffic volume of trailers to east and south are similar order of 2,600 units per day on both direction, while the traffic from/to west are comparatively smaller than the other two directions considering the many container depots and large industrial complex located in the eastern side of the port.

3) Forecast of the Daily Traffic Volume (DTV) around the port

a) Forecast of the Port Related Traffic Volume by Type of Vehicle

i) Establishment of the correlation with the cargo throughput of port and vehicle numbers

274. The forecast of the port related traffic is estimated by the correlation established based on the data of 2002 with port cargo and number of vehicles through the port.

275. The 6 major gates where the traffic counting survey were conducted are the gates to the port from the access roads of all the vehicles coming /going from/to the City, it is considered that the daily traffic through these gates would have transported all the cargoes handled in the Port. The correlation between the classified cargo volume through the port and number of respective vehicle type are worked out.

276. The share of each vehicle for transporting classified cargo and passengers is assumed that for example, the annual cargo volume of general cargo including bag cargo would have transported by 50% of pick up traffic volume and 25% of Truck 2Axls and 20% of Truck 3Axls and 5% of truck gandeng. The other classified cargo volume is transported by the above ratio of respective vehicles. This share will be checked during the second site works.

Table 8-B-6 Share of transporting classified cargo by vehicle type

Cargo	Vehicle Type				
	Pick Up	**Truck 2 Axl**	**Truck 3 Axle**	**Truck Gandeng**	**Trailer**
General cargo with bag cargo	50%	25%	20%	5%	
Dry Bulk Cargo	25%	17%	23%	40%	
Containers		10%	5%	5%	80%
Liquid Bulk Cargo	5%	30%	35%	30%	
Passenger	**Sedan**	**Van**	**Small Bus**	**Medium/Large Bus**	
Share of transport	5%	12%	25%	58%	

* The share of transporting passenger is assumed by number of passengers per car.

ii) The correlation factor of vehicle type to classified cargo and passengers

277. The correlation between the port cargo traffic of 2001 and daily traffic volume by the actual data obtained from the Survey are worked out. The results of correlation between the respective vehicles type and classified cargo are summarized in the Table 8-B-7 below.

278. The passenger cars will transport number of passengers related for passenger ships and for cargo handling operation works. The correlation of passenger cars with passenger ships and total cargo volume are worked out.

Table 8-B-7 Correlation factor of vehicle type to classified cargo and passengers

Cargo Truck	Volume in 2001 (x 1,000)	Number of daily Vehicle per cargo ton				
		Pick Up	Truck 2 Axle	Truck 3 Axle	Truck Gandeng	Trailer
General cargo	13,190	0.0896	0.0576	0.0460	0.0004	
Dry Bulk Cargo	7,244	0.0816	0.0713	0.0713	0.0963	
Containers (TEU)	2,200		0.1382	0.0689	0.0025	5.1415
Liquid Bulk Cargo	10,094	0.0117	0.0904	0.1051	0.0033	

Passenger Car and Bus		Sedan	Van	Small Bus	Medium/Large Bus
Vehicle/passenger	1,700	0.4034	0.2840	0.0115	0.0666
Vehicle/cargo	50,889	0.2695	0.0818	0.0015	0.0038

Passenger Traffic Volume (x 1,000) and Cargo Volume (x 1,000 ton)
General cargo include bag cargo

iii) Forecast of the daily traffic volume by port related cargo movement

279. The demands forecast of the classified cargo for 2012 and 2025 and passengers are estimated as follows:

Table 8-B-8 Forecast of Classified Cargo in 2012 and 2025

Cargo and Traffic	Forecast of Cargo/Passenger Volume	
	2012	2025
General & Bag Cargo ('000ton)	16,246	20,389
Dry Bulk Cargo ('000ton)	11,004	20,129
Container ('000TEU)	4,346	5,321
Liquid Bulk Cargo ('000ton)	11,644	14,046
Total Cargo Volume ('000ton)	79,916	109,307
Passenger Traffic ('000pax)	2,482	2,992

280. Based on the above correlation with the number of vehicle type and classified cargo unit volume, the daily traffic volume of the respective vehicle type are estimated as follows:

Table 8-B-9 For year 2012 Forecast of Daily Traffic Volume of Vehicle Type

	2012	Pick Up	Truck 2 Axle	Truck 3 Axle	Truck Gandeng	Trailer
General cargo	16,246	1,456	936	747	6	0
Dry Bulk Cargo	11,004	898	785	785	1,060	0
Containers (TEU)	4,346	0	601	299	11	22,345
Liquid Bulk Cargo	11,644	136	1,053	1,224	38	0
Total		2,490	3,374	3,055	1,115	22,345

	2012	Sedan	Van	Small Bus	Med/Large Bus	
By Cargo Traffic	79,916	21,537	6,537	120	304	
By Passenger Traffic	2,482	1,001	705	29	165	
Total		22,538	7,242	148	469	

Table 8-B-10 For year 2025 Forecast of Daily Traffic Volume of Vehicle Type

	2025	Pick Up	Truck 2 Axle	Truck 3 Axle	Truck Gandeng	Trailer
General & Bag cargo	20,389	1,827	1,174	938	8	0
Dry Bulk Cargo	20,129	1,643	1,435	1,435	1,938	0
Containers (TEU)	5,321	0	735	367	13	27,358
Liquid Bulk Cargo	14,046	164	1,270	1,476	46	0
Total		3,634	4,614	4,216	2,005	27,358

	2025	Sedan	Van	Small Bus	Med/Large Bus	
By Cargo Traffic	109,307	29,458	8,941	164	415	
By Passenger Traffic	2,992	1,207	850	34	199	
Total		30,665	9,791	198	614	

281. The daily traffic volume of port vehicles in 2012 and 2025 is estimated based on the actual traffic counting data and forecast of cargo throughput by applying the unit factor of vehicle cargo ton and passengers. The results are summarized in the following table.

Table 8-B-11 Summary of Forecast of Port Related Traffic by vehicle type

Vehicle Type	Daily Traffic Volume		
	2002	2012	2025
Passenger Cars	17,854	29,780	40,456
Sedan	13,715	22,538	30,665
Van	4,139	7,242	9,791
Small Bus	78	148	198
Medium/ Large Bus	194	469	615
Trucks for Cargo			
Pick up	2,363	2,490	3,634
Truck 2 Axles (Medium Truck)	3,040	3,374	4,615
Large Truck	17,286	26,516	33,580
Truck 3 Axles	3,036	3,055	4,216
Truck with trailer	111	1,115	2,006
Trailer Truck	14,139	22,345	27,358
Total	40,815	62,777	83,098

b) Traffic Forecast of Through Traffic Volume

282. The growth in the number of registered vehicles has been correlated with the growth of GDRP, and population growth of the region/province. In this study, the vehicle growth rate those used for the "Heavy Loaded Road Improvement Project, Master Plan Review" financed by JBIC in 2001 is adopted. The estimated vehicle growth rate by vehicle type is summarized below.

Table 8-B-12 Growth Rate of Vehicle Type 2010 and 2025

Vehicle Type	Vehicle Growth Rate (%)			
	2010	2015	2020	2025
Passenger Car	3.68	4.67	4.17	4.00
Small Bus	5.60	6.19	4.86	4.50
Medium/Large Bus	5.53	6.13	4.87	4.50
Pick Up	2.41	3.11	2.65	2.50
Medium Truck	2.77	3.51	2.95	2.50
Large Truck	3.06	4.04	3.30	3.00

283. The above growth factors by vehicle type are applied to the existing through traffic volumes to obtain the forecast traffic volume through the port area for years of 2012, and 2025. The result of calculation is shown in the table below. The estimated traffic volume would represent the volume of traffic which would use the existing arterial roads.

Table 8-B-13 Forecast of Through Traffic Volume (veh/day)

Vehicle Type	Traffic Volume (veh/day)								
	2002			2012			2025		
	PRT	TTV	Total	PRT	TTV	Total	PRT	TTV	Total
Passenger Car	17,854	43,134	60,988	29,780	63,099	92,880	40,456	107,987	148,443
Small Bus	78	16,249	16,327	148	28,334	28,482	198	53,603	53,801
Medium/Large Bus	194	11,069	11,263	469	19,178	19,646	615	36,236	36,851
Pick Up	2,363	5,164	7,527	2,490	6,642	9,132	3,634	9,390	13,023
Medium Truck	3,040	6,417	9,457	3,374	8,555	11,929	4,615	12,938	17,553
Large Truck	17,286	9,644	26,930	26,516	13,286	39,801	33,580	21,413	54,993
Total	40,815	91,677	132,492	62,777	139,094	201,870	83,098	241,566	324,664
PRT: Port Related Traffic Volume (veh/day)									
TTV: Through Traffic Volume around the Port area (veh/day)									

c) Traffic Forecast by Passenger Car Equivalent

i) PCU factors of Indonesian Highway Capacity Manual, 1997

284. Each vehicle has a passenger car equivalent, which varies according to the type of vehicle. The PCU factors (Passenger Car Unit), used to convert the total number of each type of vehicle recorded in the traffic count survey to equivalent passenger car units, were derived from the Indonesian Highway Capacity Manual (IHCM), 1997 and summarized on Table below.

Table 8-B-14 PCU Factor

Vehicle Type	Equivalent pcu
Passenger Car	1
Small Bus	1
Medium and Large Bus	1.5
Pick up	1
Medium Truck (Trucks of 2 Axles and 3Axls)	2.3
Heavy Truck (Trailer Truck)	4

285. The most appropriate PCU factors for large trucks depend largely on the percentage of large trucks in the traffic flow, severity of the road gradients and the number of wheel axles.

286. In this study area, the road gradients are low but large trucks account for approximately 30% of all traffic. These trucks are typically tractor-trailer combinations with six axles and carry 12m containers (40Ft long container). As a result of these characteristic, the PCU factors adopted for large trucks is rather greater than the figure given by IHCM.

ii) Forecast of Daily Traffic Volume by Passenger Car Unit of vehicle type

287. Based on the PCU factors of Indonesian Highway Capacity Manual, 1997, the traffic volumes of 2012 and 2025 are expressed in PCU as follow: These figures present the daily traffic volume which would be handled on the existing arterial roads around the port if the toll way were not developed.

Table 8-B-15 Forecast of Daily Traffic Volume by PCU

Vehicle Type	2002		2012		2025	
	DTV	PCU	DTV	PCU	DTV	PCU
Passenger Cars	60,988	60,988	92,880	92,880	148,443	148,443
Small Bus	16,327	16,327	28,482	28,482	53,801	53,801
Medium/ Large Bus	11,263	16,895	19,646	29,470	36,851	55,276
Trucks for Cargo						
Pick up	7,527	7,527	9,132	9,132	13,023	13,023
Medium Truck	9,457	21,751	11,929	27,436	17,553	40,371
Large Truck	26,930	107,720	39,801	159,204	54,993	219,971
Total (veh/day)	132,492	231,208	201,870	346,604	324,664	530,885
DTV: Daily Traffic Volume derived from port related traffic and through traffic volume around port area						
PHV: Peak Hour Volume						

iii) Corresponding Peak Hour Factor

288. The corresponding peak hour volume were determined by multiplying daily volume by the ADT factor (K), which represents the ratio between the peak hour flow and daily flow depending on the density of the development environment. The general average values as shown below are used for the study. The K value is taken 0.10 for the access road area.

Type of development Environment	K-Factor
Urban	0.09 to 0.10
Suburban	0.10 to 0.15
Rural	0.15 to 0.20

289. The results of the traffic count survey shows the K value of 0.08 at the Tanjung Priok port.

d) Forecast of Daily Traffic volume in 3 directions

290. The future traffic volume of 2012 and 2025 is derived from the port related traffic (PRT) and through traffic volume (TTV), which is distributed to 3 directions based on the present share of directional daily traffic volume of each direction of 2002. The daily traffic volume (DTV) of each direction in 2012 and 2025 are estimated as follows:

Table 8-B-16 Forecast of Directional Daily Traffic Volume in 2012 and 2025

Direction of Traffic Flow		2002		2012		2025	
	%	DTV	PCU	DTV	PCU	DTV	PCU
From East	34.7%	45,955	80,195	70,019	120,220	112,610	184,138
From West	33.1%	43,870	76,556	66,842	114,766	107,501	175,784
From South	32.2%	42,667	74,457	65,009	111,619	104,553	170,963
Total	100.0%	132,492	231,208	201,870	346,604	324,664	530,885
Note: unit of Share indicate %, and DTV and PCU indicate unit of veh/day							

291. Future traffic volume and peak hour volume in one direction of each directional traffic flow are worked out by applying the ADT factor (K) as follows: Direction of Traffic covers the roads and areas as explained in Table 8-B-4

Table 8-B-17 Future Traffic Volume and Peak Hour Volume by Direction

Direction of Traffic Flow	Traffic Volume in 2002		Traffic Volume in 2012		Traffic Volume in 2025	
	PCU	Peak Hour Volume in one direction per lane	PCU	Peak Hour Volume in one direction per lane	PCU	Peak Hour Volume in one direction per lane
From East	80,195	2,005	120,220	3,006	184,138	4,603
From West	76,556	1,914	114,766	2,869	175,784	4,395
From South	74,457	1,241	111,619	1,860	170,963	2,849
Total	231,208		346,604		530,885	

4) Lane Capacity of the Roads

a) Estimation of Lane Capacity of the Existing Road

292. The lane capacity or design service flow rate represents the maximum hourly flow rate that a highway can accommodate without congestion falling below a prescribed level. The lane capacities for the arterial roads were determined in accordance with IHCM and the following formula

$$C = Co \times Fcw \times Fcsp \times Fcsf \times Fcs \text{ (pcu/hr/lane)}$$

Where:
- C = Capacity (pcu/hr)
- C_0 = Base capacity (pcu/hr)
- Fcw = Adjustment for carriageway width
- $Fcsp$ = Adjustment for directional split
- $Fcsf$ = Adjustment for side friction
- Fcs = Adjustment for city size

293. The result of calculation is summarized below table. The lane capacity calculated in this manner is equivalent to the design capacity for Level of Service E (LOS E). If the capacity is exceeded the level of service would fall to LOS F, the lowest level, which represents congested flow.

Table 8-B-18 Capacity factor of Existing Arterial Roads around Tanjung Priok

Factor to Determine Capacity	Description
Type of Road	Existing road, Urban street, 4-lanes divided Arterial road
Design Speed	55 km/hr
Lane width	3.5 m for one lane
Shoulder width	60 cm to 1.0 m of shoulder width
Capacity per lane (C)	Capacity in one direction (pcu/hr/lane) C = Co x Fcw x Fcsp x Fcsf x Fcs
Base Capacity (Co)	Base capacity (pcu/hr/lane) for urban roads with type of four lane divided, 1,650 pcu
Width adjustment factor (Fcw)	Four –lane divided for effective carriageway width, Fcw =1
Directional split capacity adjustment factor: (Fcsp)	Directional Split 4 lane-two-way undivided roads. 50/50: 1.0, 60/40: 0.94
Adjustment factor of side friction (Fcsf)	Road type of 4/2 D and side friction class is very high and effective shoulder width of 0.60 to 1.0m. Fcsf= 0.84, for 6 lanes Fc6sf = 1-0.8 x (1-Fc4sf) = 0.872
Adjustment of City size Fcs	City size by number of inhabitants, 1-3 million Fcs = 1, more than 3 million Fcs = 1.04.
Design Hour Factor (K)	K = 0.1

294. The design hourly flow of the existing roads to the east, west and south direction for Tanjung Priok port are estimated as follows:

Table 8-B-19 Capacity of Existing Road by Direction

Description	Road Conditions		
	To East	To West	To South
Lane width (m)	3.5	3.5	3.5
Number of lane in one direction	2	2	3
Base Capacity per lane (Co)	1,650	1,650	1,650
Width adjustment factor (Fcw)	1.0	1.0	1.0
Directional split (Fcsp)	0.94	0.97	1.00
Adjustment factor for side friction (Fcsf)	0.84	0.84	0.872
City size factor (Fcs)	1.04	1.04	1.04
Capacity (pcu/hr/lane) (C)	1,355	1,398	1,496
Existing Traffic volume (veh/day)	45,955	43,870	42,667
Existing Traffic volume (pcu/day)	80,195	76,556	74,457
Design Hour Factor (K)	0.10	0.10	0.10
Peak Hour Traffic (pcu/hr/lane) (T)	2,005	1,914	1,241
Ratio (T/C)	1.48	1.37	0.83

Note) Existing traffic volume is vehicle per day in one direction based on the actual traffic counting survey results.

295. Existing traffic volume is vehicle per day in one direction based on the actual traffic counting survey results.

296. The existing daily traffic volume (ADT) of each direction is converted to the design hourly flow and is found that the existing traffic volume of East and West is about 148% to 137%whereas about 83%of South which are over to the saturated condition to East and West and are close to the saturated condition to South to the capacity.

297. The forecast daily traffic volume (vehicle /day) of three directional access roads for 2012 and 2025 are worked out by applying the above capacity adjustment factors and converted to the design hourly traffic flow (pcu/hr/lane) as shown in the table below.

Table 8-B-20 Forecast of Hourly Directional Traffic (pcu/hr/lane)

Description		To East	To West	To South
Y2012	Forecast Traffic Volume	120,220	114,766	111,619
	Traffic Volume one direction	60,110	57,383	55,809
	Peak Hour Traffic (pcu/hr/lane)	3,006	2,869	1,860
Y2025	Forecast Traffic Volume	184,138	175,784	170,963
	Traffic Volume one direction	92,069	87,892	85,482
	Peak Hour Traffic (pcu/hr/lane)	4,603	4,395	2,849

298. It is indicated that the forecast traffic volume of three directions in 2012, eastern and western direction of existing daily traffic volume of 4 lane arterial access road condition will exceed the traffic capacity of the existing road conditions. The existing 6- lane arterial access road to southern will also exceed the traffic capacity by 2012.

299. However roads should not be allowed to reach full design capacity before being widened, assuming that practical capacity is 80% of the design capacity, the widening to 6 –lanes from the existing 4 lane road or toll way development will be required.

b) Capacity Calculation of Toll Way Extension

300. The traffic capacity for the toll way extension is calculated in the similar manner of the arterial roads according to the IHCM as follows:

$$C = Co \times Fcw \times Fcsp$$

Where: C = Capacity (pcu/hr)
C_0 = Base capacity (pcu/hr)
Fcw = Adjustment for carriageway width
Fcsp = Adjustment for directional split

Table 8-B-21 Capacity Calculation Factor of Toll way

Road Type		Unit	Remarks
4 and six lanes divided	Motorway		
Base Capacity (Co)	2,300	pcu/hr/lane	Base capacity of flat and four and six lane divided motorways.
Adjustment for carriageway (Fcw)	1.0	Four-lane divided, 3.5 m width per lane 1.0 3.75 m width, 1.03	
Adjustment for directional split (Fcsp)	1.0	Directional split SP %-%, 50-50, Factor 1	
Capacity (C)	2,300	Pcu/hr/lane	

8-B-2 Improvement of Railway Access to Tanjung Priok

1) Improvement Projects by DGLC

301. At present there is the dry port in the Tanjung Priok port called Pasoso for transport containers between Bandung and Tanjung Priok by 4 daily trips of one way. In 2001 about 80,000 TEU were transported. The existing available infrastructure has potential to increase the transport capacity of containers by increasing number of trips.

302. But the PT. Kai (operation and management of railway company) is reluctant to invest the improvement of railway infrastructures for cargo and container transport.

303. The central government (DGLC: Directorate General of Land Communication) is conducting improvement projects to develop the transport capacity of railway facilities and to increase freight transport volume as well as passengers traffic and commuter services between Bandung and Tanjung Priok under the Jabotabek Railway Improvement Plan.

a) Eastern line:

From Kota- Jatinegara- Bekasi-Cikanpeck ┬ Cirebon-Surabaya
└Bandung

304. From Mannggarai to Bekasi-Cikanpeck line is planned to be elevated double tracks to separate cargo transport and commuters/passenger transport.

305. By implementation of the improvement project of this line, the infrastructures thereof will be reinforced and transport capacity of containers between Tanjung Priok –Bandung and cargo will be able to increase.

b) Cikanpeck-Bandung line to be developed to the double tracks by IBRD finance

306. In addition to such project the Bandung –Jakarta Corridor railway development as a part of the Railway efficient Project financed by IBRD is scheduled to complete in 2003.

c) Enhancement of Railway Freight Transport between Tanjung Priok port and Hinterland

307. Considering the improvement program of the eastern line, central line and Bogor lines connecting Tanjung Priok and Bandung through Bekasi, Karawang as parts of the Jabotabek rail way network, the management body of the railway (PT. KAI) should make its best efforts to utilize the existing available railway facilities for encouraging the increasing freight transport of containers

308. IPC2 should work with PT. KAI to study the possibility of enhancing railway transport from the inland container depot to the Pasoso terminal by improving its service level of frequency and/or capacity.

8-B-3 Cirebon Port Access Road

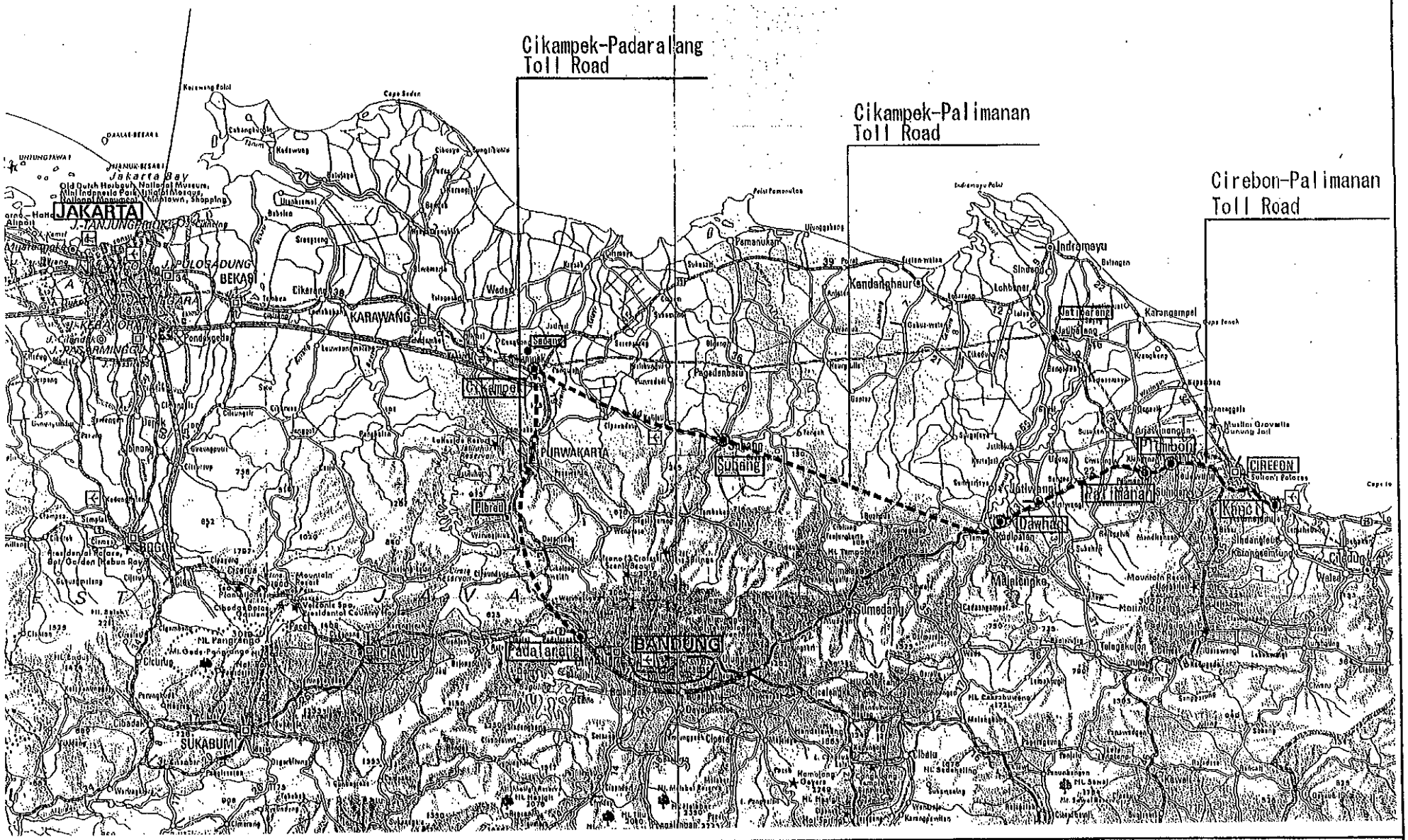
1) Toll way Development around Cirebon Area

309. There are several toll way projects of the planned and desirable improvements to inland transport infrastructure in the Cirebon area as summarized below.

Figure 8-B-7 Toll Road Development Plan

a) Cirebon-Palimanan Toll Road

This is relatively short toll way from Palimanan west of Cirebon to Kanci east of city. This road will assist the Cirebon-bound traffic, particularly from the west. The locally based traffic also benefit because a large proportion of through traffic can be bypass Cirebon city.



THE STUDY FOR DEVELOPMENT OF THE GREATER JAKARTA METROPOLITAN PORTS IN THE REPUBLIC OF INDONESIA

Figure

b) Cikanpeck-Palimanan Toll Road

This road connects at Sadang with the Cikanpeck-Padalarang tollway and make possible to travel between Jakarta to east of Cirebon. This toll road will give large savings in vehicle operating cost and travel time between Cikanpeck and Palimanan as the toll way will make a direct route between these two points compared main road of the northern coastline.

c) Cikanpeck Padalarang Toll Road

This toll way will affect the market share of container transport by rail to land transport between Bandung and Tanjung Priok by substantially reducing travel times by road. Bandung-Cirebon traffic will benefit from being able to join the Cikanpeck-Cirebon toll route at Dawuan.

d) Arterial Road Improvements

Improvement to the arterial road network has been taking place concurrently with the improvements to the toll way network. Sections of the north coast highway between Cikanpeck and Cirebon and Between Cirebon and Semarang have already taken up for improving to 4 lane divided road standard. The proposed improvement that would directly be beneficial to Cirebon Port would benefit for smooth and quick access of container trucks between the port and the inter-urban arterial highway system.

e) Railway Improvement

The Jakarta-Cikanpeck-Cirebon railway line is now double tracked as far as Cikanpeck. Double tracking from east of Cikanpeck is one of the highest priority railway projects in the country. It is planned to develop double tracking of remaining parts of 131 km by 2001.

2) Directional Classified Vehicle-Counting Survey

310. The directional classified 8 types of vehicle counting survey were carried out on January 1997, at 3 gates of the Cirebon Port. The Daily Traffic Volume by type of vehicle in and out port is listed in the following Table 8-B-22.

Table 8-B-22 The Daily Traffic Volume by Type of Vehicles

	January, 1997			
Type of Vehicle	In port	Out port	Total	Ratio
Sedan	423	345	768	16.14%
Medium/Large Bus	72	66	138	2.90%
Pick up	90	84	174	3.66%
Medium Truck	185	166	351	7.38%
Large Truck	295	150	445	9,35%
Total	1,065	811	1,876	39.43%
Motor Cycle	1,473	1,408	2,881	60.56%

311. The traffic composition is LV (light vehicle) 19.8%, HV (heavy vehicle) 19.63% and MC (motor cycle) 60.56% based on the veh/day. The above daily traffic volume is small and considered as the regular port cargo traffic vehicles and passengers working in the port. The port had handled mainly dry bulk cargo and very small volume of general cargo. The traffic volume of the Cirebon port in 1996 and 2001 had been in Table 8-B-23.

Table 8-B-23 Traffic Volume of Cirebon Port in 1996 and 2001

Cargo	In 1996	In 2001	Increase/decrease
General Cargo	260,000	228,000	- 12.3%
Bag cargo	490,000	576,000	+17.55%
Dry Bulk Cargo	670,000	1,002,000	+ 49.55%
Liquid Bulk Cargo	242,000	156,000	- 35.54%
Others	14,000	0	- 100 %
Containerized cargo	1,700	0	- 100%
Total	1,678,000	1,962,000	+16.92%

312. Since 1997, the port cargo volume had not been increased about 16.92 % in the total volume. The dry bulk cargo volume has increased substantially, but general cargo and liquid cargo have been decreased and the handling container boxes had been suspended since 1997 and no containerized cargo handled in 2001. It is considered that the port related traffic volume for cargo transport would have increased proportionally to the increase of port cargo volume, i.e. the daily traffic volume in and out port in 2001 would have increased about 17% from the daily traffic volume as counted by survey in 1996. The Port Related Traffic volume of 2001 is estimated accordingly and shown in Table 8-B-24.

Table 8-B-24 Port Related Traffic through Cirebon port in 2001

Type of Vehicle	In 2001			Ratio
	In port	Out port	Total	
Sedan	495	404	899	16.15%
Medium/ Large Bus	84	77	161	2.90%
Pick up	105	98	203	3.65%
Medium Truck	216	194	410	7.37%
Large Truck	345	176	521	9,36%
Total	1,246	949	2,195	39.45%
Motor Cycle	1,723	1,647	3,370	60.55%

313. The above traffic volume excluding motorcycles is converted to passenger car unit by PCU factor of IHCM to check the capacity of the existing access road according to the IHCM.

Table 8-B-25 Port Related Traffic Volume and PCU Traffic Volume of 2001

Type of Vehicle	Daily Traffic	PCU
Sedan	899	899
Medium/ Large Bus	161	241
Pick up	203	203
Medium Truck	410	943
Large Truck	521	2,084
Total	2,195	4,370

3) Present Conditions of the Access Road

314. It is considered that the port related traffic would be 100 % of the large trucks and 30 % of passenger transport total daily traffic of the main roads around the port. The daily traffic around the Cirebon port considering the city traffic around the port is estimated in Table 8-B-26.

Table 8-B-26 Total Daily Traffic Around Port of 2001

Type of Vehicle	Port Related Traffic	PCU	City Through Traffic	PCU	Total Daily Traffic	Total in PCU
Sedan	899	899	2,098	2,098	2,997	2,997
Medium/ Large Bus	161	241	376	564	537	805
Pick up	203	203	474	474	677	677
Medium Truck	410	943	957	2,201	1,367	3,144
Large Truck	521	2,084	0	0	521	2,084
Total	2,195	4,370	3,905	5,337	6,099	9,707

315. The toll roads surrounding the Cirebon city have been developing for container transport trucks between Bandung and Jakarta to bypass the Cirebon city. It is therefore considered that the large heavy traffic except large trucks transporting dry bulk cargo would not come to the Cirebon port through the city roads.

316. The existing main access road to the port is 4 lanes divided in 2 ways with asphalt-paved road. The parts of the access road pass through the city commercial area and resident area. It is observed that the existing access road to the port which has 2 lanes (lane width of 3.0 m) on both sides is congested with small mini buses for commuter.

317. However the existing width of the road would be proper for accommodating the future traffic volume by port related traffic and city traffic. The right of way as set by the province and Bina Marga must be checked with the local government whether future expansion of port access road is possible within the existing road area. Alternatively the development of the new access road or by flyover would be difficult by the heavily dense of commercial and residential houses along the existing access road to the port.

4) Capacity of the Present Road Conditions

318. The capacity of the existing access road condition to the port is checked by the similar manner as described in IHCM as follows.

319. For four-lane two-way divided roads (4/2 D) the capacity analysis is carried out on both directions of travel combined.

$$C = Co \times Fcw \times Fcsp \times Fcsf$$

Where, C = Actual capacity (pcu/hr)
Co = Base capacity (pcu/hr)
Fcw = Road width adjustment
Fcsp = Directional split adjustment factor (for undivided roads)
Fcsf = Side friction and shoulder adjustment factor

320. Capacity factor of Existing Arterial Roads around the Bojonegara road are set as follows:

Table 8-B-27 Capacity Factor of Existing Arterial Roads

Factor to Determine Capacity	Description
Type of Road	Existing Suburban road, 4-lanes 2-way divided road, in flat
Lane width	6.0 m for 2 lane undivided
Shoulder width	60 cm to 1.0 m of shoulder width with block pavement
Width adjustment factor (Fcw)	2–lane undivided for one direction carriageway width of 6m, Fcw =0.91
Directional split capacity adjustment factor: (Fcsp)	Directional Split 4 lane-two-way divided roads. 50/50: when the flows are equal in both direction, Fcsp = 1.0,
Capacity per lane (C)	Capacity in one direction (pcu/hr/lane) C = Co x Fcw x Fcsp x Fcsf
Adjustment factor of side friction (Fcsf)	Road type of 4/2 D and side friction class is low and effective shoulder width of 0.60 to 1.0m. Fcsf= 0.95,
Base Capacity (Co)	Base capacity (pcu/hr/) for two-lane divided road flat 1,650 pcu total in one direction
Adjustment of City size Fcs	City size by number of inhabitants, 0.1-0.5 million Fcs = 0.90, more than 3 million Fcs = 1.04.
K – factor	Ratio between design hour flow and ADDT; default value k = 0.09

C = 1,650 x 0.91 x 1.0 x 0.95 = 1,426 pcu/hr

321. The present daily traffic volume through the both direction of the existing access road is 9,707pcu/day; equivalent to the peak hour traffic will be 874 pcu/hr. The present road has capacity for accommodating the present daily traffic volume.

5) Forecast of the traffic volume

322. The future traffic around the Cirebon port will be the port related traffic and regular city traffic. The present traffic volume is forecasted by multiplying the estimated vehicles growth rate to the city traffic and port related traffic for cargo transport by using the correlation factors of vehicle types with vehicle number and port cargo volume.

a) The vehicle growth rate

323. The vehicle growth rate of the city traffic is taken from those used for the "Heavy Loaded Road Improvement Project, Master Plan Review" financed by JBIC in 2001. The estimated vehicle growth rate by vehicle type is summarized below.

Table 8-B-28 Growth Rate of Vehicle Type up to 2010 and 2025

Vehicle Type	Vehicle Growth Rate (%)			
	2010	2015	2020	2025
Passenger Car	3.68	4.67	4.17	4.00
Small Bus	5.60	6.19	4.86	4.50
Medium/Large Bus	5.53	6.13	4.87	4.50
Pick Up	2.41	3.11	2.65	2.50
Medium Truck	2.77	3.51	2.95	2.50
Large Truck	3.06	4.04	3.30	3.00

324. The above growth rates by vehicle type are applied to the present estimated city traffic volumes to obtain the forecast traffic volume around the port area for years of 2012, and 2025. The result of calculation is shown in the table below. The estimated traffic volume would represent the volume of traffic, which would use the existing arterial roads.

b) Cargo Demands Forecast Through the Port

325. The traffic demand is forecast through the Cirebon port as follows:

Table 8-B-29 Traffic Demand Forecast Through Cirebon Port of 2012 and 2025

Cargo	In 2012	In 2025
General Cargo (x 1,000 ton)	800	1,337
Dry Bulk Cargo (x 1,000 ton)	1,887	4,375
Liquid Cargo (x 1,000 ton)	150	155

c) Forecast of Port Related Traffic Volume Through the port

326. The port related traffic by type of vehicle in 2012 and 2025 is estimated by applying the correlation factors of vehicle type. The total of port related and city traffic combined are shown in the table below.

Table 8-B-30 Forecast of Traffic Volume Through and around the Cirebon Port (veh/day)

Vehicle Type	Traffic Volume (veh/day)					
	2012			2025		
	PRT	TTV	Total	PRT	TTV	Total
Passenger Car	995	4,624	5,619	2,058	7,914	9,972
Small Bus	4	0	4	9	0	9
Medium/Large Bus	11	1,024	1,035	22	1,936	1,958
Pick Up	154	901	1,055	359	1,274	1,633
Medium Truck	148	4,364	4,512	326	6,333	6,659
Large Truck	209	2,992	3,201	465	4,595	5,060

PRT: Port Related Traffic Volume (veh/day)
TTV: Traffic Volume around the Port area (veh/day)

d) Forecast of Daily Traffic Volume by Passenger Car Unit of vehicle type

327. The future traffic volume of 2012 and 2025 is derived from the port related traffic (PRT) and through traffic volume (TTV), The daily traffic volume (DTV) in 2012 and 2025 are expressed in PCU based on the equivalent pcu factor as follow:

Table 8-B-31 Forecast of Daily Traffic Volume by PCU

Year	2012		2025	
Vehicle Type	DTV	PCU	DTV	PCU
Passenger Cars	5,619	5,619	9,972	9,972
Small Bus	4	4	9	9
Medium/ Large Bus	1,035	1,558	1,958	2,937
Pick up	1,055	1,055	1,633	1,633
Medium Truck	4,512	10,378	6,659	15,315
Large Truck	3,201	12,804	5,060	20,238
Total (veh/day)	15,427	31,414	25,290	50,104

Note: DTV: Daily Traffic Volume derived from port related traffic and through traffic volume around port area.

e) Corresponding Peak Hour Factor

328. The corresponding peak hour volume were determined by multiplying daily volume by the ADT factor (K), which represents the ratio between the peak hour flow and daily flow

depending on the density of the development environment. The general average values as shown below are used for the study. The K value is taken 0.12 for the access road area located in suburban area.

f) Forecast of Daily Traffic Volume and Peak Hour Volume

329. Future traffic volume and peak hour volume in one direction of each directional traffic flow are worked out by applying the ADT factor (K) as follows.

Table 8-B-32 Future Traffic Volume and Peak Hour Volume by Direction

Traffic Volume in 2012		Traffic Volume in 2025	
Forecast PCU/day	Design Hourly Flow in one direction	Forecast PCU/day	Design Hourly Flow in one direction
31,414	3,455	50,104	5,511
Base Capacity of existing road	1,351 pcu/hr/lane	Additional lanes to make 4-lane divided, Base capacity 1,900 pcu/hr/lane, and actual capacity will be 1,805 pcu/hr/lane.	

330. The base capacity of the existing road conditions is given in IHCM at 1,650 pcu/hr in one direction. The present width of the access road will be difficult to accommodate the forecast traffic volume of the port in 2012. It is necessary to improve its pavement of the road and shoulder for wider use of lanes width as 2 way divided. However for accommodating the forecast traffic volume of 2025 the present road conditions will not be sufficient, additional lanes on both sides of road are required to be 4 lane-two–way divided road (4/2D).

8-B-4 Banten (Ciwandan & Merakmas) Access Road

a) Existing Access Road Conditions

i) The existing access road to the Merakmas container terminal

331. The existing access road to the Merakmas container terminal is focused on the road between the exit of the Merak-Jakarta toll way and the gate of the container port located at the north west of the Merak Ferry Terminal. The existing access road up to the Merak Ferry terminal has two lanes divided with concrete pavement for heavy loaded vehicles mainly large trucks, while the road from the ferry terminal to the port has two lanes undivided and partly been occupied by the local market, thus caused heavy traffic congestion with local commuters, small buses, and large trucks. It is not proper access road for the container trailer transport from the exit of the Merak Toll way, therefore at present all containers are transported through the coastal road of the peninsular to enter the Toll way.

ii) The existing access road to the Ciwandan port

332. The existing access road to the Ciwandan port is focused on the road between the national roads at the Kurakatau Steel Industrial Estate to the port. The access road has two lanes undivided arterial road with easy asphalt pavement. The heavy loaded trucks for the Steel mill industries are using the roads inside of the Steel mill main road. The congested residents and industries and railway are located along side of the access road. It is observed difficult to be widened the existing road.

2) Daily Traffic volume of Local Traffic

a) Traffic counting survey data

333. The traffic counting survey was carried out in October 2002 at two locations, one at the entrance gate of the Merak Ferry Terminal and other at the entrance of the Ciwandan port. The traffic data of the access road to the Ciwandan and Merakmas are shown in the following table.

Table 8-B-33 Result of Daily Counting Traffic Around Merakmas and Ciwandan ports area

	Daily Traffic Volume (Both Directions)			
	Access to Merakmas from Cilegon		Access to Ciwandan from Cilegon	
Vehicle Type	Veh/day (16 hrs record)	24 hrs converted data	Veh/day (16hr record)	24 hrs converted data
Motor Cycle	3,724	4,085	3,272	3,589
Passenger Car	3,290	3,609	4,062	4,456
Small Bus	4,264	4,678	4,057	4,451
Medium/Large Bus	1,935	2,123	1,273	1,396
Pick Up	998	1,095	1,087	1,192
Medium Truck	1,248	1,369	1,041	1,142
Large Truck	1,981	2,173	1,248	1,369
Total	17,440	19,132	16,040	17,596

b) Existing Access Road Conditions

i) The existing access road to the Merakmas container terminal

334. The existing access road to the Merakmas container terminal is focused on the road between the exit of the Merak-Jakarta toll way and the gate of the container port located at the north west of the Merak Ferry Terminal. The existing access road up to the Merak Ferry terminal has two lanes divided with concrete pavement for heavy loaded vehicles mainly large trucks, while the road from the ferry terminal to the port has two lanes undivided and partly been occupied by the local market, thus caused heavy traffic congestion with local commuters, small buses, and large trucks. It is not proper access road for the container trailer transport from the exit of the Merak Toll way, therefore at present all containers are transported through the coastal road of the peninsular to enter the Toll way.

ii) The existing access road to the Ciwandan port

335. The existing access road to the Ciwandan port is focused on the road between the national roads at the Kurakatau Steel Industrial Estate to the port. The access road has two lanes undivided arterial road with easy asphalt pavement. The heavy loaded trucks for the Steel mill industries are using the roads inside of the Steel mill main road. The congested residents and industries and railway are located along side of the access road. It is observed difficult to be widened the existing road.

3) Lane Capacity

336. The existing access roads from Cilegon to Ciwandan and Merakmas are national road with 2 lanes undivided arterial road. The lane capacity of the existing arterial roads were determined in accordance with IHCM and the following formula:

$$C = Co \times FCw \times FCsp \times FCsf \text{ (Pcu/hr)}$$

Where: C = Capacity (pcu/hr)
Co = Base capacity (pcu/hr)
FCw = Adjustment for carriageway width
FCsp = Adjustment for directional split
FCsf = Adjustment for side friction

Table 8-B-34 The Capacity Calculation of Arterial Road to the Access to the Ports

Type of Road & Capacity Factor		Unit	Comments
2 lanes undivided	Arterial		
Base Capacity	3,100	Pcu/hr	Flat terrain
FCw	1.0		3.5 m lane width
FCsp	0.97		Directional split (%) 53:47
FCsf	0.93		Effective shoulder < 0.5 m, low side friction
Absolute capacity	2,797	Pcu/hr	
Practical capacity	2,238	Pcu/hr	80% of absolute capacity

4) Passenger Car Equivalent of the Existing Traffic of the Access Roads

337. The daily traffic data by the traffic counting survey was recorded for 16 hrs, which is converted to 24 hrs data for assessment of the congestion ratio against the lane capacity.

338. The counted traffic volume included the local and port related traffic and it is difficult to separate traffic survey data into two different categories, since the access road between Cilegon and Ciwandan and Merakmas are used by public transport and exclusive port traffic.

339. The 24 hrs daily traffic data is converted to the passenger car unit (PCU) by using the same factor as for the Bojonegara access road as follow:

a) PCU Factor

Vehicle Type	PCU factor
Motor Cycles	0.5
Passenger Car	1
Small Bus	1
Medium and Large Bus	1.5
Pick up	1
Medium Truck	1.3
Large Truck	2.5

b) Daily traffic volume of the access road by Pcu

Table 8-B-35 Daily Traffic Volume by PCU to the Study Ports

Access Road	Cilegon to Ciwandan	Cilegon to Merakmas
Pcu / day	18,896	21,820
Pcu / hr by peak hour factor of 0.097	1,833	2,117
Absolute Capacity	2,797	2,797
Ratio against Capacity	66 %	76 %

340. The traffic analysis based on the traffic counting survey data indicates that the existing access road of 2 lanes undivided arterial roads have the capacity for the present traffic volume.

5) 4) Traffic forecasts

341. The traffic forecast of the two access roads are estimated by the following assumption. The vehicle traffic will increase along with the estimated growth rate of vehicle type as applied to the Bojonegara case. It is assuming that the volume of port related traffic to be increased according to the growth of cargo throughput will be ranged within the estimated growth rate of vehicle type. The vehicle forecast of the two access roads and ratio against the capacity are summarized below.

a) Access Road to Ciwandan Port

Table 8-B-36 Traffic Forecast of Arterial Road to Ciwandan Port

Access Road	Traffic in 2012	Traffic in 2025
Pcu / day	27,991	48,287
Pcu / hr by peak hour factor of 0.097	2,715	4,684
Absolute Capacity	2,797	2,797
Ratio against Capacity	97 %	167 %

b) Access Road to Merakmas Container Terminal

Table 8-B-37 Traffic Forecast of Arterial Road to Merakmas Container Terminal

Access Road	Traffic in 2012	Traffic in 2025
Pcu / day	32,365	55,647
Pcu / hr by peak hour factor of 0.097	3,139	5,398
Absolute Capacity	2,797	2,797
Ratio against Capacity	112 %	193 %

342. The above calculation indicates that the both access road to the ports will be required for development of the 4lanes undivided or 2lanes divided by 2012, and by 2025 these access roads shall be developed twice of the present capacity to accommodate traffic volume in 2025.

343. Under such limited inland transport capacity, the ports of Ciwandan and Merakmas will be difficult to function as an international container hub port of the region, in addition to the port historical and operational characteristic and site conditions.

8-B-5 Bojonegara Port Access Road

1) Present conditions of the access road

344. The existing access road is 2 lanes undivided lightweight load asphalt paved road located and passed between the small villages and industries. Private investors for their factories and industries complex development occupy the coastal area along the access road. The parts of the road pass through the small resident area, rice paddy area along the road and detour rocky mountain area.

345. Typically the existing road varies in width between 5m and 7 m. The first 2.5 km from the Cilegon –Bojonegara arterial road has recently been resurfaced and is in good conditions.

346. The topography is flat and either side of the road is mixture of paddy and industry. The bridge over the Jakarta – Merak Toll way is narrow with poor sight lines and would be dangerous for the heavy container trucks.

347. The steel truss bridge over the Cilegon River is currently closed for repairs and traffic uses a narrow truss bridge located immediately downstream.

348. The next 2.5 km from the bridge pass through generally flat terrain interspersed with factories on the eastside and paddy and occasional concrete walls demarcating future industrial sites on the west-side. Further north, the topography becomes hillier on the west of the existing road. By 7.5 km to 9 .5 km from the Jakarta-Merak toll way the surrounding terrain has developed into rugged hills and several quarries along the route.

349. There is the village called Ragus. At this village road makes a " horseshoe" bend through a very congested residential area. Further north, the road follows a narrow coastal belt between the sea and the hills. Immediately south of the planned port site, road skirts around a rocky promontory.

2) Directional Classified Vehicle Counting Survey

350. The directional classified 13 types of vehicle counting survey were carried out on July 27, 2002 at 2 sites on the existing access road from the Toll Way of Jakarta –Merak to The Bojonegara Port Development site. The Daily Traffic Volume by type of vehicle from both directions at 2 sites is listed in the following table.

Table 8-B-38 The Daily Traffic Volume by Type of Vehicles

	At Rava Bojonegara (veh/day) Desa Kramatwalu			At Rava Salira (veh/day) Desa Argawana		
Type of Vehicle	Fr. Cilegon -Bojo	Fr. Bojo -Cilegon	Total Both	Fr. Cilegon -Bojo	Fr.Bojo -Cilegon	Total Both directions
Sedan	209	177	386	259	297	556
Medium/ Large Bus	23	25	48	29	27	56
Pick up	59	51	110	67	71	138
Medium Truck	276	262	538	73	69	142
Large Truck	243	234	477	13	14	27
Total	810	749	1,559	441	478	919
Motor Cycle	389	357	746	1,035	1,038	2,073

351. The traffic composition is LV (light vehicle) 21.6%, HV (heavy vehicle) 46.0% and MC (motor cycle) 32.4% based on the veh/day. The above daily traffic volume is small and considered as the commuter and regular business traffic. When the new port at Bojonegara is developed, the additional port related traffic would be generated and anticipated.

352. The above traffic volume is converted to passenger car unit by PCU factor of IHCM to check the capacity of the existing access road according to the IHCM.

Table 8-B-39 Daily Traffic Volume and PCU Traffic Volume

	Desa Kramatwalu		Desa Argawana	
Type of Vehicle	Daily Traffic	PCU	Daily Traffic	PCU
Sedan	386	386	556	556
Medium/ Large Bus	48	72	56	84
Pick up	110	110	138	138
Medium Truck	538	1,237	142	327
Large Truck	477	1,908	27	108
Total	1,559	3,713	919	1,207

3) Capacity of the Present Road Conditions

353. The capacity of the existing access road condition is checked by the similar manner as described in IHCM as follows: For two-lane two-way undivided roads (2/2 UD) the capacity analysis is carried out on both directions of travel combined.

C = Co x Fcw x Fcsp x Fcsf

Where: C = Actual capacity (pcu/hr)
Co = Rase capacity (pcu/hr)
Fcw = Road width adjustment
Fcsp = Directional split adjustment factor (for undivided roads)
Fcsf = Side friction and shoulder adjustment factor

354. Capacity factor of Existing Arterial Roads around the Bojonegara road are set as follows:

Table 8-B-40 Capacity factor of Existing Arterial Roads

Factor to Determine Capacity	Description
Type of Road	Existing Suburban road, 2-lanes 2-way undivided road, in flat
Lane width	6.0 m for 2 lane undivided
Shoulder width	60 cm to 1.0 m of shoulder width without pavement
Width adjustment factor (Fcw)	2–lane undivided for total both direction carriageway width of 6m, Fcw =0.91
Directional split capacity adjustment factor: (Fcsp)	Directional Split 2 lane-two-way undivided roads. 50/50: when the flows are equal in both direction, Fcsp = 1.0,
Capacity per lane (C)	Capacity in one direction (pcu/hr/lane) C = Co x Fcw x Fcsp x Fcsf
Adjustment factor of side friction (Fcsf)	Road type of 2/2 UD and side friction class is low and effective shoulder width of 0.60 to 1.0m. Fcsf= 0.95,
Base Capacity (Co)	Base capacity (pcu/hr/) for two-lane undivided road flat 3,100 pcu total in both direction
Adjustment of City size Fcs	City size by number of inhabitants, 0.1-0.5 million Fcs = 0.90, more than 3 million Fcs = 1.04.
K – factor	Ratio between design hour flow and ADDT; default value k = 0.11

355. Based on the capacity factors, the capacity per lane is calculated set as follows:

C = 3100 x 0.91 x 1.0 x 0.95 = 2,680 pcu/hr

356. The present daily traffic volume through the both direction of the existing access road is 3,713 pcu/day; equivalent to the peak hour traffic will be 408 pcu/hr. The present road has capacity for accommodating the present regional traffic volume.

4) Forecast of the Traffic Volume

357. The future traffic around the Bojonegara will be the port related traffic and regular traffic through this area. The present traffic volume is forecasted by multiplying the estimated vehicles growth rate and port related traffic for cargo transport by using the correlation factors of vehicle types with vehicle number and port cargo volume.

a) The vehicle growth rate

358. The vehicle growth rate is taken from those used for the "Heavy Loaded Road Improvement Project, Master Plan Review" financed by JBIC in 2001. The estimated vehicle growth rate by vehicle type is summarized below.

Table 8-B-41 Growth Rate of Vehicle Type 2010 and 2025

Vehicle Type	Vehicle Growth Rate (%)			
	2010	2015	2020	2025
Passenger Car/Sedan	3.68	4.67	4.17	4.00
Small Bus	5.60	6.19	4.86	4.50
Medium/Large Bus	5.53	6.13	4.87	4.50
Pick Up	2.41	3.11	2.65	2.50
Medium Truck	2.77	3.51	2.95	2.50
Large Truck	3.06	4.04	3.30	3.00

359. The above growth rates by vehicle type are applied to the existing through traffic volumes to obtain the forecast traffic volume through the port area for years of 2012, and 2025. The result of calculation is shown in the table below. The estimated traffic volume would represent the volume of traffic, which would use the existing arterial roads.

b) Cargo Demands Forecast Through the Port

360. The traffic demand is forecast through the Cirebon port as follows:

Table 8-B-42 Traffic Demand Forecast Through Cirebon Port of 2012 and 2025

Cargo	In 2012	In 2025
Container (x 1,000 TEU)	996	4,582
Cars Terminal (x 1,000 unit)	150	300

c) Forecast of Port Related Traffic Volume Through the port

361. The port related traffic by type of vehicle in 2012 and 2025 is estimated by applying the correlation factors of vehicle type. The total of port related and city traffic combined are shown in the table below.

Table 8-B-43 Forecast of Traffic Volume Through and around the Bojonegara Port (veh/day)

Vehicle Type	Traffic Volume (veh/day)					
	2012			2025		
	PRT	TTV	Total	PRT	TTV	Total
Passenger Car	1,312	596	1,604	13,893	1,019	14,913
Small Bus	6	0	6	61	0	61
Medium/Large Bus	14	92	106	151	173	324
Pick Up	0	146	146	0	207	207
Medium Truck	52	825	877	547	1,914	2,461
Large Truck	1,950	2,800	4,750	20,643	1,052	21,695

PRT: Port Related Traffic Volume (veh/day)
TTV: Traffic Volume around the Port area (veh/day)

d) Forecast of Daily Traffic Volume by Passenger Car Unit of vehicle type

362. The future traffic volume of 2012 and 2025 is derived from the port related traffic (PRT) and through traffic volume (TTV), The daily traffic volume (DTV) in 2012 and 2025 are expressed in PCU based on the equivalent pcu factor as follow:

Table 8-B-44 Forecast of Daily Traffic Volume by PCU

Year	2012		2025	
Vehicle Type	DTV	PCU	DTV	PCU
Passenger Cars	1,604	1,604	14,913	14,913
Small Bus	6	6	61	61
Medium/ Large Bus	106	159	324	486
Pick up	146	207	207	207
Medium Truck	877	2,017	2,461	5,660
Large Truck	4,750	19,000	21,695	86,780
Total (veh/day)	7,491	22,932	39,661	108,107

Note: DTV: Daily Traffic Volume derived from port related traffic and through traffic volume around port area.

e) Corresponding Peak Hour Factor

363. The corresponding peak hour volume were determined by multiplying daily volume by the ADT factor (K), which represents the ratio between the peak hour flow and daily flow depending on the density of the development environment. The general average values as shown below are used for the study. The K value is taken 0.12 for the access road area located in suburban area.

f) Forecast of Daily Traffic volume and Peak Hour Volume

364. Future traffic volume and peak hour volume in one direction of each directional traffic flow are worked out by applying the ADT factor (K) as follows.

Table 8-B-45 Future Traffic Volume and Peak Hour Volume by Direction

Traffic Volume in 2012		Traffic Volume in 2025	
PCU/day	Design Hourly Flow in one direction	PCU/day	Design Hourly Flow in one direction
22,932	2,522	108,107	11,892
Base Capacity of existing road	1,550 pcu/hr/lane	Additional lanes to make 6-lane divided, Base capacity 1,900 pcu/hr/lane, and actual capacity will be 1,805 pcu/hr/lane.	

365. The base capacity of the existing road conditions is given in IHCM at 3,100 pcu/hr total in both directions. The present width of the access road will be able to accommodate the forecast traffic volume of 2012 by improving pavement and 2 way divided. However for accommodating the forecast traffic volume of 2025 the present road conditions will not be sufficient, additional lanes on both sides of road are required to be 6 lane-two–way divided road (6/2D).

5) Present Traffic Conditions around the Bojonegara Port Development Area

366. Typically the existing road varies in width between 5m and 7 m. The first 2.5 km from the Cilegon –Bojonegara arterial road has recently been resurfaced and is in good conditions.

367. The topography is flat and either side of the road is mixture of paddy and industry. The bridge over the Jakarta – Merak Toll way is narrow with poor sight lines and would be dangerous for the heavy container trucks.

368. The steel truss bridge over the Cilegon River is currently closed for repairs and traffic uses a narrow truss bridge located immediately downstream.

369. The next 2.5 km from the bridge pass through generally flat terrain interspersed with factories on the eastside and paddy and occasional concrete walls demarcating future industrial sites on the west-side. Further north, the topography becomes hillier on the west of the existing road. By 7.5 km to 9 .5 km from the Jakarta-Merak toll way the surrounding terrain has developed into rugged hills and several quarries along the route.

370. There is the village called Ragus. At this village road makes a " horseshoe" bend through a very congested residential area. Further north, the road follows a narrow coastal belt between the sea and the hills. Immediately south of the planned port site, road skirts around a rocky promontory.

8-C. ENVIRONMENTAL FACTORS

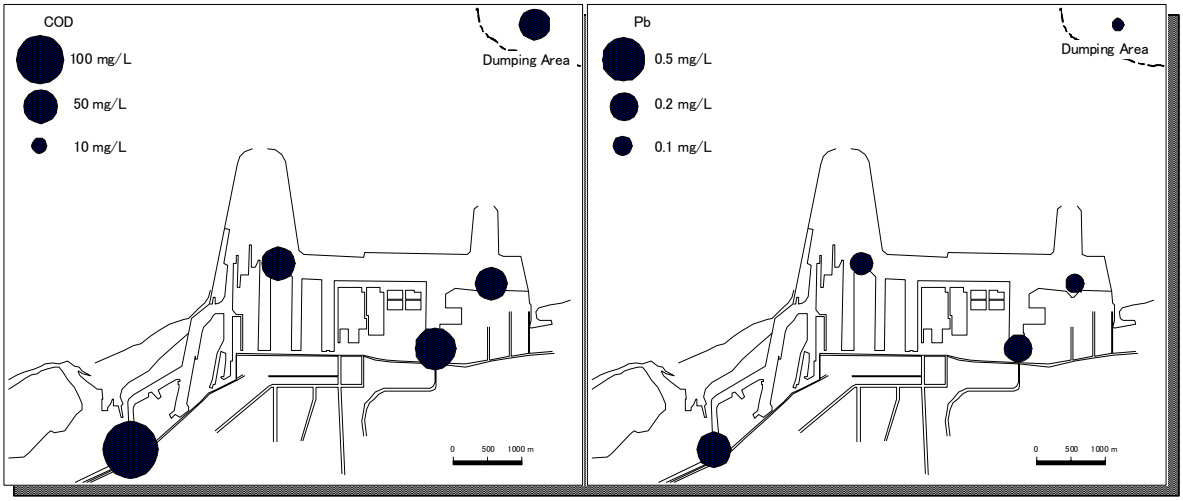
371. The JICA Study Team reviewed the monitoring surveys conducted by IPC2 and carried out field survey at Tanjung Priok and Bojonegara Project Site. Concerning Bojonegara, The study AMDAL was carried out by IPC2 in 1996. The results gave us the description of environmental condition and predicted environmental impact. Also, the JICA Study Team carried out additional survey, such as observation survey, interview survey, public meeting with related person in the Second Work in Indonesia.

8-C-1 Tanjung Priok

372. The JICA Study Team carried out field survey in Tanjung Priok Port in order to grasp current environmental aspects. This survey result was used for evaluation of environmental aspect, and also Monitoring Survey conducted by IPC2 was referred. Detailed results of the field survey are shown in "Supporting Report of Engineering Study".

1) Natural Environmental Aspects

373. Water quality condition has still be bad at Tanjung Priok Port, especially inside breakwater. According to the results of monitoring survey by IPC2, water quality of COD, BOD, TSP and several heavy metals, which are typical pollution index, showed highest values at west side of Tanjung Priok Port near the river mouth as shown in Figure 8-C-1.



Source: Pemantauan Lingkungan Pelabuhan Cabang Tanjung Priok, 2001

Figure 8-C-1 Water Quality Distribution in Tanjung Priok Port

374. According to the results of field survey conducted by JICA Study Team, DO concentration within the breakwater showed low value (bellow the environmental standards). Usually decreasing DO concentration means bad condition, it damages to surrounding ecosystem.

375. Salinity distribution were 22.3 to 32.8‰ in the sampling by the JICA Study Team. Especially salinity of surface water at point T-2 were low values; it explained that water quality at T-2 was strongly affected by discharge water through Kali Sunterbaru. Organic pollutant parameters such as COD and nutrients had strong relation with salinity as shown in Figure 8-C-2. The results of monitoring survey by IPC2 also showed similar aspects. It means that discharge water from DKI Jakarta affects damage to water quality.

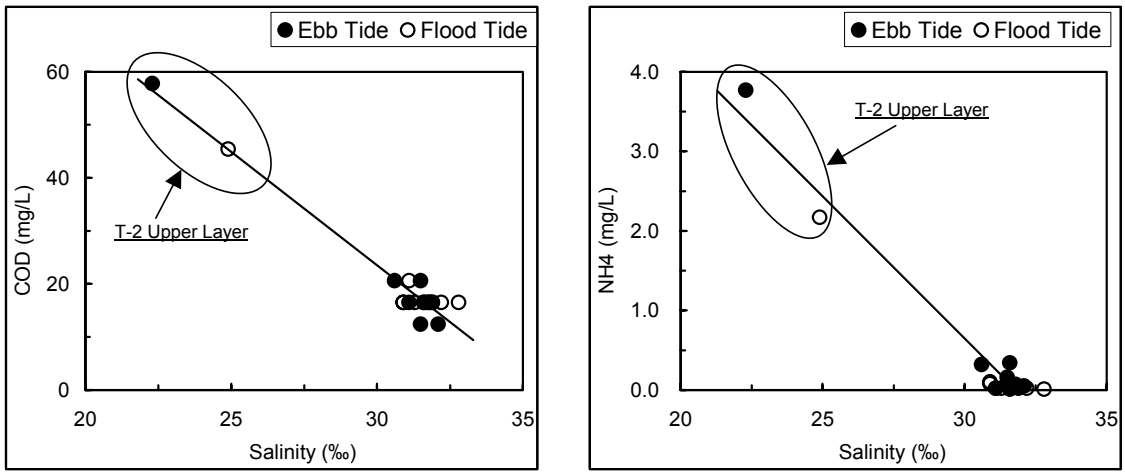
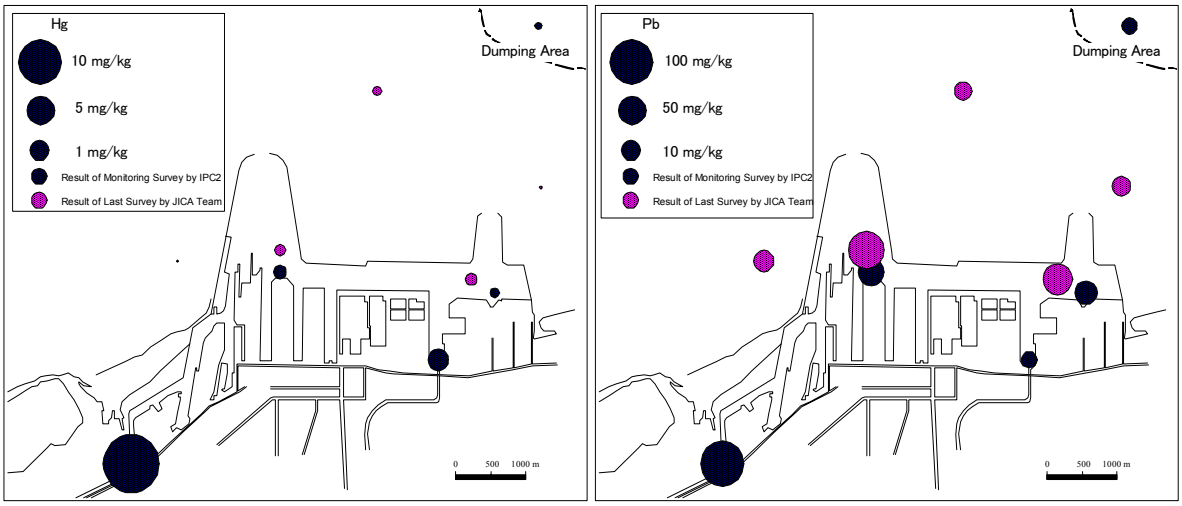


Figure 8-C-2 Relation with Salinity, COD and Ammonium Nitrogen

376. Sediment condition also gave similar aspect. Concentration of heavy metals, Hg, Pb e.g., showed high value inside breakwater as shown in Figure 8-C-3.



Source: Field survey by the JICA study team, and Pemantauan Lingkungan Pelabuhan Cabang Tanjung Priok, 2001

Figure 8-C-3 Distribution of Heavy Metal Concentration in Bottom Sediment

377. Aggravation of water and sediment qualities is caused by inflow of domestic and industrial wastewater through the river from hinterland/surroundings because of low values of salinity and pH.

378. It is concluded that inside breakwater is easy to concentrate pollutant. It will be caused by layout of breakwaters; these make a closed water area inside them. That to say, Drainage from DKI Jakarta carries pollutant and silt to the Port Area; however it is difficult them to flow out of breakwater. Hence drastic re-development of the Port Area is necessary for improvement of environmental condition inside breakwater.

379. Concerning air quality, TSP concentration showed high value as same as Banten Port and Cirebon Port. And several data of Pb concentration exceeded air quality standard, it explains serious aggravation of air quality. JICA's survey aimed at influence from road traffic

condition, one point was selected near the road, located crossroad of Jl. Sulawesi and Jl. Enggano (T-7), and one point was located near Gate 1 (T-6). TSP concentration showed highest value at T-7. CO, SO_2 and NO_2 concentrations were less than the standards, however the highest value appeared at T-7. Concentration in daytime at weekday showed higher values. It means that dominant impact to air pollution is caused by traffic activity. These results give that increasing road traffic volume will caused serious negative impact to air quality.

380. Noise survey was carried out at two points around the Port Area (Cross Jl.Enggano/Sulawesi and Koja Hospital) and one point in the Port Area (top of Multi Purpose Terminal). Noise level at two points around the Port Area exceeded the standard, however, inside port area showed lower noise level (below the standard). It means that noise level is mainly affected by traffic activity.

381. Concerning biological conditions, there is not specific aspect to need to evaluate. Territorial flora and fauna are just domestic and planted by human; there are no protected and endangered fauna/flora. And aquatic biological condition showed general; there are no specific lives.

2) Social Environmental Aspects

382. Total area of *Kelurahan* Tanjung Priok is 554 ha. However port area managed by IPC2, their office and commercial area occupies 464 ha, dwelling area is only 80 ha, less than 15 %. So population density is extremely high, it is over 33,000 persons per km_2, this value is 3 times as high as that of DKI Jakarta. According to the information from *Kelurahan* Secretary of Tanjung Priok recorded population includes only legally registered inhabitants (having *Kelurahan* Tanjung Priok ID cards), temporary workers coming from outside are excluded. Number of temporary workers is assumed 6,000 to 7,000 persons. In addition there may be many illegal inhabitants in the area, actually it will be difficult to grasp correct population.

383. Productive age (15 to 54 years) in *Kelurahan* Tanjung Priok and Koja occupy more than half of total population. Especially number of productive age in Tanjung Priok occupies 72 % of total population, 31 % of total population is young age (20 th years). This result explains that the study area can supply manpower, and residents need job occupation.

384. Educational level is one of the most important indicators to understand community condition. Grater part of the people in Tanjung Priok and Koja area junior and senior high school graduates. According to Tanjung Priok 2001 Yearly Report, 34 % of total population in Tanjung Priok was classified into this category. This result gives it will be difficult for two sub-districts to provide enough skilled worker.

385. *Kelurahan* Tanjung Priok and Koja may be vulnerable concerning security and criminal condition, because this area has big bus terminal and train station, many new comers with/without employment. According to interview with respondents, various crime such as robbery, rape, theft, violence and illegal trading occur daily however not all the crime can be reported to administration office, they can not fully grasp the condition.

386. The JICA Study Team carried out interview survey with residents around the Project Site concerning community perception and aspiration. Community perception concerning positive/negative impact are shown in Table 8-C-1.

Table 8-C-1 Community Perception for Positive/Negative Impact

No.	Perception (%)	Tanjung Priok	Koja	Total (%)
1	**Positive Impact Perception**			
1.1	New Job Opportunity			
	a. Construction Work	12.5 %	5 %	17.5 %
	b. Operational Work	12.5 %	5 %	17.5 %
	c. Open a new business of their own	27.5 %	17.5 %	45 %
	d. Not Interested	10 %	10 %	20 %
1.2	Other Positive Impact			
	a. Increasing of people's Income	62.5 %	37.5 %	100 %
	b. Developing city	35 %	22.5 %	57.5 %
	c. Accelerating Port Services	37.5 %	22.5 %	60 %
	d Opening new kind of business	30 %	20 %	50 %
2.	**Negative Impact Perception**			
	a. Noise Disturbance	22.5 %	10 %	32.5 %
	b. Air Pollution	22.5 %	10 %	32.5 %
	c. Traffic Jam	47.5 %	32.5 %	80 %
	d. Illegal business opportunities	12.5 %	10 %	22.5 %
	f. Night Recreational Business Opportunities	15 %	10 %	25 %
	g. Social Conflict			
	- Social envy (jealous)	15 %	10 %	25 %
	- Grabbling other's field business	30 %	15 %	45 %

Source: Interview survey by the JICA study team in 2002

387. Principal positive opinions are increasing business chance and income, on the other hand, negative opinions are traffic jam and air pollution.

388. Environmental sanitation condition, such as waste garbage management, wastewater treatment and others, are managed by DKI Jakarta Government.

389. The city drainage system is served by open gutter however its system is in a poor maintenance condition. Waste materials and thick sediments clog the flow; it raises flood problem in the rainy season.

390. Poor drainage system carries waste materials into the Port Area; it damages water and soil condition. IPC2 protects the waste materials by net, however fishermen breaks it to enter the port area.

3) Drainage Problem of Jakarta City Area

391. The northern part of Jakarta City area suffered a serious flood and inundation that covered some one third of the city (claiming some 30 lives and Rp. 10 trillion in financial losses) in January and February 2002. In the background of this flood, there are the problems of increasing discharge of rainfall from the city area and the intensification of peak discharge volume due to the rapid urbanization of the Jakarta area.

392. Most of the rivers and canals, which take on the drainage of the city area have not been improved since the era of the Dutch colonial government. The river cross sections have been already insufficient and also maintenance dredging of the river channel has not been executed. The drainage condition in some coastal areas has been aggravated due to development and/ or reclamation. Those reason are combined and causing the serious flood and inundation in Jakarta.

393. There are three major drainage canals still flowing into the water area of Tanjung Priok port, i.e., from west, Kali Japat, Terusan Lagoa (Lagoa canal) downstream of Kali Buntu ("buntu" means "dead end") and Kali Sunter baru, which has in outlet in Pelabuhan Minyak of Pertamina.

394. These canals convey not only rainwater but also a lot of garbage and soil as well from the Jakarta city area and cause an amount of sedimentation at their outlets in the harbor basins and navigation channels.

395. Lagoa canal had it's outlet in a harbor basin in Tanjung Priok and flew into an open channel until 1980's (refer to the attached map; Peta Rupabumi Indonesia, Lembar 1209-444, Tanjung Priok, First Edition, 1990). Presently, the drainage canal is connected to four tunnel conduits after the reclamation and construction of the container terminal (JICT 1)

396. It seems that any particular consideration has been taken in the planning and design process of the conduits to secure the effective drainage section to cope with abnormal flood.

397. In the river improvement planning in Japan, if a tunnel conduit is to be employed for a drainage measure, the design rainfall of the 100- year return period is used for the calculation of discharge, and further the 30 % extra discharge is added to determine the design discharge. Those are the considerations to secure the sufficient section of tunnel conduit even in the case of obstruction of water flow by sedimentation and or driftwood.

398. In order to cope with the flood problems of Jakarta city area and also the sedimentation problem in the water area of the port, the improvement and treatment of drainage canals should be added to one of the issues in the master plan of the long-term development of Tanjung Priok Port.

4) Environmental Constraints

- Water and sediment qualities are bad conditions within the breakwater. It is caused by inflow passed through hinterland. It will be necessary to reconstruct proper river improvement.
- The city drainage system is served by open gutter on both side of the road. These drainage systems are in a poor maintenance condition. Many are clogged with waste materials and thick sediments. During rainy season with high rainfall sometimes flood occurs at *Kelurahan* Koja, especially lorong 1,2,3,4,5 street During rain and high tide this region is flood. According to the interview survey, residents reported flood problem was caused by construction of Koja Container Terminal.
- One of the most serious negative Impact probably caused by increasing of heavy vehicle traffic. That to say, traffic jam, aggravation of air quality and noise disturbance. Even now TSP concentration and noise level exceed standard values, also residents living along the streets are difficult to cross the road. Off course traffic condition is seriously bad, it gives much damage to transportation system.

8-C-2 Cirebon

1) Natural Environmental Aspects

399. Comparing with or Tanjung Priok Port, water quality in Cirebon Port was good condition. TSS COD, which parameters give domestic pollutant conditions, appeared low concentration, and differences of concentrations among the stations were small.

400. Concentrations of heavy metals were almost same level as those in Banten Port, bellow the temporal standards.

401. Concerning air quality, Concentrations of Pb were all bellow the environmental standard. On the other hand, TSP appeared high concentration. Average value of TSP was 606 ug/m^3, especially high concentration showed near the coal terminal. The reason was why coal storage and handling process causes serious damage to surrounding area. Actually according to the data from hospital, main disease of surrounding residents is by respiratory organs illness.

2) Social Environmental aspects

402. According to AMDAL in 1995, productive age in port area was about 54 %, port project activity was expected to provide new job opportunity.

3) Environmental Constraint

- According to AMDAL in 1995, about 92 % of residential people agreed with Cirebon port development project because port activity can increase their income and decrease unemployment. On the other hand, the air pollution caused by coal activity applies in Cirebon Port.
- And also serious aggravation of air quality concerning TSP occurred as same case as Banten Port.
- Cirebon Poet was constructed in beginning of 17 Century under the Netherlands governing, historical constructions are still remained in and around port area.

8-C-3 Banten/Ciwandan Port

403. IPC2 improved AMDAL Study in 1996 for Port Development in Ciwandan-Banten Port, they have carried out monitoring survey every year following with Environmental Monitoring Program. In this chapter, current environmental aspects are summarized based on monitoring survey and AMDAL Study, and environmental constraint was evaluated.

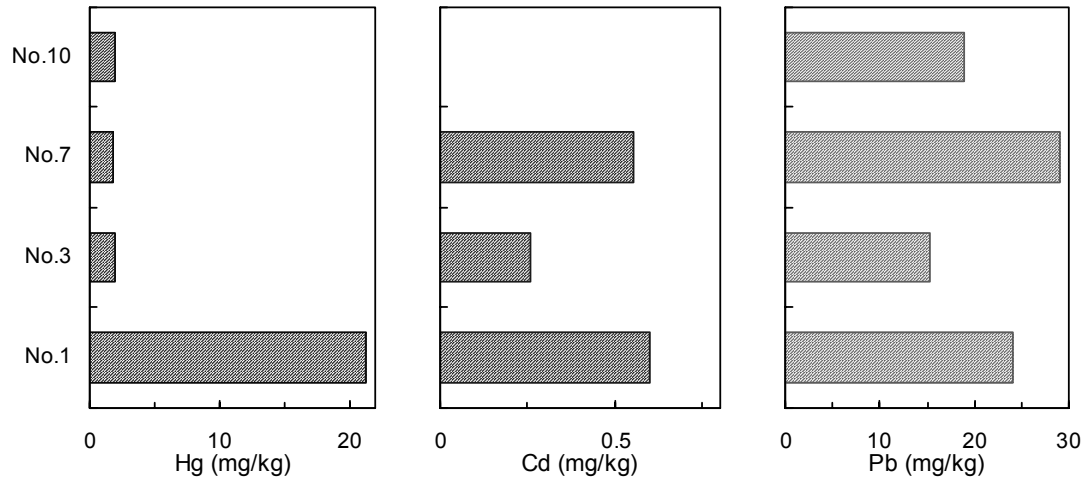
1) Natural Environmental Aspects

404. Concerning water quality, the highest concentration of COD appeared at outlet of drainage (Alur Sungal). Average value of COD was 89.5 mg/L, then it exceeded national environmental standard (under 80mg/L). BOD, TSP and nutrients such as Ammonium ion also showed similar conditions. These parameters explain water pollution caused by domestic wastewater, so these are typical parameters of organic pollution. And these concentrations in low tide were higher than those in flood tide. Therefore it was concluded that organic pollution was caused by domestic wastewater flowing through the channel in hinterland. On the other hand, all the concentration of heavy metal, such as Hg, As, Cd, Pb, were under detection limit, bellow the national environmental standard.

405. Sediment conditions in Banten Port can be divided the following 3 classifications:

- Concentrations at No.1 (outlet of Alur Sungal) were extremely high (Co, Hg, Ni and Zn, see Figure 8-C-4);
- Concentrations at No.1 and No.7 (near the No.1 multipurpose jetty) were higher than other stations (Cd and Pb, see Figure 8-C-4); and
- Concentrations at all the stations were same level (Cr, Cu, Pb, Se and As, see Figure

8-C-4).



Source: Pemantauan Lingkungan Pelabuhan Ciwandan-Banten, 2001

Figure 8-C-4 Sediment Condition in Banten Port

406. Briefly speaking heavy metal concentration near Alur Sangal relatively higher than other stations. It is inferred from distribution of sediment that pollution materials flow through the channel and these subside and accumulate.

407. Comparing with Netherlands's bottom sediment standard, which is temporarily used for evaluation of dredged soil condition, all the concentrations of heavy metal parameters were bellow the standards.

408. Concerning air quality, concentration of TSP explained that Air pollution by suspended solid occurred. Particularly, station No.2 located near the gate, and No.5 located near coal wharf appear extremely high value. Suspended solid pollution is caused by coal store and handling, actually the JICA Study Team confirmed these serious problem in the site visit survey.

2) Social Environmental Aspects

409. Result of AMDAL in 1996 indicated the number of productive age (15 to 54 years) was 52 to 61 %. Interview survey in AMDAL explained Port Project was expected to contribute to solve unemployment problem. Major work in the study area was trade and services sector, *Desa* Gunungsugih and Kepuh occupied above 90 %. Land use in *Kotip* Cilegon showed major land use was for mixed orchard occupied 43 %, next paddy farm occupied 16 %. However industrial zone spreads near Banten Port, shore side of railway, agricultural activity is not as main activity.

410. The roadway between Anyer and Cilegon as a main road connects 3 zones in *Kecamatan* Ciwandan, port zone, industrial zone and tourism resort in Anyer. Total road length in Cilegon was 276 km, however 53 % of road length get damaged, road condition is worse than average of Banten Province. The road way is not so wide, many heavy vehicles carry cargos between port area and industrial zone, and it causes serious traffic jam.

411. Electricity has already available in above 95 % of *Kotip* Cilegon. Fresh water for life such as cooking, drinking and bathing can obtain from dig well and pump well. Average depth of well was 4 to 12 m, however average dig well in *Desa* Gunungsugih, was 8 m more than

because of lack of water supply in dry season. This phenomenon conspicuously appeared after establishing Chandra Asri Industry.

3) Environmental Constraint

412. Evaluation of natural environmental aspects gives the following impacts caused by port activity:

- Water discharge, flowing into port area through the hinterland, damages to water quality. Especially the concentrations of COD, BOD and nutrients increase caused by domestic wastewater; and
- Residential people complains about air pollution especially dust pollution. To solve this problem, PT. Indocement Tunggal Prakasa tries covering coal canvas and using wagon to carry it. Also respondent in *Desa* Tegalratu does not agree with port development program caused by negative impact from coal dust, especially people who live near railway with pass trough the wagon to carry on coal.

413. According to the result of AMDAL in 1996, residential people agreed with port development, because this development project was expected to increase people's welfare by creating new and existing business. However people was afraid of negative impact caused by port project, accentually some negative impact appeared as shown the bellows:

- *Desa* Randa Kari especially near the roadside is often trouble with flood problem in rainy season. It was caused by construction of new drainage for development of coal terminal, which was regulated to make moat for conservation of surrounding area;
- Many heavy vehicles from/to Banten Port–industrial zone cause to negative impact, serious traffic jam; and
- According to interview survey with key persons, increasing vessel from inter-island and abroad carries on many type of people, it causes negative impact to religion and community moral, that to say to rise of prostitution activity and juvenile delinquent.

8-C-4 Bojonegara Site (Proposed Port Project Area)

414. The JICA Study Team carried out field survey in Bojonegara Site in order to grasp current environmental aspect. In this chapter, this survey result was used for evaluation of environmental aspect, and also Study AMDAL conducted by IPC2 in 1997 was referred. Detailed results of field survey are shown in "Supporting Report of Engineering Study".

1) Natural Environmental aspects

415. Bojonegara project site is located west side of Banten Bay. There are many port areas in Banten Peninsula, especially west and north of peninsula. Industrial zones are also constructed surrounding area.

416. Concerning water quality, distribution of salinity were 31.9 – 32.4‰; it means that impact to the coastal water area from inland water such as canals is not so high. Concentrations of TSS were showed 2 – 7mg/L at upper layer and 1 – 18mg/L at bottom layer. Near shore line tended to give higher TSS concentration.

417. Concentration of organic pollution (COD and Nutrients), heavy metals and bacteriological pollution were still low; these values were below the environmental standard. Hence it is concluded that coastal water condition at Bojonegara Project Site is still good.

418. According to the AMDAL Study, ammonium concentration in air sometimes showed higher value than environmental standard. On the other hand, other parameters such as SO_2, NO_2 and CO gave lower value than standards.

419. There are several factories around the Project Site; sometimes offensive odor is smelled close to some factories. However according to the last field survey, broadly speaking, air quality has still good condition. Concentrations of CO, NO, SO_2 and SPM did not exceed the environmental standard.

420. Concerning terrestrial flora and fauna, there is little wild species, most flora and fauna are plantation, domestic animals or pets. Several types of marine life, plankton, benthos and nekton are almost common condition as shown in Table 8-C-2.

Table 8-C-2 Brief Description of Marine Life in Bojonegara Site

	Phytoplankton	Zooplankton	Benthos
Abundance	4,320 to 7,705 Individu/m^3	345 to 1,495 Individu/m^3	200 to 325 Individu/m^3
Diversity Index	High Diversity	Medium Diversity	Medium Diversity
Similarity Index	High population Similarity	High population Similarity	High population Similarity

Source: Field survey by the JICA Study Team in 2002

421. In the field survey, coral reef and mangrove forest were observed. Figure 8-C-5 shows coral reef and mangrove distribution in Bojonegara Site.

Figure 8-C-5 Coral Reef and Mangrove Distribution in Bojonegara Site

422. In Banten Bay, reefs mostly occur under marginal condition such as high turbidity and/or high sedimentation environment (Bak and Meester, 2000). They pointed that re-suspension of bottom sediments possibly prevents negative effects of sedimentation. Asexual recruitment was still occurring. Reef surveys showed changes in community characteristics. Apparently, corals are able to adapt to some degree to higher turbidity levels.

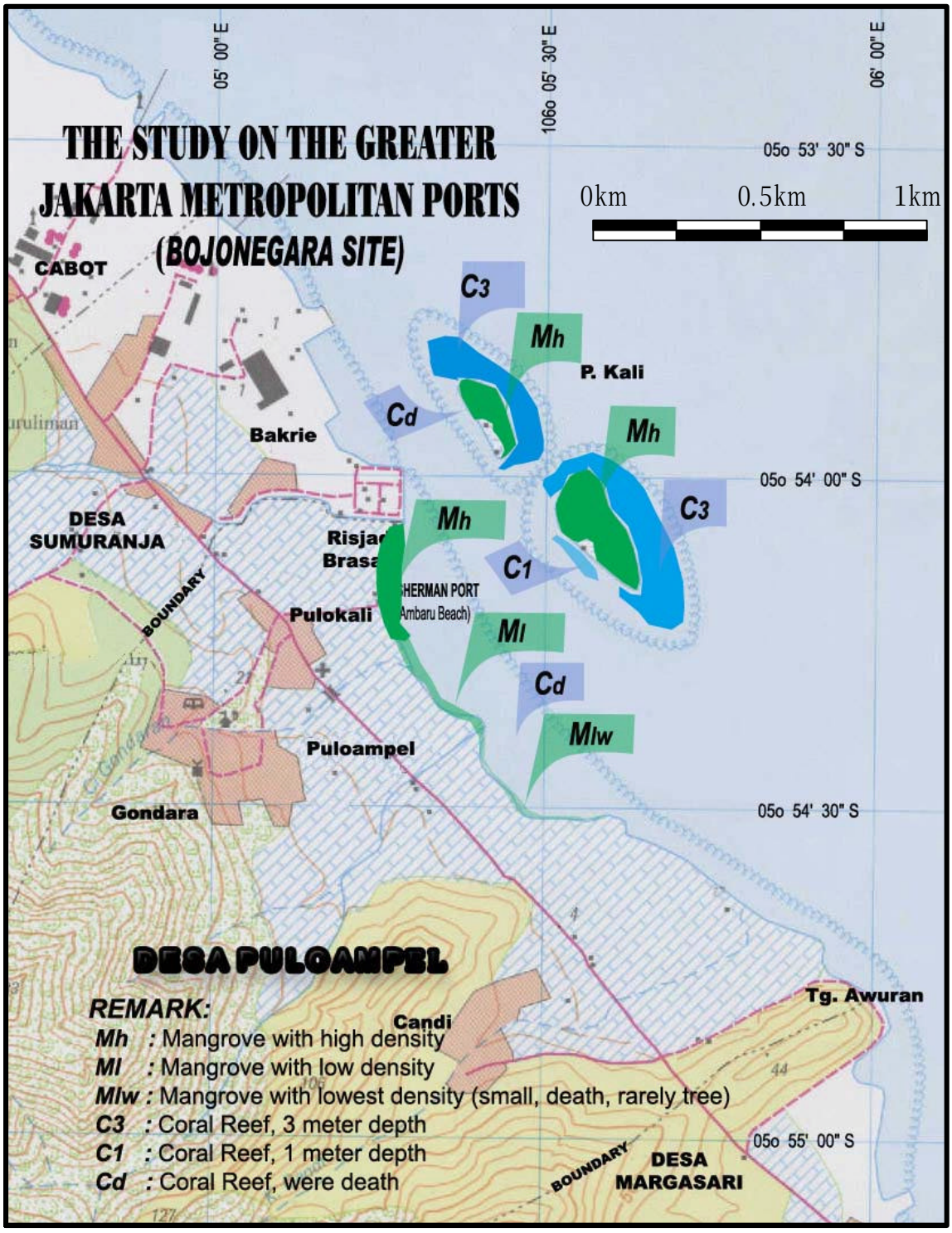
423. Domestic flora and fauna are common at Bojonegara because the Project Area is man made ecosystem. Any protected/endangered species were not observed.

424. However it is important to remember that there are small coral Reef offshore Pulau Kali. Coral living coverage around Pulau Kali estimated 31.3 – 35.3%; however these values could not indicate condition of whole coral reef because JICA's survey were carried out 2 line transects and it could not cover whole area. Principal coral where living at shallow water were *Porites lobata* and *Tubipora Musica* e.g.

425. Mangrove ecosystem provides nursery ground and protected coastal areas by wave action. The formation of respiratory root provides habitat for fish larvae. Mangrove forest in Bojonegara is distributed along coastal areas, at Pulau Java and Pulau Kali. About 3 genera are found in this area, Rhizophora, Avicennia and Sonneratia. Mangrove density range from 0.01 to 0.42 ind/m2 and higher density is composed by seedling of Rhizophora . Thus indicates that ecosystem has been recovery.

2) Social Environmental Aspects

426. Proposed port project site in Bojonegara is located in *Kabupaten* Serang, belongs to *Kecamatan* Pulo Ampel. Area of project site is about 500ha, IPC2 who is developer of the project has procured 455 ha (current result in 2002), however 120 ha of this land is out of



Source: Field Survey by the JICA Study Team

Coral Reef and Mangrove Distribution in Bojonegara Site.

proposed area, actually IPC2 has to improve more land purchase process. Land purchase conditions in 2002 are shown in Figure 8-C-6.

Figure 8-C-6 Land Purchase Condition in 2002

427. Three villages are located close to the Bojonegara Project Site; these are *Desa* Puloampel, Sumuranja and Margasari. Total population number was 8,600 persons; and population density was 760 persons/km^2. Population density is 80% of average of Serang.

428. Dominant business type was farmer; it occupied 36 to 48 %. Principal agricultural productions are Peanut and rice. Number of fishermen in 2002 was total 280 persons; these occupied 10%.

429. Along Jl. Sumuranja Mejid, which is closed to the Project Site, is main road. Many type of facilities exist along the road.

430. Most of the resident are obedient Moslem; they have total 29 units of Mosque. Mosque and Mushila are one of the most important symbol for Moslem. Hence they require to relocate them. Residents have close religious relation ship each other, especially *Desa* Puloampel. For example Desa Puloampel has 2 units of deep well facility for water supply. Residents use them with pipe line system. These deep well facilities operated by the society of village Mosque.

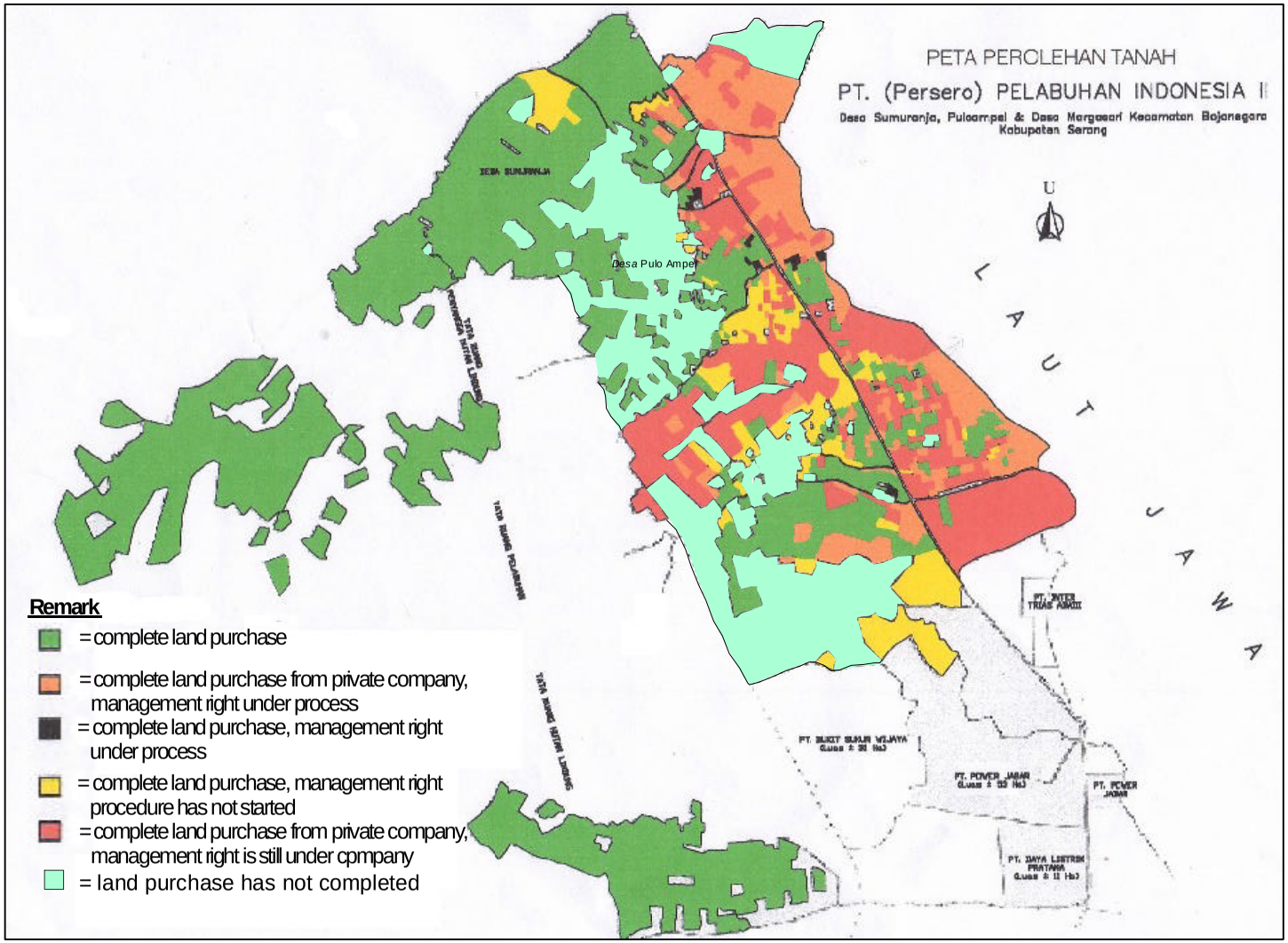
431. Solid management system does not operated systematically; each household individually carries out. Usually they burn their collecting waste in their yard; or some of them are dumped into the river.

432. There are 3 big canals around the Project Site; these are used for drainage. Discharge water flows into the water area of the Project Site. And gutters are constructed along the roadside; connected to the canals. In rainy season, flood problems often occur at some gutters because of poor management.

433. Concerning fishery condition, total 280 fishermen stay in the 3 villages; and one small fishery port exists. According to the interview with fishermen, average fish catching amount was approximately 60 – 100kg/trip; principal fish types were Tuna, Kakap e.g. Fishing activity is mainly traditionally operated; and principal fishing area is far from the project Site. However, several small fishing activity around Pulau kali was observed. And small seaweed cultivation activity also observed near Tanjung Awran.

434. Proposed alternate fishing port will be constructed Argawana.

435. The JICA Study Team carried out interview survey with residents in the Project Site concerning community perception and aspiration. Community perception concerning positive/negative impact are shown in Table 8-C-3. Residents expect increasing job opportunities, acceleration of business chance. Dominant negative opinion was complaining of land acquisition process.



Source: PT. (Persero) PELABUHAN INDONESIA II

Land Purchase Condition in 2002

Table 8-C-3 The results of Interview Survey

No	Perception (%)	Pulo Ampel	Sumuranja	Margasari	Total (%)
1	Positive Impact Perception				
1.1	New Job Opportunity (in new and surrounding Port Area)				
	a. Construction	2.2 %	6.4 %	4.3 %	12.8 %
	b. Operation	6.4 %	2.1 %	19.2 %	27.7 %
	c. Other opportunity of their own effort	6.4 %	31.9 %	4.3 %	42.6 %
	d. Not interested	14.9 %	0 %	2.1 %	17.0 %
	Total	29.8 %	40.4 %	29.8 %	100 %
1.2	Other Positive Impact				
	a. Increase of people Income	29.8 %	40.4 %	29.8 %	100 %
	b. Village progress	0 %	40.4 %	29.8 %	70.2 %
	c. Accelerate business	29.8 %	40.4 %	29.8 %	100 %
	d. Better facility transportation	29.8 %	40.4 %	29.8 %	100 %
2.	Negative Impact Perception				
	a. Noise disturbance	4.3 %	0 %	4.3 %	8.5 %
	b. Air pollution	4.3 %	0 %	4.3 %	8.5 %
	c. Traffic jam	4.3 %	0 %	4.3 %	8.5 %
	d. Reducing fisherman production	0 %	0 %	0 %	0 %
	e. Social friction between local people and newcomers	0 %	0 %	0 %	0 %
	f. Social conflict from the dissatisfied land acquisition process	4.3 %	4.3 %	17.0 %	25.5 %

436. Average of population density in Kabupaten Serang was 959 persons, so density of *Desa* Pulo Ampel and Mangasari were lower than *Kabupaten* Serang, on the other hand *Desa* Sumuranja was higher density. Ratio of working age (15 to 54 age) were 60.6 % in *Desa* Sumuranja, 56.7 % in Pulo Ampel and 55.3 % in Margasari, these results show increasing of employment is expected. All the people in the study area have Islamic religion, they are religiously devoted. Also most of people were born and live the same area, there are little newcomer. According to the result of interview survey with residential key persons, their custom tends not to allow people to marry outsiders. It is believed that this tendency is caused by strong traditional relationship in the community.

437. All the residential people is obedient Moslem, there are total 29 units of Mosque and Mushila. Mosque and Mushila are one of the most important facilities for Moslem people, many traditional, religious and social problem are solved by meeting in these facilities. Interview survey of AMDAL in 1997 showed that 46 % of respondent were worried about relocation of Mosque and Mushila because of expensive land price.

438. In *Desa* Sumuranja, there is a gutter in front of the Risyard Brasalli Factory, which gutter has narrowed by waste materials, as a result over flow often occurs.

3) Environmental Constraints

439. Environmental constraints are mainly divided into the following types:

- Water Quality and Air Quality

  Actually, current water quality and air quality condition may be not so serious, because industrial activity is still low level. However port development will increase necessity of increasing industrial activity. JICA's interview survey gave

that 8.5 % of residents, who belong to *Desa* Pulo Ampel and Margasari, think there are some problem concerning air pollution and noise disturbance. And 8.5 % of residents in Pulo Ampel and Margasari think port project gives negative impact to air pollution, noise disturbance and traffic jam. And environmental impact assessment should aim not only to project site but also to surrounding area including whole Banten Bay.

- Conservation of Mangrove and Coral Reef

  According to the field survey, most of residents, such as fisherman, does not depend on mangrove and coral resources so much. However conservation of mangrove and coral resources is the first priority for sustainable use of natural resources. Indonesian government is establishing conservation policy and guideline for sustainable use. As a result, proper consideration will be required.

- Community Perception

  According to the results of JICA's interview survey and AMDAL in 1997, most of residential people expected to increase new job opportunity by Bojonegara Port development project. Especially development surrounding project areas such as industrial facilities are expected to improve their life style. Also the following opinions were expressed as other positive impact:

- Increasing their income;
- Development their village and heir facilities;
- Accelerating business chance; and
- Improvement of mobilization/transportation.

440. On the other hand, some people, about 25% of residents, had negative opinions concerning social conflict, which was mainly caused by land acquisition process. And also land purchase process has not been finished, there are much problem such as double certification among IPC2, residents and land owners, permission of management right for land using, etc. Actually Many residents hope to change their occupations to hired by port project, new established factories and related companies. So residents required to relocate near the boundary of port activity site because of convenience of communication.

8-D. NATURAL CONDITION

441. The natural condition of each potential development site is summarized as follows. Table 8-D-1 shows the outline of natural condition of each potential development site. Details of natural condition of each site and natural condition survey which has been executed by JICA Study Team are described on "Supporting Report of Engineering Study".

Table 8-D-1 Port Development Potential Viewing from Natural Conditions

Name of Port	Tanjung Pirok Port	Bojonegara	Banten/Ciwandan	Banten/Merakmas	Cirebon
Province/location	DKI Jakarta/Tanjung Priok Port	Banten/Bojonegara	Banten/Ciwandan	Banten/Merakmas	West Jawa/Cirebon
Distance from Jakarta Pusat	10 km	130 km	110 km	120 km	260 km
Distance from Bandung	180 km	310 km	290 km	300 km	130 km
Topography	Swampy lowland facing shallow water of Jawa Sea	Narrow band of low-lying coastal flat, deep-water beach facing Banten Bay	Rock, reef line coast, steep slope and deep water beach facing Sunda Strait	Rock, reef line coast, steep slope and deep water beach facing Sunda Strait	Swampy lowland facing shallow water of Java Sea
Sub-soil condition/foundation layer	Sand or sandy clay layer in the depth from -19 m to -30 m with N-value of 40 to more than 60	Volcanic rock in the depth from -6.5 m to -15 m	Hard sandy clay in the depth from -15 m to -25 m	Hard sandy clay in the depth from -15 m to -25 m	Sandy clay or silty sand layer in the depth more than -30 m with N-value about 23
Tide/Tide range	Diurnal type Z = 60 cm	Mixed dominant semidiurnal type/Z = 60 cm	Mixed dominant semidiurnal type/Z0 = 62.3 cm	No data. However, it is presumed same as Banten/Ciwandan.	Mixed dominant semidiurnal type Z0 = 60 cm
Wave	Cumulative frequency of wave height less than 0.5 m is about 87 %, maximum 2.5 m ～3.0 m	Cumulative frequency of wave height less than 0.5 m is about 87 %, maximum 2.5 m～3.0 m	Generally less than 1 m Maximum 2.5 m～3.0 m	Generally less than 1 m Maximum 2.5 m～3.0 m	Generally less than 1.5 m, Maximum 2.5 m～3.0 m
Siltation/Maintenance dredging	0.4～1.2 m/year 400,000m^3/year	Less than 0.2 m/year No dredging data	Negligible	Negligible	1.2～1.4 m/year 200,000～250,000m^3/year

8-D-1 Topography

1) Tanjung Priok Port

442. Tanjung Priok Port is located along the coastline in the northeastern direction from the center of Jakarta City. The surrounding area of Tanjung Priok Port is flat with the elevation of approximately 2 m (MSL), and the coastline runs nearly in the east-west direction and varies in the northeast to southwest direction at the west end of Tanjung Priok Port. Many rivers and drain channels run in the south-north direction through the flat terrain surrounding the Tanjung Priok Port. The following three rivers or drain channels flow into the waters of Tanjung Priok Port:

- Kali Sunter Baru flowing into Pertamina Berth at Tanjung Priok Port
- Terusan Lagoa flowing into the front water area of Koja Terminal at Tanjung Priok Port
- Kali Ancol flowing into Pelabuhan Nusantara on the west side of Tanjung Priok Port

2) Bojonegara

443. The candidate site of Bojonegara for the development of a complementary port of Tanjung Priok Port is located north of the Town of Bojonegara and belongs to Desa Pulosoampel, Kecamatan Pulosoampel, Kabupaten Serang, Banten Province. The site is close to deep water on the west coast of Banten Bay and adjacent to Sunda Strait. It is situated at about 16 km north of the City of Cilegon and 100 km west of Jakarta. The land use in the area is generally industrial. There are small heavy industries adjacent to the development site and a major Suralaya power station is located at about 10 km west of the site.

444. The general topography of the area consists of a narrow band of low-laying coastal flats and steeply rising foothills to the west and south. The coastal flats are currently cultivated with a mixture of paddy field farming and dry crops such as corn and occasional grove of banana plants. Some areas adjacent to the shoreline are not cultivated and have either a cover of low scrubby bushed or are bare mud flats. The shoreline is covered by dead coral reef and appears stable without erosion and/or accretion. At approximately 500 m offshore, there are two small and low islands that cover areas of 400 m×150 m and 250 m×100 m, respectively. These islands have a cover of low scrubby bush.

3) Banten/Ciwandan

445. Banten Public Port is located at Ciwandan, 110 km west of Jakarta (along arterial road) in Banten Province, and faces the north-west shore of Sunda Strait. The port location is a flat, green coastal strip bordered by a rocky, reef-lined coast that is punctuated by stretches of white-sand beach. The water area around the port is favored with steep and deep-water beach. The sediment is sand in the water area around the public port.

4) Banten/Merakmas

446. Banten Merakmas Port is located east side (around 2 km) of Merak Ferry Terminal Port in Banten Province and face the north shore of Sunda Strait. The port location is narrow flat area with rocky reef along the existing public road. The water area around the port is favored with steep and deep-water beach.

5) Cirebon

447. Cirebon is 280 km east of Jakarta in West Java Province and borders the north coast of Java Sea. Cirebon Port is located in a bay between Tanjung Losari about 15 km to the south and Tanjung Tanah about 30 km to the north.

8-D-2 Tide

1) Tanjung Priok Port

448. According to the tide tables 2002, Dinas Hidro-Oceanogafi, Z_0 is 60 cm and tide is diurnal type.

2) Bojonegara

449. According to the tide tables 2002, Dinas Hidro-Oceanogafi, Z_0 is 60 cm and tide is mixed dominant semidiurnal type.

3) Banten/Ciwandan

450. According to IPC-2 Report for Pelabuhan Ciwandan and Pelabuhan Umum Bojonegara, December 1993, Z_0 is 62.3 cm and tide is mixed dominant semidiurnal type.

4) Banten/Merakmas

451. The tide data of Banten/Merakmas was not found. However, Z_0 at Banten/Merakmas is presumed same as Banten/Ciwandan (62.3 cm).

5) Cirebon

452. According to the tide table 2002, Dinas Hidro Oceanografi, Z_0 is 60 cm and tide is mixed dominant semidiurnal type.

8-D-3 Wave

1) Tanjung Priok Port

453. No observed wave data along the north coast of West Java is opened to public. Wave condition is analyzed based on wave hindcast in Java Sea by the 5-year wind data at the Cengkareng meteorological station (Soekarno-Hatta Airport, 1997 – 2001). According to the results of wave hindcast at offshore Tanjung Priok, wave condition is generally calm in the western portion of Java Sea and the cumulative frequency of wave height less than 0.5 m is about 87 %.

2) Bojonegara

454. According to the results of wave hindcast at offshore Bojonegara, wave condition is generally calm in the western portion of Java Sea and the cumulative frequency of wave height less than 0.5 m is about 87 %.

3) Banten/Ciwandan

455. Preliminary synthesis of the wave climate based on the Indonesia Pilot book (UK Hydrographic Office) shows that, through the year, the height of the sea waves is frequently less

than 1 m. It is reported that swells with 2.5 m – 3 m wave height from Indian Ocean invade into the sea in northwest monsoon season.

4) Banten/Merakmas

456. The wave data of Banten/Merakmas was not found. However, The characteristics of wave condition at Banten/Merakmas seem to be almost same as Banten/Ciwandan.

5) Cirebon

457. Within Cirebon Bay, the wave height is generally less than 1.5 m, and the wave period is generally less than 3 seconds. The observed maximum wave height is 3 m from a westerly direction. Waves from the easterly direction are less than 2.5 m (source: Evaluation Report on the Hydraulic and Sedimentation Studies for the Development of a Container Terminal at Cirebon; MAP Services Pte. Ltd., September 1993)

8-D-4 Water Depth

1) Tanjung Priok Port

458. The approach channel about 2 km within port area is located in shallow waters with seabed between –2 m to –10 m below LWS and is maintained by dredging to a design depth of –14 m.

2) Bojonegara

459. The water depth between shoreline and P. Kali is about –6 m to –7 m. The water depth of offshore of P. Kali become rapidly deep and the water depth at the distance of 500 m from P. Kali are around –17 m.

3) Banten/Ciwandan

460. Natural depth of port entrance is around –10 m and the existing port has the same depth.

4) Banten/Merakmas

461. Natural depth of port entrance is around –14 m to –17 m and the existing port has –11 m depth.

5) Cirebon

462. The approach channel about 2.5 km within port area is located in shallow waters with seabed between 0 m to –6 m below LLWL and is maintained by dredging to a minimum depth of –7 m.

8-D-5 Maintenance Dredging and Sedimentation

1) Tanjung Priok Port

463. The annual volumes of maintenance dredging are about 300,000 m^3/year in the navigation channels and about 100,000 m^3/year in harbor basins (total about 400,000 m^3/year). Estimation of seabed variation at Tanjung Priok Port based on the existing sounding data is described on Supporting Report of Engineering Study. According to this estimation, seabed rise

at entrance channel and within breakwater is approximately 0.4 – 1.2 m/year. However, the outlet of drain shows more high value of seabed rise.

2) Bojonegara

464. At present, Bojonegara has no port facilities. Therefore, no maintenance dredging has been executed up to now. Estimation of seabed variation at project site at Bojonegara is described on Supporting Report. According to this estimation, seabed rise at project site at Bojonegara is less than 20 cm/year. Therefore, it is considered that the sedimentation is not serious problem at Bojonegara.

3) Banten/Ciwandan

465. There is no sedimentation problem in the area of Banten/Ciwandan Port.

4) Banten/Merakmas

466. There is no sedimentation problem in the area of Banten/Merakmas Port.

5) Cirebon

467. Cirebon Port has strong tendency to suffer from siltation. According to an existing study report*, the average siltation within the 2.5 km channel extension is estimated as an order of 1.2 – 1.4 m/year or 200,000 – 250,000 m^3/year. (*: Report for Consulting Services for Feasibility Study of Cirebon Port, December 1997.)

8-D-6 Subsoil Condition

1) Tanjung Priok Port

468. The details of soil conditions of the western development area of Tanjung Priok Port are described on Supporting Report. The seabed soil (from the seabed to approx. –35 m) can be divided into three layers. The third layer is a sand layer or a sandy clay layer in the depth range from –19 m to –30 m and it can be used as a foundation layer having the N-value of 40 to more than 60.

2) Bojonegara

469. According to the existing and newly executed boring data, marine geophysical survey there is a bedrock layer of Breccia in the depth from –6.5 m to –15 m and it can be used as a foundation layer having the N-value of more than 60. However, the results of P-wave logging and RQD (Rock Quality Designation) of boring core shows that the condition of this bedrock is "Very poor" or "Poor" and is classified CL to D (soft rock). Therefore, It is presumed that dredging up to -15 m (planning depth of channel and basin) can be executed by dipper ship or crasher ship.

3) Banten/Ciwandan

470. According to the boring log of the design of multi-purpose wharf, the foundation layer is hard sandy clay at the depth -15 to -25 m.

4) Banten/Merakmas

471. It is estimated that the hard sandy clay layer is located approximately –15 m to –25 m from LLWL.

5) Cirebon

472. The soil conditions at the waterfront of Cirebon Port are understood to have three layers. The first layer from seabed to –12 m below seabed) is a very soft layer and clay with N-value about 1. The second layer (from –12 to –20 m below seabed) is silty clay with N-value about 18. The third layer is sandy clay, clayey sand and silty sand with N-value about 23.

8-D-7 Possibility of Land Subsidence in the Northern Part of DKI Jakarta

473. The top elevation of the container quay wall at the JICT in the Tanjung Priok Port is reported at +2.5 m, which is lower, at the side for berthing the large container ship and cargo handling operation. It is reported that the new container berths extension of the Koja terminal is set at + 3.0 m, while the stack yard area is set at +3.5 m.

474. It is reported at the fishing port located adjacent to the Sunda Kelapa Port that the BM supported by the file foundation driven to the bearing layer at about -20 m depth was sunk for 49 cm between 1984 and 1996 due to the consolidation of clay layers under the bearing of the pile foundation which was considered to be caused by the intensive ground water extraction. The possibility of land subsidence in the northern part of the DKI Jakarta was reported since 1984.

475. The Dinas PU DKI Jakarta had investigated the elevation of the existing bench marks in the western, central and eastern parts of Jakarta in 1989/1990, 1991/1992, and 1993/1994, and compared the elevation established in 1974/1978. The results obtained are as follows:

Table 8-D-2 Change of Elevation of the Existing Benchmark at DKI Jakarta

Location of BM	Difference in elevation Between 1974 to 1994	Remark
Jl. Daan Mogot in Kec. Jakarta Barat	0.2 m to 0.9 m	Jakarta north-west part, heavily subsided
Jl. Pangeran Jayakarta in Kec. Jakarta Pusat	0.2 m to 0.7 m	Jakarta central area, Jakarta down town area
Jl. Perintis Kemerdekaan in Kec. Jakarta Timur	0.2 m to 0.5 m	Jakarta east area, Tanjung Priok Port area

476. Figure 8-D-1 shows the contour lines of different elevation by subsidence during 1974 to 1994. As a result of such investigation, it was determined that the northern part of Jakarta has subsided and that the current land subsidence is mainly caused by the intensive groundwater abstraction through observation of the decline of the piezometric levels in deeper aquifer among the coastal areas. It is advised that the elevation of BM available near the Tanjung Priok Port area should be checked from the elevation of the national BM in Bogor area for the design of the facilities.

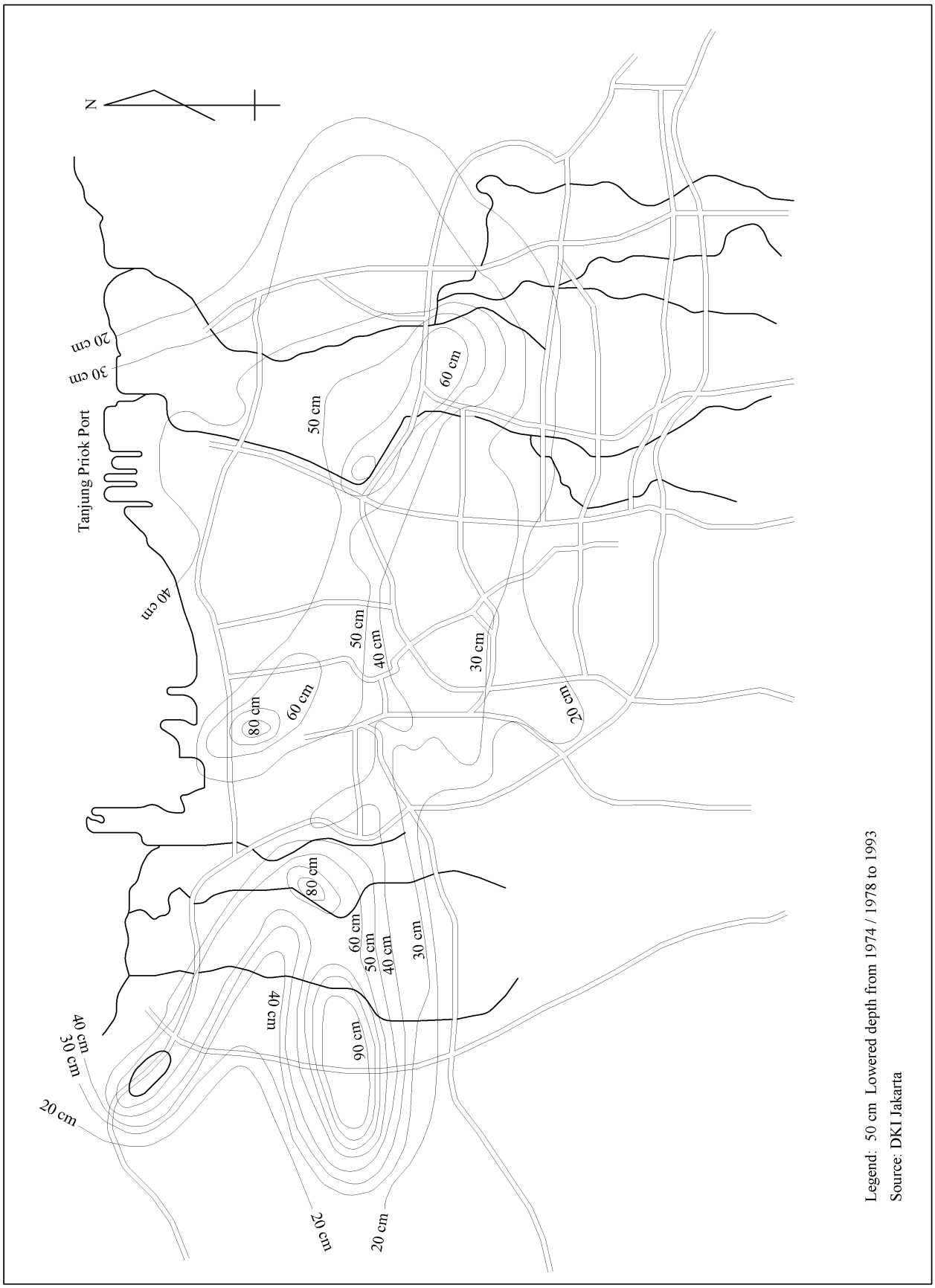


Figure 8-D-1 Land Subsidence in Northern Part of DKI Jakarta

8-E. HINTERLAND SITUATION

8-E-1 Hinterland Characteristics

477. Distribution of container cargo volume in West Java area is estimated in Table 8-E-1 based on the OD traffic survey carried out by the Study team in August 2002, interviews with container terminal companies, shipping companies and other data such as GRDP.

Table 8-E-1 Distribution of Container Cargo Volume

	Estimated	OD Survey		Shipping Line		Terminal Company		GRDP		Popu-lation
		Traffic	%	Import	Export	A	B	Total	Manu-facturing	
Jakarta	**34.8%**	3,963	34.8%	29.0%	23.0%	59.4%	72.0%	46.5%		16.1%
South JKT	**1.3%**	143	1.3%		1.0%			8.5%		3.5%
East JKT	**15.6%**	1,778	15.6%	7.1%	2.0%			9.0%	37.1%	4.5%
Central JKT	**2.6%**	294	2.6%		6.0%	57.4%		11.4%		1.7%
West JKT	**8.0%**	907	8.0%	9.5%		0.1%		7.4%		3.7%
North JKT	**7.4%**	842	7.4%	12.4%	14.0%	1.9%	72.0%	10.3%		2.8%
Tangerang	**12.2%**	1,389	12.2%	14.9%	28.0%	2.0%	11.5%	7.9%		7.8%
Serang	**7.9%**	897	7.9%	7.9%	2.0%			3.9%		3.7%
Bogor	**8.5%**	970	8.5%	18.1%	3.0%	1.1%		5.2%		8.1%
Bandung	**9.0%**			3.0%	9.0%	1.1%		9.7%		12.1%
Cirebon	**3.0%**	1,073	9.4%		10.0%	0.1%		2.2%	62.9%	4.2%
Purwakarta	**3.0%**			7.5%	3.0%	0.2%	3.4%	0.7%		1.3%
Karawang	**3.0%**			3.3%	11.0%			2.0%		3.4%
Bekasi	**16.2%**	2,824	24.8%	16.3%	11.0%	2.5%	13.1%	6.7%		6.4%
Other Area	**2.5%**	285	2.5%			33.6%		15.1%		36.8%
Total	**100.0%**	11,402	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

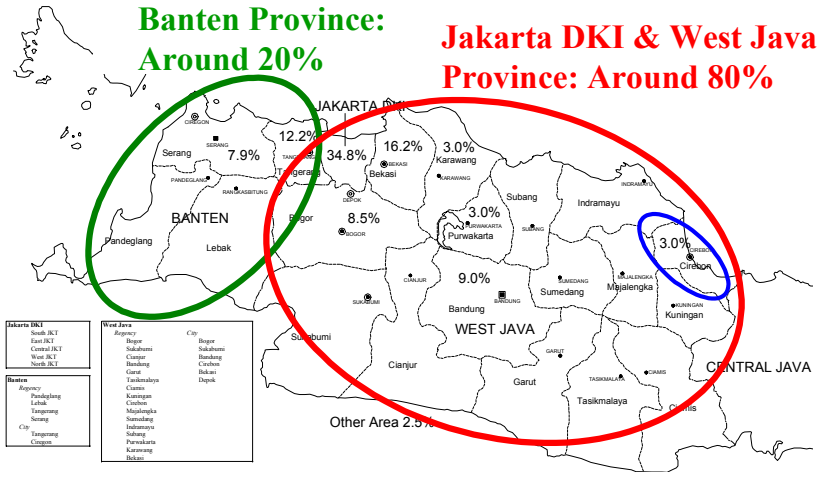


Figure 8-E-1 Current Cargo Distribution

478. The hinterland characteristics of each port are shown in Table 8-E-2. Generally speaking, it is considered that cargoes are handled at the nearest port. This is applicable especially to conventional cargo because most of cargoes are delivered by tramper services and cargo values are less against transportation cost. Each port has established its own hinterland.

479. On the other hand, container cargoes delivered by liner services, are handled at a few selected ports because of scale economies. In case of West Java, Tanjung Priok is the sole container handling port and its hinterland distribution is almost the same as the distribution of container cargo volume in West Java.

Table 8-E-2 Hinterland Potential

	General Description of Hinterland Potential	Container Cargo Distribution	Hinterland Share for Container Cargo
Tanjung Priok	Being located in front of Jakarta metropolitan area, the hinterland of Tanjung Priok is considered to cover throughout Western Java area. A lot of industrial estates have been established in the east side of Jakarta.	Jakarta 34.8% South JKT 1.3% East JKT 15.6% Central JKT 2.6% West JKT 8.0% North JKT 7.4% Tangerang 12.2% Serang 7.9% Bogor 8.5% Bandung 9.0% Cirebon 3.0% Purwakarta 3.0% Karawang 3.0% Bekasi 16.2% Other Area 2.5% Total 100.0%	◆ Whole area (West Java area) ◆ Excluding Banten province, West JKT and Cirebon regency - around 69% of total cargo volume
Banten/Ciwandan	The hinterland of Port of Banten is considered to cover Banten province, in which there are a lot of heavy and chemical industries in Serang regency and Ciregon city, one of the fastest growing area in West Java. Potentially, the hinterland may stretch toward the west of Jakarta such as Tangerang. Furthermore, after the completion of the Outer Ring Road, it can be expanded south and even to the east side of Jakarta such as Bekasi.	Almost no container handling. (Few containers to/from companies in Serang Regency.)	◆ Serang regency - around 8% of total west Java area cargo total ◆ Banten province (Serang and Tangerang regency) - around 20% ◆ Banten province & Wets JKT - around 28%
Banten/Merakmas	Currently the hinterland consists of one paper company, but the potential hinterland is the same as Banten/Ciwandan.	Paper company in Serang Regency.	
Banten/Bojonegara	Potential hinterland is the same as Banten/Ciwandan.	-	
Cirebon	Currently, the hinterland of Port of Cirebon is considered to be limited within Cirebon regency area, but the potential hinterland is considered to the area surrounding Cirebon regency. However, the area is overlapped by the hinterland of Tanjung Priok and Tanjung Emas due to its location of the middle point of both ports. By realizing toll road linking Cikanpeck and Jakarta, there is possibility that the hinterland will be extended to the industrial area east of Jakarta.	No container handling. In the past, container handling service was tried for container to/from companies in Cirebon Regency.	◆ Cirebon regency - around 3% of total west Java area cargo total

8-E-2 Outlook for the Socio-Economic Development of the Hinterland

1) Regional Development Plans of DKI, Banten & West Java Province

a) Regional Development Plan of DKI (2010)

480. By the effective of Law Number 24 of 1992 about Spatial Structure and Government Regulation Number 47 of 1997 about National Spatial Structure Plan, therefore, the strategy and policy guidance of the use of national spatial should be spelled out into the Regional Spatial Structure Plan for DKI Jakarta.

481. The objectives of the spatial structure are:

- To create community's life prosperously, cultured and justice;
- To implement the use of regional spatial in sustainable manner and have the environmental conception;
- To create the integrity in using natural resources and artificial resources by taking into account to the human resources;
- To arrange the use of spatial at protected area and cultivation area;

482. Development Policies are:

- To stabilize the function of Jakarta town as service town with national and international scales;
- To give priority to the direction of town development to the east, west, and north corridors and restrict development in the south direction in order to achieve the ecosystem balance;
- To conserve the function and harmony of environmental in the structuring of spatial by optimizing the carrying capacity and accommodating capacity of environment;
- To develop town facilities and infrastructure system, which is integrated with regional, national, and international system.
- To materialize the regional spatial structure, policy on demography is determined as follows:
- Population number of Jakarta as of 2010 is restricted to 12,500,000 persons.
- Its distribution is directed as 10.8% in Central Jakarta, 17.6% in North Jakarta, 23.6% in West Jakarta, 25.6% in South Jakarta, and 22.4% in East Jakarta.

483. Three main development areas are described in the Development Plan: the north development area, the central development area and the south development area. In the north development area, the focus will be on increasing tourism activities and to protecting the environment. The seat of government, trade, and service center and residential areas will be concentrated in the central development area. South Development Area is directed for limited residential by applying Low Building to keep function as water penetration area.

b) Regional Development Plan of Banten Province (2001-2016)

484. Dominate sector of manufacture industry of Banten province is steel manufacture activity. Non-steel manufacture and small manufacturing industry are distributed in Cilegon. Based on constant price of 1993, manufacturing sector accounted for 53% of the regional

domestic product of Tangerang regency. Regency of Tangerang has the highest average economic growth among other regencies/cities in Banten province at 4.09%. Economic growth of 3.94%(1998-1999) was recorded in Cilegon city, while a growth rate 0.3% per year was recorded in Lebak regency.

Table 8-E-3 Economic growth rate of each regency/city in Banten province

	1995	1996	1997	1998	Average growth(%)	
					1995-1997	1995-1998
Serang regency	7.39	8.79	4.32	-14.42	6.83	1.52
Lebak regency	8.79	8.88	3.26	-19.86	6.98	0.27
Pandeglang regency	6.59	6.59	3.3	-25.79	5.49	2.33
Tangerang regency	9.02	10.65	5.96	-9.28	8.54	4.09
Cilegon city	-	-	-	-	-	3.94

Source) Regional Development Plan Banten

485. Tangerang city has become an important base as many manufacturers have relocated here from Jakarta. Manufacturing industry employs a large part of the population in this regency. In addition, both private and state-run universities have been developed here. These institutions can increase the quality of human resources not only in Tangerang regency itself but also can serve other regions as well.

486. Economic activity of Serang regency is supported by existing industrial area that is divided into the west industrial zone and east industrial zone. West industrial zone is located along the coast, and includes 64 individual companies engaged in industrial machinery, basic metal, chemical industry, maritime and port industry. East industrial zone is already occupied by 299 individual companies engaged in such industries as shoes, toy, furniture, plastics good, bag, ceramic, textile, garment, electronic and so on.

487. Pandeglang regency has fishery resources that can been developed along the coastal area. Marine tourism is another potential growth area.

488. Lebak regency has significant deposits of gold, coal and quartz with strong development potential. In addition, the coastal area has the potential to be developed as a tourism area or fishery.

Table 8-E-4 Potential Economy Sector in Banten Province

Regency/City	Leading Sector	Main Commodity
Pandeglan Regency	Agriculture	Wet land rice Dry land rice Soy been Corn
Lebak Regency	Mining and dredge	Coal Zeolite Clay Stone
Serang City	Industry	Concrete industry Small industry
Tangerang Regency	Electronic, gas and water	
Tangerang City	Trade, hotel, transportation and communication	

c) Regional Development Plan of West Java Province

489. Regional Development Plan of West Java is determined through the regional regulation of West Java No.3/1994, and is still referred to the Law No.5/1974.Regional Development Plan

of West Java, which should be reflected by new administration border of West Java province, i.e., Serang, Lebak, Pandeglang, Tangerang regency, Cilegon city and Tangerang City had been determined into Banten Province since April 2000.

490. The objective of the spatial structure is:

- To revise Regional Development Plan of West Java which has been determined by the regional regulation No.3/1994.
- To achieve utilizing the natural resource for improvement in the community prosperity
- To conserve the function and the harmony of environmental in the structuring of spatial by optimizing the carrying capacity and accommodating capacity of environment.
- To improve and conserve environment quality.

491. Policy of spatial structure development plan is based on the following six development priority activities: human resource development, manufacture development, service industry, agriculture, maritime and tourism business.

492. The following trends are stipulated:

- Population of West Java is 35.72 million persons as a result of census in 2000. Population is forecast to increase at a growth rate 1.7%-1.8%, reaching 43.8 million persons in 2010.
- Java Island is the important area for the national economic activity, contributing 57% of GDP to the national economy in 2000, and West Java contributing 16% of GDP to Java Island. Major city in West Java have grown high. High economic growth has been seen in Bekasi city, Bogor city, Cirebon city Sukabumi city, Tangerang City, Bandung city, Depok city, Bogor regency, Bandung regency and Karawang regency from 1993-2000.

Table 8-E-5 Leading Sector in West Java

No	Sector	Dominant	Potential
1	Agriculture/Farming	Karawang Sukabumi Cianjur Tasikmalaya Ciamis Subang Bogor Indramayu Garut	Bandung Cirebon Majalengka Kuningan Sumedang Purwakarta
2	Mining and Digging	Bogor Indramayu	
3	Processing industry	Bandung Karawang Bekasi Bogor Bekasi city Bandung city	Indramayu
4	Electrical, Gas, and Fresh water	Bandung Cirebon Purwakarta Bandung city Bogor Karawang Bogor city	Bekasi
5	Building	Tasikmalaya Ciamis	Bekasi Bogor city

No	Sector	Dominant	Potential
		Bogor Bandung Bandung city Bekasi city	Sukabumi city Kuningan Majalengka Garut
6	Trade, Hotel and Restaurant	Bekasi city Bandung city Bandung Garut	Bogor Bekasi Sukabumi city Karawang Cianjur Tasikmalaya Ciamis Kuningan Cirebon Sumedang Subang Purwakarta Bogor city Cirebon city
7	Transportation and Communication	Cirebon city Ciamis Karawang Bandung city Bekasi city Bandung	Bogor Majalengka Bogor city Sukabumi city Sukabumi Cianjur Cirebon Tasikmalaya
8	Financial, Rental and Firm Service	Tasikmalaya Ciamis Bandung city Sukabumi Cirebon Bogor city	Bogor Bandung Bekasi Sumedang Sukabumi city Majalengka Purwakarta Cirebon city Garut
9	Services	Sukabumi Bandung city Tasikmalaya Ciamis Garut	Bogor Bandung Cianjur Majalengka Subang Sukabumi city Kuningan Cirebon Sumedang Purwakarta Garut

Source) Regional Development West Java

Table 8-E-6 Estimated Economy Growth Rate by Land Use

Years	Economy growth	Activity of the land									
		Wet soil		Dry soil		Settlement and infrastructure		Industry		Mining	
		Growth	Cont.	Growth	Cont.	Growth	Cont.	Growth	Cont.	Growth	Cont.
2001	4.30	0.75	11.42	1.54	2.55	8.96	3.66	5.74	33.84	(3.29)	3.15
2002	4.06	4.89	11.51	5.74	2.59	2.82	3.62	4.38	33.94	3.93	3.15
2003	4.60	3.76	11.42	4.65	2.59	2.81	3.56	4.28	33.84	3.88	3.13
2004	4.62	4.06	11.35	4.99	2.60	5.10	3.58	4.51	33.80	4.68	3.13
2005	4.65	4.23	11.31	5.21	2.62	5.01	3.59	4.61	33.79	4.72	3.13
2006	4.75	4.12	11.24	5.15	2.63	5.26	3.60	4.62	33.75	4.80	3.13
2007	4.74	4.24	11.19	5.33	2.64	5.31	3.62	4.73	33.74	4.89	3.14
2008	4.87	4.21	11.12	5.37	2.65	5.31	3.64	4.72	33.69	4.89	3.14
2009	5.01	4.36	11.05	5.58	2.67	5.37	3.65	4.85	33.64	5.00	3.14
2010	5.18	4.49	10.98	5.79	2.68	5.47	3.66	4.99	33.58	5.13	3.14

Source) Regional Development West Java

2) Social and Economic Activities in the Hinterland and its Prospect

a) Population

493. Population of the study area is distributed as in Table 8-E-7.

Table 8-E-7 Population in the Study Area

b) Outlook for the Production & Consumption

494. As mentioned in Chapter II, the government sets national economic framework up to year 2005 as follows:

Indicator	1999	2000	2001	2002	2003	2004	2005
GDP growth (%)	0.3%	4-5%	4.5-5.5%	5-6%	6-7%	6-7%	
Agriculture	2.1%	1.4%	2.5%	2.5%	2.7%	2.9%	
Manufacturing Industry	2.6%	4.8%	6.4%	7.3%	8.4%	9.2%	
Non-oil and gas	2.2%	5.5%	6.9%	7.9%	9.2%	10.0%	
Others	▲ 1.2%	5.3%	5.5%	6.0%	6.2%	6.4%	
GDP per/c (at 1998 constant, Rp)	4,785.0	4,929.0	5,111.0	5,328.0	5,583.0	5,873.0	
GDP per/c growth		3.0%	3.7%	4.2%	4.8%	5.2%	

Source: PROPENAS

Indicator	1999	2000	2001	2002	2003	2004	2005
GDP growth (%)	0.3%	4.9%	3.3%	3.5-4.5%	4.5-5.5%	5-6%	5.5-6.5%
GDP per/c (at 1998 constant, Rp)	4,785.0	4,967.0	5,058.0	5,186.0	5,370.0	5,588.0	5,843.0
GDP per/c growth		3.8%	1.8%	2.5%	3.5%	4.1%	4.6%

Source: REPETA for 2003 (National Annual Plan)

495. On the other hand, regional economic framework is not clear, as only West Java province has forecasted future framework (GRDP growth) as follows:

- 2003~2005 4.60 - 4.65%
- 2006~2010 4.75 - 5.18%

		Population		Employee					
		2000	%(2000)	Total	%(Total)	Agri.	%(Agri)	Industry	%(Industry)
DKI Jakarta	**Total**	**8,384,853**	**16.1%**	**3,426,700**	**17.3%**	**8,000**	**0.2%**	**700,600**	**19.8%**
DKI Jakarta	South JKT	1,792,214	3.5%						
DKI Jakarta	East JKT	2,348,962	4.5%						
DKI Jakarta	Central JKT	892,750	1.7%						
DKI Jakarta	West JKT	1,910,470	3.7%						
DKI Jakarta	North JKT	1,440,457	2.8%						
Banten	**Total**	**8,052,312**	**15.5%**	**2,790,383**	**14.1%**	**779,640**	**16.0%**	**526,366**	**14.9%**
Banten	KB. Pandeglang	1,010,741	1.9%	369,038	1.9%	213,366	4.4%	18,967	0.5%
Banten	KB. Lebak	1,027,053	2.0%	366,610	1.8%	242,819	5.0%	10,975	0.3%
Banten	KB. Tangerang	2,775,435	5.3%	936,046	4.7%	83,455	1.7%	246,839	7.0%
Banten	KB. Serang	1,631,571	3.1%	652,391	3.3%	233,980	4.8%	99,107	2.8%
Banten	KT. Tangerang	1,311,746	2.5%	466,298	2.4%	6,020	0.1%	150,478	4.3%
Banten	KT. Cilegon	295,766	0.6%		0.0%		0.0%		0.0%
West Java	**Total**	**35,500,611**	**68.4%**	**13,600,041**	**68.6%**	**4,085,907**	**83.8%**	**2,308,794**	**65.3%**
West Java	KB. Bogor	3,489,746	6.7%	1,619,535	8.2%	313,584	6.4%	294,702	8.3%
West Java	KB. Sukabumi	2,059,920	4.0%	810,575	4.1%	370,689	7.6%	91,864	2.6%
West Java	KB. Cianjur	1,931,840	3.7%	837,064	4.2%	504,170	10.3%	42,972	1.2%
West Java	KB. Bandung	4,146,997	8.0%	1,571,119	7.9%	292,922	6.0%	547,716	15.5%
West Java	KB. Garut	2,042,386	3.9%	700,012	3.5%	277,965	5.7%	78,748	2.2%
West Java	KB. Tasikmalaya	2,049,688	3.9%	839,559	4.2%	306,054	6.3%	147,974	4.2%
West Java	KB. Ciamis	1,599,064	3.1%	709,396	3.6%	320,357	6.6%	57,027	1.6%
West Java	KB. Kuningan	980,605	1.9%	400,813	2.0%	210,480	4.3%	18,991	0.5%
West Java	KB. Cirebon	1,911,625	3.7%	729,178	3.7%	157,173	3.2%	158,690	4.5%
West Java	KB. Majalengka	1,117,802	2.2%	508,623	2.6%	200,709	4.1%	86,500	2.4%
West Java	KB. Sumedang	967,049	1.9%	388,520	2.0%	155,052	3.2%	49,697	1.4%
West Java	KB. Indramayu	1,585,922	3.1%	636,116	3.2%	275,075	5.6%	28,529	0.8%
West Java	KB. Subang	1,319,264	2.5%	561,131	2.8%	303,125	6.2%	28,807	0.8%
West Java	KB. Purwakarta	698,353	1.3%	264,991	1.3%	93,656	1.9%	40,729	1.2%
West Java	KB. Karawang	1,765,263	3.4%	654,253	3.3%	201,222	4.1%	126,836	3.6%
West Java	KB. Bekasi	1,642,952	3.2%	565,048	2.9%	74,532	1.5%	104,584	3.0%
West Java	KT. Bogor	743,478	1.4%	258,725	1.3%	9,651	0.2%	58,464	1.7%
West Java	KT. Sukabumi	252,293	0.5%	80,279	0.4%	2,756	0.1%	9,525	0.3%
West Java	KT. Bandung	2,141,837	4.1%	777,191	3.9%	4,505	0.1%	193,250	5.5%
West Java	KT. Cirebon	269,186	0.5%	101,758	0.5%	2,295	0.0%	10,833	0.3%
West Java	KT. Bekasi	1,639,286	3.2%	586,155	3.0%	9,935	0.2%	132,356	3.7%
West Java	KT. Depok	1,146,055	2.2%		0.0%		0.0%		0.0%
West Java & Banten		**43,552,923**	**83.9%**	**16,390,424**	**82.7%**	**4,865,547**	**99.8%**	**2,835,160**	**80.2%**
Total		**51,937,776**	**100.0%**	**19,817,124**	**100.0%**	**4,873,547**	**100.0%**	**3,535,760**	**100.0%**

c) Industrial Activities in the hinterland

i) GRDP of Manufacturing Industries Sector

496. Gross Regional Domestic Products of DKI Jakarta and West Java Province are disaggregated by industrial origin, and shown in the following tables individually. Areas of the present Banten Province were parts of West Java Province at that time. Values in the tables are expressed at constant 1993 prices.

497. Looking at the figures of DKI Jakarta, GRDP was Rp. 59,492 Billion in 2000, which was 14.5 % less than that in 1997. Economy in the Indonesian capital region has not recovered from the crisis.

498. The largest industry in this region is Trade, Hotel &restaurant, which accounts for 23.8 % of the total economy. Manufacturing Industries account for 21.6%, and the third largest after Finance, Rent of Building & Business Services.

Table 8-E-8 GRDP of DKI Jakarta at 1993 Constant Price by Industrial Origin

million Rupiah

	1997	1998	1999*	2000**
1. Agricultural	123,492	104,971	116,868	115,743
2. Mining & Quarrying	-	-	-	-
3. Manufacturing Industries	14,717,834	12,072,978	12,391,061	12,875,191
4. Electricity, Gas & Water Supply	1,209,840	1,103,238	1,161,177	1,225,904
5. Construction	10,677,749	6,589,239	6,404,740	6,469,953
6. Trade , Hotel & Restaurant	15,922,398	13,466,401	13,550,295	14,166,036
7. Transportation & Communication	6,008,735	5,287,988	5,613,963	6,042,125
8. Finance, Rent Of Building & Business Services	14,954,196	13,515,814	12,681,993	13,168,002
9. Services	5,929,204	5,239,888	5,295,127	5,429,247
TOTAL	69,543,448	57,380,517	57,215,224	59,492,201

Note: * Preliminary figures

** Very Preliminary figures

Source: Gross regional Domestic Product of Provinces in Indonesia by Industrial Origin 1997-2000 BPS

499. GRDP of West Java Province (including Banten Province) is larger than that of DKI Jakarta, and amounted to Rp. 63,150 billion in 2000 at constant 1993 prices. GRDP in 2000 is 88.2 % of that in 1997.

500. Unlike DKI Jakarta, Manufacturing industries is by far the largest industry in West Java Province, and accounts for 35.1 % of the total GRDP in this province. The second largest industry is Trade, Hotel & Restaurant, which accounts for 19.4 % of the total output.

Table 8-E-9 GRDP of West Java (including Banten) at 1993 Constant Price by Industrial Origin

million Rupiah

	1997	1998	1999*	2000**
1. Agricultural	8,675,504	8,013,996	9,103,516	9,422,440
2. Mining & Quarrying	3,624,036	2,912,315	2,142,073	2,071,577
3. Manufacturing Industries	26,310,836	20,913,548	21,029,934	22,189,453
4. Electricity, Gas & Water Supply	1,859,827	1,816,765	2,046,565	2,432,777
5. Construction	4,202,306	2,262,253	2,210,240	2,408,267
6. Trade , Hotel & Restaurant	13,511,208	11,565,562	3,368,042	12,268,738
7. Transportation & Communication	3,908,370	4,531,602	3,555,871	3,957,046
8. Finance, Rent Of Building & Business Services	3,666,643	2,189,228	1,829,170	2,685,593
9. Services	5,810,195	5,676,177	5,780,293	5,713,687
TOTAL	71,568,925	59,881,446	51,065,704	63,149,578

Note: * Preliminary figures
** Very Preliminary figures

501. As mentioned earlier, manufacturing industry is the largest economic sector in West Java Province. In order to identify prospective sub-sectors, manufacturing industries sector is disaggregated into 9 sub-sectors, and outputs of each sub-sector are tabulated for the latest four years.

502. It should be noted that figures in Table 8-E-10 are expressed at current market prices. Amongst the nine sub-sectors, Textile, Wearing Apparel and Leather Industries sub-sector is the largest and account for 35.7 % in 1999. The second is Fabricated Metal Product, Machinery and Equipment, and the third is Chemical and Chemical Product, Petroleum, Coal, Rubber and Plastic.

503. Total value of Gross Output in West Java has grown around 2 times since 1996 till 1999. Looking at the growth rate by sub-sector, "Textile, Wearing Apparel and Leather Industries" shows the highest, and output level has grown around 2.4 times larger than in 1996. It is expected that this sub-sector will continue to lead the Indonesian economy.

504. Besides macro economic frame, we should pay attention to specific demand of cargo. Some of cargoes were already analyzed in the demand forecasting, here we just point out the fact that a significant demand for importing/exporting cars will emerge in the very near future under the AFTA agreement among the ASEAN countries. In a few years, thousands of Indonesian cars are expected to be monthly exported.

Table 8-E-10 Value of Gross Output by Group of Industry (West Java Province)

Group of Industry	Year	Total
1 Food Beverages & Tabacco	1996	5,905,783
	1997	7,211,638
	1998	12,543,404
	1999	13,859,802
2 Textile, Wearing Apparel and Leather Industries	1996	29,435,144
	1997	30,466,788
	1998	59,108,954
	1999	69,670,975
3 wood and wood product, including furniture	1996	3,021,382
	1997	2,404,071
	1998	3,903,612
	1999	3,996,811
4 Paper and Paper Products, Printing and Publishing	1996	3,828,761
	1997	3,185,127
	1998	6,902,798
	1999	8,999,652
5 Chemical and Chemical Product, Petroleum, Coal, Rubber and Plastic	1996	16,319,949
	1997	18,048,296
	1998	33,794,436
	1999	37,898,226
6 Non metalic mineral products, except product of petroleum and coal	1996	3,423,304
	1997	3,990,880
	1998	4,313,220
	1999	4,338,372
7 Basic Metal Industry	1996	9,601,044
	1997	7,282,226
	1998	11,240,906
	1999	11,482,385
8 Fabricated Metal Product, Machinery and Equipment	1996	23,598,539
	1997	22,132,897
	1998	34,918,968
	1999	42,297,436
9 Other Manucfaturing Industries	1996	880,391
	1997	1,186,414
	1998	2,533,265
	1999	2,403,068
Total	1996	96,014,297
	1997	95,908,337
	1998	169,259,563
	1999	194,946,727

Source: Jawa Barat In Figures 2000

ii) Industrial Estates

505. Many industrial estates have been established in the neighborhood of DKI Jakarta. Some of them were constructed and managed by private companies and some were owned by public corporations. Japanese companies also have invested in developing such estates and attracted Japanese manufacturing companies.

506. A considerable portion of container cargo is originated and destined to such industrial estates. Companies in the industrial estates import raw or semi-finishing materials and export finished goods to foreign and domestic markets.

507. According to the Indonesian Estate Association, areas of industrial estates are 1,256 ha in DKI Jakarta, 7,303 ha in Banten Province, and 19,382 ha in West Java Province. Thus, West Java Province forms an industrial center not only for Java Island but also for all of Indonesia.

508. Presently these industrial estates are only partially developed and utilized for manufacturing and commercial activities. According to the Association's statistics, about 35 per cent of land has been developed.

509. In addition to that, as shown in Table 8-E-11, more lands have been made available for the development of industrial estates. Total area of these lands reached 33,824 ha in the Jakarta metropolitan area. Amongst them, Karawang is the largest with a land area of 14,047 ha.

Table 8-E-11 Permits Issued for Industrial Estates

Location	Size Ha	%
Serang	6,277	18.6
Tangerang	2,394	7.1
Bekasi	5,737	17
Karawang	14,047	41.5
Purwakarta	3,082	9.1
Others West Java	1,137	3.4
DKI Jakarta	1,150	3.4
Total	33,824	100

Source:Industrial Estate Directory 2001
Indonesian Estate Association HKI

d) Land Transport Development Plan & Projects

i) Road

510. Ministry of Settlements and Regional Development Infrastructure is proceeding with its future development plan. Future road network is shown in Table 8-E-12 and Figure 8-E-2.

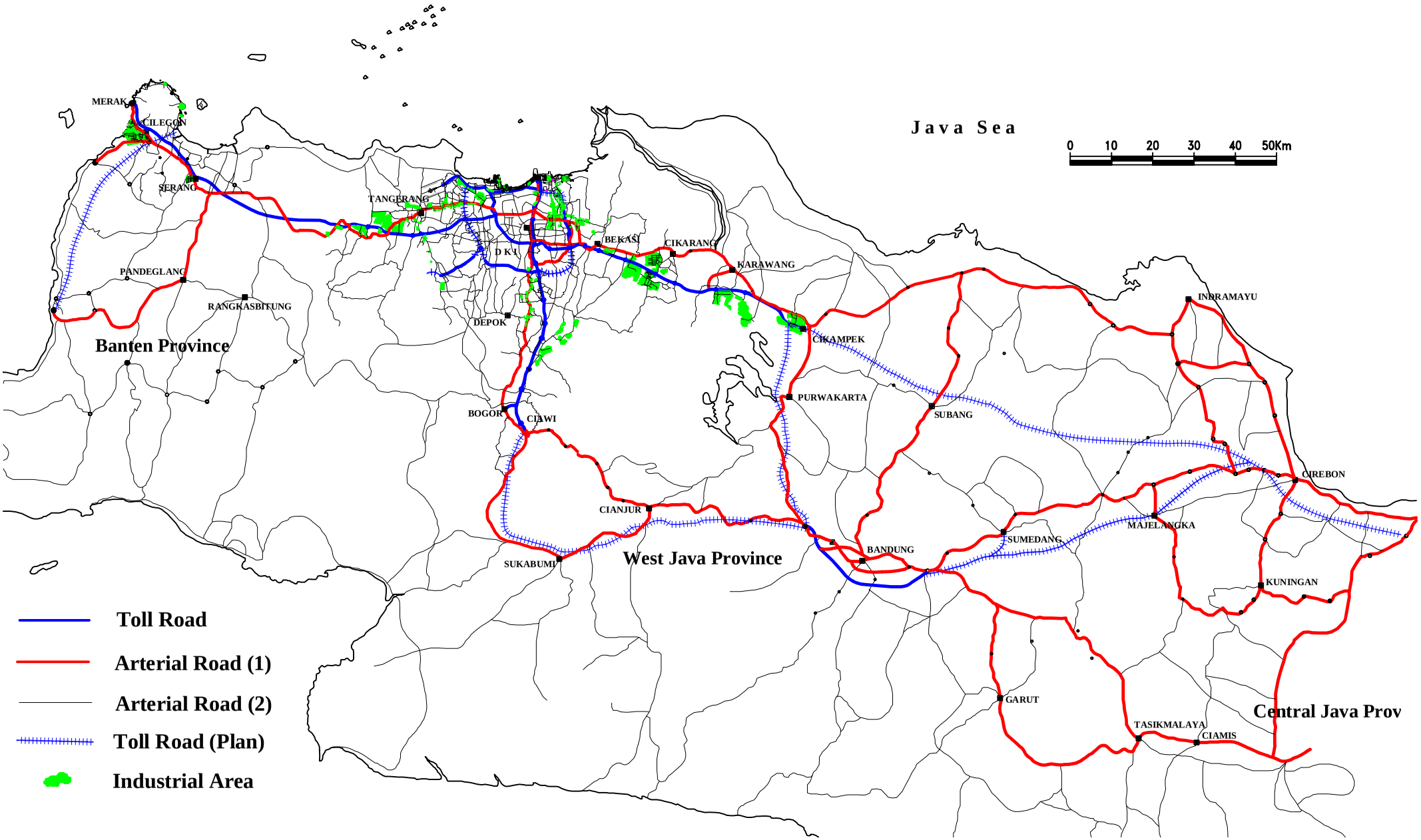
Table 8-E-12 Future Development for Toll Road

	2010	2020
Jakarta – Bandung Corridor	◆ Cikampek – Padalarang ◆ Cikampek – Jakarta (3 lanes)	◆ Cikampek/Sadang – Jakarta ◆ Capacity on Cikampek – Padalarang
Surabaya Corridor	◆ Gempol – Malang Toll Road ◆ Western by pass Toll Road	◆ Gempol – Pasuruan
Central Java		◆ Cirebon – Semarang – Demak ◆ Semarang – Solo – Yogyakarta

Figure 8-E-2 Road Network in Future (Western Java Area)

511. Other programs for improvement of road capacity are as follows:

- Additional toll road capacity in corridors leading to Jakarta/Jabotabek
- Significant toll road capacity leading to and around Surabaya
- Toll roads on heavy-use sections of Main Trunk Network, particularly on the North Java Coast and between Semarang – Solo/Yogyakarta
- Four-lanes for the remainder of Main Trunk Network, Merak – Jakarta and Probolinggo – Banyuwangi
- Four-lanes for approach road to major urban areas and other developments


Java Sea
0 10 20 30 40 50Km
MERAK
CILEGON
SERANG
TANGERANG
BEKASI
CIKARANG
KARAWANG
D K I
PANDEGLANG
RANGKASBITUNG
DEPOK
Banten Province
CIKAMPEK
INDRAMAYU
PURWAKARTA
SUBANG
BOGOR
CIAWI
CIREBON
CIANJUR
MAJELANGKA
SUMEDANG
BANDUNG
SUKABUMI
West Java Province
KUNINGAN
GARUT
Central Java Prov
TASIKMALAYA
CIAMIS
Toll Road
Arterial Road (1)
Arterial Road (2)
Toll Road (Plan)
Industrial Area

512. Aside from the nationwide development plan, the government, MoSRD (Ministry of Settlement and Regional Development) has taken up the project of the Jakarta Outer Ring Road (JORR) between Cengkareng airport through the southern parts of Pasar Minggu to Tanjung Priok area to connect with the existing Jakarta harbor Toll-way road. The key objectives are as follows:

- To reduce existing traffic congestion of city traffic and to improve heavily congested situation of traffic to the port
- To improve access to and from international air port/industrial estates in Jabotabek region to Tanjung Priok port
- To promote the efficient development of Jabotabek as a metropolitan region.

513. JORR has a total length of about 70 km and was divided into seven sections for implementation by private investors. Two sections between Cilandak to Jagorawi toll way were constructed and operated till 1997 but the construction of the remaining parts was suspended due to the 1997 economic crisis and has not yet started since then. This JORR is located on the fringe of DKI Jakarta and strategically serve both Jakarta and surrounding conurbations of Bogor, Tangerang, and Bekasi regions, making it an essential components of the Jakarta-West Java toll way system.

514. JORR Northern Extension to provide direct access to the port from the existing toll way road as an alternative route was studied as part of the JORR development project, since the planned toll way road from the Jakarta Harbor Road to Cilincing was indefinitely suspended due to the heavy land acquisition cost and social environmental issues. Therefore the proposed northern extension road is 7 km in length and follows the alignment of Cilincing Access Road, which is classified as a primary arterial road. The existing road carries high volumes of heavy container trucks to and from the port and container depots located in surrounding areas of the port.

515. It is reported that the existing 4 lane arterial road will reach practical capacity by 2008 by applying the appropriate growth factor of traffic from the port to the hinterland without construction of JORR Northern Extension. It is recommended to widen to 6 lanes. Due to the narrow Right of Way (ROW), JORR Northern Extension must be elevated and built as a viaduct structure in JL. Jampea is located immediately south of the JICT /KOJA Terminal.

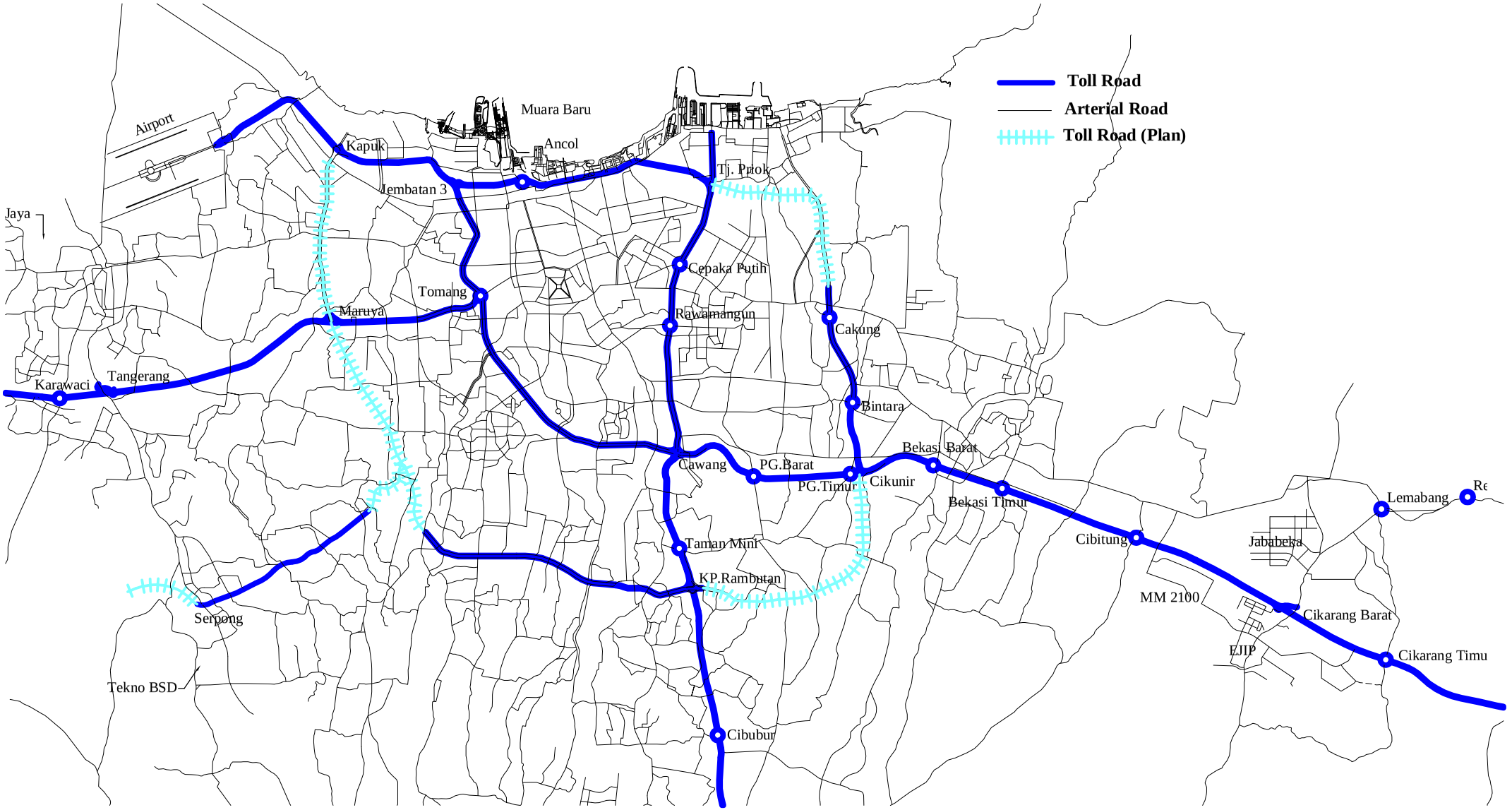
Figure 8-E-3 Road Network in Future (DKI Area)

ii) Railway

516. Policy on Freight Transport: After recovering from the economic downturn, it is expected that agricultural and industrial sectors will begin to expand again. Consequently, demand for the transportation of raw materials and industrial products will increase. The policy will be aimed at utilizing railway for container transport.

517. A recent project to consider reform and modernization of the railway sector is the World Bank funded Railway Efficiency Project (REP), which started in 1997. The project has four objectives.

- Reforming railway policy by restructuring the corporation and its relationship to government.
- Rationalization of capital investments and expanding the opportunity for PSP.


Toll Road
Arterial Road
Toll Road (Plan)
Airport
Kapuk
Muara Baru
Ancol
Tj. Priok
Jembatan 3
Jaya
Cepaka Putih
Tomang
Maruya
Rawamangun
Cakung
Karawaci
Tangerang
Bintara
Bekasi Barat
Cawang
PG.Barat
PG.Timur
Cikunir
Bekasi Timur
Lemabang
Taman Mini
Cibitung
Jababeka
KP.Rambutan
MM 2100
Serpong
Cikarang Barat
EJIP
Cikarang Timu
Tekno BSD
Cibubur

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- Improving management and operations
- Enhancing railway capacity in major railway corridors.

518. Existing railway between Jakarta and Cikampek is double-track section, between Cikampek and Bandung is single-track section. PT. KAI is constructing double-track between Cikampek and Bandung until 2003, using a loan from the World Bank. Future railway network is shown in Figure 8-E-4.

Figure 8-E-4 Railway Network in Future

8-E-3 Accessibility to/from the Hinterland

1) Access Conditions to Tanjung Priok Port

519. There is the serious problem of direct access to the port of Tanjung Priok, particularly from the major industrial estates of Jabotabek and beyond. The Government of Indonesia, Department of the Public Works had taken up the project of the Jakarta Outer Ring Road (JORR) between Cengkareng airport through the southern parts of Pasar Minggu to Tanjung Priok area to connect with the existing Jakarta harbor Toll-way road.

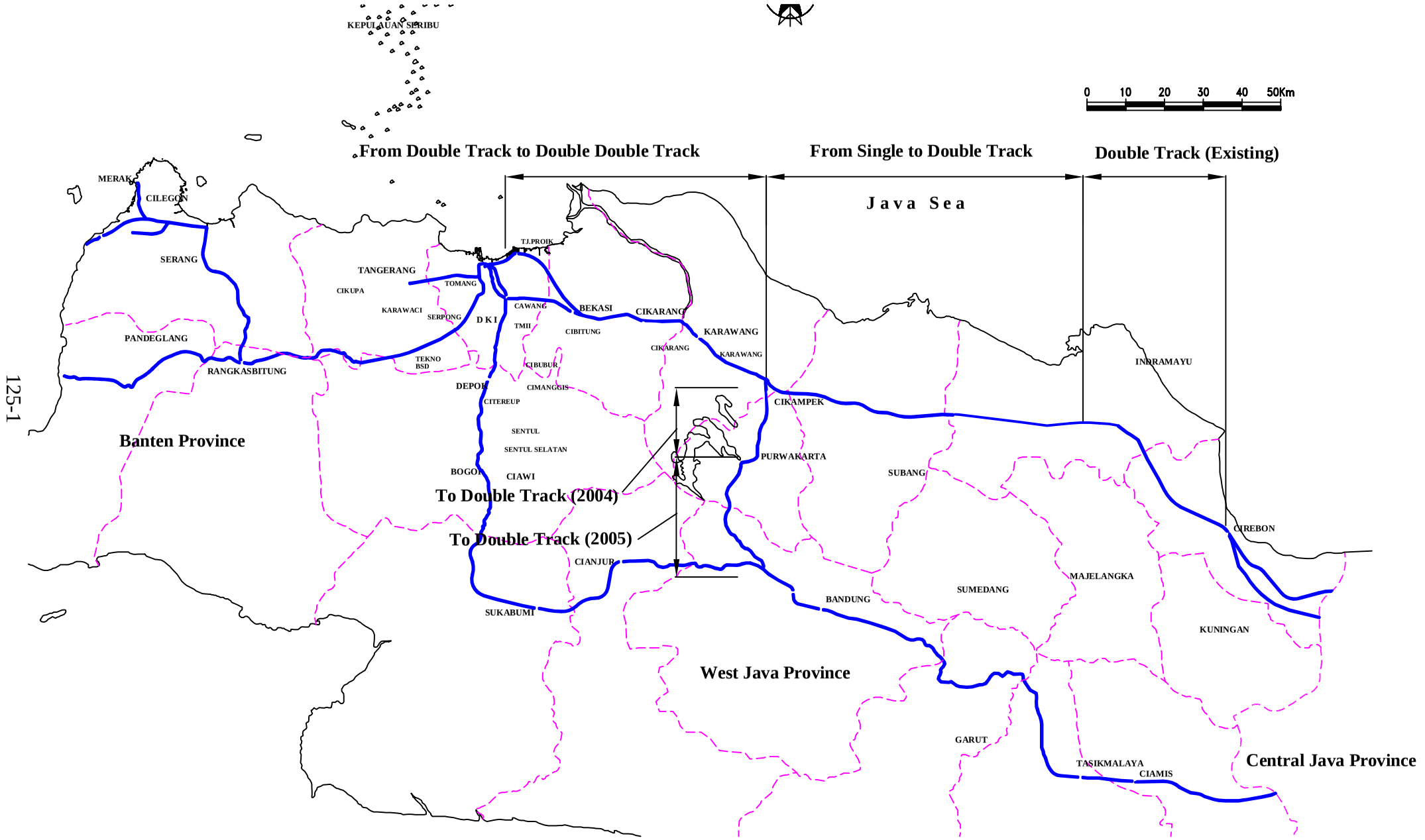
520. JORR Northern Extension to make direct access to the port from the existing toll way road as an alternative routes were studied as parts of the JORR development project, since the planned toll way road parts from the Jakarta Harbor Road to Cilincing were indefinitely suspended due to the heavy land acquisition cost and social environmental issues. Therefore the proposed northern extension road is 7 km in length and follows to the alignment of Cilincing Access Road, which is classified as a primary arterial road. The existing road carries high volumes of heavy container trucks to and from the port and container depots located surrounding areas to the port.

521. In connection with the JORR project, the following projects have been planned to improve the accessibility.

- In 1998 PT. Jasa Marga (Toll Road construction and management Company) planned to build an access road from the existing Arterially road to Tanjung Priok Port.
- IPC 2 is planning an access road construction for 2 km distance to connect from the existing toll road gate to the Port JICT 1 gate by flyover with the interchange.
- New road connection from Marunda area to the Koja Terminal area is planned by the Bekasi Metropolitan government to connect the port and Bekasi industrial area by the short cut route.
- The railway dry port “Pasoso” was developed for container transport in the Tanjung Priok port from the Bandung Gedebage dry port from 1991. It is planned to extend the railway line from Pasoso dry port to JICT 1 and Koja terminal for increasing container traffic volume by railway to inland customers.

522. Primarily, the following alternative sites are considered to be improved for smooth traffic around the port, i.e., the East, North, North Koja and West site of the Port. The highway network to all the sites are required to serve container terminal.

- East site is north of Kali Baru and would require a new access road from JL. Cilincing Raya. The length is estimated 1,450 m. This route would require soil improvement to


KEPULAUAN SERIBU
0 10 20 30 40 50Km
From Double Track to Double Double Track
From Single to Double Track
Double Track (Existing)
Java Sea
MERAK
CILEGON
SERANG
PANDEGLANG
RANGKASBITUNG
Banten Province
TANGERANG
CIKUPA
TOMANG
KARAWACI
SERPONG
D K I
TJ.PRIOK
CAWANG
BEKASI
CIKARANG
TMII
CIBITUNG
KARAWANG
CIKARANG
KARAWANG
TEKNO BSD
CIBUBUR
DEPOK
CIMANGGIS
CITEREUP
SENTUL
SENTUL SELATAN
BOGOR
CIAWI
To Double Track (2004)
To Double Track (2005)
CIANJUR
SUKABUMI
CIKAMPEK
PURWAKARTA
SUBANG
INDRAMAYU
CIREBON
MAJELANGKA
SUMEDANG
BANDUNG
KUNINGAN
West Java Province
GARUT
TASIKMALAYA
CIAMIS
Central Java Province

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cater for heavy traffic load due to poor soil conditions at site.

- North site is immediate north of the existing JICT-1 would be routed along the existing JL. Kali Baru, which would need to be up graded.
- The West site, North of the Nusantara Basin would require a new access road to JL. R.E Martadinata.

523. When the harbor road is completed, the road connection for the west site will be improved. Since almost all traffic entering and leaving the terminal will be able to use the primary arterial road system directly for all destinations. All traffic between the terminal and the east and south directions as well as parts of Jakarta would use the Cawing – Tanjung Priok toll road. The west bound traffic could also use the toll road.

2) Existing Access Road Conditions to the Bojonegara Site

a) Infrastructure

524. The existing access to the Bojonegara site from the toll way of Jakarta-Merak are 2 lanes lightweight load asphalt paved road in the distance of 16 km. There is one bridge constructed with steel member trussed structure which slab and concrete foundation are heavily damaged. The bridge super structure and foundation shall be checked its strength for heavy loaded trucks running. It is considered necessary to be rehabilitated and reinforced.

525. The coastal area along the access road is occupied by private investors for their factories and industrial complex development. And the road passes through the short distance of resident area on the hilly land. The alignment of the access road may be able to study in detail based on the aero photo to be taken for the preparation of topographic map of the road and port planning area.

526. It is obvious for the site reconnaissance check that the presently damaged asphalt pavement and steel trussed bridge shall be rehabilitated and reinforced by widening to 4 lanes with concrete pavement for container transport. The road through the resident area shall be detoured to an alternative route out side the resident area.

527. There is a plan to develop a rail way along with the access road route with connection between the port area to the existing railway line of Jakarta-Merak for transport containers from Bandung and Jakarta dry ports.

b) Existing Traffic Volume

528. The directional classified 13 types of vehicles counting survey on the access road was carried out in July 2002 at two points, Desa Kramatwalu and Desa Argawana (Bojonegara site). From the survey the daily traffic volume is not so heavy. The regular commuter service buses, business trucks transporting cargo for industries, factories located along the coast are running in the similar order of daily traffic to both directions. However 509 units of heavy loaded trucks were running at Kramatwalu and 118 units at Argawana. The daily traffic counting volume are summarized below:

Table 8-E-13 Existing Traffic Volume on the Access Road for Bojonegara

Type of Vehicles	Deas Kramatwalu (Bojonegara area)			Desa Argawana		
	Fr. Cil-Boj	Fr. Boj-Cil	Both Dirs.	Fr. Cil-Boj	Fr.Boj-Cil	Both Dirs
M.Cycle	389	357	746	1,035	1,038	2,073
Sedan	202	177	379	259	297	556
Pickup	59	51	110	67	77	138
Bus	23	25	48	29	27	56
Truck<5t	13	16	29	15	9	24
Truck>5t Double axis	263	246	509	58	60	118
Truck>5 t Triple axis	232	225	457	11	13	26
Truck 4axis	0	2	2	1	0	1
Truck 3 semi tronton	8	5	13	1	0	1
Truck 4A	2	1	3	0	1	1
Total	1,192	1,106	2,298	1,476	1,516	2,992

3) Accessibility of Each Port

529. West Java area is wide of 350km from east to west. There are Bojonegara at the west end, Tanjung Priok at the center, and Cirebon at the east end. Major industry areas are located in Cilegon, Serang and Tangerang in west side of Jakarta, Bekasi and Karawang in east side of Jakarta, and Bandung in the center of West Java area. The Study team preliminarily tried to calculate the time to be taken between the ports and major industrial area. The conditions of the calculation is shown in Figure 8-E-5.

Figure 8-E-5 Provided Road Network and Vehicle Speed

530. At present, the area reached within 2 hours from Tanjung Priok covers just only Jakarta DKI because of heavy traffic. That area for Bojonegara is rather large, however, does not cover Tangerang because of lack of accessibility. (See Figure 8-E-6) In future, on condition that the expected toll road network will be completed and each port will have good access to/from the toll road network, equal accessibility areas to/from each port can be described as in Figure 8-E-7.

531. Taking examples of major industrial area around Jakarta such as Tangerang and Bekasi, Tangerang will be covered within 2 hours from both Tanjung Priok and Bojonegara, while Bekasi will be covered within 2 hours from Tanjung Priok and 3 hours from Bojonegara.

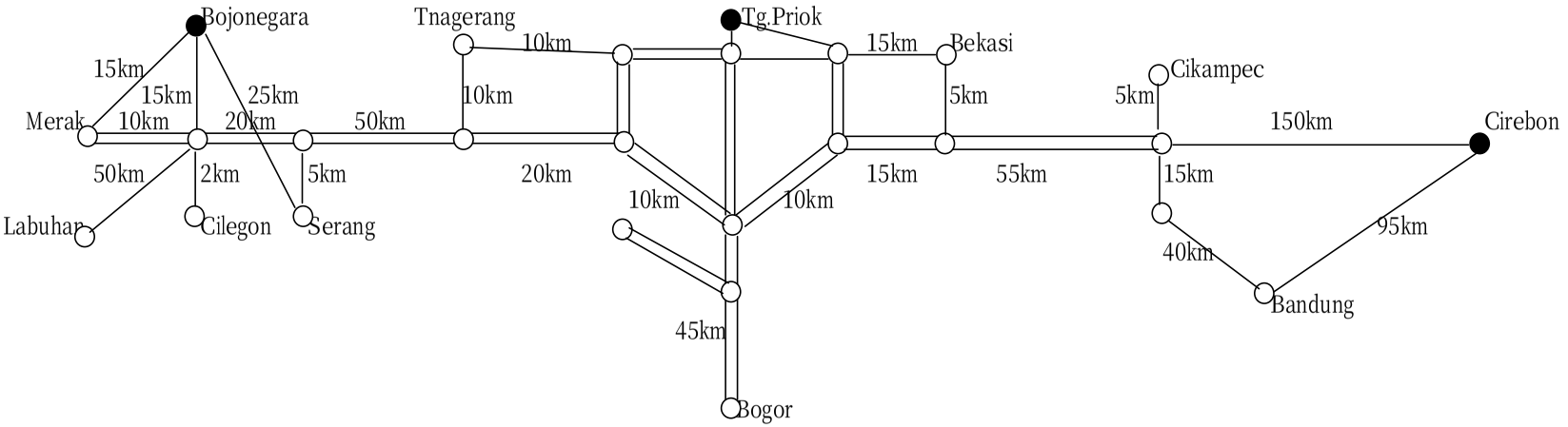
Figure 8-E-6 Transportation Time in Present Situation

Figure 8-E-7 Transportation Time in Future Situation

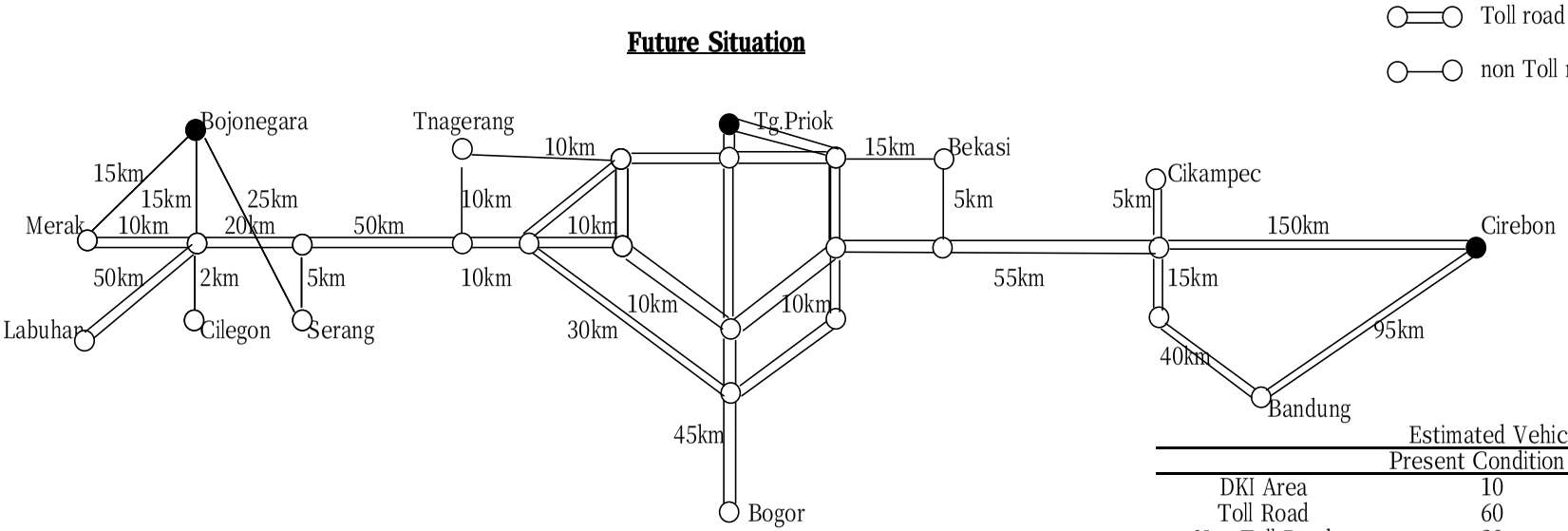
532. Table 8-E-14 and Figure 8-E-8 shows accessibility of the ports to/from major industrial area with the description of distance and time between the ports and major industrial area.

Figure 8-E-8 Major Industrial Area

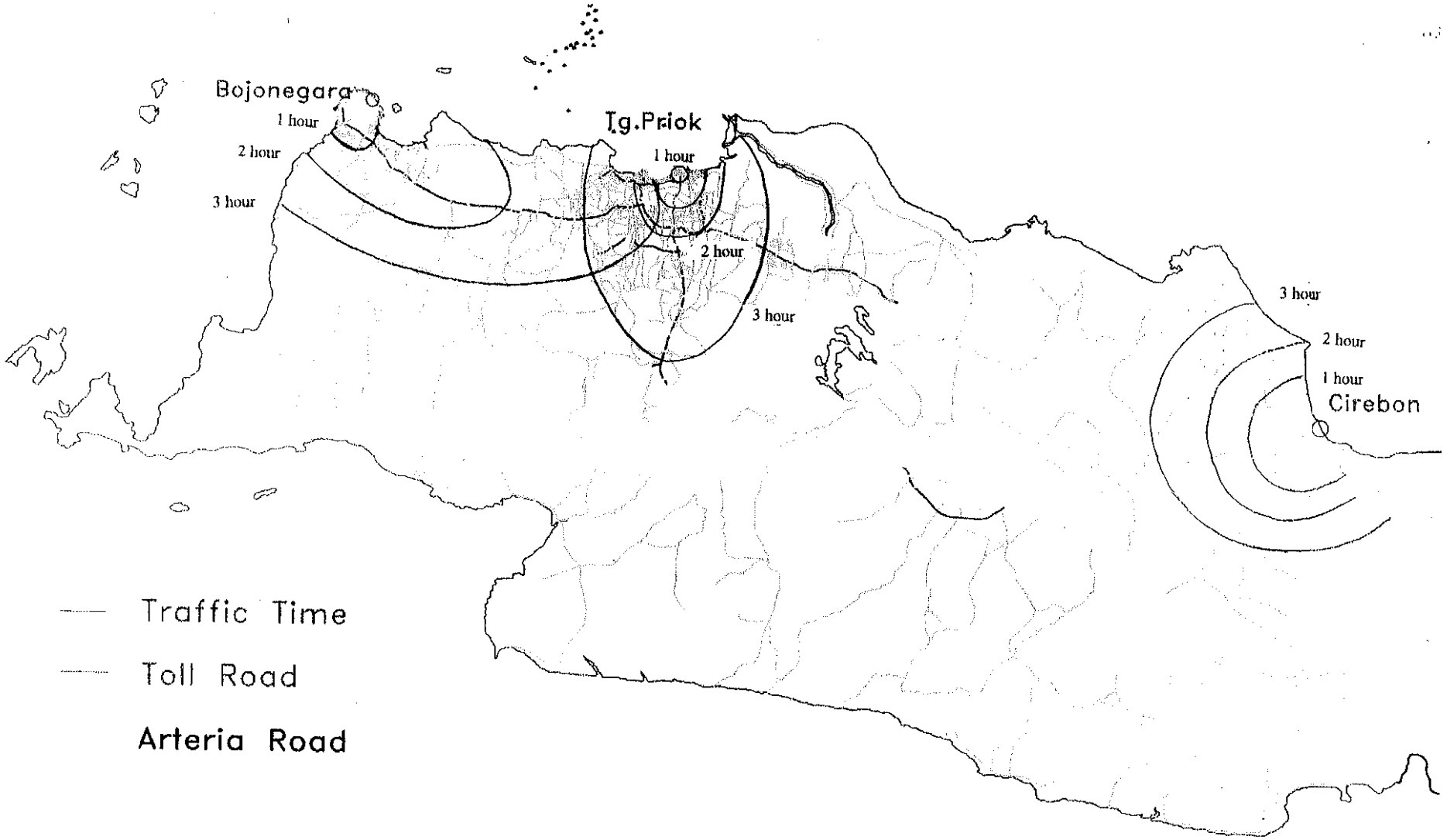
Present Situation



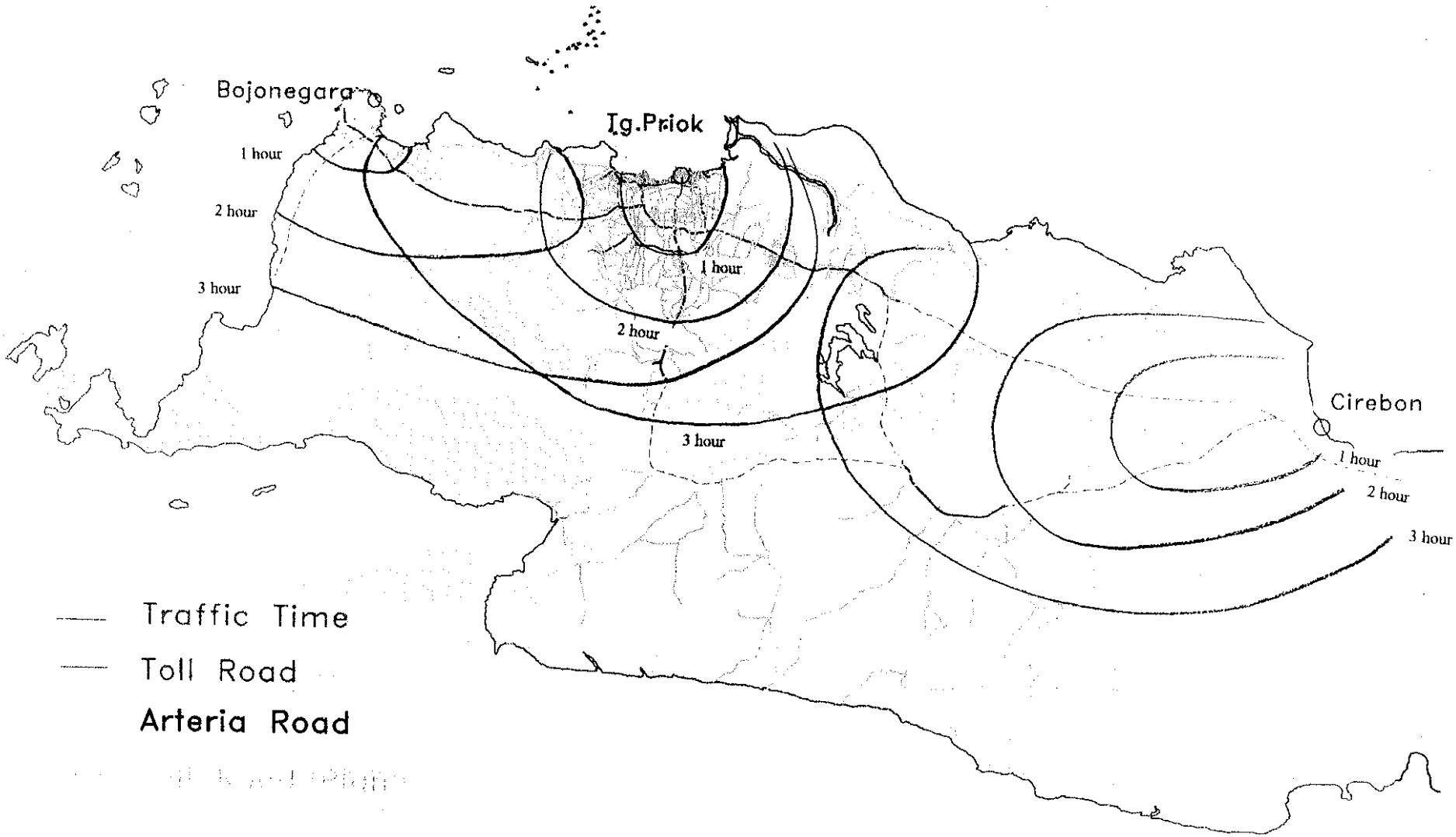
Future Situation



	Estimated Vehicle Speed	
	Present Condition	Future Condition
DKI Area	10	20
Toll Road	60	70
Non Toll Road	20	25



Present Situation



Future Situation

Major Industrial Estate Location

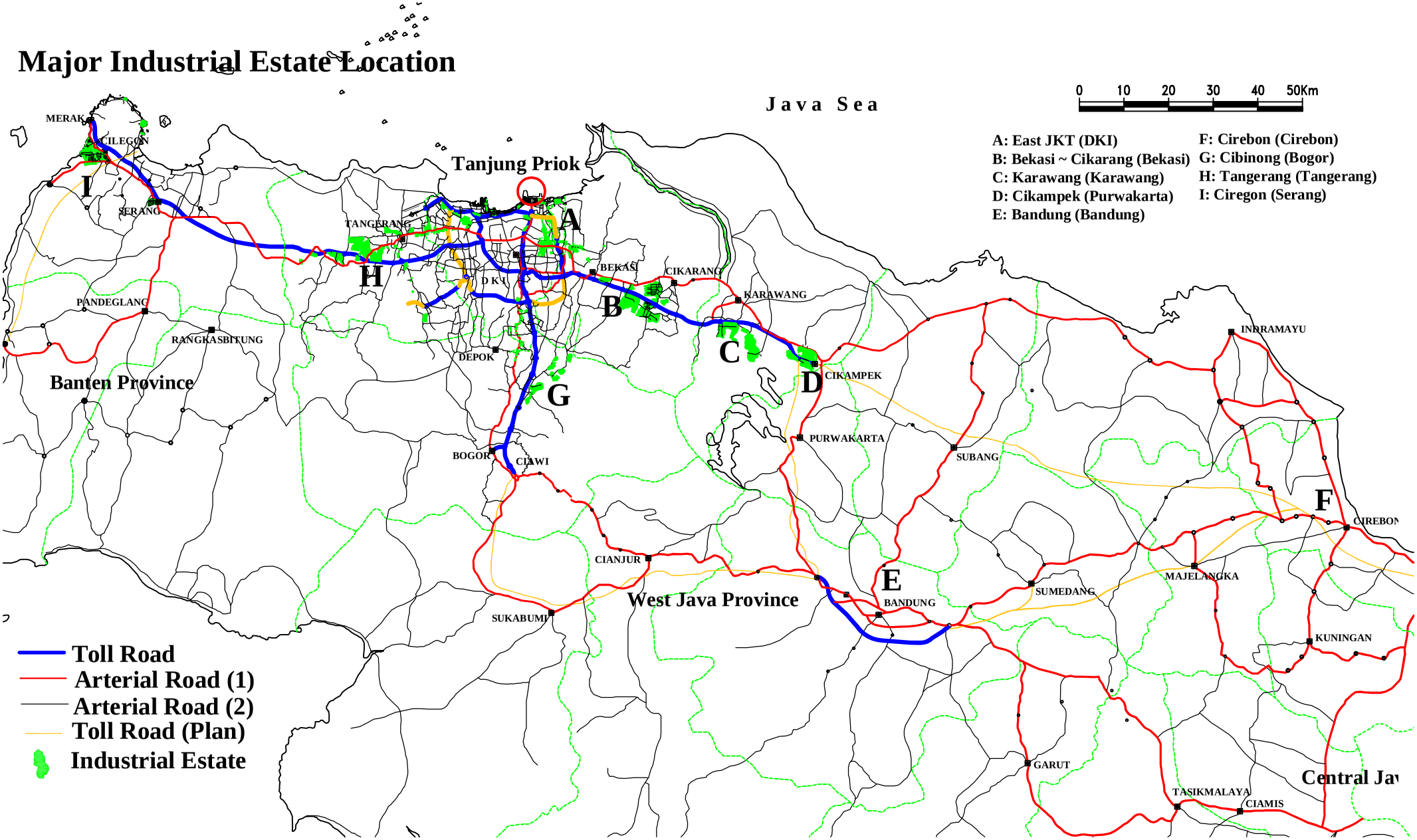


Table 8-E-14 Location and Accessibility of the Ports

	Distance and Time Distance from Major Industrial Area									Accessibility
	A	B	C	D	E	F	G	H	I	
Tanjung Priok	10km 1.0hr (0.5hr)	30km 2.5hr (1.4hr)	75km 3.1hr (1.9hr)	100km 3.4hr (2.2hr)	150km 6.2hr (3.0hr)	240km 10.7hr (4.3hr)	70km 2.9hr (1.8hr)	40km 2.7hr (1.4hr)	110km 3.6hr (2.3hr)	Despite being close to the Metropolitan area, accessibility is not always good at this moment due to lack of direct access to/from toll road (3km to the nearest interchange). Furthermore, there is a heavy traffic congestion in Jakarta metropolitan area. Accessibility will be greatly improved by constructing the Outer Ring Road and connecting the port to the toll road network,
Banten/Ciwandan	130km 3.1hr (2.6hr)	140km 2.8hr (2.4hr)	180km 3.4hr (2.9hr)	240km 4.4hr (3.7hr)	290km 7.2hr (4.5hr)	380km 11.7hr (5.8hr)	170km 3.3hr (2.7hr)	80km 2.0hr (1.7hr)	40km 1.1hr (0.9hr)	Very close to the industrial area and easy to access to/from toll road. It is 10km to the nearest interchange, however, access road condition is in fairly good condition physically and traffic-wise.
Banten/Merakmas	130km 2.9hr (2.4hr)	140km 2.7hr (2.2hr)	180km 3.2hr (2.7hr)	240km 4.2hr (3.6hr)	290km 7.0hr (4.4hr)	380km 11.5hr (5.7hr)	170km 3.1hr (2.6hr)	80km 1.8hr (1.5hr)	40km 0.9hr (0.7hr)	Easy to access to/from toll road. It is 4km to the nearest interchange and access road is in fairly good condition physically and traffic-wise.
Banten/Bojonegara	140km 3.5hr (2.9hr)	160km 3.3hr (2.7hr)	190km 3.8hr (3.2hr)	250km 4.8hr (4.1hr)	300km 7.6hr (4.9hr)	390km 12.1hr (6.2hr)	180km 3.7hr (3.1hr)	100km 2.4hr (2.0hr)	50km 1.5hr (1.2hr)	Currently rather difficult to access to/from toll road. It is 15km to the nearest interchange and access road condition is bad and not suitable for truck and trailer traffic. New access road of 16km should be developed to link with the existing toll road.
Cirebon	240km 9.7hr (4.1hr)	220km 8.8hr (3.3hr)	180km 8.1hr (2.8hr)	160km 7.8hr (2.8hr)	130km 6.8hr (2.2hr)	5km 0.3hr (0.2hr)	280km 9.8hr (4.2hr)	270km 9.6hr (4.0hr)	320km 10.4hr (4.8hr)	No toll road connection, however, few problems to/from the existing hinterland. Accessibility to/from industrial area in east of Jakarta and Bandung will be improved by realizing the planned toll road network.

* Figures in ( ) shows time distance in the future when the all toll road network plans are realized.

** A~I means major industrial area as follows:

A: East JKT (DKI)
B: Bekasi ~ Cikarang (Bekasi)
C: Karawang (Karawang)
D: Cikampek (Purwakarta)
E: Bandung (Bandung)
F: Cirebon (Cirebon)
G: Cibinong (Bogor)
H: Tangerang (Tangerang)
I: Cilegon (Serang)

*** Conditions of time distance calculation

Speed on toll road: Current - 60km/hr, Future - 70km/hr
Speed on the other roads: Current - 20km/hr, Future - 25km/hr

8-F. POTENTIAL IN THE INTERNATIONAL CONTAINER NETWORK

1) The Direct or Indirect Service Routes to/from International Container Network

533. Figure 8-F-1 was made using the data shown on Appendix–A of Volume-I. It represents a birds' eyes view of the Service Route to/from International Container Network, direct or indirect. The chart thus does not show the service frequency. With an objective to show the service frequency to/from each region, Table 8-F-1 is also compiled based on the data of Appendix–A of Volume-I.

Figure 8-F-1 Distribution of Direct Sailing Ports from Jakarta

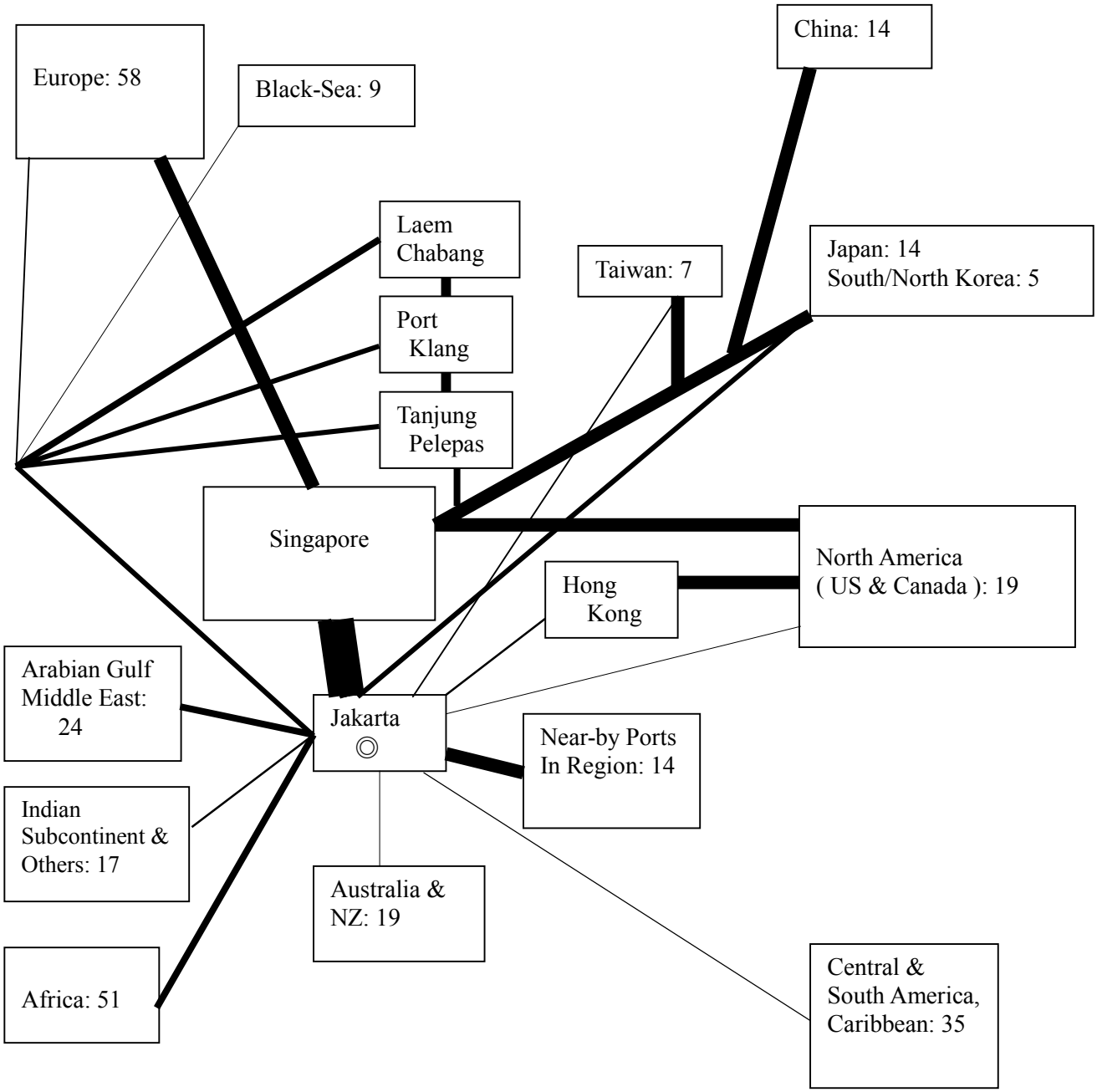


Table 8-F-1 Region-wise Services Frequency to/from Jakarta

Region	Shipping Lines	Frequency	Year Total
Europe	MSL	Weekly	52 Weekly
	CMA-CGM/ANL	1 per 3 days	122 sailings
	OOCL (Grand Alliance)	Weekly	52 Weekly
	Norasia	Weekly	52 Weekly
			278 Weekly (3.7 %)
Africa	MSL (East, West, North, South)	4 Weekly	208 Weekly
	CMA-CGM/ANL (North Africa)	1 per 3 days	122 Weekly
	Gold Star	1 Weekly	52 Weekly
			382 Weekly (5.1%)
Japan	Wan Hai	1 per 3 days	122 Weekly
	MSL-1	1 Weekly	52 Weekly
	TSK	1 per 3 days	122 Weekly
	Yang Ming	1 Weekly	52 Weekly
	Hanjn/Dongnama/Heung-A	1 Weekly	52 Weekly
	MSL-2	1 per 3 days	122 Weekly
	TSK/MSL/NYK	1 Weekly	52 Weekly
	Wan Hai/MISC/TSA	1 Weekly	52 Weekly
	MISC/TSK	1 Weekly	52 Weekly
			678 Weekly (9.1%)
South & North Korea	KMTC/Hyundai	1 Weekly	52 Weekly
	Heung-A	1 every 10 d	36 Weekly
	MSL	1 Weekly	52 Weekly
	Hanjin/Dongnama/Heung-A	1 Weekly	52 Weekly
	Wan Hai	1 per 3 days	122 Weekly
	Yang Ming/CNC/TSL	1 Weekly	52 Weekly
	KMTC/Hyundai/TMM	1 Weekly	52 Weekly
	KMTC/Hyundai	1 Weekly	52 Weekly
	Rickmers	na	na
			470 Weekly (6.3%)
China	Wan Hai	1 per 3 days	122 Weekly
	MSL	2 Weekly	104 Weekly
	COSCO	1 Weekly	52 Weekly
	CNC	1 Weekly	52 Weekly
	Rickmers	na	na
			330 Weekly (4.4%)
Black Sea	CMA-CGM/ANL	1 Weekly	52 Weekly
	Norasia	1 Weekly	52 Weekly
			104 Weekly (1.4%)
Arabian Gulf, Middle East	MSL	1 Weekly	52 Weekly
	CMA-CGM/ANL	1 per 3 days	122 Weekly
	Thorensen CMA-CGM/ANL/Gold Star	1 every 10 d	36 Weekly
	Norasia	1 Weekly	52 Weekly
	Gold Star	1 per 3 days	122 Weekly
			384 Weekly (5.1% 9
North America (USA & Canada)	MSL	1 Weekly	104 Weekly
	CMA-CGM/ANL	1 every 10 d	36 Weekly
	Oldendorf	na	na
		2	140 Weekly (1.9%)
Central & South America, Caribbean Sea	MSL	1 Weekly	52 Weekly
	Oldendorf	na	na
			52 Weekly (0.7%)
Near-by in The Region	MSL	1 Weekly	52 Weekly
	TSK	1 per 3 days	122 Weekly
	Wan Hai	1 per 3 days	122 Weekly
	Gold Star	1 per 3 days	122 Weekly
	MISC/Dongnam/TSK	1 Weekly	52 Weekly
	Joo Tat/Hub	1 Weekly	52 Weekly
	Thorensen	1 Weekly	52 Weekly
	Hanjin/Dongnam	1 Weekly	52 Weekly
	Uniglory	1 every 10 d	36 Weekly
	CNC/Gold Star	1 Weekly	52 Weekly
	MISC/TSK	1 Weekly	52 Weekly
			766 Weekly (10.2%)
Taiwan & Other South Pacific	MSL	1 Weekly	52 Weekly
	Uniglory	1 per 3 days	122 Weekly
	Wan Hai	1 per 3 days	122 Weekly
	Yang Ming/CNC/TAL	1 per 3 days	122 Weekly
	MISC/TSK	1 Weekly	52 Weekly
	KMTC/Hyundai	1 Weekly	52 Weekly
	TSK/KMTC/NYK	1 Weekly	52 Weekly

Region	Shipping Lines	Frequency	Year Total
	Wan Hai	1 per 3 days	122 Weekly
	NGPL	every 15 days	26 Weekly
	AAL	every 15 days	26 Weekly
			748 Weekly (10.0%)
Australia & NZ	Gold Star	1 per 3 days	122 Weekly
	MSL	1 Weekly	52 Weekly
	AAL	every 10 days	36 Weekly
	NGPL	1 Weekly	52 Weekly
	Tasman Orient Line	every 15 days	26 Weekly
	AAL/NGPL	every 10 days	36 Weekly
			324 Weekly (4.3%)
Indian	MSL-1	Combined to Arabian Gulf Line (52 W.)	
Sub-Continent &	Gold Star	Combined to Arabian Gulf Line (52 W.)	
Indian Ocean	CMA-CGM/ANL/Gold Star	Combined to Arabian Gulf Line (52 W.)	
	Norasia	1 Weekly	52 Weekly
	Oldendorf	na	na
	MSL-2	1 Weekly	52 Weekly
			260 Weekly (3.5%)
Singapore	RCL/Hyundai	1 Weekly	52 Weekly
	16 Lines Group	1 Weekly	52 Weekly
	RCL	1 per 3 days	122 weekly
	18 Lines Group	1 Weekly	52 Weekly
	TSK/KMTC/NYK	1 per 3 days	122 Weekly
	Uniglory	1 Weekly	52 Weekly
	RCL/CMA-CGM/ANL	1 Weekly	52 Weekly
	Dongnama/Hanjin/Heug-A	1 Weekly	52 Weekly
	PIL/ACL/MISC	1 Weekly	52 Weekly
	MSC	1 Weekly	52 Weekly
	OOCL	1 Weekly	52 Weekly
	NGPL	every 10 days	36 Weekly
	MISC/Dongnama/TSK	1 Weekly	52 Weekly
	5 Lines Group	1 Weekly	52Weekly
	Thorensen	1 Weekly	52 Weekly
	Lykes/Marfret	every 10 days	36 Weekly
	Joo Tat/Hub Line	1 Weekly	52 Weekly
	Samudera Ind.	1 Weekly	52 Weekly
			1,024 Weekly (13.7%)
Hong Kong	KMTC/Hyundai/MSC/TSK	1 Weekly	52 Weekly
	Heug-A	1 Weekly	52 Weekly
	Uniglory	1 Weekly	52 Weekly
	TSK/KMTC/NYK	1 Weekly	52 Weekly
	Wan Hai	1 Weekly	52 Weekly
	Yang Ming/CNC/TSL	1 Weekly	52 Weekly
	5 Lines Group	1 Weekly	52 Weekly
	CNC	1 Weekly	52 Weekly
	Dongnama/Heug-A	1 Weekly	52Weekly
	MSL	1 Weekly	52 Weekly
	COSCO	1 Weekly	52 Weekly
			572 Weekly (7.6%)
Port Klang	MISC/China Shipping/Hub/RCL,	1 Weekly	52 Weekly
	PMS/China Shipping/Hub/QC Line,	1 Weekly	52 Weekly
	CMA-CGM/ANL/China S./Gold Star,	1 per 3 days	122 Weekly
	TSK	1 Weekly	52 Weekly
	TMS/Hub	1 Weekly	52 Weekly
	Thorensen	1 Weekly	52 Weekly
			382 Weekly (5.1%)
Laem Chabang	MSL	1 Weekly	52 Weekly
	Gold Star	1 per 3 days	122 Weekly
	Wan Hai	1 per 3 days	122 Weekly
	TSK	1 per 3 days	122 Weekly
	MSC	1 Weekly	52 Weekly

534. Many of the services are combined; for example the Arabian Gulf line is combined with the Indian Sub-Continent and Indian Ocean line. Thus, the total weekly service numbers (converted to weekly service frequency) of 7, 486 from JICT and TPK Koja is not equal to the actual numbers of container ships that sailed out from the two terminals in 2001.

535. However, the share of the weekly service of each route reflects the accessibility of Jakarta to/from the East-West Trunk Line. As has already been mentioned, the direct service is not necessarily appreciated by shippers and the main access routes to the East-West Trunk Route from Jakarta are centered in Singapore. The shuttle services to/from Singapore are daily. From Jakarta, two or three (sometimes even four) container ships are sailing to Singapore. The average size of the ships deployed is around 1,500/2,000 TEU type and the transit time is just one day or two days depending on the speed of ships.

536. As discussed in 5-B-1, the port status of Singapore in terms of calling frequency is overwhelming. The access channel through Hong Kong is narrower than Singapore. There are 1,024 weekly services between Jakarta and Singapore, while 572 weekly services between Jakarta and Hong Kong. Furthermore, the services to/from Singapore are nearly 100 % dedicated to the traffic to connect the mother vessels calling Singapore, while most of the services to/from Hong Kong are independent and those containers carried to Hong Kong onboard the ships deployed in this route are " on the way " containers. The fatal difference between Singapore and Hong Kong as a connecting port to the Trunk Line is the transit time. From Jakarta, Singapore can be reached in just one or two days, but it takes a minimum of four days to reach Hong Kong.

537. In terms of the transit time, both Laem Chabang and Port Klang are attractive to shippers wishing to connect to mother vessels. The access channels to/from these two ports are wider than imagined. The weekly service share of the two ports is 6.3% for Laem Chabang, and 5.1% for Port Klang (that of Hong Kong is 7.6 %). Tanjung Pelepas is still very young and it is early to evaluate an access channel to/ from Jakarta, but geographically, the port can be considered as a second Singapore.

2) Analysis of International Transshipment via Singapore

538. From a traditional view point, direct service is more attractive than a indirect transshipment service. Table 5-6 and Table 5-7 tell most eloquently of the magic of the modern transshipment service. The fact that the transshipment at Singapore is cheaper and quicker than a direct service seems to contradict traditional maritime knowledge.

539. Three years ago, the oldest Australia/UK direct service ended its long life of more than 150 years since the sailing boat days and replaced by a transshipment service via Singapore. Apart from sentiment, it was a customer oriented idea to switch the direct service to the indirect service, because of the cheaper charges and the shorter transit time. The switch was welcomed by many customers and immediately settled down.

540. How many containers are actually moving back and forth between Jakarta and Singapore? There are no appropriate statistics to show the exact figures of the international feeder containers traveling the route of the East-West Trunk Line via Singapore to/from Jakarta. However, it is possible to grasp approximate volume and share of those containers by making certain assumptions as follows:

- Calculation I

- Frequency of Service between Singapore/Jakarta

  5 sailings per day (Export 2.5 sailings, Import 2.5 sailings)

- Numbers of Containers

  Loaded at Jakarta per vessel: 600 TEU (per vessel average in March 2002)
  Unloaded at Jakarta per vessel: 500 TEU (per vessel average in March 2002)
  Total Containers: 1,000 TEU (assumed)

- 365 working days per year
- Total Import/Export Containers: Jakarta/Singapore

  5 sailings/day x 365 days = 1,825 sailings (total both ways)
  1,825 sailings x 1,000 TEU = 1,825,000 TEU
  2,222,000 TEU (International Container handled at Jakarta in the year 2002)
  Singapore feeder Ratio = 1,825,000 TEU÷2,222,000 TEU = 82.1 %

➢ Calculation II

The figures of Pelindo II (March, 2002)

- Singapore

  Unloading Containers from Singapore: 32,632 boxes x 1.4 = 45,684 TEU
  Loading Containers to Singapore: 37,419 boxes x 1.4 = 52,387 TEU
  Total: 98,071 TEU
  98,000 TEU/month x 12 = 1,176,000 TEU (Jakarta/Singapore Containers)
  1,176,000 TEU ÷ 2,222,000 TEU = 52.3 %

- Similar Calculation for Hong Kong

  10,418 boxes x 1.4 = 14585 TEU (Unloading & Loading)
  14,500 TEU x 12 = 174,000 TEU (Jakarta/Hong Kong Containers
  174,000 TEU ÷ 2,222,000 TEU= 7.8 %

- Port Klang

  12,170 boxes x 1.4 = 17,038 TEU (Unloading & Loading)
  17,000 TEU x 12 =204,000 TEU (Jakarta/Port Klang Containers)
  204,000 TEU ÷2,222,000 TEU = 9.2 %

- The total share of the three Major Transshipment Ports

  52.3 + 7.8 + 9.2 = 69.3%

541. About 50 % to 80% of the international ocean going containers handled at Jakarta are heading or coming from Singapore. It is also noteworthy that about 17-18% of the Jakarta containers are feedered to/from Hong Kong and Port Klang. Laem Chabang and Tanjung Pelepas will join this feeder network connecting the East-West Trunk Line in the quite near future.

542. The strong points of Singapore as an international hub port are summarized as follows:

- Geographically superior location
- Superior container terminal services
- Variety of feeder services
- Superior place for bunker supply
- Superior navigational aids system

543. The weak points of Singapore are few.

- Almost no home cargo (few local containers)
- Comparatively high charge level

544. Singapore will retain its strong position as long as the East-West Trunk Line remains unchanged. Any deviation from the trunk line would raise costs for shipping lines and this would sooner or later be reflected in the ocean freight level.

545. PSA is renowned for its high quality service. The precision of its terminal operation comes from the experience of handling numerous ships over the past 20 years.

546. PSA enjoys a solid reputation for container security and acts promptly whenever a problem arises.

547. Another sales point of Singapore is its wide feeder service network. Many shuttle services with Singapore have already established, not only from Jakarta but many other Indonesian ports as well. (See Table 8-F-2)

Table 8-F-2 Direct Sailings to Singapore from Indonesian Ports other than Jakarta

	From Port (Island) to Singapore	Shipping Lines	Frequency (Days)
1	Tanjung Perak (Surabaya-East Java)	Dongnama/Hanjin/Heug-A, Thorensen, Samudera, Ind/OOCL/P&O-N/Safmarine/Sinotrans, Uniglory, RCL, ACL/PIL/P&O-N, RCL/Hyundai, PIL/CMA-CGM/ANL,	3-4 daily services (2-3 days maximum: 11 days)
2	Medan (North Sumatra)	Samudela Ind, PIL/ACL, Dongnama/Heung-A, P&O-N	4 Weekly (1-5 days)
3	Panjang (South Sumatra)	P&O-N, Samudera Ind, RCL/ACL/Evergreen/Kien Hang/P&O-N /PIL/Samudera Ind/Uniglory, Samudera Ind/P&O-N	4 Weekly (2-4 days)
4	Pontianak (West Kalimantan)	Samudera Ind	1 Weekly (2 days)
5	Sampit (South Kalimantan)	Merarus	Every 10 days
6	Semarang (Central Java)	RCL/ACL/Evergreen/PIL/Uniglory, Samudera Ind/Kien Hung/Uniglory, RCL, Samudera Ind, Samudera Ind/Kien Hung/Uniglory, PIL/ACL/CMA-CGM/ANL,	6 Weekly (3-4 days)

Source: Indonesia Shipping Gazette, June 2002

548. The container charge level at Singapore is 20-30% higher than its competitor, Tanjung Pelepas. This caused many ocean carriers to reconsider the selection of the calling ports in the region. MSL, a closely related company of PSA moved to Tanjung Pelepas in 2000 and some major lines followed MSL.

549. This March, PSA saw its margins fall for the first time in its history. The charge level is quickly being adjusted to compete with the near-by competitors. Only outstanding weak point is, therefore, " no Home Cargo ". With a small population of only 3.5 million, Singapore has a quite limited amount of Local Containers.

550. Indonesia has a large population of 206.3 million (Source: Economist, World in Figures 2001) and this is the strongest point of Tanjung Priok. It must be taken into consideration in the strategic planning of the port.

3) Toward a Mother Port Status

551. The Jakarta Metropolitan port faces many challenges if it wishes to be a mother port instead of feeder port of Singapore. Items requiring improvement are compiled in Table 8-F-3. It should be noted that the current shortcomings of Jakarta are some of the main strength of Singapore.

Table 8-F-3 Main Items of Challenges for Jakarta becoming a second Singapore

Items	Existing Situation	Suggestions for Improvement
Container Terminal (Hardware)	Physical rehabilitation needed	Large scale rehabilitation
Container Terminal (Software)	EDI & Operation control by computer need to be improved	Brush up of EDI & yard computer system and training of terminal staff
Container Terminal (Humanware)	Interface with users need to be improved	Customer oriented service
Container Terminal Service Charge Level	Jakarta is one of the high charge ports in Asia	Reasonable and competitive charge level
Centralization of Inter Island Network	Major Indonesian ports are maintaining ties with Singapore and other ports skipping Jakarta	Try to minimize charge and transit time to compete with present direct routes from other island
Port Sales Efforts by Terminal Operators & Port Administration Body	Poor sales activity by both terminal operator and Pelindo II	Approach shipping lines and shippers to sell Jakarta

8-G. AVAILABLE SPACE FOR PORT EXPANSION/DEVELOPMENT

552. Table 8-G-1 shows available space for port expansion/development.

Table 8-G-1 Spatial Availability for Port Expansion/Development

	Availability of Space for Port Expansion/Development	Existing Facilities/Activities
Tanjung Priok	No space for expansion within the port. Most possible area for expansion will be east Ancol, followed by west and offshore of the port. In any case, land reclamation and relocation breakwaters will be needed.	Largest port in Indonesia with a lot of facilities for container, general cargo, bulk (dray & liquid) and passenger.
Banten /Ciwandan	There is space within the port for another new berth with 300m length, accompanying some land reclamation. A large breakwater and huge land reclamation will be necessary for large-scale expansion.	Public port handling general cargo and such bulk cargo as coal and cement but very few containers. Whole Banten port including private ports/wharves has large area and handles second largest volume of cargo in West Java area.
Banten /Merakmas	There is space for extending another berth with a length of 600m on the north side. Land reclamation will be necessary. Huge scale of breakwater and land reclamation will be necessary for large-scale expansion.	Private wharf for a paper company but handling container in joint operation with Pelindo II.
Banten /Bojonegara	There is enough space to develop a new port, however, breakwater and land reclamation is needed.	No port facilities except some fishery berths.
Cirebon	There is little space within the port that could be covered by the long existing breakwaters; possibly another new berth of 100m in length could be developed. Relocation/development of breakwater and huge dredging of access channels and land reclamation will be necessary for large-scale expansion.	Second largest public port in West Java area handling general cargo and bulk cargo. Regular container handling services have not yet been realized in spite of trials in the past.

8-H. SUMMARY - DEVELOPMENT POTENTIAL & CONSTRAINTS OF THE PORTS

553. Preliminary comparative analysis on the major ports in West Java area, i.e., Tanjung Priok, Banten/Ciwandan, Banten/Merakmas and Cirebon plus proposed port development site Bojonegara can be summarized in Table 8-H-1. Crucial factors in evaluating function/role of the port are:

- Potential demand
- Accessibility
- Spatial availability for port expansion/development
- Natural condition and,
- Environmental condition

Table 8-H-1 Summary of Development Potential & Constraints of the Ports in Western Java Area

Development Potential of Each Port in West Java Area

	Tanjung Priok	Banten/Ciwandan	Banten/Merakmas	Banten/Bojonegara	Cirebon
Location					
Distance from Jakarta	10km	110km	110km	130km	260km
Distance from Bandung	180km	290km	290km	310km	130km
Existing Facilities and Activities	Largest port in Indonesia with a lot of facilities for container, general cargo, bulk (dray & liquid) and passenger.	Public port handling general cargo and such bulk cargo as coal and cement but very few of container. Whole Banten port including private ports/wharves has large area and handles second largest volume of cargo in West Java area.	Private wharf for a paper company but handling container in joint operation with Pelindo II.	No port facilities except some fishery berths.	Second largest public port in West Java area handling general cargo and bulk cargo. Regular container handling services has not yet realized in spite of trials in the past.
Potential Demand					
Hinterland	Located in front of Jakarta metropolitan area, throughout whole West Java area especially concentrated in/around Jakarta which has a big potential of manufacturing with a lot of industrial estate.	Banten area especially distributed to the industrial estate in Serang regency and Ciregon city, one of the fastest growing area in West Java. Potentially, the hinterland may be distributed to west of Jakarta industrial area such as Tangerang. Furthermore, after the completion of outer ring road, it can be expanding to south and even just east side of Jakarta such as Bekasi.	Currently just a paper company is a sole hinterland, however, potential hinterland is same as Banten/Ciwandan.	Potential hinterland is same as Banten/Ciwandan.	Currently concentrating on Cirebon area. Potential hinterland is considered to be distributed to around Cirebon regency, however, which is overlapped by the hinterland of Tanjung Priok and Tanjung Emas due to its location of just middle point of both ports. However, realizing toll road linking Cikanpek and Jakarta, there is possibility that the hinterland will be extended to the industrial area in east of Jakarta.
Volume of Demand for Container	Huge volume of container demand with the backing of hinterland economic development, which can cover whole West Java area, with the estimation of 6~10 million TEUs in 2025 including domestic container. It is also possible that enough export/import container will lead to attract ocean-going trunk line as well as domestic feeder line, which will add another demand.	Potentially, the portion of Banten area including Tangerang will be counted as container demand, with the estimation of 20~30% of West Java area container.	Same as Banten/Ciwandan.	Same as Banten/Ciwandan.	Rather small volume of container demand due to the limited hinterland. However, feeder line for neighboring international/regional hub port can be realized depending on local cargo volume.
Accessibility	Despite of being close to the large potential area, accessibility is not always good at this moment due to lack of direct access to/from toll road with heavy traffic congestion in Jakarta metropolitan area. (3km to the nearest interchange) Realizing outer ring road and connecting the port with toll road network, accessibility will be greatly improved.	Very close to the industrial area and easy to access to/from toll road. It is 10km to the nearest interchange, however, access road condition is fairly good physically and traffic-wise.	Easy to access to/from toll road. It is 4km to the nearest interchange and access road is under fairly good condition physically and traffic-wise.	Currently rather difficult to access to/from toll road. It is 15km to the nearest interchange and access road condition is bad and not suitable for truck and trailer traffic. New access road of 16km should be developed to link with the existing toll road.	No toll road connection, however, few problems to/from the existing hinterland. Accessibility to/from industrial area in east of Jakarta and Bandung will be improved by realizing the planned toll road network.
Spatial Availability for Port Expansion/Development	No space for expansion within the port. Most possible area for expansion will be east Anchol, followed by west and offshore of the port. In any case, land reclamation and relocation breakwaters will be needed.	There is space within the port for another new berth with 300m length, accompanying few land reclamation. Huge scale of breakwater and land reclamation will be necessary for large-scale expansion.	There is space for extending another berth with the length of 600m to the north side. Land reclamation will be necessary. Huge scale of breakwater and land reclamation will be necessary for large-scale expansion.	There is enough space to develop a new port, however, breakwater and land reclamation is needed.	There is few space within the port surrounding by the long breakwaters, possibly another new berth with just 100m length. Relocation/developing of breakwater, huge dredging of access channels and land reclamation will be necessary for large-scale expansion.
Natural Condition					
Wave	Generally less than 1m, more than 1.5m mainly from W to NW (0.39%) and from NE to ENE (0.18%) direction.	Generally less than 1m. It is reported that swell with 2.5-3m from Indian Ocean. Currently, there is no breakwater.	Generally less than 1m. It is reported that swell with 2.5-3m from Indian Ocean.	Generally less than 1m (97.6%), more than 1.5m from W to WNW (0.15%) and from NE to ENE (0.18%) direction.	Generally less than 1.5m. Less than 2.5-3m from E direction.
Water Depth	Originally shallow beach with -10m depth line located at 4km offshore, however, existing port has already -14m depth.	Natural depth of port entrance is around -10m and existing port has the same depth.	Natural depth of port entrance is around -14~17m and existing port has -11m depth.	Natural depth of -12~14m line is located at around 1km offshore in the proposed port development area.	Extremely shallow beach with -10m depth line located at 30km offshore. The existing port has -7m depth.
Foundation	Sand and silty sand layer with N>50 at DL-20 to 30m	Hard sandy clay at DL-15 to 25m	Hard sandy clay at DL-15 to 25m	Volcanic-origin bedrock layer ranging at DL-8 to 17m	Sandy clay and silty sand layer with N>20 at DL-30m
Sedimentation	Not negligible due to drainage from the city and Siltation in the coast. 0.4-1.2m/year within the port.	Negligible	Negligible	Negligible	Not negligible due to siltation in the coast. 1.2-1.4m/year within the port.
Environmental Condition					
Natural Environment	Contamination of water and bed soil. Unplanned drainage system and garbage treatment.	Nothing to be remarkable., except air pollution caused by dust from coal terminal.	Nothing to be remarkable.	Living coral offshore side of Pulau Kali. Small mangrove forest.	Nothing to be remarkable., except air pollution caused by dust from coal terminal.
Social Environment	Serious traffic jam. Dense land use and population	Nothing to be remarkable.	Nothing to be remarkable.	Large scale of land acquisition is necessary to develop a new port with access road..	Moderate dense land use within the city.
Preliminary Evaluation (Possibility of Large-Scale Port Development)	(Possible)	(Limited)	(Limited)	(Possible)	(Difficult)
Investment Size	-	-	-	-	-