3.3.5 Port of Tanjung Perak

(1) Socioeconomic framework of the hinterland

38. The hinterland of Tanjung Perak port is East Jawa province whose population will reach 37 million in 2010. The GRDP growth rate of the hinterland is estimated by applying the correlation between the GDP growth rate of Indonesia and the GRDP growth rate of hinterland from 1984 to 1992.

The GRDP growth rate under each scenario is listed below.

Table 3.50 GRDP Growth

(Unit: %)

	1994-1998	199-2003	2004-2008	2009-2013	2014-2018
Scenario 1	6.1	6.6	6.8	7.1	7.5
Scenario 2	9.0	8.9	8.2	7.4	6.7
Scenario 3	5.9	6.0	5.7	5.5	5.2

(2) International container cargo traffic in 2010

39. International cargo is classified into export and import cargo, and further divided by cargo type such as liquid bulk cargo, dry bulk cargo, general cargo, bagged cargo, united cargo and container cargo. The elasticity between the increase rate of each cargo type and the GRDP growth rate is calculated, and by adopting this value, the future cargo volume of each cargo type is estimated for the three scenarios. The potential container cargo volume is estimated by assuming the final containerized ratio for each cargo type. The growth of the containerized ratio is estimated from the correlation between the past trend and the logistic curve, which is shown in **Fig.3.14.** Container cargo volume in the target year is forecast by multiplying potential container cargo volume by the containerized ratio. The results are shown in **Table 3.54 and .55** and summarized below.

Table 3.51 International Potential Container Cargo Volume

(Unit: 1,000 TEU)

Scenario 1	Export			Import			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	450	62	512	490	22	512	1,024
2010	754	215	969	946	23	969	1,938
2018	1,414	429	1,843	1,821	22	1,843	3,686
Scenario 2	Export			Import			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	634	66	700	629	71	700	1,400
2010	1,092	234	1,326	1,273	53	1,326	2,652
2018	1,865	447	2,312	2,282	30	2,312	4,624
Scenario 3	Export			Import			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	491	51	542	487	55	542	1,084
2010	725	155	880	845	35	880	1,760
2018	1,091	261	1,352	1,334	18	1,352	2,704

(3) Inter-island container cargo traffic in 2010

40. The inter-island cargo is classified into loading and unloading cargo, and further divided by cargo type such as liquid bulk cargo, dry bulk cargo, general cargo, bagged cargo, united cargo and container cargo. The elastic value between the increase rate of each cargo type and the GRDP is calculated, and by adopting this value, future cargo volume of each cargo type is estimated for the three scenarios. The potential of container cargo volume is estimated by assuming the final containerized ratio for each cargo type. The growth of containerized ratio is estimated from the correlation between the past trend and the logistic curve which is shown in see **Fig.3.15**. Container cargo volume in the target year is forecast by multiplying the potential container cargo volume

by the containerized ratio. The results are presented in **Table 3.56 and 3.57** and summarized below.

Table 3.52 Inter-island Potential Container Cargo Volume

(Unit: 1,000 TEU)

Scenario 1	Loading			Unloading			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	112	7	119	50	69	119	238
2010	207	10	217	117	100	217	434
2018	321	11	332	284	48	332	664
Scenario 2	Loading			Unloading			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	138	10	148	62	86	148	296
2010	278	13	291	157	134	291	582
2018	417	14	431	369	62	431	862
Scenario 3	Loading			Unloading			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	108	7	115	48	67	115	230
2010	185	9	194	104	90	194	388
2018	244	8	252	216	36	252	50

41. The inter-island container cargo traffic in 2010 is further estimated by adopting the 1992 OD table of inter-island cargo
shown in **Table 3.16** [Oil and coal shipment are not included in these figures]. The inter-island container cargo volume through Tanjung Perak port is estimated in **Table 3.17** and summarized below.

Table 3.53 Domestic Container Cargo Volume

(Unit: 1,000 TEU)

	Loading			Unloading			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2010	235	24	259	131	128	259	518

Table 3.54 Forecast of Container Cargo Traffic at Port of Tanjung Perak

(Scenario 1)

Type of Trade : Export

Port		CTI & CTTI and TJ Perak			Conventional	Form of Cargo			TJ. Perak	CTI & CTTI	Total	Container Ratio			CTI & CTTI		TJ. Perak		Total		Total
		Container Berth	Conventional Berth	Sub Total	Berth	Liquid Bulk Cargo	Dry Bulk Cargo	General Cargo	Container Cargo	Containerized Cargo	General Cargo	Potential Container Cargo	Container Cargo		Loaded Container	Empty Container	Loaded Container	Empty Container	Loaded Container	Empty Container	
		Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton				TEU	TEU	TEU	TEU	TEU	TEU	TEU
1978											1.000										
1979						0.938	0.943				1.072										
1980						99.82%	100.42%				114.17%										
1981						106.45%	106.45%		77.702	-	106.45%		77.702	7.12%	-		5.474	6.985	5.474	6.985	12.459
1982									71.323	-			71.323	6.54%	-		5.025	8.366	5.025	8.366	13.390
1983									126.679	-			126.679	11.61%	-		8.924	8.704	8.924	8.704	17.628
1984	6.13%		1.222.389	1.222.389	1.222.389	43.642	92.101	938.617	148.028	-	1.080.646	1.091.010	148.028	13.57%	-		10.428	5.219	10.428	5.219	15.648
1985	5.51%		1.055.724	1.055.724	1.055.724	34.856	73.559	749.653	197.656	-	947.309	950.794	197.656	20.79%	-		13.925	6.982	13.925	6.982	20.907
1986	6.17%		1.257.002	1.257.002	1.257.002	45.968	101.688	733.422	376.525	-	1.109.946	1.114.543	376.525	33.78%	-		26.830	9.222	26.830	9.222	36.052
1987	4.87%		1.622.437	1.622.437	1.622.437	60.353	86.491	976.829	498.763	-	1.475.593	1.481.628	498.763	33.66%	-		31.358	4.005	31.358	4.005	35.364
1988	6.63%		1.732.349	1.732.349	1.732.349	42.621	85.936	862.936	740.856	-	1.603.792	1.608.654	740.856	46.07%	-		46.483	2.399	46.483	2.399	48.883
1989	7.46%	793.629	1.465.201	2.168.830	1.465.201	38.087	86.974	1.089.496	250.644	703.629	2.043.769	2.047.578	954.273	46.60%	46.233	2.465	16.469	1.682	62.702	4.127	66.829
1990	8.02%	900.408	1.312.239	2.212.647	1.312.239	22.258	69.802	891.171	329.007	900.408	2.120.587	2.122.812	1.229.415	57.91%	62.243	6.552	22.743	806	84.986	7.358	92.344
1991	7.09%	1.180.578	1.163.367	2.343.945	1.163.367	36.935	81.795	570.788	473.850	1.180.578	2.225.216	2.228.909	1.054.427	74.23%	84.194	3.022	33.793	2.421	117.987	6.043	124.030
1992	6.19%	1.562.212	1.353.933	2.916.145	1.353.933	37.862	83.848	745.190	487.033	1.562.212	2.794.435	2.798.222	2.049.246	73.23%	115.504	5.701	36.009	2.059	151.513	7.760	159.274
1993	6.49%	2.140.549	1.549.932	3.690.481	1.549.932	34.301	76.095	978.948	460.529	2.140.549	3.580.026	3.583.402	2.601.078	72.59%	158.204	9.068	31.732	663	189.996	9.731	199.727
1994	6.30%					35.902	79.968				3.807.702	3.811.301	2.883.722	75.66%					213.609	10.680	224.289
1995	6.23%					37.655	83.936				4.044.863	4.048.628	3.177.406	78.48%					244.420	12.221	256.641
1996	6.10%					39.346	87.993				4.291.599	4.295.534	3.457.972	80.50%					276.638	13.832	290.470
1997	6.18%					41.143	92.314				4.558.681	4.560.795	3.736.189	81.92%					311.349	15.567	326.917
1998	6.25%					43.054	96.918				4.841.677	4.845.983	4.017.435	82.90%					349.342	17.467	366.809
1999	6.50%					45.159	101.988				5.156.497	5.161.012	4.313.421	83.58%					392.129	19.606	411.736
2000	6.54%					47.381	107.358				5.493.559	5.498.297	4.620.615	84.04%					420.056	21.003	441.059
2001	6.57%					49.736	113.048				5.854.566	5.859.539	4.942.505	84.35%					449.319	22.466	471.785
2002	6.61%					52.215	119.086				6.241.708	6.246.930	5.282.487	84.56%					480.228	38.247	518.473
2003	6.65%					54.846	125.495				6.657.062	6.662.546	5.643.465	84.70%					513.042	53.316	566.358
2004	6.70%					57.632	132.302				7.102.879	7.108.642	6.028.186	84.80%					548.017	70.547	618.564
2005	6.74%					60.584	139.535				7.581.611	7.587.609	6.439.341	84.87%					585.395	87.827	673.221
2006	6.78%					63.713	147.223				8.095.921	8.102.202	6.879.631	84.91%					625.421	105.106	730.527
2007	6.84%					67.040	155.417				8.649.751	8.656.455	7.352.724	84.94%					668.429	122.403	790.832
2008	6.90%					70.579	164.158				9.246.509	9.253.507	7.861.749	84.96%					714.704	139.769	854.473
2009	6.96%					74.347	173.485				9.889.931	9.897.305	8.410.035	84.97%					764.549	157.288	921.837
2010	7.02%					78.359	183.448				10.584.111	10.591.946	9.001.192	84.98%					818.290	175.073	993.363
2011	7.08%					82.636	194.094				11.333.542	11.341.806	9.639.121	84.99%					876.284	193.252	1.069.535
2012	7.15%					87.206	205.498				12.144.323	12.153.644	10.329.068	84.99%					939.006	211.990	1.150.996
2013	7.23%					92.092	217.724				13.022.178	13.031.388	11.075.944	84.99%					1.006.904	231.449	1.238.353
2014	7.30%					97.322	230.841				13.973.432	13.983.165	11.885.159	85.00%					1.080.469	251.802	1.332.271
2015	7.38%					102.923	244.927				15.005.079	15.015.372	12.762.982	85.00%					1.160.244	273.231	1.433.475
2016	7.46%					108.928	260.065				16.124.860	16.135.753	13.715.112	85.00%					1.246.828	295.930	1.542.759
2017	7.54%					115.371	276.348				17.341.952	17.352.889	14.749.755	85.00%					1.340.887	320.104	1.660.990
2018	7.63%					122.289	293.678				18.664.069	18.676.208	15.874.708	85.00%					1.443.155	345.968	1.789.123
2019	7.71%					129.724	312.708				20.103.571	20.116.543	17.098.957	85.00%					1.554.451	373.756	1.928.207
2020	7.80%					137.723	333.140				21.671.597	21.685.369	18.432.487	85.00%					1.675.681	403.717	2.079.398

Source : TPT III and Estimated by The Study Team

Table 3.55 Forecast of Container Cargo Traffic at Port of Tanjung Perak

(Scenario 1)

Type of Trade : Import

Port	GDP Increase Rate	CTI & CTII and TJ. Perak Container Conventional			TJ. Perak Conventional	Form of Cargo				CTI & CTI Container	Total General	Container Ratio			CTI & CTII		TJ. Perak		Total		Total
		Berth	Berth	Sub Total	Berth	Liquid Bulk Cargo	Dry Bulk Cargo	General Cargo	Container Cargo	Container Cargo	Cargo	Potential Container Cargo	Container Cargo		Loaded Container	Empty Container	Loaded Container	Empty Container	Loaded Container	Empty Container	
Unit	(Scenario)	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton				TEU	TEU	TEU	TEU	TEU	TEU	TEU
1978											1.000										
1979						0.985	0.988				1.028										
1980						104.84%	105.18%				110.07%										
1981						106.45%	106.45%		131.408	-	107.05%		131.408	2.16%		-	10.513	1.312	10.513	1.312	11.825
1982									146.906	-			146.906	5.01%		-	11.752	896	11.752	896	12.648
1983									187.073	-			187.073	10.38%		-	14.960	1.607	14.960	1.607	16.573
1984	6.13%	-	2.019.162	2.019.162	2.019.162	70.805	152.387	1.491.422	304.488	-	1.795.910	1.802.997	304.488	16.89%	-	-	24.359	1.699	24.359	1.699	26.059
1985	5.51%	-	2.365.177	2.365.177	2.365.177	87.912	189.044	1.850.184	238.037	-	2.088.222	2.097.013	238.037	11.35%	-	-	19.043	6.107	19.043	6.107	25.150
1986	6.17%	-	2.557.522	2.557.522	2.557.522	118.990	261.673	1.898.510	278.349	-	2.176.858	2.188.757	278.349	12.72%	-	-	25.289	6.314	25.289	6.314	31.603
1987	4.87%	-	2.519.879	2.519.879	2.519.879	117.581	168.502	1.903.062	330.735	-	2.233.797	2.245.555	330.735	14.73%	-	-	20.188	9.097	20.188	9.097	35.285
1988	6.63%	-	2.634.120	2.634.120	2.634.120	95.357	192.267	1.930.670	415.826	-	2.346.496	2.356.031	415.826	17.65%	-	-	32.328	13.879	32.328	13.879	40.207
1989	7.46%	422.106	2.575.024	2.997.130	2.575.024	76.928	175.672	2.200.583	121.840	422.106	2.744.529	2.752.222	543.947	19.76%	34.414	12.518	9.934	7.178	44.348	19.696	64.044
1990	8.02%	595.459	2.549.412	3.144.871	2.549.412	54.228	170.060	2.171.177	153.946	595.459	2.920.583	2.926.005	749.406	25.61%	51.397	13.098	13.288	9.990	64.685	23.088	87.773
1991	7.09%	638.161	3.430.811	4.068.972	3.430.811	171.722	380.291	2.653.787	225.011	638.161	3.510.959	3.534.131	863.172	24.42%	56.042	23.391	19.760	11.353	75.802	34.744	110.546
1992	6.19%	933.609	3.576.285	4.509.894	3.576.285	150.274	332.793	2.957.685	135.554	933.609	4.026.828	4.041.855	1.059.163	26.45%	85.000	30.385	12.341	14.232	97.341	44.617	141.958
1993	6.49%	1.103.307	3.678.694	4.782.001	3.678.694	108.444	240.157	3.089.587	240.500	1.103.307	4.433.400	4.444.245	1.343.813	30.24%	100.450	55.724	21.615	225	122.065	55.949	178.014
1994	6.30%					113.592	252.383				4.715.348	4.726.707	1.609.325	34.05%					134.027	90.202	224.229
1995	6.23%					118.839	264.904				5.009.041	5.020.925	1.913.725	38.11%					106.411	90.231	256.641
1996	6.10%					124.177	277.710				5.314.593	5.327.011	2.252.653	42.29%					204.787	85.683	290.470
1997	6.18%					129.849	291.346				5.642.862	5.655.847	2.627.926	46.46%					238.902	88.014	326.917
1998	6.25%					135.880	305.875				5.995.794	6.009.382	3.038.618	50.56%					276.238	90.572	366.809
1999	6.50%					142.522	321.877				6.385.057	6.399.909	3.488.019	54.52%					317.174	94.501	411.736
2000	6.54%					149.537	338.820				6.803.065	6.818.019	3.971.649	58.25%					361.059	80.000	441.059
2001	6.57%					156.949	356.784				7.250.125	7.265.820	4.484.960	61.73%					407.724	64.061	471.785
2002	6.61%					164.791	375.839				7.729.552	7.746.031	5.027.618	64.91%					457.058	59.417	516.473
2003	6.65%					173.094	396.067				8.243.913	8.261.223	5.588.765	67.67%					508.979	57.380	566.358
2004	6.70%					181.887	417.550				8.796.001	6.814.189	6.198.245	70.32%					563.477	55.087	618.564
2005	6.74%					191.204	440.375				9.388.848	9.407.908	6.820.080	72.56%					620.607	52.614	673.221
2006	6.78%					201.081	464.639				10.025.755	10.045.863	7.485.470	74.51%					680.498	50.030	730.527
2007	6.84%					211.580	490.502				10.711.602	10.732.766	8.177.782	76.19%					743.435	47.398	790.832
2008	6.90%					222.750	518.087				11.450.610	11.472.885	8.966.760	77.63%					809.706	44.767	854.473
2009	6.96%					234.640	547.527				12.247.405	12.270.869	9.676.278	78.86%					879.682	42.175	921.857
2010	7.02%					247.304	578.968				13.107.057	13.131.788	10.490.813	79.89%					953.710	39.853	993.563
2011	7.08%					260.802	612.567				14.035.132	14.061.212	11.355.463	80.76%					1.032.315	37.221	1.069.535
2012	7.15%					275.224	648.558				15.039.180	15.066.702	12.277.080	81.48%					1.116.059	34.897	1.150.956
2013	7.23%					290.640	687.142				16.126.290	16.155.355	13.262.279	82.09%					1.205.662	32.691	1.238.353
2014	7.30%					307.151	728.541				17.304.296	17.335.011	14.318.304	82.60%					1.301.664	30.608	1.332.271
2015	7.38%					324.829	772.995				18.581.858	18.614.340	15.453.127	83.02%					1.404.830	28.645	1.433.475
2016	7.46%					343.780	820.771				19.968.562	20.002.940	16.675.483	83.37%					1.515.953	26.806	1.542.759
2017	7.54%					364.113	872.182				21.475.031	21.511.442	17.994.959	83.65%					1.635.905	25.085	1.660.990
2018	7.63%					385.947	927.487				23.113.045	23.151.640	19.422.090	83.89%					1.765.845	23.479	1.789.123
2019	7.71%					409.414	987.103				24.895.683	24.930.624	20.968.474	84.09%					1.906.225	21.982	1.928.207
2020	7.80%					434.659	1.051.400				26.837.481	26.880.940	22.646.908	84.25%					2.058.810	20.588	2.079.398

Source : PIPI III and Estimated by The Study Team

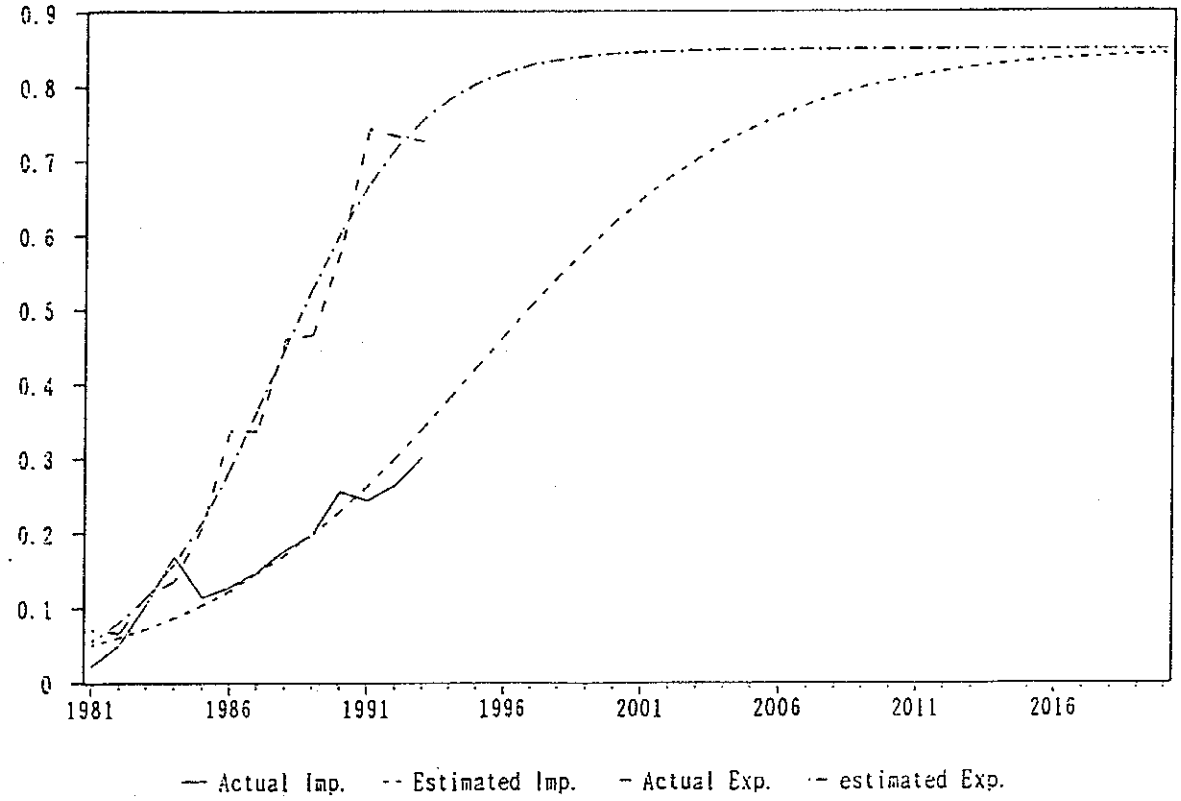


Fig. 3.14 Forecast of Container Rate at Tanjung Perak
(Unit: %)

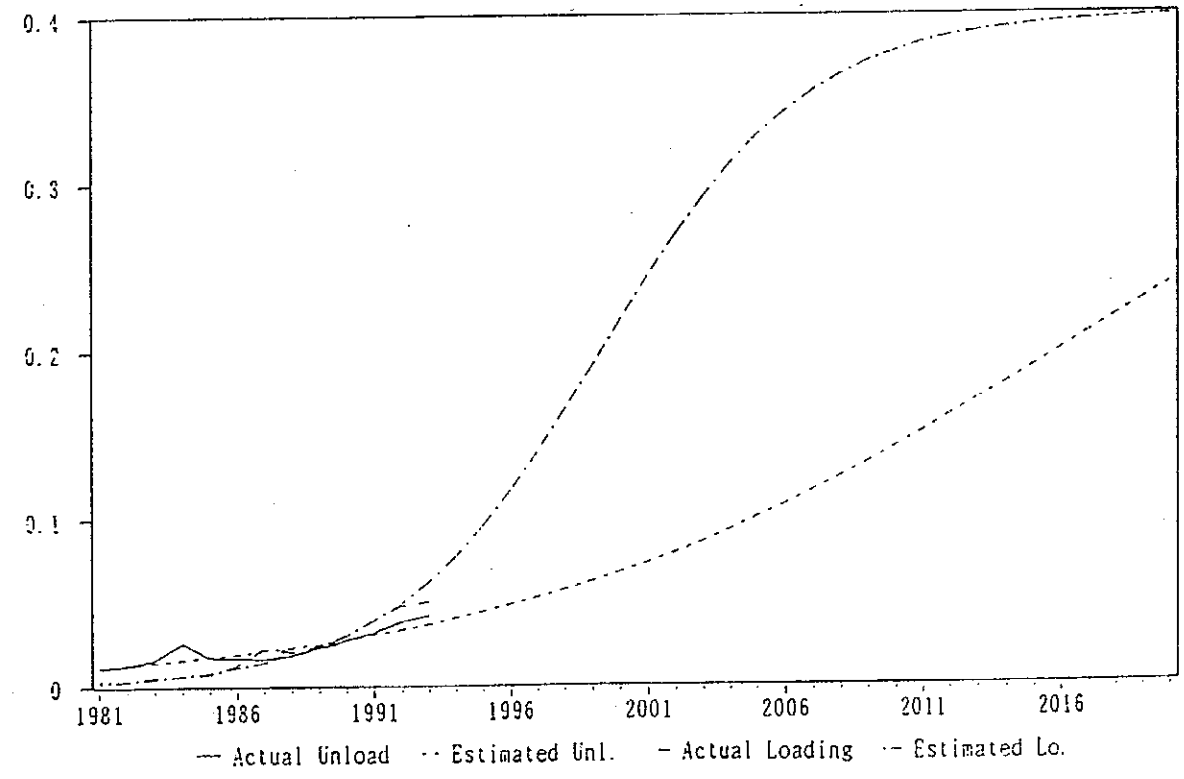


Fig. 3.15 Forecast of Container Rate at Tanjung Perak
(Unit; %)

Table 3.56 Forecast of Inter-island Container Cargo Traffic at Port of Tanjung Perak

(Scenario 1)

Type of Trade Loading

Unit	GRDP Increase Rate	Loading Ton	Form of Cargo: Liquid Bu Cargo Ton	Dry Bulk Cargo Ton	General Cargo Ton	Container Cargo Ton	Total General Cargo Ton	Container Ratio: Potential Container Cargo	Container Cargo		Tj. Perak: Loaded Container TEU	Empty Container TEU	Total TEU
1978													
1979			0.969	0.971			0.976						
1980			103.17%	103.32%			103.93%						
1981			106.45%	106.45%		6,069	106.45%		6,069	0.31%	446	1,018	1,464
1982						5,571			5,571	0.29%	409	1,227	1,637
1983						9,895			9,895	0.51%	727	1,357	2,084
1984	6.13%	2,217,362	89,435	195,504	1,920,860	11,563	1,932,423	1,941,366	11,563	0.60%	850	2,543	3,392
1985	5.51%	2,597,207	104,678	228,827	2,248,262	15,439	2,263,701	2,274,169	15,439	0.68%	1,134	1,518	2,652
1986	6.17%	2,850,970	147,241	323,800	2,349,255	30,674	2,379,929	2,394,653	30,674	1.28%	2,186	1,336	3,522
1987	4.87%	2,028,076	106,747	152,976	1,727,720	40,632	1,768,352	1,779,027	40,632	2.28%	2,555	1,093	3,647
1988	6.63%	3,358,592	141,781	285,869	2,870,587	60,355	2,930,942	2,945,120	60,355	2.05%	3,787	716	4,502
1989	7.46%	3,495,821	107,186	244,768	3,066,125	77,741	3,143,866	3,154,585	77,741	2.46%	5,108	1,068	6,176
1990	8.02%	3,720,725	81,962	257,033	3,281,574	100,156	3,381,730	3,389,926	100,156	2.95%	6,924	2,085	9,009
1991	7.09%	4,040,826	209,231	463,359	3,233,456	134,780	3,368,236	3,389,159	134,780	3.98%	9,612	945	10,557
1992	6.19%	4,028,462	168,651	373,492	3,319,375	166,944	3,486,319	3,503,184	166,944	4.77%	12,343	1,214	13,557
1993	6.49%	3,933,936	118,466	262,352	3,375,119	178,000	3,553,119	3,564,965	178,000	4.99%	15,478	1,522	17,000
1994	6.36%		122,116	270,826			3,689,308	3,701,520	230,000	6.21%	18,400	1,840	20,240
1995	6.23%		125,724	279,229			3,825,994	3,838,567	297,594	7.75%	23,807	2,273	26,080
1996	6.10%		129,281	287,545			3,962,946	3,975,874	380,296	9.57%	30,424	2,773	33,197
1997	6.18%		133,036	296,323			4,107,769	4,121,073	480,026	11.65%	38,402	3,342	41,744
1998	6.25%		136,999	305,593			4,261,002	4,274,702	597,449	13.98%	47,796	3,971	51,767
1999	6.50%		141,410	315,887			4,430,259	4,444,400	733,293	16.50%	58,663	4,654	63,317
2000	6.54%		146,010	326,633			4,607,726	4,622,327	884,831	19.14%	70,787	5,361	76,148
2001	6.57%		150,809	337,856			4,793,867	4,808,948	1,049,129	21.82%	83,930	6,069	90,000
2002	6.61%		155,825	349,599			4,989,456	5,005,039	1,222,528	24.43%	97,802	6,752	104,555
2003	6.65%		161,072	361,892			5,195,063	5,211,170	1,401,090	26.89%	112,087	7,389	119,476
2004	6.70%		166,562	374,766			5,411,294	5,427,950	1,581,211	29.13%	126,497	7,961	134,458
2005	6.74%		172,308	388,255			5,638,799	5,656,030	1,760,057	31.12%	140,805	8,461	149,265
2006	6.78%		178,326	402,395			5,878,274	5,896,107	1,935,788	32.83%	154,863	8,884	163,747
2007	6.84%		184,652	417,272			6,131,202	6,149,668	2,107,816	34.28%	168,625	9,236	177,861
2008	6.90%		191,307	432,936			6,398,502	6,417,633	2,276,227	35.47%	182,098	9,523	191,621
2009	6.96%		198,313	449,437			6,681,166	6,700,997	2,441,748	36.44%	195,340	9,753	205,093
2010	7.02%		205,691	466,831			6,980,264	7,000,833	2,605,527	37.22%	208,442	9,936	218,378
2011	7.08%		213,466	485,178			7,296,954	7,318,300	2,768,953	37.84%	221,516	10,081	231,598
2012	7.15%		221,687	504,590			7,633,219	7,655,387	2,933,796	38.32%	234,704	10,198	244,902
2013	7.23%		230,385	525,144			7,990,546	8,013,585	3,101,626	38.70%	248,130	10,294	258,424
2014	7.30%		239,594	546,925			8,370,558	8,394,517	3,273,984	39.00%	261,919	10,374	272,293
2015	7.38%		249,353	570,024			8,775,019	8,799,954	3,452,366	39.23%	276,189	10,444	286,634
2016	7.46%		259,702	594,539			9,205,856	9,231,826	3,638,222	39.41%	291,058	10,509	301,566
2017	7.54%		270,686	620,579			9,665,173	9,692,242	3,832,968	39.55%	306,637	10,570	317,207
2018	7.63%		282,353	648,262			10,155,270	10,183,505	4,038,000	39.65%	323,040	10,632	333,672
2019	7.71%		294,756	677,715			10,678,662	10,708,137	4,254,720	39.73%	340,378	10,695	351,073
2020	7.80%		307,952	709,080			11,238,102	11,268,898	4,484,551	39.80%	358,764	10,763	369,527

Source : PTPI III and Estimated by The Study Team

Table 3.57 Forecast of Inter-island Container Cargo Traffic at Port of Tanjung Perak

Type of Trade Unloading (Scenario 1)

Unit	GRDP Increase Rate	Unloading Ton	Form of Cargo: Liquid Bul Cargo Ton	Dry Bulk Cargo Ton	General Cargo Ton	Container Cargo Ton	Total General Cargo Ton	Container Ratio: Potential Container Cargo	Container Cargo		Tj. Perak: Loaded Container TEU	Empty Container TEU	Total TEU
1978													
1979			0.945	0.946	1.058		0.985						
1980			100.64%	100.74%	112.63%		104.88%						
1981			106.45%	106.45%	106.45%	16,561	106.45%		16,561	1.12%	1,451	13	1,464
1982						18,514			18,514	1.26%	1,623	14	1,637
1983						23,576			23,576	1.60%	2,066	18	2,084
1984	6.13%	1,676,408	66,630	143,644	1,427,761	38,373	1,466,134	1,472,797	38,373	2.61%	3,363	30	3,392
1985	5.51%	2,056,655	82,438	177,724	1,766,495	29,999	1,796,493	1,804,737	29,999	1.66%	2,629	23	2,652
1986	6.17%	2,716,211	139,801	307,438	2,230,544	38,428	2,268,972	2,282,952	38,428	1.68%	3,491	31	3,522
1987	4.87%	3,203,454	169,608	243,060	2,745,126	45,660	2,790,786	2,807,747	45,660	1.63%	3,615	32	3,647
1988	6.63%	3,552,454	150,241	302,928	3,041,878	57,407	3,099,286	3,114,310	57,407	1.84%	4,463	39	4,502
1989	7.46%	3,692,151	113,426	259,017	3,244,613	75,095	3,319,708	3,331,051	75,095	2.25%	6,122	54	6,176
1990	8.02%	4,147,616	91,551	287,105	3,665,500	103,460	3,768,960	3,778,115	103,460	2.74%	8,930	79	9,009
1991	7.09%	4,464,826	232,779	515,508	3,597,372	119,166	3,716,538	3,739,816	119,166	3.19%	10,465	92	10,557
1992	6.19%	4,446,533	187,755	415,799	3,695,374	147,605	3,842,979	3,861,754	147,605	3.82%	13,439	118	13,557
1993	6.49%	4,817,926	146,221	323,819	4,165,886	182,000	4,347,886	4,362,508	182,000	4.17%	16,852	148	17,000
1994	6.36%		147,032	325,940			4,555,944	4,570,648	183,607	4.02%	15,301	4,939	20,240
1995	6.23%		147,665	327,670			4,768,072	4,782,838	209,992	4.39%	17,499	8,581	26,080
1996	6.10%		148,121	329,011			4,984,042	4,998,854	239,648	4.79%	19,971	13,226	33,197
1997	6.18%		148,686	330,597			5,213,563	5,228,431	273,407	5.23%	22,784	18,960	41,744
1998	6.25%		149,362	332,433			5,457,645	5,472,582	311,802	5.70%	25,983	25,784	51,767
1999	6.50%		150,391	335,060			5,726,479	5,741,519	355,989	6.20%	29,666	33,652	63,317
2000	6.54%		151,477	337,816			6,010,495	6,025,643	406,047	6.74%	33,837	42,311	76,148
2001	6.57%		152,620	340,705			6,310,658	6,325,920	462,657	7.31%	38,555	51,445	90,000
2002	6.61%		153,831	343,753			6,628,373	6,643,756	526,589	7.93%	43,882	60,672	104,555
2003	6.65%		155,112	346,964			6,964,814	6,980,325	598,654	8.58%	49,888	69,588	119,476
2004	6.70%		156,467	350,344			7,321,244	7,336,890	679,723	9.26%	56,644	77,814	134,458
2005	6.74%		157,896	353,900			7,699,019	7,714,809	770,731	9.99%	64,228	85,038	149,265
2006	6.78%		159,405	357,638			8,099,602	8,115,542	872,669	10.75%	72,722	91,025	163,747
2007	6.84%		161,013	361,609			8,525,591	8,541,693	986,709	11.55%	82,226	95,636	177,861
2008	6.90%		162,727	365,824			8,978,881	8,995,154	1,114,003	12.38%	92,834	98,787	191,621
2009	6.96%		164,551	370,294			9,461,525	9,477,980	1,255,773	13.25%	104,648	100,445	205,093
2010	7.02%		166,489	375,030			9,975,755	9,992,404	1,413,297	14.14%	117,775	100,603	218,378
2011	7.08%		168,546	380,046			10,523,994	10,540,848	1,587,920	15.06%	132,327	99,271	231,598
2012	7.15%		170,746	385,391			11,109,940	11,127,015	1,781,212	16.01%	148,434	96,468	244,902
2013	7.23%		173,095	391,085			11,736,687	11,753,997	1,994,703	16.97%	166,225	92,199	258,424
2014	7.30%		175,602	397,145			12,407,620	12,425,180	2,230,001	17.95%	185,833	86,459	272,293
2015	7.38%		178,274	403,592			13,126,446	13,144,274	2,488,795	18.93%	207,400	79,234	286,634
2016	7.46%		181,121	410,449			13,897,233	13,915,345	2,772,867	19.93%	231,072	70,494	301,566
2017	7.54%		184,154	417,738			14,724,441	14,742,857	3,084,101	20.92%	257,008	60,199	317,207
2018	7.63%		187,382	425,487			15,612,976	15,631,714	3,424,499	21.91%	285,375	48,297	333,672
2019	7.71%		190,817	433,722			16,568,228	16,587,310	3,796,198	22.89%	316,350	34,723	351,073
2020	7.80%		194,473	442,474			17,596,134	17,615,581	4,201,495	23.85%	350,125	19,402	369,527

Source : PTPI III and Estimated by The Study Team

3.3.6 Port of Ujung Pandang

(1) Socioeconomic framework of the hinterland

42. The hinterland of Ujung Pandang port is South Sulawesi province whose population will reach 8.7 million in 2010. The GRDP growth rate of the hinterland is estimated by applying the correlation between the GDP growth rate of Indonesia and the GRDP growth rate of hinterland from 1984 to 1992.

The GRDP growth rate under each scenario is listed below.

Table 3.58 GRDP Growth

(Unit: %)

	1994-1998	199-2003	2004-2008	2009-2013	2014-2018
Scenario 1	6.8	7.1	7.1	7.1	7.0
Scenario 2	10.0	9.6	8.6	7.5	6.3
Scenario 3	6.6	6.5	6.0	5.5	4.8

(2) International container cargo traffic in 2010

43. International cargo is classified into export and import cargo, and further divided by cargo type such as liquid bulk cargo, dry bulk cargo, general cargo, bagged cargo, united cargo and container cargo. The elasticity between the increase rate of each cargo type and the GRDP growth rate is calculated, and by adopting this value, the future cargo volume of each cargo type is estimated for the three scenarios. The potential container cargo volume is estimated by assuming the final containerized ratio for each cargo type. The growth of the containerized ratio is estimated from the correlation between the past trend and the logistic curve, which is shown in **Fig.3.16.** Container cargo volume in the target year is forecast by multiplying potential container cargo volume by the containerized ratio. The results are shown in **Table 3.64 and .65** and summarized below.

Table 3.59 International Potential Container Cargo Volume

(Unit: 1,000 TEU)

Scenario 1	Export			Import			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	36	3	39	2	37	39	78
2010	67	4	71	3	68	71	142
2018	119	6	125	6	119	125	250

Scenario 2	Export			Import			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	44	4	48	3	45	48	96
2010	89	6	95	5	90	95	190
2018	152	8	160	8	152	160	320

Scenario 3	Export			Import			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	33	3	36	2	34	36	72
2010	57	4	61	3	58	61	122
2018	85	5	90	4	86	90	180

(3) Inter-island container cargo traffic in 2010

44. The inter-island cargo is classified into loading and unloading cargo, and further divided by cargo type such as liquid bulk cargo, dry bulk cargo, general cargo, bagged cargo, united cargo and container cargo. The elastic value between the increase rate of each cargo type and the GRDP is calculated, and by adopting this value, future cargo volume of each cargo type is estimated for the three scenarios. The potential of container cargo volume is estimated by assuming the final containerized ratio for each cargo type. The growth of containerized ratio is estimated from the correlation between the past trend and the logistic curve which is shown in see **Fig.3.15**. Container cargo volume in the target year is forecast by multiplying the potential container cargo volume

by the containerized ratio. The results are presented in **Table 3.66 and .67** and summarized below.

Table 3.60 Inter-island Potential Container Cargo Volume

(Unit: 1,000 TEU)

Scenario 1	Loading			Unloading			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	47	35	82	80	2	82	164
2010	76	59	135	132	3	135	270
2018	133	102	235	230	5	235	470
Scenario 2	Loading			Unloading			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	60	45	105	102	3	105	210
2010	106	82	188	184	4	188	376
2018	181	138	319	313	6	319	638
Scenario 3	Loading			Unloading			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2003	45	34	79	77	2	79	158
2010	68	52	120	117	3	120	240
2018	101	78	179	175	4	179	358

45. The inter-island container cargo traffic in 2010 is further estimated by adopting the 1992 OD table of inter-island cargo shown in **Table 3.16** [Oil and coal shipment are not included in these figures]. The inter-island container cargo volume through Ujung Pandang port is estimated in **Table 3.17** and summarized below.

Table 3.61 Domestic Container Cargo Volume

(Unit: 1,000 TEU)

	Loading			Unloading			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2010	22	113	135	103	32	135	270

(4) Effect of the new container terminal on container cargo flow.

46. In 1997, the new container terminal will be completed and begin operations. If container liners call at the port of Ujung Pandang and are served properly, cargo flow will change as follows.

1) Approximately fifty percent of the container cargo originating in the hinterland of Ujung Pandang port and presently exported via Tanjung Perak and Tanjung Priok port will be exported directly from the port of Ujung Pandang.

2) Approximately fifty percent of the container cargo destinated for hinterland of Ujung Pandang port and presently imported via Tanjung Perak and Tanjung Priok port will be imported directly from the port of Ujung Pandang.

3) Twenty or thirty percent of the container cargo originating in the Eastern Indonesia which is presently exported via Tanjung Perak and Tanjung Priok port will be exported via port of Ujung Pandang.

4) Twenty or thirty percent of the container cargo destinated for the Eastern Indonesia which is presently imported via Tanjung Perak and Tanjung Priok port will be imported via port of Ujung Pandang.

47. Based on these projected changes, the container cargo traffic through the port of Ujung Pandang in 2010 is estimated as follows.

Table 3.62 Container Cargo Traffic

(Unit: 1,000 TEU)

	Export			Import			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2010	122	69	191	108	83	191	382

Table 3.63 Container Cargo Traffic

(Unit: 1,000 TEU)

	Loading			Unloading			Total
	Loaded	Empty	Total	Loaded	Empty	Total	
2010	67	68	135	83	52	135	27

Table 3.64 Forecast of International Container cargo Traffic at Port of Hjung Panding

(Scenario 1)

Type of Trade Export

Port	GDP	Makassar Total	Container	Convention	Form of Cargo					Container			Container		
					Bagged Cargo	Dry Bulk Cargo	Liquid Bul Cargo	General Cargo	General Cargo	Potential Container	Container Cargo	Ratio	Loaded Container	Empty Container	Total
Unit	Increase Rate	Ton	Cargo Ton	Cargo Ton	Ton	Ton	Ton	Ton	Ton		Ton		TEU	TEU	TEU
					1.021	1.070	0.999		1.014						
					109.49%	114.73%	107.11%		108.74%						
					107.22%	107.22%	107.22%		107.22%						
				148,613											
1984	4.45%	148,683	70	148,613	34,742	8,203	26,058	79,519	79,589	99,566	70	0.07%	7		
1985	7.43%	139,124	32	139,092	30,352	17,023	26,392	65,325	65,357	83,172	32	0.04%	3		
1986	9.36%	294,139	67	294,072	62,908	38,334	29,879	162,861	162,927	197,414	67	0.03%	6		
1987	3.58%	321,260	96	321,164	74,104	42,697	36,633	167,730	167,826	208,541	96	0.05%	9		
1988	10.01%	285,590	283	285,307	79,432	22,130	54,908	128,837	129,120	174,327	283	0.16%	27		
1989	6.48%	307,376	1,033	306,343	76,989	19,357	46,562	163,436	164,469	207,619	1,033	0.50%	97		
1990	6.74%	323,488	1,130	322,358	90,386	16,970	52,763	162,239	163,369	213,838	1,130	0.53%	110		
1991	9.96%	334,290	3,065	331,225	137,257	18,631	2,613	172,724	175,789	244,679	3,065	1.25%	284		
1992	6.90%	323,307	3,995	319,312	108,525	26,988	41,870	141,929	145,924	204,373	3,995	1.95%	400	90	490
1993	7.24%	441,430	6,500	434,930	172,835	51,110	48,352	162,624	169,124	260,377	6,500	2.50%	572	255	827
1994	7.09%				185,348	54,097	51,729		181,284	279,131	13,542	4.85%	1,231	123	1,354
1995	6.94%				198,489	59,083	55,266		194,050	298,821	23,721	7.94%	2,156	210	2,366
1996	6.80%				212,273	63,383	58,966		207,432	319,465	40,500	12.68%	3,682	349	4,031
1997	6.89%				227,199	68,053	62,964		221,918	341,814	66,755	19.53%	6,069	560	6,629
1998	6.97%				243,375	73,131	67,288		237,610	366,026	104,755	28.62%	9,523	856	10,379
1999	7.12%				261,064	78,700	72,006		254,760	392,493	154,621	39.39%	14,056	1,230	15,287
2000	7.12%				280,033	84,693	77,054		273,144	420,866	212,902	50.59%	19,355	1,649	21,004
2001	7.11%				300,376	91,140	82,454		292,851	451,285	274,040	60.72%	24,913	2,067	26,980
2002	7.11%				322,192	98,076	88,231		313,973	483,892	333,065	68.83%	30,279	2,446	32,725
2003	7.11%				345,585	105,539	94,412		336,613	518,846	387,522	74.69%	35,229	2,771	38,001
2004	7.11%				370,669	113,566	101,023		360,878	556,315	437,386	78.62%	39,762	3,046	42,808
2005	7.11%				397,567	122,202	108,095		386,885	596,478	483,936	81.13%	43,994	3,281	47,275
2006	7.10%				426,408	131,492	115,660		414,759	639,528	528,786	82.68%	48,071	3,491	51,562
2007	7.10%				457,329	141,484	123,751		444,629	685,668	573,379	83.62%	52,125	3,686	55,811
2008	7.10%				490,480	152,231	132,405		476,638	735,118	618,864	84.19%	56,260	3,874	60,134
2009	7.10%				526,020	163,790	141,661		510,938	788,114	666,110	84.52%	60,555	4,060	64,615
2010	7.09%				564,120	176,222	151,559		547,691	844,907	715,780	84.72%	65,071	4,248	69,318
2011	7.09%				604,969	189,592	162,145		587,072	905,768	768,394	84.83%	69,854	4,440	74,294
2012	7.09%				648,742	203,969	173,464		629,264	970,981	824,383	84.90%	74,944	4,638	79,582
2013	7.08%				695,665	219,429	185,568		674,466	1,040,855	884,128	84.94%	80,375	4,843	85,219
2014	7.08%				745,957	236,053	198,509		722,890	1,115,720	947,984	84.97%	86,180	5,056	91,237
2015	7.08%				799,857	253,926	212,346		774,764	1,195,928	1,016,301	84.98%	92,391	5,278	97,669
2016	7.07%				857,621	273,142	227,139		830,332	1,281,856	1,089,428	84.99%	99,039	5,509	104,548
2017	7.07%				919,523	293,802	242,954		889,852	1,373,909	1,167,728	84.99%	106,157	5,750	111,907
2018	7.06%				985,856	316,012	259,861		953,603	1,472,517	1,251,580	85.00%	113,780	6,001	119,781
2019	7.06%				1,056,934	339,887	277,934		1,021,883	1,578,143	1,341,384	85.00%	121,944	6,262	128,206
2020	7.06%				1,133,092	365,551	297,252		1,095,010	1,691,281	1,437,565	85.00%	130,688	6,534	137,222

Source : PTPI IV and Estimated by The Study Team

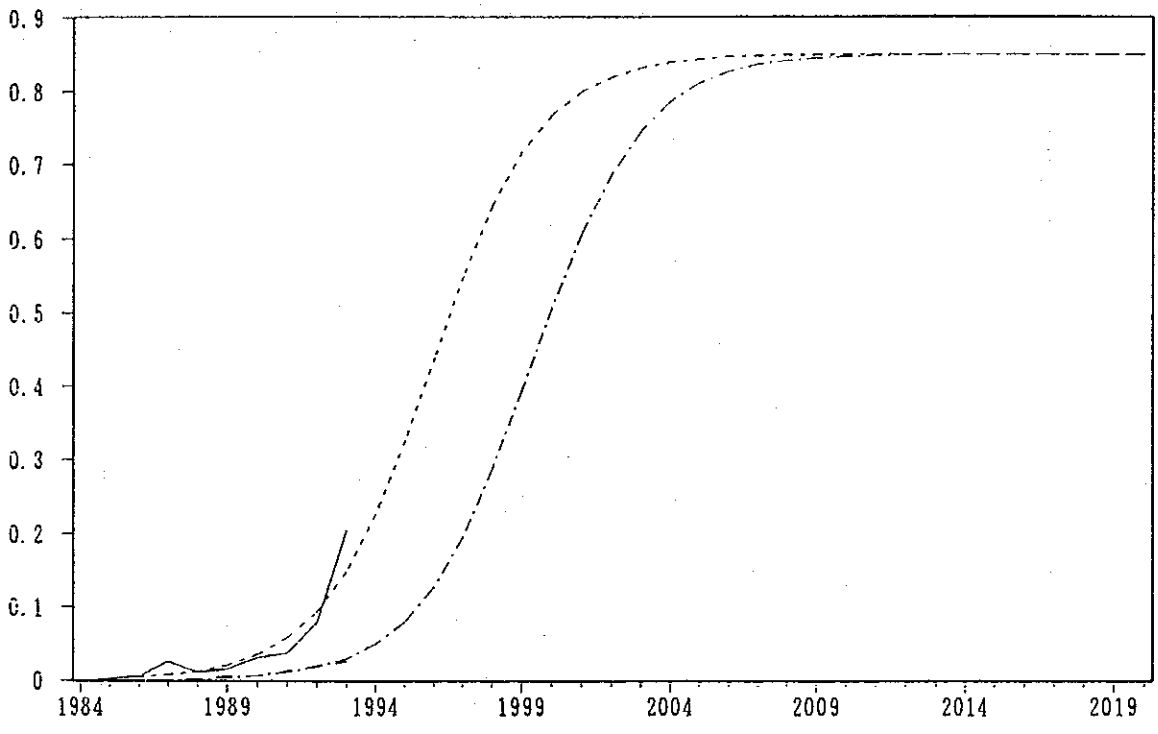
Table 3.65 Forecast of International Container cargo Traffic at Port of Hjung Panding

(Scenario 1)

Type of Trade Import

Port	GDP	Makassar	Container	Conventio	Form of Cargo					Container			Container		
		Total	Cargo	Cargo	Bagged Cargo	Dry Bulk Cargo	Liquid Bul Cargo	General Cargo	General Cargo	Potential Container	Container Cargo	Ratio	Loaded Container	Empty Container	Total
Unit	Increase Rate	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton		TEU	TEU	TEU
					0.809	0.953			1.082						
					86.76%	102.12%			116.01%						
					107.22%	107.22%			107.22%						
				375,148											
1984	4.45%	378,677	70	375,148	74,378	262,721	0	38,049	38,119	75,308	70	0.08%	5		
1985	7.43%	356,975	114	356,861	43,626	290,917	0	22,318	22,431	44,244	114	0.21%	8		
1986	9.36%	390,257	185	390,072	28,422	347,110	0	14,540	14,725	28,936	185	0.53%	14		
1987	3.58%	367,695	301	367,394	9,636	352,829	0	4,929	5,230	10,048	301	2.51%	22		
1988	10.01%	348,708	489	348,219	39,950	287,832	0	20,437	20,926	40,901	489	1.00%	36		
1989	6.48%	316,604	796	315,808	45,024	247,751	0	23,033	23,829	46,341	796	1.44%	59		
1990	6.74%	272,937	1,295	271,642	34,918	218,861	0	17,863	19,158	36,617	1,295	2.97%	93		
1991	9.96%	303,438	2,107	301,331	45,837	232,045	0	23,449	25,556	48,475	2,107	3.66%	160		
1992	6.90%	345,054	3,429	341,625	33,291	291,304	0	17,030	20,460	37,105	3,429	7.84%	236	254	490
1993	7.24%	350,866	5,579	345,287	20,724	317,390	0	7,173	12,752	23,114	5,579	20.47%	449	377	827
1994	7.09%			345,287	17,960	323,746			13,730	22,710	5,136	22.62%	428	926	1,354
1995	6.94%				15,543	329,779			14,762	22,533	7,349	32.61%	612	1,754	2,366
1996	6.80%				13,433	335,475			15,848	22,565	9,910	43.92%	826	3,205	4,031
1997	6.89%				11,619	341,542			17,029	22,838	12,567	55.03%	1,047	5,582	6,629
1998	6.97%				10,058	348,001			18,313	23,343	15,063	64.53%	1,255	9,124	10,379
1999	7.12%				8,719	355,062			19,724	24,083	17,279	71.75%	1,440	13,847	15,287
2000	7.12%				7,558	362,261			21,242	25,021	19,203	76.74%	1,600	19,404	21,004
2001	7.11%				6,551	369,600			22,878	26,153	20,920	79.99%	1,743	25,237	26,980
2002	7.11%				5,679	377,081			24,638	27,477	22,534	82.01%	1,878	30,847	32,725
2003	7.11%				4,922	384,707			26,534	28,995	24,133	83.23%	2,011	35,990	38,001
2004	7.11%				4,266	392,479			28,574	30,708	25,783	83.96%	2,149	40,660	42,808
2005	7.11%				3,698	400,401			30,772	32,620	27,529	84.39%	2,294	44,981	47,275
2006	7.10%				3,205	408,474			33,137	34,739	29,405	84.64%	2,450	49,112	51,562
2007	7.10%				2,778	416,700			35,683	37,072	31,434	84.79%	2,620	53,192	55,811
2008	7.10%				2,407	425,081			38,424	39,628	33,636	84.88%	2,803	57,331	60,134
2009	7.10%				2,086	433,619			41,374	42,417	36,025	84.93%	3,002	61,613	64,615
2010	7.09%				1,808	442,317			44,549	45,454	38,617	84.96%	3,218	66,100	69,318
2011	7.09%				1,567	451,177			47,967	48,751	41,426	84.98%	3,452	70,842	74,294
2012	7.09%				1,358	460,200			51,645	52,324	44,468	84.99%	3,706	75,876	79,582
2013	7.08%				1,177	469,388			55,603	56,192	47,758	84.99%	3,980	81,239	85,219
2014	7.08%				1,020	478,743			59,863	60,373	51,314	85.00%	4,276	86,961	91,237
2015	7.08%				884	488,268			64,446	64,888	55,153	85.00%	4,596	93,073	97,669
2016	7.07%				766	497,965			69,378	69,760	59,295	85.00%	4,941	99,607	104,548
2017	7.07%				663	507,837			74,684	75,015	63,762	85.00%	5,314	106,593	111,907
2018	7.06%				575	517,885			80,392	80,680	68,577	85.00%	5,715	114,066	119,781
2019	7.06%				498	528,112			86,534	86,783	73,765	85.00%	6,147	122,059	128,206
2020	7.06%				431	538,521			93,141	93,357	79,353	85.00%	6,613	130,609	137,222

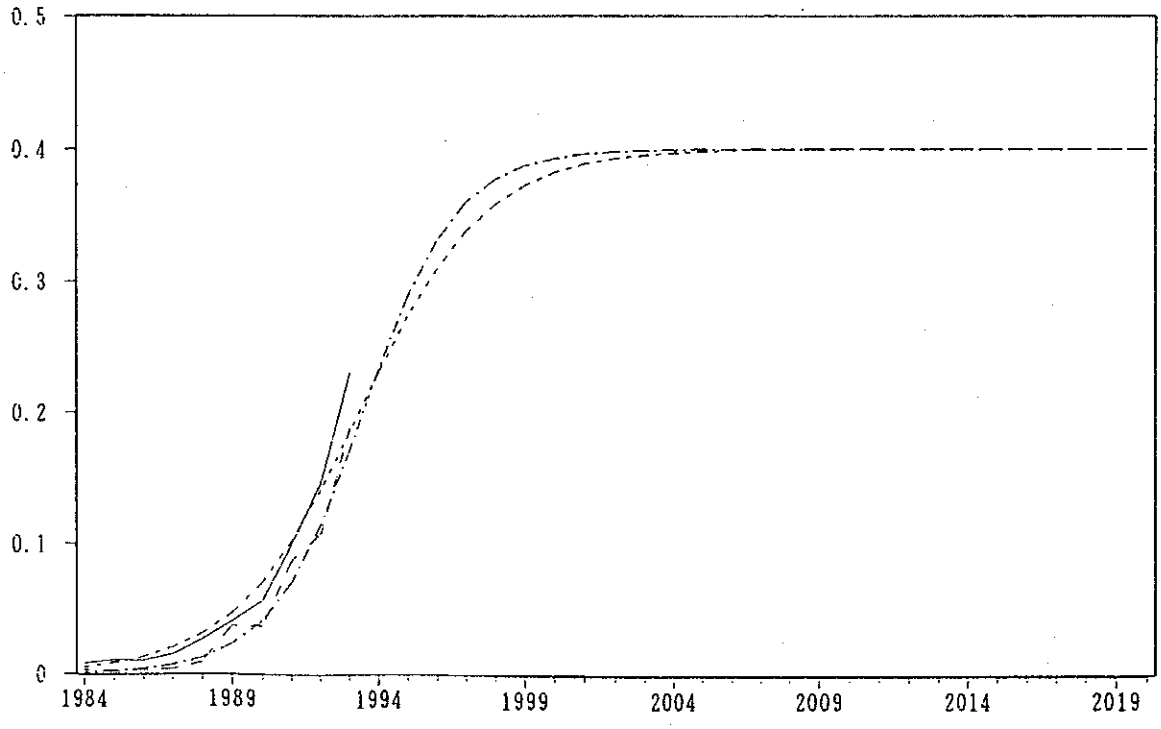
Source : PTPI IV and Estimated by The Study Team



— Actual Imp. -- Estimated Imp. - Actual Exp. -- Estimated Exp.

Fig. 3.16 Forecast of Container Rate at Port of Ujung Pandang

(Unit: %)



— Actual Unload -- estimated Unl. - Actual Loading -- Estimated Lo.

Fig. 3.17 Forecast of Container Rate at Ujung Pandang Port

(Unit: %)

Table 3.66 Forecast of Inter-island Container Cargo Traffic at Port of Ujung Pandang

(Scenario 1)

Type of Trade　　Loading

Port		Makassar	Form of Cargo				Total	Container			Container		
	GRDP Increase Rate		Bagged Cargo	Dry Bulk Cargo	Liquid Bul Cargo	General Cargo	General Cargo	Potential Container	Container Cargo	Ratio	Loaded Container	Empty Container	Total
Unit		Ton	Ton	Ton	Ton	Ton	Ton	Ton	Ton		TEU	TEU	TEU
			1.020	0.968	0.990		0.957						
			109.31%	103.81%	106.11%		102.62%						
			107.22%	107.22%	107.22%		107.22%						
1984	4.45%	690,964	137,317	32,779	206,574	314,294	315,486	404,802	1,192	0.29%	113		
1985	7.43%	653,160	119,561	67,058	209,217	257,324	257,870	338,573	546	0.16%	52		
1986	9.36%	788,693	131,587	80,070	236,864	340,173	341,308	430,788	1,136	0.26%	108		
1987	3.58%	930,443	166,694	96,044	290,404	377,301	378,940	491,327	1,639	0.33%	154		
1988	10.01%	930,666	224,801	62,630	278,613	364,623	369,437	509,699	4,814	0.94%	460		
1989	6.48%	845,629	155,976	39,215	319,324	331,114	348,668	458,588	17,554	3.83%	1,647		
1990	6.74%	919,014	200,778	37,697	320,150	360,389	379,606	512,010	19,217	3.75%	1,863		
1991	9.96%	1,033,719	289,113	39,243	341,546	363,818	415,930	594,641	52,113	8.76%	4,829		
1992	6.90%	1,093,439	292,094	72,638	346,708	381,999	449,911	630,629	67,912	10.77%	6,808	4,549	11,357
1993	7.24%	1,036,399	305,875	90,468	352,251	287,805	398,304	586,467	110,499	18.84%	9,725	12,873	22,598
1994	7.09%		327,967	96,926	373,194		427,801	629,104	146,419	23.27%	14,642	11,124	25,766
1995	6.94%		351,165	103,704	394,842		458,829	673,896	194,436	28.85%	19,444	13,243	32,687
1996	6.80%		375,492	110,807	417,186		491,421	720,886	238,759	33.12%	23,876	15,690	39,566
1997	6.89%		401,831	118,491	441,148		526,767	771,798	277,706	35.98%	27,771	18,423	46,194
1998	6.97%		430,373	126,811	466,864		565,133	827,006	312,066	37.73%	31,207	21,287	52,493
1999	7.12%		461,577	135,899	494,749		607,147	887,411	343,865	38.75%	34,386	24,174	58,561
2000	7.12%		495,036	145,636	524,290		652,275	952,223	374,392	39.32%	37,439	27,008	64,447
2001	7.11%		530,912	156,069	555,588		700,746	1,021,761	404,926	39.63%	40,493	29,793	70,285
2002	7.11%		569,378	167,245	588,743		752,805	1,096,368	436,359	39.80%	43,636	32,564	76,200
2003	7.11%		610,619	179,219	623,865		808,716	1,176,412	469,299	39.89%	46,930	35,367	82,297
2004	7.11%		654,835	192,046	661,070		868,762	1,262,287	504,184	39.94%	50,418	38,247	88,665
2005	7.11%		702,239	205,788	700,481		933,249	1,354,416	541,345	39.97%	54,134	41,242	95,377
2006	7.10%		753,060	220,509	742,226		1,002,502	1,453,254	581,058	39.98%	58,106	44,389	102,494
2007	7.10%		807,539	236,276	786,440		1,076,866	1,559,279	623,571	39.99%	62,357	47,716	110,073
2008	7.10%		865,935	253,165	833,267		1,156,715	1,673,009	669,123	40.00%	66,912	51,250	118,163
2009	7.10%		928,530	271,254	882,858		1,242,451	1,795,002	717,954	40.00%	71,795	55,018	126,814
2010	7.09%		995,623	290,627	935,377		1,334,505	1,925,854	770,315	40.00%	77,031	59,043	136,074
2011	7.09%		1,067,535	311,376	990,992		1,433,339	2,066,206	826,467	40.00%	82,647	63,348	145,994
2012	7.09%		1,144,603	333,595	1,049,880		1,539,441	2,216,731	886,683	40.00%	88,668	67,956	156,624
2013	7.08%		1,227,194	357,389	1,112,232		1,653,341	2,378,101	951,259	40.00%	95,126	72,891	168,017
2014	7.08%		1,315,699	382,866	1,178,246		1,775,606	2,551,281	1,020,509	40.00%	102,051	78,179	180,230
2015	7.08%		1,410,538	410,145	1,248,137		1,906,845	2,736,928	1,094,769	40.00%	109,477	83,845	193,322
2016	7.07%		1,512,160	439,353	1,322,126		2,047,709	2,936,001	1,174,400	40.00%	117,440	89,919	207,359
2017	7.07%		1,621,044	470,624	1,400,452		2,198,896	3,149,463	1,259,785	40.00%	125,978	96,428	222,407
2018	7.06%		1,737,703	504,102	1,483,363		2,361,157	3,378,345	1,351,338	40.00%	135,134	103,405	238,539
2019	7.06%		1,862,687	539,942	1,571,124		2,535,292	3,623,748	1,449,499	40.00%	144,950	110,884	255,833
2020	7.06%		1,996,582	578,307	1,664,014		2,722,161	3,886,853	1,554,741	40.00%	155,474	118,899	274,373

Source : PTPI IV and Estimated by The Study Team

Table 3.67 Forecast of Inter-island Container Cargo Traffic at Port of Ujung Pandang

(Scenario 1)

Type of Trade Unloading

Port	GRDP Increase Rate	Makassar	Form of Cargo				Total General Cargo	Container			Container		
			Bagged Cargo	Dry Bulk Cargo	Liquid Bul Cargo	General Cargo		Potential Container	Container Cargo	Ratio	Loaded Container	Empty Container	Total
Unit		Ton	Ton	Ton	Ton		Ton	Ton	Ton		TEU	TEU	TEU
			1.019	1.000	0.989		1.045						
			109.23%	107.20%	106.07%		112.00%						
			107.22%	107.22%	107.22%		107.22%						
1984	4.45%	1,008,720	130,098	31,050	549,795	297,771	301,300	421,329	3,529	0.84%	259		
1985	7.43%	1,213,866	176,951	99,246	556,828	380,840	386,582	530,740	5,741	1.08%	422		
1986	9.36%	1,730,588	262,343	159,635	630,410	678,200	687,542	881,754	9,342	1.06%	683		
1987	3.58%	2,053,398	333,495	192,151	772,908	754,845	770,045	1,014,083	15,200	1.50%	1,122		
1988	10.01%	1,881,140	378,268	105,386	783,943	613,544	638,275	905,803	24,732	2.73%	1,799		
1989	6.48%	1,949,882	322,599	81,108	861,342	684,833	725,073	972,507	40,240	4.14%	2,996		
1990	6.74%	2,211,743	426,448	80,067	939,769	765,459	830,933	1,138,135	65,475	5.75%	4,694		
1991	9.96%	2,062,720	498,656	67,685	868,875	627,505	734,037	1,070,253	106,533	9.95%	8,111		
1992	6.90%	2,136,790	513,341	127,657	824,447	671,345	844,083	1,183,798	173,338	14.64%	11,953	595	12,548
1993	7.24%	2,249,714	588,064	173,930	934,397	553,323	835,359	1,222,830	282,030	23.06%	22,718	383	23,100
1994	7.09%		630,536	186,347	989,950		897,222	1,311,485	303,133	23.11%	25,261	505	25,766
1995	6.94%		675,136	199,377	1,047,375		962,297	1,404,602	384,551	27.38%	32,046	641	32,687
1996	6.80%		721,906	213,033	1,106,646		1,030,652	1,502,270	465,481	30.99%	38,790	776	39,566
1997	6.89%		772,546	227,807	1,170,209		1,104,783	1,608,077	543,453	33.80%	45,288	906	46,194
1998	6.97%		827,419	243,803	1,238,425		1,185,247	1,722,799	617,567	35.85%	51,464	1,029	52,493
1999	7.12%		887,411	261,275	1,312,392		1,273,363	1,848,308	688,950	37.27%	57,413	1,148	58,561
2000	7.12%		951,738	279,995	1,390,757		1,368,010	1,982,954	758,198	38.24%	63,183	1,264	64,447
2001	7.11%		1,020,712	300,052	1,473,778		1,469,667	2,127,401	826,884	38.87%	68,907	1,378	70,285
2002	7.11%		1,094,665	321,540	1,561,726		1,578,850	2,282,355	896,470	39.28%	74,706	1,494	76,200
2003	7.11%		1,173,953	344,560	1,654,893		1,696,111	2,448,577	968,204	39.54%	80,684	1,614	82,297
2004	7.11%		1,258,961	369,221	1,753,584		1,822,045	2,626,884	1,043,121	39.71%	86,927	1,739	88,665
2005	7.11%		1,350,098	395,640	1,858,127		1,957,292	2,818,154	1,122,080	39.82%	93,507	1,870	95,377
2006	7.10%		1,447,805	423,941	1,968,804		2,102,535	3,023,324	1,205,816	39.88%	100,485	2,010	102,494
2007	7.10%		1,552,543	454,256	2,086,148		2,258,498	3,243,384	1,294,972	39.93%	107,914	2,158	110,073
2008	7.10%		1,664,814	486,725	2,210,362		2,425,965	3,479,408	1,390,150	39.95%	115,846	2,317	118,163
2009	7.10%		1,785,158	521,502	2,341,910		2,605,779	3,732,548	1,491,927	39.97%	124,327	2,487	126,814
2010	7.09%		1,914,148	558,749	2,481,222		2,798,843	4,004,039	1,600,876	39.98%	133,406	2,668	136,074
2011	7.09%		2,052,402	598,640	2,628,750		3,006,126	4,295,202	1,717,580	39.99%	143,132	2,863	145,994
2012	7.09%		2,200,570	641,358	2,784,960		3,228,653	4,607,434	1,842,635	39.99%	153,553	3,071	156,624
2013	7.08%		2,359,356	687,102	2,950,356		3,467,534	4,942,248	1,976,670	40.00%	164,722	3,294	168,017
2014	7.08%		2,529,513	736,084	3,125,470		3,723,959	5,301,263	2,120,350	40.00%	176,690	3,534	180,230
2015	7.08%		2,711,848	788,530	3,310,864		3,999,204	5,686,214	2,274,381	40.00%	189,532	3,791	193,322
2016	7.07%		2,907,222	844,684	3,507,132		4,294,636	6,098,960	2,439,513	40.00%	203,293	4,066	207,359
2017	7.07%		3,116,557	904,804	3,714,902		4,611,721	6,541,490	2,616,548	40.00%	218,046	4,361	222,407
2018	7.06%		3,340,842	969,168	3,934,836		4,952,028	7,015,932	2,806,340	40.00%	233,862	4,677	238,539
2019	7.06%		3,581,131	1,038,072	4,167,635		5,317,239	7,524,568	3,009,805	40.00%	250,817	5,016	255,833
2020	7.06%		3,838,554	1,111,832	4,414,039		5,709,157	8,069,838	3,227,920	40.00%	268,993	5,380	274,373

Source : PTPI IV and Estimated by The Study Team

3.4 EXAMINATION OF LOCATIONS AND HINTERLANDS OF DRY PORTS

3.4.1 Conditions of examination

48. Locations and hinterlands of dry ports are determined by the following conditions.

(1) Transportation cost

(2) Transportation time

(3) Dry port and connecting railway service

(4) Potential container cargo

3.4.2 Examination of the locations of dry ports by transportation cost

(1) Transportation cost of railways, trailers and trucks

49. In 1991, the charter cost of 20-foot trailers was 150,000 rupiahs per day. It is assumed that this cost will increase to 200,000 rupiahs per day in 1994, and the charter cost of 40-foot trailer will reach 360,000 rupiahs per day in 1994. In 1991, the charter cost of trucks was 75,000 rupiahs per day. The price is expected to rise to 100,000 rupiahs per day in 1994. The transportation cost per km between dry ports and ports is estimated below based on these assumptions. This estimation will be verified in the next stage of this study.

Table 3.68 Transportation Cost per km between Dry Ports and Ports

(Unit: rupiah)

Dry Port	Trips/day		40-foot trailer	20-foot tailer	Truck
Tebing Tinggi	Round trip	208 km	1,800	1,000	500
Gedebage	One way	187 km	2,000	1,100	500
Solo Jebres	Round trip	220 km	1,800	1,000	500
Rambipuji	One way	194 km	2,000	1,100	500

50. The transportation cost per km of loaded containers by railway is presented below.

Table 3.69 Transportation Cost per km of Loaded Containers by Railway

(Unit : rupiah)

Dry Port	Transportation Cost		Distance	40-foot container	20-foot container
	40-foot Container	20-foot Container			
Tebing Tinggi		69,800	104 km		671
Gedebage	210,400	120,200	187 km	1,125	643
Solo Jebres	100,000	55,000	220 km	909	500
Rambipuji	144,000	70,000	194 km	742	361

Source : PERUMKA

51. The transportation cost per km of empty containers by railway is presented below.

Table 3.70 Transportation Cost per km of Empty Containers by Railway

(Unit : rupiah)

Dry Port	Transportation Cost		Distance	40-foot container	20-foot container
	40-foot Container	20-foot Container			
Tebing Tinggi		45,400	104 km		437
Gedebage	132,500	73,300	187 km	709	392
Solo Jebres	65,000	35,000	220 km	591	318
Rambipuji	94,000	52,000	194 km	485	268

Source : PERUMKA

52. The average container transportation cost of both loaded and empty containers is presented below.

Table 3.71 Average Container Transportation Cost of Both Loaded and Empty Containers (Unit : rupiah /km)

Dry Port	Transportation Cost by railway		40-foot trailer	20-foot trailer	Truck
	40-foot	20-foot			
Tebing Tinggi		554		1,000	500
Gedebage	917	518	2,000	1,100	500
Solo Jebres	750	409	1,800	1,000	500
Rambipuji	614	315	2,000	1,100	500

(2) Container cargo transportation patterns on land

53. There are four patterns of container cargo transportation on land, as follows.

1) Pattern 1
General cargo -(Truck)- CFS at port -(Trailer)- Container yard

2) Pattern 2 (herein after called Type-A dry port)
General cargo -(Truck)- CFS at dry port(Containerized) -(Railway)- Terminal at port -(Trailer)- Container yard

Tebing Tinggi, Solo Jebres and Rambipuji dry port follow this pattern, and are operated without container loading or unloading equipment. Goods are stuffed or unstuffed directly to and from the containers (which are on a freight car) by forklift or by hand. For Type-A dry ports to be economically feasible, the transportation cost of 20-foot containers by railway must be lower than the transportation cost for these general cargoes by truck. As demonstrated in **Table 3.71** ,Tebing Tinggi dry port is not economically viable in terms of the transportation cost.

3) Pattern 3 (Type-B dry port)
Container cargo -(Trailer)- Dry port -(Railway)- Terminal at port -(trailer)- Container yard

Gedebage dry port follows this pattern. Containers are loaded and unloaded using equipment such as trans-tainers and top-lifters.

4) Pattern 4

Container cargo -(Trailer)- Container yard at port

(3) Transportation cost of each pattern

54. The transportation cost of each pattern is expressed by the following equations. (See **Fig.3.18**)

1) Pattern 1

$T1 = D \times Trc + Tsc + D \times Trc + Csc + CC2 + KTc + CC2$

2) Pattern 2

$T2 = Dd \times Trc + Tsc + Dd \times Trc + Dp \times Rce + Csc + Dp \times Rc + CC2 + KTc + CC2$

3) Pattern 3

$T3 = CC2 + KTc + CC2 + Dp \times Rce + CCe1 + Dd \times Tlc + Csc + Dd \times Tlc + CC1 + Dp \times Rc + CC2 + KTc + CC2$

4) Pattern 4

$T4 = CC2 + D \times Tlc + Csc + D \times Tlc + CC2$

Where,

Trc : Per Km transportation cost by truck
Tlc : Per Km transportation cost by trailer
Rc : Per Km transportation cost of loaded container by railway
Rce : Per Km transportation cost of empty container by railway
ARc : Average container transportation cost by railway
Tsc : Commodity loading cost (trucks)
Csc : Commodity stuffing cost (containers)
CC1 : Loaded container loading and unloading cost at dry port
CCe1: Empty container loading and unloading cost at dry port
D : Distance from cargo origin to the port
Dd : Distance from cargo origin to the dry port
Dp : Distance from dry port to port
KTc : Transportation cost within the port
CC2 : Container lift-on or lift-off cost at the port

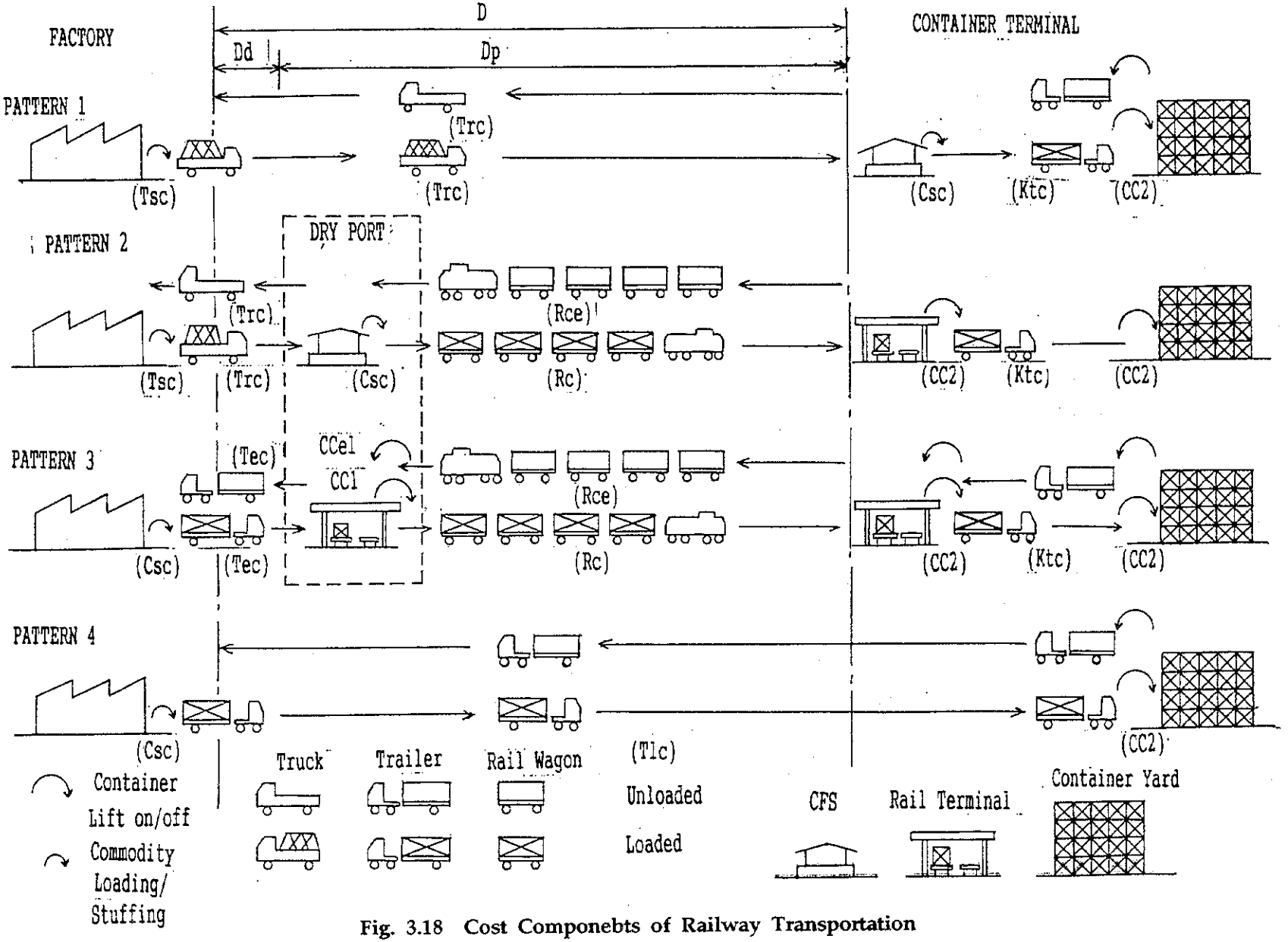


Fig. 3.18 Cost Componebts of Railway Transportation

(4) Examination of the location of Gedebage dry port

55. From the point of view of transportation cost, the following equation must be satisfied to confirm the economic feasibility of the dry port.

$$T4 = CC2 + D \times Tlc + Csc + D \times Tlc + CC2 > T3 = CC2 + KTc + CC2 + Dp \times Rce + CCe1 + Dd \times Tlc + Csc + Dd \times Tlc + CC1 + Dp \times Rc + CC2 + KTc + CC2$$

Where, $ARc = (Rc+Rce)/2$

$Tlc = K \times ARc$

Assumed $D = Dd + Dp$

This equation may be restated as follows;

$$Dp > (KTc + CC2 + (CCe1 + CC1)/2)/ (ARc \times (K-1))$$

Where,

Tlc = Rp. 2,000 / Km
ARc = Rp. 917 / Km
CCe1 = Rp. 11,500
CC1 = Rp. 40,000
KTc = Rp. 52,500
CC2 = Rp. 27,000
K = 2,000 / 917 = 2.181

$$Dp > 97.2$$

56. The requisite distance from the port of Tanjung Priok to the dry port must be at least 97.2 km. As Gedebage dry port is actually 187 km from the port of Tanjung Priok, Gedebage dry port is deemed feasible in terms of the transportation cost.

57. Further, the above equation may also be restated as follows to calculate the minimum transportation cost by trailer to confirm economic feasibility of the dry port.

$$K > (KTc + CC2 + (CCe1 + CC1)/2) / (Dp \times ARc) + 1$$

$K > 1.614$

$Tlc = K \times ARc = 1.614 \times 917 = 1,480$

58. According to the above, Gedebage dry port will be competitive if the container transportation cost by trailer decreases to Rp. 1,480/km (Rp. 280,000/day).

(5) Transportation cost examinations of the locations of Tebing Tinggi, Solo Jebres and Rambipuji dry ports as Type-B dry port

59. The locations of Tebing Tinggi, Solo Jebres and Rambipuji dry ports are examined using the same equations. The conditions for each dry port are as follows.

Table 3.72 Transportation Cost Examinations of the Location

(Unit : Rupiah)

	Tlc	ARc	CCe1	CC1	KTc	CC2
T. Tinggi	1,000	554	7,500	27,000	35,000	18,000
Solo Jebres	2,000	750	11,500	40,000	52,500	27,000
Rambipuji	2,000	614	11,500	40,000	52,500	27,000

$Dp > (KTc + CC2 + (CCe1 + CC1)/2)/ (ARc \times (K-1))$

60. The necessary minimum distances for the location of each dry port are calculated using above equation, as follows.

Table 3.73 Necessary Minimum Distans for the Location of each Dry Port

	K	Dp	Remarks
Tebing Tinggi	1.805	157.5	20-foot Container
Solo Jebres	2.400	100.2	40-foot Container
Rambipuji	3.257	75.9	40-foot Container

$K > (KTc + CC2 + (CCe1 + CC1)/2) / (Dp \times ARc) + 1$

$Tlc = K \times ARc$

61. Minimum transportation cost by trailer to confirm the economic feasibility for each dry port is calculated using to the above equation, as follows.

Table 3.74 Minimum Transportation Cost by Trailer

	Dp	K	Tlc	Cost/day	Container
Tebing Tinggi	104	2.219	1,229	250,000	20-foot
Solo Jebres	110	2.276	1,707	340,000	40-foot
Rambipuji	194	1.884	1,157	230,000	40-foot

(6) Results of examinations

62. 1) Tebing Tinggi dry port

Tebing Tinggi dry port is not economically viable as either a Type-B dry port or a Type-A dry port, for the following reasons.

- Tebing Tinggi dry port is only 104 km from the port of Belawan, while necessary distance to function as a Type-B dry port (by transportation cost) is 157 km.
- The transportation cost of this route is more expensive than the transportation cost by truck. Also this route is the most expensive among the railway routes. Thus, Tebing Tinggi dry port is also not viable as a Type-A dry port.
- Forty-foot containers can not be transported by railway because the axle load limit is 11 tons.
- There are plans to improve the road system running along the railway line. Therefore road transportation is more promising than railway transport. For Tebing Tinggi dry port becomes feasible as a Type-B dry port, the railway transportation cost must decrease, or the road transportation cost by 20-foot trailer must increase to Rp. 250,000 / day.

2) Solo Jebres dry port

Solo Jebres dry port is now feasible as a Type-B dry port. Solo Jebres dry port is 110 km from the port of Tanjung Emas, while the minimum distance from the port is 100 km. The tariff on this route is cheaper than that for Tebing Tinggi dry port. However, if the container transportation cost by forty-foot trailer

decreases to Rp. 340,000 per day, Solo Jebres dry port will no longer be economically feasible.

3) Rambipuji dry port

From the viewpoint of transportation cost, Rambipuji dry port is now feasible as a Type-B dry port. Rambipuji dry port is 194 km form the port of Tanjung Perak while the minimum distance from the port is only 76 km. Moreover the tariff on this route is the most economical. The railway transport to Rambipuji dry port will remain competitive even if the forty-foot trailer tariff decreases to Rp. 230,000. Nevertheless, it is not clear if the hinterland of Rambipuji dry port can generate sufficient container cargo traffic demand.

3.4.3 Examination of hinterland areas by transportation cost

63. Hinterland boundaries are defined by Dd which satisfies the following equation.

T4 = Csc + D x Tlc + CC2 > T3 = Csc + Dd x Tlc + CC1 + Dp x Rc + CC2 + KTc + CC2

Where, D = (Dd^2 + 2xDdxDpxcosT + Dp^2)^(1/2)
Tlc = K x Rc
PC = (CC1 + KTc + CC2)/K x RC
T = Direction from dry port

64. The above equation may be restated as follow;

(Dp x (1 - 1/K^2) - (2/K) x (PC - PC^2/DP)) / (2 x (1/K - cosT + PC/Dp)) >= Dd

65. The hinterlands are defined by the following conditions, and the extent of the hinterlands of each dry port are shown in **Table 3.76** and **Fig.3.19.**

Table 3.75 Extent of the Hinterlands

	PC	K	Dp	Remarks
Tebing Tinggi	80.0	1.805	104	20-foot Container
Gedebage	119.5	2.181	187	40-foot Container
Solo Jebres	119.5	2.400	110	40-foot Container
Rambipuji	119.5	3.257	194	40-foot Container

Table 3.76 Extent of Hinterland of Dry Port

(Unit: km)

	T.Tinggi	Gedebage	Solo Jebre	Rmbipuji
PC	80	119.5	119.5	119.5
Dp=	104	187	110	194
K=	1.80	2.18	2.40	3.26
T	Dd	Dd	Dd	Dd
	80		99	
15	72		93	
30	56	234	78	
45	42	138	63	342
60	31	90	50	174
75	24	64	40	111
90	20	49	33	80
105	16	40	28	62
120	14	34	25	52
135	13	30	23	45
150	12	28	21	41
165	11	26	20	39
180	11	26	20	38
195	11	26	20	39
210	12	28	21	41
225	13	30	23	45
240	14	34	25	52
255	16	40	28	62
270	20	49	33	80
285	24	64	40	111
300	31	90	50	174
315	42	138	63	342
330	56	234	78	
345	72		93	
360	80		99	

Estimated by The Study Team

3.4.4 Examination of dry port and hinterland by transportation time

(1) Closing time of reception of Container at port

66. Based on the interviews, export containers are received as follows:

1) Port of Belawan
Reception of containers terminates 12 hours before arrival of the ship.

2) Port of Tanjung Priok
Reception of containers terminates 24 hours before arrival of the ship.

3) Port of Tanjung Emas
Reception of containers terminates 12 hours before arrival of the ship

4) port of Tanjung Perak
Reception of containers terminates 24 hours before arrival of the ship.

5) Gedebage dry port
Reception of containers terminates 6 hours before arrival of the ship.

67. According to the above, there is a difference of 18 hours between the reception time of Gedebage dry port and the port of Tanjung Priok. The transportation time from Gedebage dry port to the port of Tanjung Priok is around 6 hours both by train and by trailer. (Without economy, in case of the container cargo is delay at closing time of reception at Tanjung Priok, the container cargo is transported to Gedebage dry port to catch the ship.) Thus, at the Gedebage dry port, railway transportation is competitive with the trailer transportation in terms of transportation time.

68. Other dry ports such as Tebing Tinggi, Solo Jebre and Rambipuji are not competitive with the trailer transportation because of following reasons.

1) Transportation from dry port to the port is not regular.
2) There is no liner train.
3) It takes a long time when Goods are stuffed or unstuffed directly to and from the containers (which are on a freight car) by forklift or by hand.
4) It is usually necessary to wait for empty container at dry port.

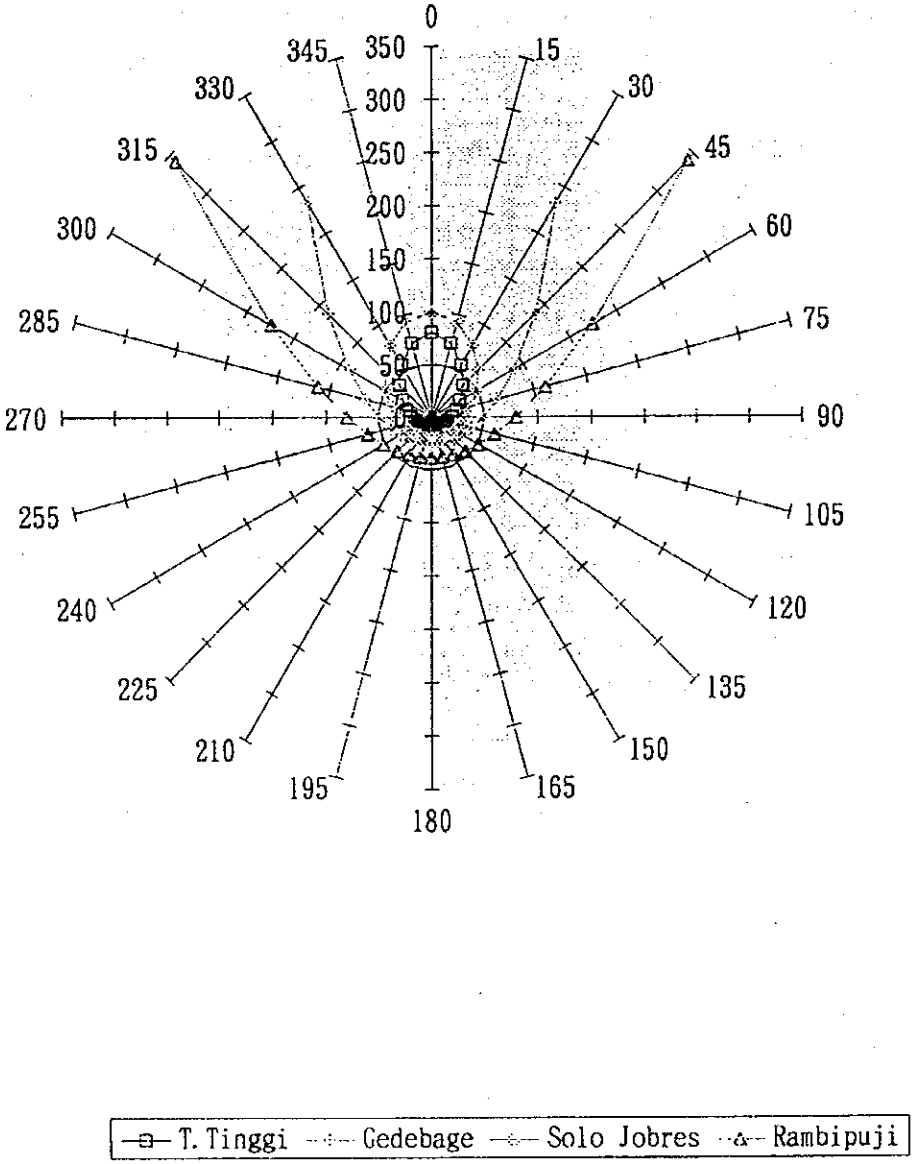


Fig. 3.19 Extend of Hinterland by Transportation Cost
(Unit: km)

3.5 MACRO FORECAST OF CONTAINER CARGO TRAFFIC THROUGH DRY PORTS IN 2010

3.5.1 Macro forecast of container cargo traffic at Tebing Tinggi dry port in 2010

(1) Hinterland and location of Tebing Tinggi dry port

69. Tebing Tinggi dry port is judged to be economically unfeasible because the dry port is located too near Belawn port (104 km), the transportation cost of the connecting railway is too expensive, and 40-foot containers can not be transported by rail because of the 11-ton axle load limit. Regardless of the economic issues, the extent of the hinterland of the dry port is assumed to be around Tebing Tinggi and along the railway. The major commodities of the hinterland are listed below.

Table 3.77 Major commodities of dry port hinterland in 1993

	T. Tinggi	P. Siantar	Kirasan	R. Prapat	Total
From BLW	104 km	153 km	178 km	284 km	
Cr. Rubber	54,000	9,639	34,409	48,992	147,040
Furniture	12,895				12,895
Tapioca	2,500				2,500
Tobacco		463			463
Ginger		487			487
Incense		48			48
Tea		650			650
Palm oil		4,700			4,700
Chocolate		250			250
Charcoal			7,391		7,391
Brush			616		616
Plywood				12,840	12,840
Total	69,395	16,237	42,416	61,832	189,880

Source : PERUMKA

(2) Statistics of container cargo traffic through Tebing Tinggi dry port

70. The actual container cargo traffic through Tebing Tinggi dry port is shown in **Table 3.79**. The main commodity is rubber.

(3) Macro forecast of container cargo traffic through Tebing Tinggi dry port in 2010

71. 1) Scenario 1

The competitiveness of container transportation of by railway decreases with the development of roads along the railway line. Container cargo is no longer handled through Tebing Tinggi dry port.

72. 2) Scenario 2

Agricultural products (primarily rubber) account for 90 % of all cargo handled at Tebing Tinggi dry port. The annual growth rate of rubber products from 1970 to 1991 was 2.18%, and the future annual growth rate is assumed to be 2.0%. In 1991, 9.1% of the rubber production from the hinterland was exported through the dry port. Based on these figure, the future container cargo traffic is estimated as shown in **Table 3.80** and **Fig.3.20**.

73. 3) Scenario 3

Tebing Tinggi dry port is located too near the port of Belawan, and the railway transportation cost is too high. Thus railways are not competitive to road traffic. Kisaran is located 178 km from the port of Belawan, and is therefore feasible as a Type-A dry port. But Kisaran is not competitive as a Type-B dry port because the transportation cost by truck is still lower than that by railway. Accordingly, container cargo traffic at Kisaran was estimated using the following procedure. The hinter land of Kisaran dry port is assumed to be Kisaran and R.Prapat. Agricultural products (primarily rubber) account for over 80 % of all cargo handled at Kisaran dry port. The annual growth rate of rubber products from 1970 to 1991 was 2.18% in Indonesia and the future annual growth rate is assumed to be 2.0%. 20 % of the products from the hinterland are assumed to be exported through the Kisaran dry port, because the railway transportation cost is cheaper than at Tebing Tinggi dry port. Based on these factors, the future container cargo traffic is estimated as shown in **Table 3.81** and summarized below.

Table 3.78 Container Cargo Traffic (Unit : TEU)

	1993	2003	2010	2018
Scenario 1	592	0	0	0
Scenario 2	592	1,700	2,000	2,300
Scenario 3	0	3,000	3,600	4,500

Table 3.79 Statistics for Tebingtinggi Dry Port

			1987	1988	1989	1990	1991	1992	1993	91予測1	91予測2	91/05
Tebin Tinggi												
Export	Cargo Volume	Ton		?	800	3,800	13,040	13,600	5,920	0	0	0
	Landed	20 Feet		36	40	211	703	684	296	0	0	0
		40 Feet										
		TEU		36	40	211	703	684	296	0	0	0
		Ton/TEU			20.00	18.01	18.55	19.88	20.00	0	0	0
	Empty	20 Feet										
		40 Feet								0	0	0
		TEU		0	0	0	0	0	0	0	0	0
	Subtotal	TEU		36	40	211	703	684	296	0	0	0
Import	Cargo Volume	Ton										
	Landed	20 Feet										
		40 Feet										
		TEU		0	0	0	0	0	0	0	0	0
		Ton/TEU										
	Empty	20 Feet		36	40	211	703	684	296			
		40 Feet										
		TEU		36	40	211	703	684	296	0	0	0
	Subtotal	TEU		36	40	211	703	684	296	0	0	0
	Total	TEU		72	80	422	1,406	1,368	592	0	0	0
	Cargo Volume	Ton			800	3,800	13,040	13,600	5,920	0	0	0

Source : PERUMKA

Table 3.80 Container Cargo Forecast at Tebing Tinggi Dry Port

(Scenario 2)

	Export			Total	Export Rubber			Hinter Land RubbX		Sumatera Rubb	
	Ton	TEU	Ton/TEU	TEU	TEU	Portion	Ton	Producti	Rate	Producti	Rate
1987								130. 567			
1988	?	36	19. 29	72	36	100. 0%	694	133. 179	2. 00%	319. 187	
1989	800	40	20. 00	80	40	100. 0%	800	135. 842	2. 00%	324. 317	
1990	3. 800	211	18. 01	422	211	100. 0%	3. 800	138. 559	2. 00%	416. 153	
1991	13. 040	703	18. 55	1. 406	696	99. 0%	12. 910	141. 330	2. 00%	368. 673	
1992	13. 600	684	19. 88	1. 368	680	99. 4%	13. 520	144. 157	2. 00%	376. 046	2. 00%
1993	5. 920	296	20. 00	592	294	99. 2%	5. 873	147. 040	2. 00%	383. 567	2. 00%
1994		716		1. 432	710		13. 700	149. 981	2. 00%	391. 239	2. 00%
1995		730		1. 461	724		13. 974	152. 980	2. 00%	399. 064	2. 00%
1996		745		1. 490	739		14. 254	156. 040	2. 00%	407. 045	2. 00%
1997		760		1. 520	754		14. 539	159. 161	2. 00%	415. 186	2. 00%
1998		775		1. 550	769		14. 830	162. 344	2. 00%	423. 489	2. 00%
1999		790		1. 581	784		15. 126	165. 591	2. 00%	431. 959	2. 00%
2000		806		1. 613	800		15. 429	168. 903	2. 00%	440. 598	2. 00%
2001		822		1. 645	816		15. 737	172. 281	2. 00%	449. 410	2. 00%
2002		839		1. 678	832		16. 052	175. 726	2. 00%	458. 399	2. 00%
2003		856		1. 711	849		16. 373	179. 241	2. 00%	467. 567	2. 00%
2004		873		1. 745	866		16. 701	182. 826	2. 00%	476. 918	2. 00%
2005		890		1. 780	883		17. 035	186. 482	2. 00%	486. 456	2. 00%
2006		908		1. 816	901		17. 375	190. 212	2. 00%	496. 185	2. 00%
2007		926		1. 852	919		17. 723	194. 016	2. 00%	506. 109	2. 00%
2008		945		1. 889	937		18. 077	197. 896	2. 00%	516. 231	2. 00%
2009		964		1. 927	956		18. 439	201. 854	2. 00%	526. 556	2. 00%
2010		983		1. 966	975		18. 808	205. 891	2. 00%	537. 087	2. 00%
2011		1. 003		2. 005	995		19. 184	210. 009	2. 00%	547. 829	2. 00%
2012		1. 023		2. 045	1. 014		19. 567	214. 210	2. 00%	558. 785	2. 00%
2013		1. 043		2. 086	1. 035		19. 959	218. 494	2. 00%	569. 961	2. 00%
2014		1. 064		2. 128	1. 055		20. 358	222. 864	2. 00%	581. 360	2. 00%
2015		1. 085		2. 170	1. 077		20. 765	227. 321	2. 00%	592. 987	2. 00%
2016		1. 107		2. 214	1. 098		21. 180	231. 867	2. 00%	604. 847	2. 00%
2017		1. 129		2. 258	1. 120		21. 604	236. 505	2. 00%	616. 944	2. 00%
2018		1. 152		2. 303	1. 142		22. 036	241. 235	2. 00%	629. 283	2. 00%

Source : PERUMKA Estimated by The Study Team

3.5.2 Macro forecast of container cargo traffic through Kertapati dry port in 2010

74. Container cargo was handled at Kertapati dry port from 1989 to 1991, but container cargo handling operations at the dry port ceased in 1992. Kertapati dry port is located 5 km from the port of Palembang and 400 km from the port of Panjang. Therefore exports from Kertapati's hinterland are more profitable using feeder ships from the port of Palembang to the port of Panjang. Accordingly, no container cargo throughput is forecast for Kertapati dry port in the year 2010. Nevertheless, the possibility of re-opening this dry port can not be ignored, especially if sufficient cargo for the oceangoing container ship Panjang is generated from the hinterland of Kertapati dry port.

3.5.3 Macro forecast of container cargo traffic through Gedebage dry port in 2010

(1) Hinterland

75. The hinterland of Gedebage dry port extends along the railway and major hinterland is around Bandung. The major export container cargo consists of light industrial products.

(2) Actual throughput of the dry port

76. The actual container cargo traffic through Gedebage dry port is shown in **Table 3.85** and **Fig.3.20**. The following trends are assumed, based on the data in this Table.

1) The container cargo increase rate at Gedebage and in its hinterland has been decreasing, and it will be stable as shown in **Fig.3.22** and **Fig.3.23**.

2) The percentage of the container cargo traffic generated in the hinterland that is handled at the dry port has a tendency to converge, and it is assumed to be stable at around 85%. This trend is seen **Fig.3.24**.

The above estimations will be verified in the next stage of this study.

(3) Macro forecast of container cargo traffic through the dry port

77. 1) Scenario 1

The growth rate of the industrial sector GDP is estimated to be decreasing while the GDP growth rate will be increasing according to the 25 years long-term development plan (PJP II). The GRDP of the West Jawa industrial sector is estimated by adopting the above trend based on PJP II. The main container cargo commodity through the dry port is light industrial products, and therefore the growth rate of the GRDP of the hinterland is assumed to be 75 % of the GDRP growth rate of the West Jawa industrial sector. The potential container cargo traffic of the hinterland is estimated based on this assumption, and the annual container cargo traffic at the dry port is estimated based on the aforementioned trends.

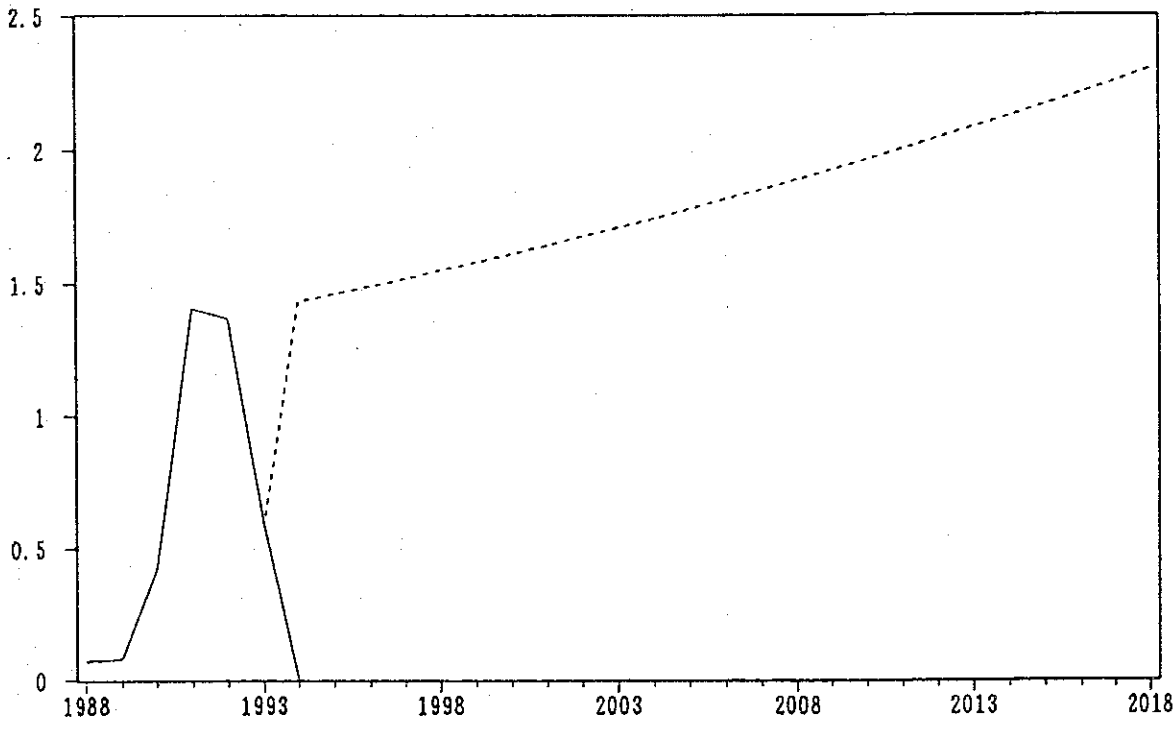


Fig. 3.20 Estimation for Container at Tebing Tinggi Dry Port
(1,000 TEU)

Table 3.81 Container Cargo Forecast at Kisaran Dry Port

(Scenario 3)

	Export			Total	Export (ton)			Hinter Land Rubb		Hinter Land othe	
	Ton	TEU	Ton/TEU	TEU	Total	Rubber	Others	Producti	Rate	Producti	Rate
1993	20,847	1,158	18.00	2,316	20,847	16,680	4,167	83,401	2.00%	20,834	4.80%
1994	21,381	1,188	18.00	2,376	21,381	17,014	4,367	85,069	2.00%	21,834	4.80%
1995	21,930	1,218	18.00	2,437	21,930	17,354	4,576	86,770	2.00%	22,882	4.80%
1996	22,497	1,250	18.00	2,500	22,497	17,701	4,796	88,506	2.00%	23,980	4.80%
1997	23,081	1,282	18.00	2,565	23,081	18,055	5,026	90,276	2.00%	25,131	4.80%
1998	23,684	1,316	18.00	2,632	23,684	18,416	5,268	92,081	2.00%	26,338	4.80%
1999	24,305	1,350	18.00	2,701	24,305	18,785	5,520	93,923	2.00%	27,602	4.80%
2000	24,946	1,386	18.00	2,772	24,946	19,160	5,785	95,802	2.00%	28,927	4.80%
2001	25,607	1,423	18.00	2,845	25,607	19,544	6,063	97,718	2.00%	30,315	4.80%
2002	26,288	1,460	18.00	2,921	26,288	19,934	6,354	99,672	2.00%	31,771	4.80%
2003	26,992	1,500	18.00	2,999	26,992	20,333	6,659	101,665	2.00%	33,295	4.80%
2004	27,718	1,540	18.00	3,080	27,718	20,740	6,979	103,699	2.00%	34,894	4.80%
2005	28,468	1,582	18.00	3,163	28,468	21,155	7,314	105,773	2.00%	36,569	4.80%
2006	29,242	1,625	18.00	3,249	29,242	21,578	7,665	107,888	2.00%	38,324	4.80%
2007	30,042	1,669	18.00	3,338	30,042	22,009	8,033	110,046	2.00%	40,163	4.80%
2008	30,868	1,715	18.00	3,430	30,868	22,449	8,418	112,247	2.00%	42,091	4.80%
2009	31,721	1,762	18.00	3,525	31,721	22,898	8,822	114,492	2.00%	44,112	4.80%
2010	32,602	1,811	18.00	3,622	32,602	23,356	9,246	116,782	2.00%	46,229	4.80%
2011	33,513	1,862	18.00	3,724	33,513	23,823	9,690	119,117	2.00%	48,448	4.80%
2012	34,455	1,914	18.00	3,828	34,455	24,300	10,155	121,500	2.00%	50,773	4.80%
2013	35,428	1,968	18.00	3,936	35,428	24,786	10,642	123,929	2.00%	53,211	4.80%
2014	36,435	2,024	18.00	4,048	36,435	25,282	11,153	126,408	2.00%	55,765	4.80%
2015	37,476	2,082	18.00	4,164	37,476	25,787	11,688	128,936	2.00%	58,441	4.80%
2016	38,552	2,142	18.00	4,284	38,552	26,303	12,249	131,515	2.00%	61,247	4.80%
2017	39,666	2,204	18.00	4,407	39,666	26,829	12,837	134,145	2.00%	64,186	4.80%
2018	40,819	2,268	18.00	4,535	40,819	27,366	13,453	136,828	2.00%	67,267	4.80%

Source : PERMUKA, Estimated by The Study Team

Table 3.82 Growth Rate of GRP and GRDP

(Unit: %)

REPELITA	VI	VII	VIII	IX	X
GDP growth rate	6.2	6.6	7.1	7.8	8.7
Industrial GDP growth rate	10.3	10.2	10.0	9.5	9.0
GRDP of West Jawa industrial sector growth rate	9.2	9.1	8.9	8.5	8.0
GDRP of hinterland growth rate	6.9	6.8	6.7	6.4	6.0

78. 2) Scenario 2

The potential container cargo traffic of the hinterland is estimated according to the projected GRDP of the West Jawa industrial sector, and the annual container cargo traffic at the dry port is estimated using same method adopted for Scenario 1.

79. 3) Scenario 3

A container cargo forecast model is devised by adopting a logistic curve based on the above-mentioned trends (See **Fig.3.23.** The estimated growth rates of container cargo traffic at the dry port are presented below.

Table 3.83 Growth Rates of Container Cargo Traffic at the Dry Port

(Unit : %)

REPELITA	VI	VII	VIII	IX	X
Container Increase rate	8.0	5.2	4.3	3.6	3.0

80. The container cargo increase rates under the three scenarios are shown in **Fig.3.25.** According to thses scenarios, the annual container cargo traffic of Gedebage dry port is forecast in Tables 3.86, .87, .88 and Fig.3.26, and summarized below.

Table 3.84 Container Cargo Traffic of Gedebage Dry Port

(Unit: TEU)

	1993	2003	2010	2018
Scenario 1	60,918	134,000	210,000	338,000
Scenario 2	60,918	157,000	283,000	530,000
Scenario 3	60,918	122,000	162,000	208,000

Table 3.85 Statistics of Bandung and Gedebade Dry Port

			1987	1988	1989	1990	1991	1992	1993	1994	94/03
Export											
Gedebage	Cargo Volume	Ton	7,754	31,569	61,688	90,385	142,279	212,942	423,570	460,944	95,040
		Increase		307.13%	95.41%	46.52%	57.41%	49.67%	98.91%	8.82%	
	Loaded	20 Feet									
		40 Feet									
		TEU	1,027	3,313	6,182	8,880	14,926	23,327	28,238	30,730	6,336
		Increase		222.59%	86.60%	43.64%	68.09%	56.28%	21.05%	8.82%	
		Ton/TEU	7.55	9.53	9.98	10.18	9.53	9.13	15.00	15.00	15.00
	Empty	20 Feet									
		40 Feet									
		TEU	336	1,159	1,153	2,722	2,996	2,498	2,610	2,800	386
		Increase		244.94%	-0.52%	136.08%	10.07%	-16.62%	4.48%	7.28%	
	Subtotal	TEU	1,363	4,472	7,335	11,602	17,922	25,825	30,848	33,530	6,722
		Increase		228.10%	64.02%	58.17%	54.47%	44.10%	19.45%	8.69%	
	By Trailer	20 Feet				144	177	30	1,274		
		40 Feet				8,448	10,242	8,488	6,581		
	Subtotal	TEU	4,399	5,499	6,874	8,592	10,419	8,518	7,855	9,000	
		Increase		25.00%	25.00%	25.00%	21.26%	-18.25%	-7.78%	14.57%	
	Total	TEU	5,762	9,971	14,209	20,194	28,341	34,343	38,703	42,530	6,722
		Increase		73.04%	42.50%	42.13%	40.34%	21.18%	12.70%	9.89%	
Import											
	Cargo Volume	Ton	8,172	19,851	27,751	59,859	57,414	63,118	134,115	168,707	34,785
		Increase		142.91%	39.80%	115.70%	-4.08%	9.93%	112.48%	25.79%	
	Loaded	20 Feet									
		40 Feet									
		TEU	490	1,430	1,849	3,811	4,755	5,322	8,941	11,247	2,319
		Increase		191.84%	29.30%	106.11%	24.77%	11.92%	68.00%	25.79%	
		Ton/TEU	16.68	13.88	15.01	15.71	12.07	11.86	15.00	15.00	15.00
	Empty	20 Feet									
		40 Feet									
		TEU	742	2,985	5,623	7,652	13,159	20,861	21,129	22,785	4,698
		Increase		302.29%	88.38%	36.08%	71.97%	58.53%	1.28%	7.84%	
	Subtotal	TEU	1,232	4,415	7,472	11,463	17,914	26,183	30,070	34,032	7,017
		Increase		258.36%	69.24%	53.41%	56.28%	46.16%	14.85%	13.18%	
	By Trailer	20 Feet									
		40 Feet									
	Subtotal	TEU	4,470	5,588	6,985	8,731	10,427	8,160	8,833	9,000	
		Increase		25.00%	25.00%	25.00%	19.43%	-21.74%	5.80%	4.25%	
	Subtotal	TEU	5,702	10,003	14,457	20,194	28,341	34,343	38,703	43,032	7,017
		Increase		75.42%	44.53%	39.69%	40.34%	21.18%	12.70%	11.19%	
Bandung	Total	TEU	11,464	19,974	28,665	40,388	56,682	68,686	77,406	85,562	13,739
		Increase		74.22%	43.52%	40.89%	40.34%	21.18%	12.70%	10.54%	
Gedebage	Total	TEU	2,595	8,887	14,807	23,065	35,836	52,008	60,918	67,562	13,739
		Increase		242.47%	66.61%	55.77%	55.37%	45.13%	17.13%	10.91%	
	Cargo Volume	Ton	15,926	51,420	89,439	150,244	199,693	276,060	557,685	629,651	129,825
		Increase		222.87%	73.94%	67.98%	32.91%	38.24%	102.02%	12.90%	

Source : PERUMKA, Cabang Dinas Llajr Kabupaten DT. II Subang

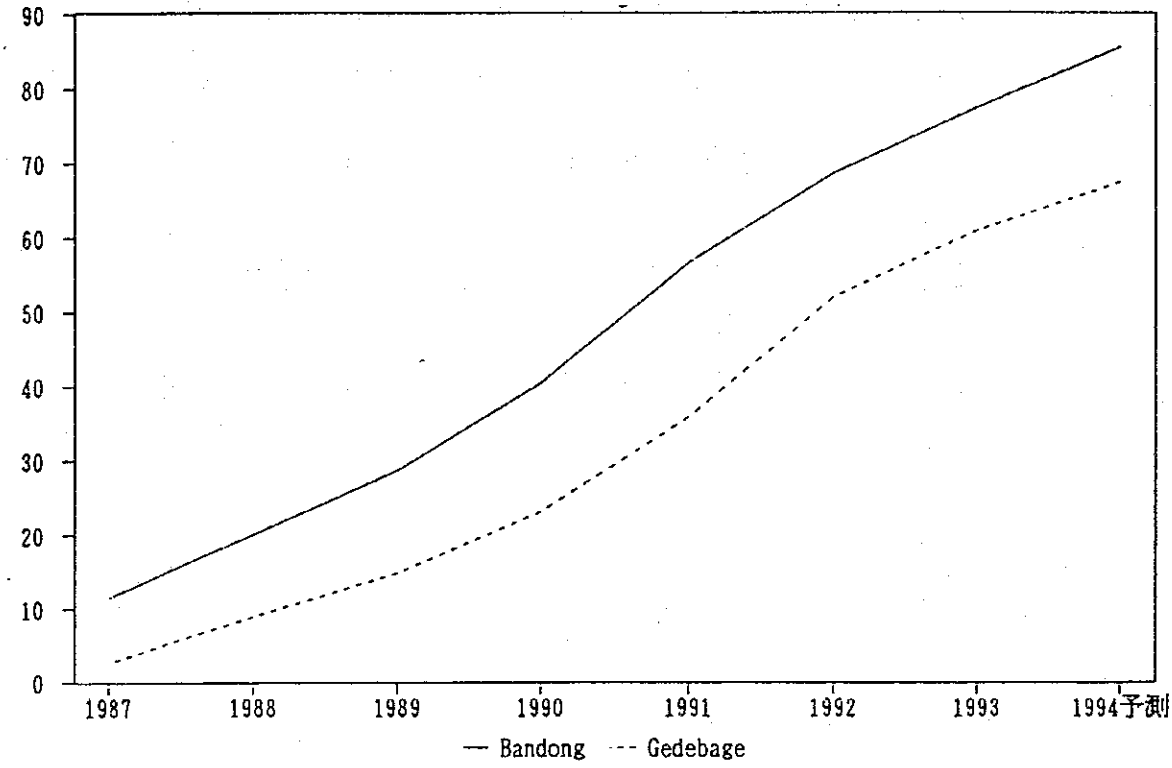


Fig. 3.21 Container Cargo Traffic at Bandung & Gedebage
(Unit: 1,000 TEU)

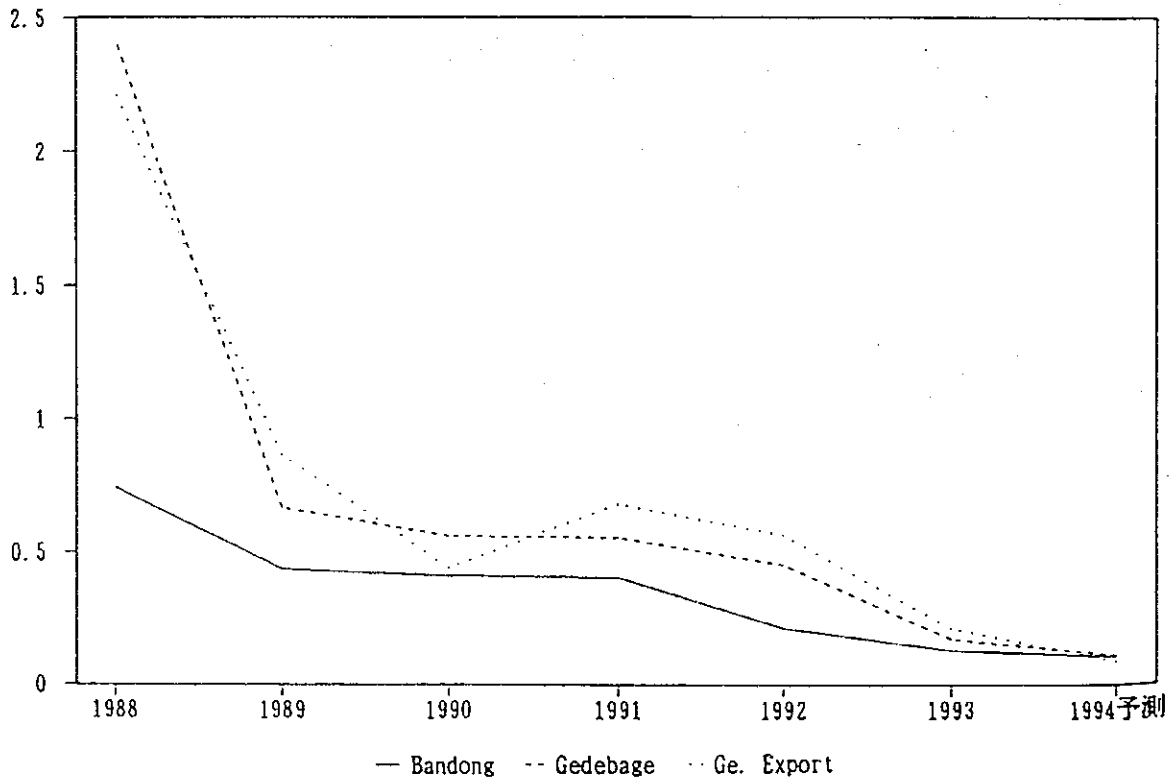


Fig. 3.22 Container Increase Rate at Bandung & Gedebage for Bandung in Container Volume

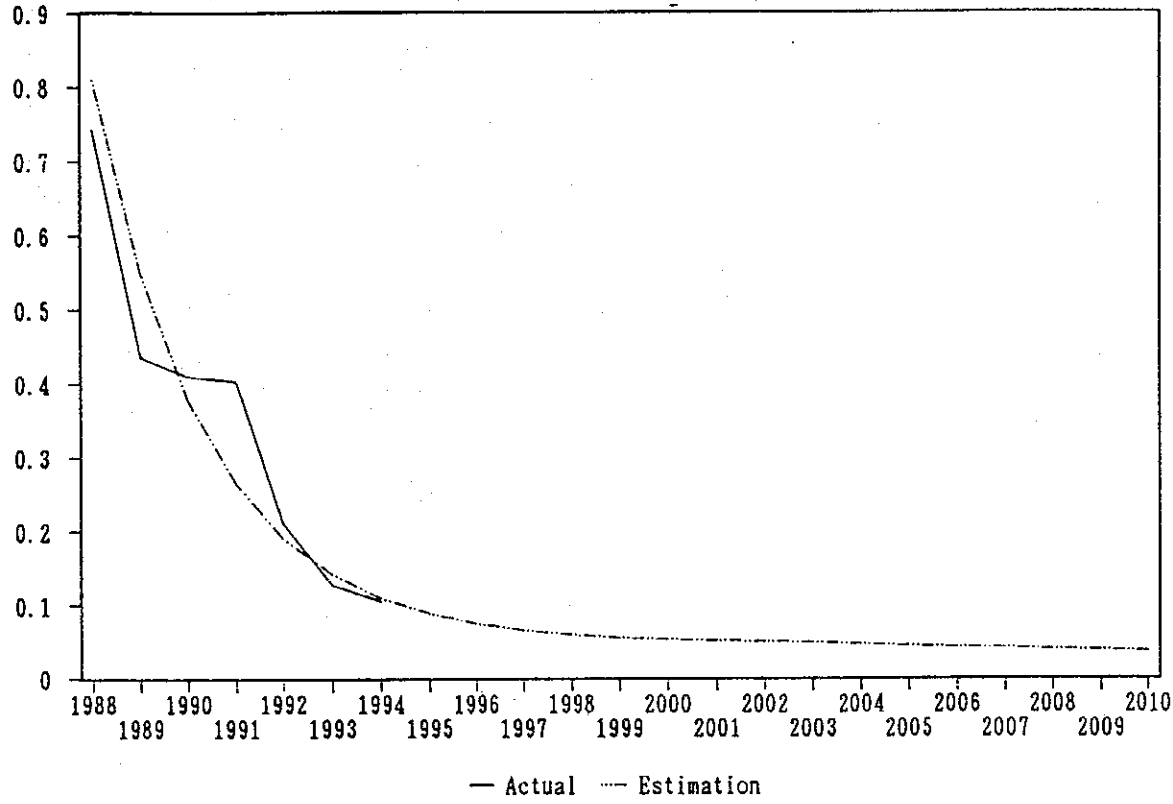


Fig. 3.23 Container Increase Rate at Bandung

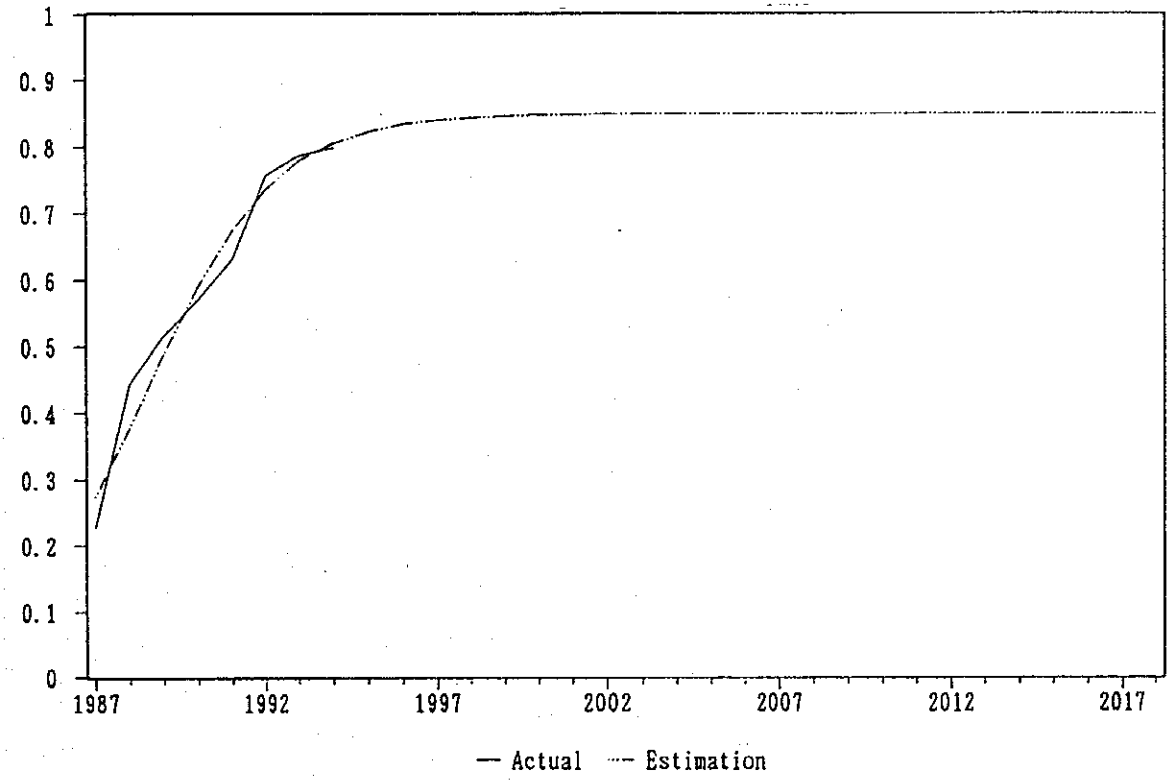


Fig. 3.24 Portion of Gedebage for Bandung in Container Volume

Table 3.86 Estimation for Container Volume at Gedebage Dry Port

(Scenario 1)

	Bandung						Gedebage		Export				Import		
	Total TEU	Increa %	Export TEU	Increa %	Import TEU	Increa %	Total TEU	Portion %	Loaded TEU	Increa %	Empty TEU	Total TEU	Loaded TEU	Empty TEU	Total TEU
1987	11,464		5,762		5,702		2,595	22.64%	1,027		336	1,363	490	742	1,232
1988	19,974	74.2%	9,971	73.0%	10,003	75.4%	8,887	44.49%	3,313	******	1,159	4,472	1,430	2,985	4,415
1989	28,665	43.5%	14,209	42.5%	14,457	44.5%	14,807	51.65%	6,182	86.6%	1,153	7,335	1,849	5,623	7,472
1990	40,388	40.9%	20,194	42.1%	20,194	39.7%	23,065	57.11%	8,880	43.6%	2,722	11,602	3,811	7,652	11,463
1991	56,682	40.3%	28,341	40.3%	28,341	40.3%	35,836	63.22%	14,926	68.1%	2,996	17,922	4,755	13,159	17,914
1992	68,686	21.2%	34,343	21.2%	34,343	21.2%	52,008	75.72%	23,327	56.3%	2,498	25,825	5,322	20,861	26,183
1993	77,406	12.7%	38,703	12.7%	38,703	12.7%	60,918	78.70%	28,238	21.1%	2,610	30,848	8,941	21,129	30,070
1994	85,562	10.5%	42,530	9.9%	43,032	11.2%	67,562	79.90%	30,730	8.8%	2,800	33,530	11,247	22,785	34,032
1995	93,021	8.7%	46,511	9.4%	46,511	8.1%	76,595	82.3%	34,857	13.4%	3,440	38,297	11,060	27,238	38,297
1996	99,440	6.9%	49,720	6.9%	49,720	6.9%	82,935	83.4%	37,820	8.5%	3,647	41,467	11,985	29,483	41,467
1997	106,286	6.9%	53,143	6.9%	53,143	6.9%	89,328	84.0%	40,809	7.9%	3,855	44,664	12,917	31,747	44,664
1998	113,588	6.9%	56,794	6.9%	56,794	6.9%	95,903	84.4%	43,882	7.5%	4,069	47,951	13,876	34,075	47,951
1999	121,375	6.9%	60,687	6.9%	60,687	6.9%	102,757	84.7%	47,086	7.3%	4,293	51,379	14,876	36,502	51,379
2000	129,677	6.8%	64,838	6.8%	64,838	6.8%	109,964	84.8%	50,455	7.2%	4,527	54,982	15,928	39,054	54,982
2001	138,527	6.8%	69,264	6.8%	69,264	6.8%	117,582	84.9%	54,016	7.1%	4,776	58,791	17,039	41,752	58,791
2002	147,940	6.8%	73,970	6.8%	73,970	6.8%	125,644	84.9%	57,784	7.0%	5,038	62,822	18,215	44,607	62,822
2003	157,948	6.8%	78,974	6.8%	78,974	6.8%	134,189	85.0%	61,778	6.9%	5,317	67,095	19,462	47,633	67,095
2004	168,586	6.7%	84,293	6.7%	84,293	6.7%	143,256	85.0%	66,016	6.9%	5,612	71,628	20,785	50,843	71,628
2005	179,890	6.7%	89,945	6.7%	89,945	6.7%	152,880	85.0%	70,514	6.8%	5,925	76,440	22,188	54,251	76,440
2006	191,897	6.7%	95,949	6.7%	95,949	6.7%	163,096	85.0%	75,290	6.8%	6,258	81,548	23,679	57,869	81,548
2007	204,591	6.6%	102,296	6.6%	102,296	6.6%	173,892	85.0%	80,336	6.7%	6,610	86,946	25,254	61,692	86,946
2008	218,002	6.6%	109,001	6.6%	109,001	6.6%	185,295	85.0%	85,666	6.6%	6,981	92,648	26,917	65,730	92,648
2009	232,162	6.5%	116,081	6.5%	116,081	6.5%	197,333	85.0%	91,293	6.6%	7,374	98,667	28,673	69,993	98,667
2010	247,101	6.4%	123,551	6.4%	123,551	6.4%	210,033	85.0%	97,229	6.5%	7,787	105,017	30,526	74,490	105,017
2011	262,854	6.4%	131,427	6.4%	131,427	6.4%	223,424	85.0%	103,489	6.4%	8,223	111,712	32,480	79,232	111,712
2012	279,414	6.3%	139,707	6.3%	139,707	6.3%	237,501	85.0%	110,068	6.4%	8,682	118,750	34,533	84,217	118,750
2013	296,807	6.2%	148,404	6.2%	148,404	6.2%	252,285	85.0%	116,979	6.3%	9,164	126,143	36,690	89,453	126,143
2014	315,061	6.2%	157,530	6.2%	157,530	6.2%	267,801	85.0%	124,231	6.2%	9,669	133,901	38,954	94,947	133,901
2015	334,201	6.1%	167,100	6.1%	167,100	6.1%	284,070	85.0%	131,836	6.1%	10,199	142,035	41,327	100,708	142,035
2016	354,253	6.0%	177,126	6.0%	177,126	6.0%	301,115	85.0%	139,803	6.0%	10,754	150,557	43,813	106,744	150,557
2017	375,242	5.9%	187,621	5.9%	187,621	5.9%	318,956	85.0%	148,142	6.0%	11,336	159,478	46,416	113,062	159,478
2018	397,194	5.9%	198,597	5.8%	198,597	5.8%	337,615	85.0%	156,864	5.9%	11,943	168,807	49,138	119,669	168,807

Table 3.87 Estimation for Container Volume at Gedebage Dry Port

(Scenario 2)

	Bandung						Gedebage		Export				Import		
	Total	Increa	Export	Increa	Import	Increa	Total	Portion	Loaded	Increa	Empty	Total	Loaded	Empty	Total
	TEU	%	TEU	%	TEU	%	TEU	%	TEU	%	TEU	TEU	TEU	TEU	TEU
1987	11,464		5,762		5,702		2,595	22.64%	1,027		336	1,363	490	742	1,232
1988	19,974	74.2%	9,971	73.0%	10,003	75.4%	8,887	44.49%	3,313	******	1,159	4,472	1,430	2,985	4,415
1989	28,665	43.5%	14,209	42.5%	14,457	44.5%	14,807	51.65%	6,182	86.6%	1,153	7,335	1,849	5,623	7,472
1990	40,388	40.9%	20,194	42.1%	20,194	39.7%	23,065	57.11%	8,880	43.6%	2,722	11,602	3,811	7,652	11,463
1991	56,682	40.3%	28,341	40.3%	28,341	40.3%	35,836	63.22%	14,926	68.1%	2,996	17,922	4,755	13,159	17,914
1992	68,686	21.2%	34,343	21.2%	34,343	21.2%	52,008	75.72%	23,327	56.3%	2,498	25,825	5,322	20,861	26,183
1993	77,406	12.7%	38,703	12.7%	38,703	12.7%	60,918	78.70%	28,238	21.1%	2,610	30,848	8,941	21,129	30,070
1994	85,562	10.5%	42,530	9.9%	43,032	11.2%	67,562	79.00%	30,730	8.8%	2,800	33,530	11,247	22,785	34,032
1995	94,005	9.9%	45,984	8.1%	45,984	6.9%	75,728	82.3%	34,452	12.1%	3,412	37,864	10,933	26,931	37,864
1996	100,430	9.2%	50,215	9.2%	50,215	9.2%	83,760	83.4%	38,206	10.9%	3,674	41,880	12,105	29,775	41,880
1997	109,649	9.2%	54,825	9.2%	54,825	9.2%	92,154	84.0%	42,130	10.3%	3,947	46,077	13,330	32,747	46,077
1998	119,693	9.2%	59,846	9.2%	59,846	9.2%	101,057	84.4%	46,291	9.9%	4,237	50,529	14,628	35,900	50,529
1999	130,633	9.1%	65,316	9.1%	65,316	9.1%	110,595	84.7%	50,750	9.6%	4,548	55,298	16,020	39,278	55,298
2000	142,547	9.1%	71,273	9.1%	71,273	9.1%	120,877	84.8%	55,556	9.5%	4,883	60,439	17,520	42,919	60,439
2001	155,518	9.1%	77,759	9.1%	77,759	9.1%	132,004	84.9%	60,757	9.4%	5,245	66,002	19,143	46,859	66,002
2002	169,608	9.1%	84,804	9.1%	84,804	9.1%	144,047	84.9%	66,386	9.3%	5,638	72,023	20,900	51,123	72,023
2003	184,907	9.0%	92,453	9.0%	92,453	9.0%	157,093	85.0%	72,484	9.2%	6,063	78,546	22,803	55,743	78,546
2004	201,512	9.0%	100,756	9.0%	100,756	9.0%	171,234	85.0%	79,094	9.1%	6,523	85,617	24,866	60,751	85,617
2005	219,527	8.9%	109,763	8.9%	109,763	8.9%	186,565	85.0%	86,260	9.1%	7,023	93,283	27,103	66,180	93,283
2006	239,065	8.9%	119,532	8.9%	119,532	8.9%	203,184	85.0%	94,028	9.0%	7,564	101,592	29,527	72,065	101,592
2007	260,150	8.8%	130,075	8.8%	130,075	8.8%	221,114	85.0%	102,409	8.9%	8,148	110,557	32,143	78,414	110,557
2008	282,887	8.7%	141,444	8.7%	141,444	8.7%	240,445	85.0%	111,445	8.8%	8,778	120,223	34,963	85,260	120,223
2009	307,385	8.7%	153,693	8.7%	153,693	8.7%	261,272	85.0%	121,179	8.7%	9,456	130,636	38,001	92,635	130,636
2010	333,759	8.6%	166,879	8.6%	166,879	8.6%	283,691	85.0%	131,659	8.6%	10,187	141,846	41,272	100,574	141,846
2011	362,128	8.5%	181,064	8.5%	181,064	8.5%	307,807	85.0%	142,931	8.6%	10,972	153,903	44,790	109,114	153,903
2012	392,547	8.4%	196,274	8.4%	196,274	8.4%	333,664	85.0%	155,017	8.5%	11,815	166,832	48,562	118,270	166,832
2013	425,129	8.3%	212,564	8.3%	212,564	8.3%	361,358	85.0%	167,962	8.4%	12,717	180,679	52,602	128,077	180,679
2014	459,989	8.2%	229,995	8.2%	229,995	8.2%	390,990	85.0%	181,813	8.2%	13,682	195,495	56,925	138,570	195,495
2015	497,248	8.1%	248,624	8.1%	248,624	8.1%	422,661	85.0%	196,617	8.1%	14,714	211,330	61,545	149,785	211,330
2016	537,028	8.0%	268,514	8.0%	268,514	8.0%	456,474	85.0%	212,422	8.0%	15,815	228,237	66,478	161,759	228,237
2017	579,453	7.9%	289,727	7.9%	289,727	7.9%	492,535	85.0%	229,278	7.9%	16,990	246,268	71,738	174,529	246,268
2018	624,651	7.8%	312,325	7.8%	312,325	7.8%	530,953	85.0%	247,235	7.8%	18,242	265,477	77,343	188,134	265,477

Table 3.87 Estimation for Container Volume at Gedebage Dry Port

(Scenario 3)

	Bandung						Gedebage		Export				Import		
	Total	Increa	Export	Increa	Import	Increa	Total	Portion	Loaded	Increa	Empty	Total	Loaded	Empty	Total
	TEU	%	TEU	%	TEU	%	TEU	%	TEU	%	TEU	TEU	TEU	TEU	TEU
1987	11,464		5,762		5,702		2,595	22.64%	1,027		336	1,363	490	742	1,232
1988	19,974	74.2%	9,971	73.0%	10,003	75.4%	8,887	44.49%	3,313	******	1,159	4,472	1,430	2,985	4,415
1989	28,665	43.5%	14,209	42.5%	14,457	44.5%	14,807	51.65%	6,182	86.6%	1,153	7,335	1,849	5,623	7,472
1990	40,388	40.9%	20,194	42.1%	20,194	39.7%	23,065	57.11%	8,880	43.6%	2,722	11,602	3,811	7,652	11,463
1991	56,682	40.3%	28,341	40.3%	28,341	40.3%	35,836	63.22%	14,926	68.1%	2,996	17,922	4,755	13,159	17,914
1992	68,686	21.2%	34,343	21.2%	34,343	21.2%	52,008	75.72%	23,327	56.3%	2,498	25,825	5,322	20,861	26,183
1993	77,406	12.7%	38,703	12.7%	38,703	12.7%	60,918	78.70%	28,238	21.1%	2,610	30,848	8,941	21,129	30,070
1994	85,562	10.5%	42,530	9.9%	43,032	11.2%	67,562	79.90%	30,730	8.8%	2,800	33,530	11,247	22,785	34,032
1995	91,969	7.5%	45,984	8.1%	45,984	6.9%	75,728	82.3%	34,452	12.1%	3,412	37,864	10,933	26,931	37,864
1996	98,833	7.5%	49,416	7.5%	49,416	7.5%	82,428	83.4%	37,584	9.1%	3,630	41,214	11,911	29,303	41,214
1997	105,307	6.6%	52,654	6.6%	52,654	6.6%	88,505	84.0%	40,424	7.6%	3,828	44,252	12,797	31,455	44,252
1998	111,575	6.0%	55,787	6.0%	55,787	6.0%	94,203	84.4%	43,087	6.6%	4,014	47,101	13,628	33,473	47,101
1999	117,775	5.6%	58,888	5.6%	58,888	5.6%	99,710	84.7%	45,661	6.0%	4,193	49,855	14,432	35,423	49,855
2000	124,015	5.3%	62,007	5.3%	62,007	5.3%	105,162	84.8%	48,210	5.6%	4,371	52,581	15,227	37,354	52,581
2001	130,373	5.1%	65,187	5.1%	65,187	5.1%	110,661	84.9%	50,780	5.3%	4,550	55,331	16,029	39,301	55,331
2002	136,912	5.0%	68,456	5.0%	68,456	5.0%	116,278	84.9%	53,406	5.2%	4,733	58,139	16,849	41,290	58,139
2003	143,677	4.9%	71,839	4.9%	71,839	4.9%	122,065	85.0%	56,111	5.1%	4,922	61,033	17,693	43,339	61,033
2004	150,443	4.7%	75,221	4.7%	75,221	4.7%	127,839	85.0%	58,810	4.8%	5,110	63,919	18,535	45,384	63,919
2005	157,208	4.5%	78,604	4.5%	78,604	4.5%	133,604	85.0%	61,504	4.6%	5,297	66,802	19,376	47,425	66,802
2006	163,974	4.3%	81,987	4.3%	81,987	4.3%	139,363	85.0%	64,197	4.4%	5,485	69,682	20,217	49,465	69,682
2007	170,739	4.1%	85,370	4.1%	85,370	4.1%	145,119	85.0%	66,887	4.2%	5,673	72,560	21,056	51,503	72,560
2008	177,505	4.0%	88,752	4.0%	88,752	4.0%	150,874	85.0%	69,577	4.0%	5,860	75,437	21,896	53,541	75,437
2009	184,270	3.8%	92,135	3.8%	92,135	3.8%	156,626	85.0%	72,266	3.9%	6,047	78,313	22,735	55,578	78,313
2010	191,036	3.7%	95,518	3.7%	95,518	3.7%	162,378	85.0%	74,954	3.7%	6,235	81,189	23,574	57,615	81,189
2011	197,801	3.5%	98,901	3.5%	98,901	3.5%	168,130	85.0%	77,643	3.6%	6,422	84,065	24,413	59,652	84,065
2012	204,567	3.4%	102,283	3.4%	102,283	3.4%	173,881	85.0%	80,331	3.5%	6,610	86,941	25,252	61,688	86,941
2013	211,332	3.3%	105,666	3.3%	105,666	3.3%	179,632	85.0%	83,019	3.3%	6,797	89,816	26,091	63,725	89,816
2014	218,098	3.2%	109,049	3.2%	109,049	3.2%	185,383	85.0%	85,707	3.2%	6,984	92,691	26,930	65,761	92,691
2015	224,863	3.1%	112,432	3.1%	112,432	3.1%	191,134	85.0%	88,395	3.1%	7,172	95,567	27,769	67,798	95,567
2016	231,629	3.0%	115,814	3.0%	115,814	3.0%	196,884	85.0%	91,083	3.0%	7,359	98,442	28,608	69,834	98,442
2017	238,394	2.9%	119,197	2.9%	119,197	2.9%	202,635	85.0%	93,771	3.0%	7,546	101,318	29,447	71,871	101,318
2018	245,160	2.8%	122,580	2.8%	122,580	2.8%	208,386	85.0%	96,459	2.9%	7,734	104,193	30,286	73,907	104,193

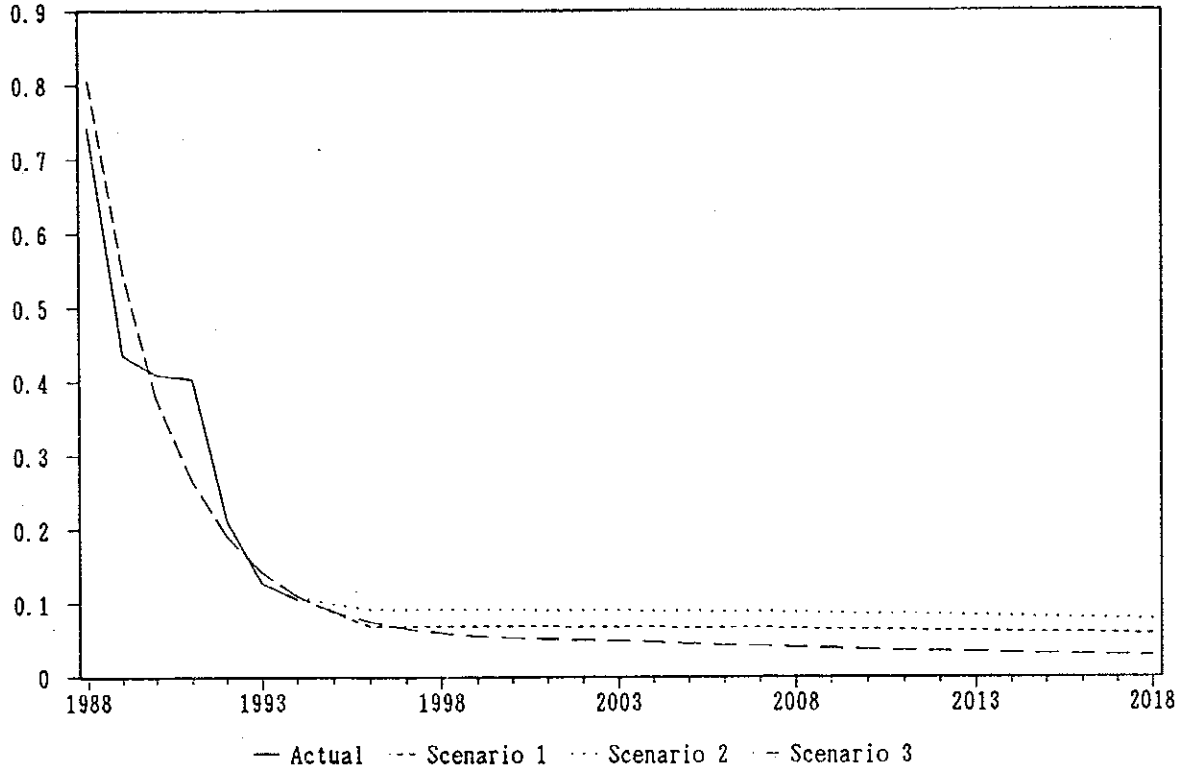


Fig. 3.25 Estimation for Increase Rate of Container at Bandung

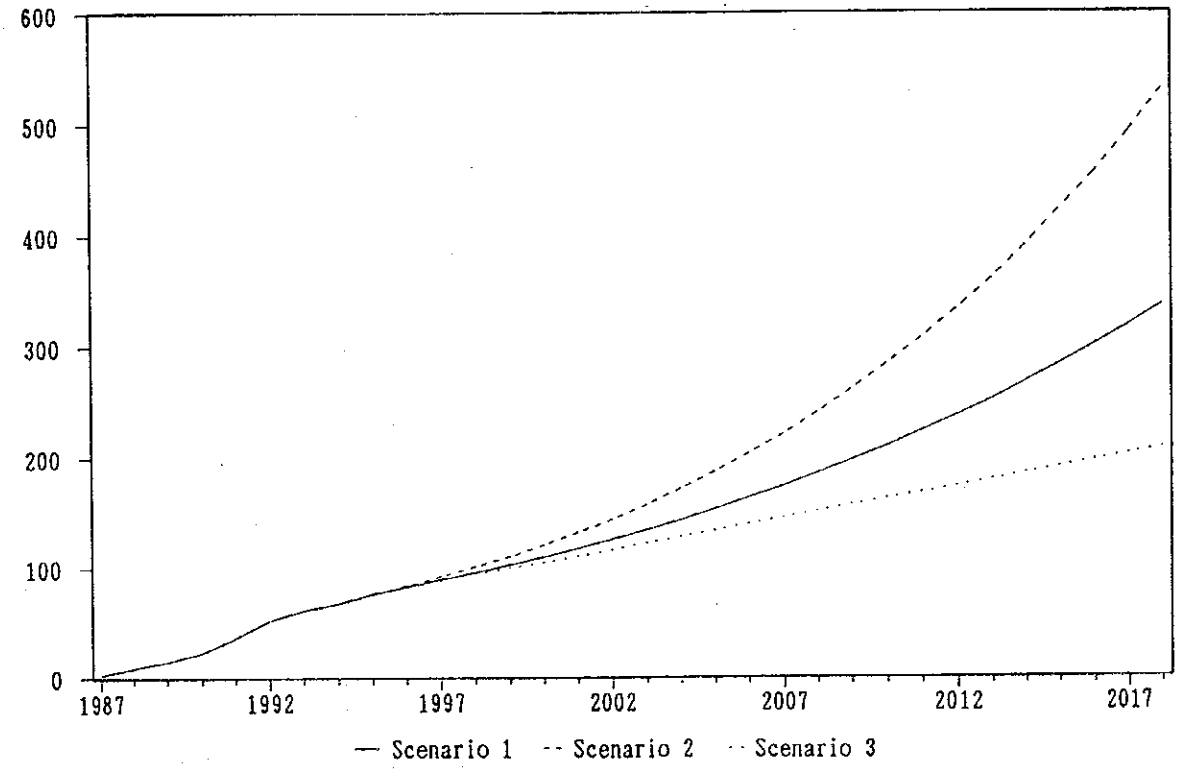


Fig. 3.26 Estimation for Container Vol. at Gedebage
(Unit: 1,000TEU)

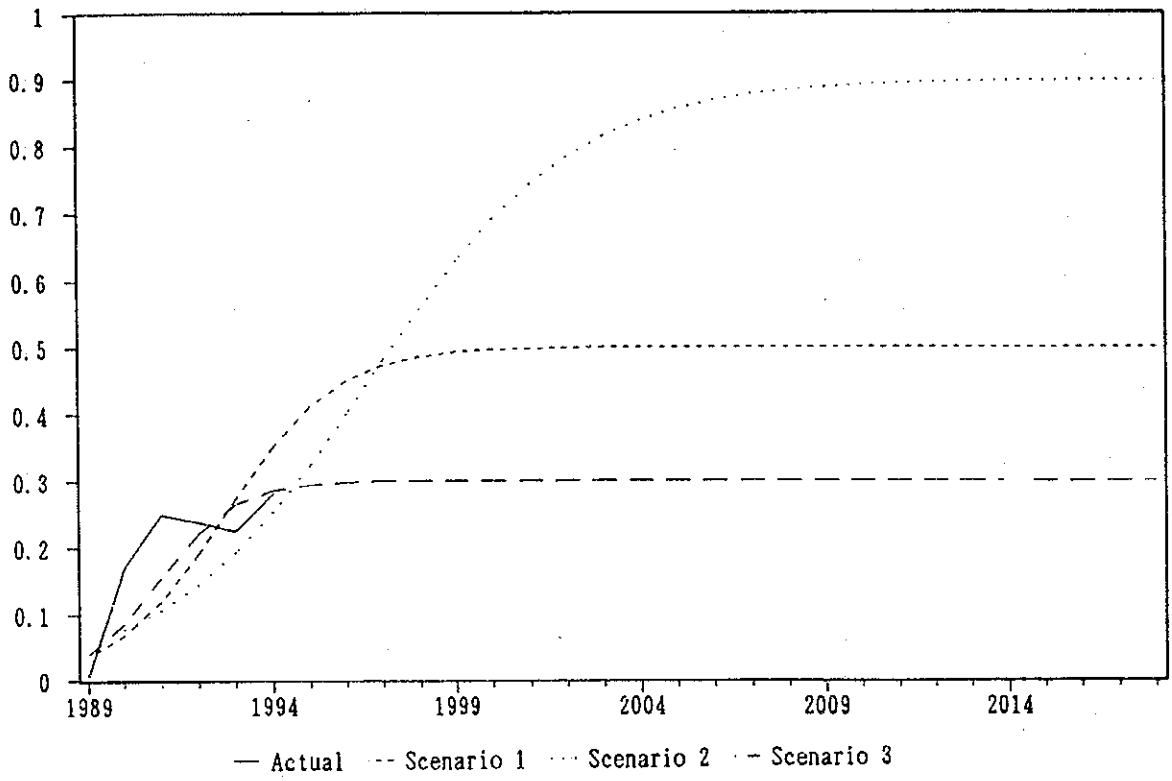


Fig. 3.27 Estimation for share of Dry Port for Surakarta in Container

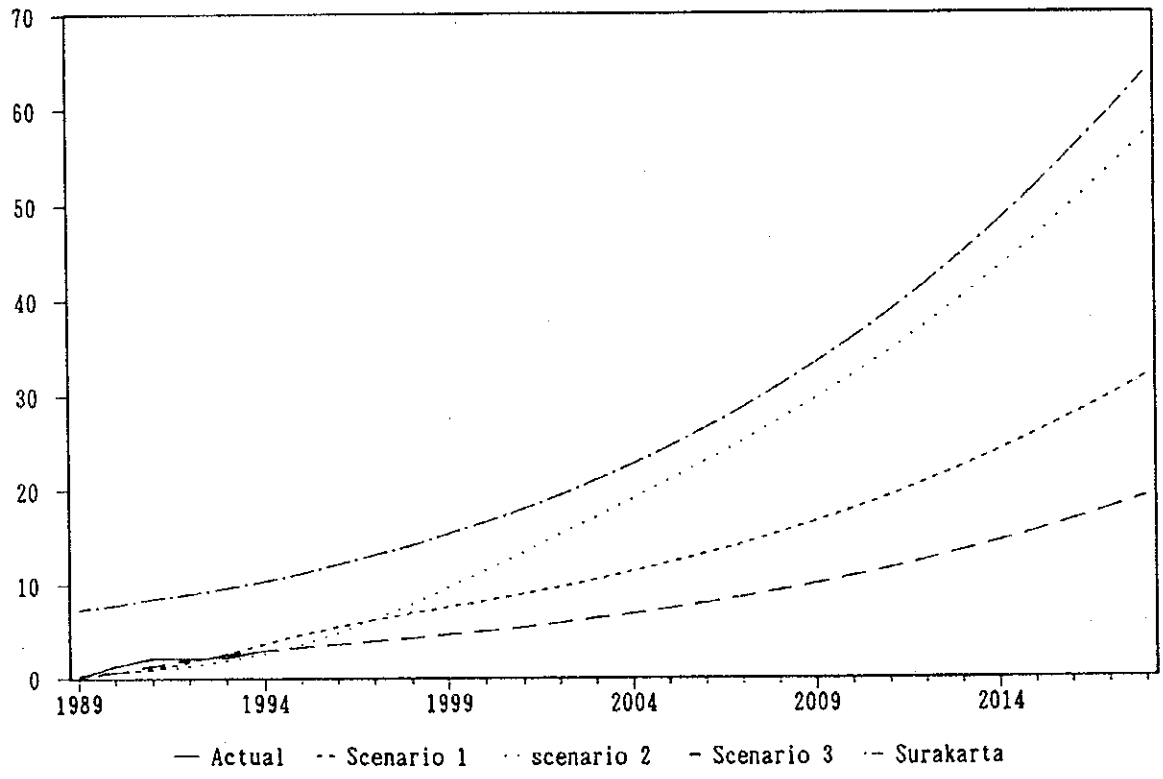


Fig. 3.28 Estimation for Container Vol. at Dry Port
(Unit: 1,000 TEU)

3.5.4 Macro forecast of container cargo traffic through Solo Jebres dry port in 2010

(1) Hinterland

81. The hinterland of Solo Jebres dry port extends along the railway, and the major hinterland is around Surakarta. The major export container cargo consists of light industrial products. The potential container cargo traffic is estimated at approximately 10,000 TEU.

(2) Actual throughput of the dry port

82. The actual container cargo traffic through Solo Jebres dry port is shown **Table 3.91.** The 1994 growth rate of container cargo traffic will conspicuously increase because of the implementation of KM 74. Based on interviews, the 1993 container cargo traffic generated in the hinterland of Solo Jebres dry port is estimated at approximately 700 TEU per month (10,000 TEU / year). Based on the above, approximately 20 % of the container cargo traffic of the hinterland is assumed to be transported though the dry port.

(3) Macro forecast of container cargo traffic through the dry port

83. 1) Scenario 1

The GDP growth rate of the industrial sector is presented in the 25 years long-term development Plan (PJP II). The main container cargo commodity through the dry port is light industrial products. The growth rate of the GRDP of the hinterland is assumed to be 80 % of the growth rate of the industrial sector GDP. This rate is nearly equal to the GRDP growth rate of Yogyakarta city. The potential container cargo traffic of the hinterland is estimated based on this assumption, and finally 50 % of the container cargo traffic generated in the hinterland is projected to be handled through the dry port. The annual container cargo traffic is estimated by the correlation between above assumption and the logistic curve.

Table 3.89 Growth Rate of GRP and GRDP

(Unit : %)

REPELITA	VI	VII	VIII	IX	X
GDP growth rate	6.2	6.6	7.1	7.8	8.7
Industrial GDP	10.3	10.2	10.0	9.5	9.0
GDRP of hinterland	8.3	8.2	8.1	7.7	7.3

84. 2) Scenario 2

The final container cargo traffic through the dry port is assumed to increase to 90 % of the container cargo traffic of the hinterland. The annual container cargo traffic through the dry port is estimated by the correlation between past trend and the logistic curve.

85. 3) Scenario 3

Final container cargo traffic through the dry port is assumed to be 30 % of the container cargo traffic of the hinterland. Container cargo traffic through the dry port is estimated by the correlation between past trend and the logistic curve.

86. The estimated growth rates are shown in **Fig.3.27.**

87. According to the three scenarios, container cargo traffic of Solo Jebres dry port is forecast in **Table 3.92, .93, .94** and **Fig.3.28**, and summarized below.

Table 3.90 Container Cargo Traffic of Solo Jebres

(Unit : TEU)

	1993	2003	2010	2018
Scenario 1	2,153	10,000	18,000	32,000
Scenario 2	2,153	17,000	32,000	57,000
Scenario 3	2,153	6,000	11,000	19,000

Table 3.91 Statistics for Solo Jobres Dry Ports

			1989	1990	1991	1992	1993	1994予測1	1994予測2	94/04
Solo Jobres										
Export	Cargo Volume	Ton	386	9,659	12,504	13,865	13,225	16,605	17,712	5,535
	Loaded	20 Feet		467	455	520	667	819	874	273
		40 Feet		160	378	352	300	306	326	102
		TEU	25	627	833	872	967	1,125	1,200	375
		Ton/TEU	15.44	15.41	15.01	15.90	13.68	14.76	14.76	14.76
	Empty	20 Feet		14	228	188	96	135	144	45
		40 Feet				2	12	210	224	70
		TEU		14	228	190	108	345	368	115
	Subtotal	TEU	25	641	1,061	1,062	1,075	1,470	1,568	490
Import	Cargo Volume	Ton	0	293	2,131	1,739	1,316	5,460	5,824	1,820
	Loaded	20 Feet		2	253	195	104	180	192	60
		40 Feet		24			8	186	198	62
		TEU	0	26	253	195	112	366	390	122
		Ton/TEU		11.27	8.42	8.92	11.75	14.92	14.92	14.92
	Empty	20 Feet		477	419	511	664	801	854	267
		40 Feet		186	356	354	302	318	339	106
		TEU	28	663	775	865	966	1,119	1,194	373
	Subtotal	TEU	28	689	1,028	1,060	1,078	1,485	1,584	495
	Total	TEU	53	1,330	2,089	2,122	2,153	2,955	3,152	985
	Cargo Volume	Ton	386	9,952	14,635	15,604	14,541	22,065	23,536	7,355

Source : PERMUKA

Table 3.92 Estimation for Container Volume at Solo Jabres Dry Port

(Scenario 1)

	Surakarta						Solo Jobres		Export				Import			Total
	Total TEU	Increa %	Export TEU	Increa %	Import TEU	Increa %	Total TEU	Portion %	Loaded TEU	Increa %	Empty TEU	Total TEU	Loaded TEU	Empty TEU	Total TEU	
1989	7,300	7.0%	3,650		3,650		53	0.73%	25		0	25	0	28	28	53
1990	7,800	7.0%	3,900		3,900		1,330	17.05%	627	2408%	14	641	26	663	689	1,330
1991	8,400	7.0%	4,200		4,200		2,089	24.87%	833	32.9%	228	1,061	253	775	1,028	2,089
1992	8,900	7.0%	4,450		4,450		2,122	23.84%	872	4.7%	190	1,062	195	865	1,060	2,122
1993	9,600	7.0%	4,800		4,800		2,153	22.43%	967	10.9%	108	1,075	112	966	1,078	2,153
1994	10,314	7.4%	5,157	7.4%	5,157	7.4%	2,900	28.12%	1,150	18.9%	300	1,450	400	1,050	1,450	2,900
1995	11,125	7.9%	5,562	7.9%	5,562	7.9%	4,580	41.17%	1,860	61.8%	430	2,290	528	1,762	2,290	4,580
1996	12,048	8.3%	6,024	8.3%	6,024	8.3%	5,431	45.07%	2,198	18.2%	517	2,715	638	2,077	2,715	5,431
1997	13,046	8.3%	6,523	8.3%	6,523	8.3%	6,179	47.36%	2,496	13.5%	594	3,090	736	2,354	3,090	6,179
1998	14,123	8.3%	7,062	8.3%	7,062	8.3%	6,867	48.62%	2,769	11.0%	664	3,434	825	2,609	3,434	6,867
1999	15,287	8.2%	7,644	8.2%	7,644	8.2%	7,535	49.29%	3,035	9.6%	733	3,767	912	2,856	3,767	7,535
2000	16,544	8.2%	8,272	8.2%	8,272	8.2%	8,212	49.64%	3,303	8.9%	802	4,106	1,000	3,106	4,106	8,212
2001	17,900	8.2%	8,950	8.2%	8,950	8.2%	8,917	49.81%	3,584	8.5%	875	4,458	1,092	3,367	4,458	8,917
2002	19,365	8.2%	9,682	8.2%	9,682	8.2%	9,664	49.90%	3,880	8.3%	951	4,832	1,189	3,643	4,832	9,664
2003	20,945	8.2%	10,472	8.2%	10,472	8.2%	10,462	49.95%	4,198	8.2%	1,033	5,231	1,293	3,939	5,231	10,462
2004	22,650	8.1%	11,325	8.1%	11,325	8.1%	11,319	49.98%	4,538	8.1%	1,121	5,660	1,404	4,256	5,660	11,319
2005	24,489	8.1%	12,244	8.1%	12,244	8.1%	12,241	49.99%	4,905	8.1%	1,216	6,121	1,524	4,597	6,121	12,241
2006	26,473	8.1%	13,236	8.1%	13,236	8.1%	13,235	49.99%	5,299	8.0%	1,318	6,617	1,653	4,964	6,617	13,235
2007	28,596	8.0%	14,298	8.0%	14,298	8.0%	14,297	50.00%	5,721	8.0%	1,427	7,148	1,791	5,357	7,148	14,297
2008	30,866	7.9%	15,433	7.9%	15,433	7.9%	15,433	50.00%	6,173	7.9%	1,544	7,716	1,939	5,777	7,716	15,433
2009	33,292	7.9%	16,646	7.9%	16,646	7.9%	16,646	50.00%	6,655	7.8%	1,668	8,323	2,097	6,226	8,323	16,646
2010	35,882	7.8%	17,941	7.8%	17,941	7.8%	17,941	50.00%	7,169	7.7%	1,801	8,971	2,265	6,705	8,971	17,941
2011	38,645	7.7%	19,323	7.7%	19,323	7.7%	19,323	50.00%	7,718	7.7%	1,943	9,661	2,445	7,217	9,661	19,323
2012	41,590	7.6%	20,795	7.6%	20,795	7.6%	20,795	50.00%	8,303	7.6%	2,094	10,398	2,636	7,761	10,398	20,795
2013	44,726	7.5%	22,363	7.5%	22,363	7.5%	22,363	50.00%	8,926	7.5%	2,255	11,181	2,840	8,341	11,181	22,363
2014	48,063	7.5%	24,031	7.5%	24,031	7.5%	24,031	50.00%	9,589	7.4%	2,426	12,016	3,057	8,959	12,016	24,031
2015	51,610	7.4%	25,805	7.4%	25,805	7.4%	25,805	50.00%	10,294	7.3%	2,608	12,902	3,288	9,615	12,902	25,805
2016	55,377	7.3%	27,689	7.3%	27,689	7.3%	27,689	50.00%	11,042	7.3%	2,802	13,844	3,533	10,312	13,844	27,689
2017	59,375	7.2%	29,688	7.2%	29,688	7.2%	29,688	50.00%	11,837	7.2%	3,007	14,844	3,793	11,051	14,844	29,688
2018	63,615	7.1%	31,807	7.1%	31,807	7.1%	31,807	50.00%	12,679	7.1%	3,225	15,904	4,068	11,835	15,904	31,807

Source : PERUMUKA, Estimated by The Study Team

Table 3.93 Estimation for Container Volume at Solo Jabres Dry Port

(Scenario 2)

	Surakarta						Solo Jobres		Export				Import			Total
	Total TEU	Increa %	Export TEU	Increa %	Import TEU	Increa %	Total TEU	Portion %	Loaded TEU	Increa %	Empty TEU	Total TEU	Loaded TEU	Empty TEU	Total TEU	
1989	7,300	7.0%	3,650		3,650		53	0.73%	25		0	25	0	28	28	53
1990	7,800	7.0%	3,900		3,900		1,330	17.05%	627	2408%	14	641	26	663	689	1,330
1991	8,400	7.0%	4,200		4,200		2,089	24.87%	833	32.9%	228	1,061	253	775	1,028	2,089
1992	8,900	7.0%	4,450		4,450		2,122	23.84%	872	4.7%	190	1,062	195	865	1,060	2,122
1993	9,600	7.0%	4,800		4,800		2,153	22.43%	967	10.9%	108	1,075	112	966	1,078	2,153
1994	10,314	7.4%	5,157	7.4%	5,157	7.4%	2,900	28.12%	1,150	18.9%	300	1,450	400	1,050	1,450	2,900
1995	11,125	7.9%	5,562	7.9%	5,562	7.9%	3,595	32.31%	1,469	27.7%	328	1,797	399	1,398	1,797	3,595
1996	12,048	8.3%	6,024	8.3%	6,024	8.3%	4,820	40.00%	1,956	33.1%	454	2,410	559	1,851	2,410	4,820
1997	13,046	8.3%	6,523	8.3%	6,523	8.3%	6,263	48.00%	2,529	29.3%	602	3,131	746	2,385	3,131	6,263
1998	14,123	8.3%	7,062	8.3%	7,062	8.3%	7,883	55.82%	3,173	25.5%	769	3,942	957	2,985	3,942	7,883
1999	15,287	8.2%	7,644	8.2%	7,644	8.2%	9,630	63.00%	3,867	21.9%	948	4,815	1,184	3,631	4,815	9,630
2000	16,544	8.2%	8,272	8.2%	8,272	8.2%	11,453	69.23%	4,591	18.7%	1,135	5,726	1,421	4,305	5,726	11,453
2001	17,900	8.2%	8,950	8.2%	8,950	8.2%	13,314	74.38%	5,331	16.1%	1,326	6,657	1,663	4,994	6,657	13,314
2002	19,365	8.2%	9,682	8.2%	9,682	8.2%	15,194	78.46%	6,078	14.0%	1,519	7,597	1,908	5,689	7,597	15,194
2003	20,945	8.2%	10,472	8.2%	10,472	8.2%	17,091	81.60%	6,832	12.4%	1,714	8,546	2,155	6,391	8,546	17,091
2004	22,650	8.1%	11,325	8.1%	11,325	8.1%	19,015	83.95%	7,596	11.2%	1,911	9,507	2,405	7,103	9,507	19,015
2005	24,489	8.1%	12,244	8.1%	12,244	8.1%	20,982	85.68%	8,378	10.3%	2,113	10,491	2,661	7,830	10,491	20,982
2006	26,473	8.1%	13,236	8.1%	13,236	8.1%	23,013	86.93%	9,185	9.6%	2,322	11,506	2,925	8,582	11,506	23,013
2007	28,596	8.0%	14,298	8.0%	14,298	8.0%	25,115	87.83%	10,020	9.1%	2,538	12,558	3,198	9,360	12,558	25,115
2008	30,866	7.9%	15,433	7.9%	15,433	7.9%	27,307	88.47%	10,891	8.7%	2,763	13,654	3,483	10,170	13,654	27,307
2009	33,292	7.9%	16,646	7.9%	16,646	7.9%	29,605	88.92%	11,804	8.4%	2,999	14,802	3,782	11,020	14,802	29,605
2010	35,882	7.8%	17,941	7.8%	17,941	7.8%	32,023	89.24%	12,765	8.1%	3,247	16,011	4,096	11,915	16,011	32,023
2011	38,645	7.7%	19,323	7.7%	19,323	7.7%	34,576	89.47%	13,779	7.9%	3,509	17,288	4,428	12,859	17,288	34,576
2012	41,590	7.6%	20,795	7.6%	20,795	7.6%	37,276	89.63%	14,852	7.8%	3,786	18,638	4,780	13,859	18,638	37,276
2013	44,726	7.5%	22,363	7.5%	22,363	7.5%	40,137	89.74%	15,989	7.7%	4,080	20,068	5,152	14,917	20,068	40,137
2014	48,063	7.5%	24,031	7.5%	24,031	7.5%	43,168	89.82%	17,193	7.5%	4,391	21,584	5,546	16,038	21,584	43,168
2015	51,610	7.4%	25,805	7.4%	25,805	7.4%	46,383	89.87%	18,470	7.4%	4,721	23,191	5,964	17,227	23,191	46,383
2016	55,377	7.3%	27,689	7.3%	27,689	7.3%	49,790	89.91%	19,824	7.3%	5,071	24,895	6,407	18,488	24,895	49,790
2017	59,375	7.2%	29,688	7.2%	29,688	7.2%	53,401	89.94%	21,259	7.2%	5,441	26,700	6,876	19,824	26,700	53,401
2018	63,615	7.1%	31,807	7.1%	31,807	7.1%	57,225	89.96%	22,779	7.1%	5,834	28,613	7,374	21,239	28,613	57,225

Source : PERUMUKA, Estimated by The Study Team

Table 3.94 Estimation for Container Volume at Solo Jabres Dry Port

(Scenario 3)

	Surakarta						Solo Jobres		Export				Import			Total
	Total	Increa	Export	Increa	Import	Increa	Total	Portion	Loaded	Increa	Empty	Total	Loaded	Empty	Total	
	TEU	%	TEU	%	TEU	%	TEU	%	TEU	%	TEU	TEU	TEU	TEU	TEU	
1989	7,300	7.0%	3,650		3,650		53	0.73%	25		0	25	0	28	28	53
1990	7,800	7.0%	3,900		3,900		1,330	17.05%	627	2408%	14	641	26	663	689	1,330
1991	8,400	7.0%	4,200		4,200		2,089	24.87%	833	32.9%	228	1,061	253	775	1,028	2,089
1992	8,900	7.0%	4,450		4,450		2,122	23.84%	872	4.7%	190	1,062	195	865	1,060	2,122
1993	9,600	7.0%	4,800		4,800		2,153	22.43%	967	10.9%	108	1,075	112	966	1,078	2,153
1994	10,314	7.4%	5,157	7.4%	5,157	7.4%	2,900	28.12%	1,150	18.9%	300	1,450	400	1,050	1,450	2,900
1995	11,125	7.9%	5,562	7.9%	5,562	7.9%	3,276	29.44%	1,342	16.7%	296	1,638	358	1,280	1,638	3,276
1996	12,048	8.3%	6,024	8.3%	6,024	8.3%	3,589	29.79%	1,467	9.3%	328	1,795	399	1,396	1,795	3,589
1997	13,046	8.3%	6,523	8.3%	6,523	8.3%	3,903	29.92%	1,592	8.5%	360	1,952	440	1,512	1,952	3,903
1998	14,123	8.3%	7,062	8.3%	7,062	8.3%	4,233	29.97%	1,722	8.2%	394	2,116	482	1,634	2,116	4,233
1999	15,287	8.2%	7,644	8.2%	7,644	8.2%	4,584	29.99%	1,862	8.1%	430	2,292	528	1,764	2,292	4,584
2000	16,544	8.2%	8,272	8.2%	8,272	8.2%	4,962	30.00%	2,012	8.1%	469	2,481	577	1,904	2,481	4,962
2001	17,900	8.2%	8,950	8.2%	8,950	8.2%	5,370	30.00%	2,174	8.0%	511	2,685	630	2,055	2,685	5,370
2002	19,365	8.2%	9,682	8.2%	9,682	8.2%	5,809	30.00%	2,349	8.0%	556	2,905	687	2,217	2,905	5,809
2003	20,945	8.2%	10,472	8.2%	10,472	8.2%	6,283	30.00%	2,537	8.0%	604	3,142	749	2,393	3,142	6,283
2004	22,650	8.1%	11,325	8.1%	11,325	8.1%	6,795	30.00%	2,740	8.0%	657	3,397	816	2,582	3,397	6,795
2005	24,489	8.1%	12,244	8.1%	12,244	8.1%	7,347	30.00%	2,960	8.0%	714	3,673	887	2,786	3,673	7,347
2006	26,473	8.1%	13,236	8.1%	13,236	8.1%	7,942	30.00%	3,196	8.0%	775	3,971	965	3,006	3,971	7,942
2007	28,596	8.0%	14,298	8.0%	14,298	8.0%	8,579	30.00%	3,449	7.9%	840	4,289	1,048	3,242	4,289	8,579
2008	30,866	7.9%	15,433	7.9%	15,433	7.9%	9,260	30.00%	3,720	7.8%	910	4,630	1,136	3,494	4,630	9,260
2009	33,292	7.9%	16,646	7.9%	16,646	7.9%	9,988	30.00%	4,009	7.8%	985	4,994	1,231	3,763	4,994	9,988
2010	35,882	7.8%	17,941	7.8%	17,941	7.8%	10,765	30.00%	4,318	7.7%	1,065	5,382	1,332	4,050	5,382	10,765
2011	38,645	7.7%	19,323	7.7%	19,323	7.7%	11,594	30.00%	4,647	7.6%	1,150	5,797	1,440	4,357	5,797	11,594
2012	41,590	7.6%	20,795	7.6%	20,795	7.6%	12,477	30.00%	4,998	7.6%	1,240	6,239	1,555	4,684	6,239	12,477
2013	44,726	7.5%	22,363	7.5%	22,363	7.5%	13,418	30.00%	5,372	7.5%	1,337	6,709	1,677	5,032	6,709	13,418
2014	48,063	7.5%	24,031	7.5%	24,031	7.5%	14,419	30.00%	5,770	7.4%	1,440	7,209	1,807	5,402	7,209	14,419
2015	51,610	7.4%	25,805	7.4%	25,805	7.4%	15,483	30.00%	6,193	7.3%	1,549	7,741	1,945	5,796	7,741	15,483
2016	55,377	7.3%	27,689	7.3%	27,689	7.3%	16,613	30.00%	6,642	7.3%	1,665	8,307	2,092	6,214	8,307	16,613
2017	59,375	7.2%	29,688	7.2%	29,688	7.2%	17,813	30.00%	7,118	7.2%	1,788	8,906	2,248	6,658	8,906	17,813
2018	63,615	7.1%	31,807	7.1%	31,807	7.1%	19,084	30.00%	7,624	7.1%	1,919	9,542	2,414	7,128	9,542	19,084

Source : PERUMUKA, Estimated by The Study Team

3.5.5 Macro forecast of container cargo traffic through Rambipuji dry port in 2010

(1) Hinterland

88. The hinterland of Rambipujis dry port extends along the railway, and include Jember, Situbondo, Bondowoso, Kalibaru and Banyuwangi. Based on data from PERUMKA, in 1993 the potential container cargo traffic generated in the hinterland is estimated at around 22,000 TEU per year. In 1992, approximately 11,400 TEU of container cargo was exported from the hinterland. Thus, approximately 10 % of the container cargo traffic generated in the hinterland was transported though the dry port. The main container cargo commodities are tobacco, rubber, coffee, tea and teppei stone. It is assumed that frozen tuna, frozen shrimp, chopsticks, paper, corned beef and textiles will be containerized in the future. But agricultural and fish products will remain the main commodities.

(2) Actual throughput of the dry port

89. The actual container cargo traffic through Rambipujis dry port is shown **Table 3.97.** The 1994 growth rate of container cargo traffic is expected to conspicuously increase because of the implementation of KM 74.

(3) Macro forecast of container cargo traffic through the dry port

90. 1) Scenario 1

The GDP growth rate of the agriculture sector is estimated in the 25yearslong-term development plan (PJP II). The GRDP growth rate of East Jawa is calculated based on PJP II and REPELITA VI. The GRDP growth rate of the East Jawa agriculture sector is estimated based on the above figures. The main container cargo commodity generated in the hinterland of the dry port is agricultural products. Thus, the GRDP growth rate of the hinterland is assumed to be the same as the GDRP growth rate of the East Jawa agriculture sector. The potential container cargo traffic of the hinterland is estimated based on this assumption, and finally 50 % of the container cargo traffic generated in the hinterland is projected to be handled through the dry port. The annual container cargo traffic is estimated by correlation between the above assumption and the logistic curve.

Table 3.95 Growth Rates of GDP and GRDP

(Unit : %)

REPELITA	VI	VII	VIII	IX	X
GDP growth rate	6.2	6.6	7.1	7.8	8.7
Agricultural GDP	3.4	3.5	3.5	3.5	3.5
GRDP of East Jawa	6.2	6.6	7.1	7.8	8.7
GDRP of hinterland	2.5	2.5	2.5	2.5	2.5

91. 2) Scenario 2
Finally 90% of the container cargo traffic of the hinterland is assumed to be shipped through the dry port. The annual container cargo traffic through the dry port is estimated by the correlation between the past trend and the logistic curve.

92. 3) Scenario 3
The percentage of the container cargo traffic generated in the hinterland that is handled at the dry port is projected to remain the same as at present.
the rates estimated above are shown in **Fig.3.29.**

93. The annual container cargo traffic of Rambipuji dry port under three scenarios is forecast in **Tables 3.98, .99, .100** and
Fig.3.30 and summarized below.

Table 3.96 Container Cargo Traffic of Rambipuji Dry Port

(Unit : TEU)

	1993	2003	2010	2018
Scenario 1	2,516	8,500	16,000	21,000
Scenario 2	2,516	12,000	25,000	37,000
Scenario 3	2,516	5,000	7,000	8,500

Table 3.97 Estimation for Container Volume at Rembipuji Dry Port

(Scenario 1)

	Jember						Rambipuji		Export				Import			Total
	Total TEU	Increa %	Export TEU	Increa %	Import TEU	Increa %	Total TEU	Portion %	Loaded TEU	Increa %	Empty TEU	Total TEU	Loaded TEU	Empty TEU	Total TEU	
1983	17,968	2.5%	8,984		8,984		50	0.28%	25		0	25	0	25	25	50
1984	18,417	2.5%	9,208		9,208		426	2.31%	213	752%	0	213	0	213	213	426
1985	18,877	2.5%	9,439		9,439		404	2.14%	202	-5%	0	202	0	202	202	404
1986	19,349	2.5%	9,675		9,675		604	3.12%	302	50%	0	302	0	302	302	604
1987	19,833	2.5%	9,916		9,916		1,090	5.50%	545	80%	0	545	0	545	545	1,090
1988	20,329	2.5%	10,164		10,164		806	3.96%	403	-26%	0	403	0	403	403	806
1989	20,837	2.5%	10,418		10,418		518	2.49%	259	-36%	0	259	0	259	259	518
1990	21,358	2.5%	10,679		10,679		648	3.03%	324	25%	0	324	0	324	324	648
1991	21,892	2.5%	10,946		10,946		706	3.22%	353	9.0%	0	353	0	353	353	706
1992	22,439	2.5%	11,220		11,220		1,236	5.51%	521	47.6%	0	521	0	521	521	1,042
1993	23,000	2.5%	11,500		11,500		2,516	10.94%	1,258	******	0	1,258	0	1,258	1,258	2,516
1994	23,575	2.5%	11,788		11,788		2,600	11.03%	1,300	3.3%	0	1,300	0	1,300	1,300	2,600
1995	24,164	2.5%	12,082	2.5%	12,082	2.5%	2,840	11.75%	1,420	9.2%	0	1,420	68	1,352	1,420	2,840
1996	24,768	2.5%	12,384	2.5%	12,384	2.5%	3,436	13.87%	1,718	21.0%	0	1,718	88	1,630	1,718	3,436
1997	25,388	2.5%	12,694	2.5%	12,694	2.5%	4,117	16.22%	2,058	19.8%	0	2,058	112	1,947	2,058	4,117
1998	26,022	2.5%	13,011	2.5%	13,011	2.5%	4,879	18.75%	2,439	18.5%	0	2,439	138	2,302	2,439	4,879
1999	26,673	2.5%	13,336	2.5%	13,336	2.5%	5,715	21.43%	2,857	17.1%	0	2,857	167	2,691	2,857	5,715
2000	27,340	2.5%	13,670	2.5%	13,670	2.5%	6,613	24.19%	3,307	15.7%	0	3,307	198	3,109	3,307	6,613
2001	28,023	2.5%	14,012	2.5%	14,012	2.5%	7,559	26.97%	3,779	14.3%	0	3,779	230	3,549	3,779	7,559
2002	28,724	2.5%	14,362	2.5%	14,362	2.5%	8,534	29.71%	4,267	12.9%	0	4,267	264	4,003	4,267	8,534
2003	29,442	2.5%	14,721	2.5%	14,721	2.5%	9,519	32.33%	4,760	11.6%	0	4,760	298	4,462	4,760	9,519
2004	30,178	2.5%	15,089	2.5%	15,089	2.5%	10,499	34.79%	5,250	10.3%	0	5,250	332	4,918	5,250	10,499
2005	30,932	2.5%	15,466	2.5%	15,466	2.5%	11,458	37.04%	5,729	9.1%	0	5,729	365	5,365	5,729	11,458
2006	31,706	2.5%	15,853	2.5%	15,853	2.5%	12,387	39.07%	6,193	8.1%	0	6,193	397	5,797	6,193	12,387
2007	32,498	2.5%	16,249	2.5%	16,249	2.5%	13,277	40.85%	6,638	7.2%	0	6,638	427	6,211	6,638	13,277
2008	33,311	2.5%	16,655	2.5%	16,655	2.5%	14,125	42.40%	7,063	6.4%	0	7,063	457	6,606	7,063	14,125
2009	34,144	2.5%	17,072	2.5%	17,072	2.5%	14,932	43.73%	7,466	5.7%	0	7,466	484	6,982	7,466	14,932
2010	34,997	2.5%	17,499	2.5%	17,499	2.5%	15,699	44.86%	7,849	5.1%	0	7,849	511	7,339	7,849	15,699
2011	35,872	2.5%	17,936	2.5%	17,936	2.5%	16,429	45.80%	8,214	4.7%	0	8,214	536	7,679	8,214	16,429
2012	36,769	2.5%	18,384	2.5%	18,384	2.5%	17,127	46.58%	8,564	4.3%	0	8,564	560	8,004	8,564	17,127
2013	37,688	2.5%	18,844	2.5%	18,844	2.5%	17,799	47.23%	8,899	3.9%	0	8,899	583	8,316	8,899	17,799
2014	38,630	2.5%	19,315	2.5%	19,315	2.5%	18,448	47.76%	9,224	3.6%	0	9,224	606	8,619	9,224	18,448
2015	39,596	2.5%	19,798	2.5%	19,798	2.5%	19,081	48.19%	9,540	3.4%	0	9,540	627	8,913	9,540	19,081
2016	40,586	2.5%	20,293	2.5%	20,293	2.5%	19,701	48.54%	9,850	3.2%	0	9,850	649	9,202	9,850	19,701
2017	41,601	2.5%	20,800	2.5%	20,800	2.5%	20,312	48.83%	10,156	3.1%	0	10,156	670	9,486	10,156	20,312
2018	42,641	2.5%	21,320	2.5%	21,320	2.5%	20,918	49.06%	10,459	3.0%	0	10,459	691	9,768	10,459	20,918

Source : PERUMUKA, Estimated by The Study Team

Table 3.98 Estimation for Container Volume at Rembipuji Dry Port

(Scenario 2)

	Jember						Rambipuji		Export				Import			
	Total TEU	Increa %	Export TEU	Increa %	Import TEU	Increa %	Total TEU	Portion %	Loaded TEU	Increa %	Empty TEU	Total TEU	Loaded TEU	Empty TEU	Total TEU	Total
1983	17,968	2.5%	8,984		8,984		50	0.28%	25		0	25	0	25	25	50
1984	18,417	2.5%	9,208		9,208		426	2.31%	213	752%	0	213	0	213	213	426
1985	18,877	2.5%	9,439		9,439		404	2.14%	202	-5%	0	202	0	202	202	404
1986	19,349	2.5%	9,675		9,675		604	3.12%	302	50%	0	302	0	302	302	604
1987	19,833	2.5%	9,916		9,916		1,090	5.50%	545	80%	0	545	0	545	545	1,090
1988	20,329	2.5%	10,164		10,164		806	3.96%	403	-26%	0	403	0	403	403	806
1989	20,837	2.5%	10,418		10,418		518	2.49%	259	-36%	0	259	0	259	259	518
1990	21,358	2.5%	10,679		10,679		648	3.03%	324	25%	0	324	0	324	324	648
1991	21,892	2.5%	10,946		10,946		706	3.22%	353	9.0%	0	353	0	353	353	706
1992	22,439	2.5%	11,220		11,220		1,236	5.51%	521	47.6%	0	521	0	521	521	1,042
1993	23,000	2.5%	11,500		11,500		2,516	10.94%	1,258	******	0	1,258	0	1,258	1,258	2,516
1994	23,575	2.5%	11,788		11,788		2,600	11.03%	1,300	3.3%	0	1,300	0	1,300	1,300	2,600
1995	24,164	2.5%	12,082	2.5%	12,082	2.5%	2,876	11.90%	1,438	10.6%	0	1,438	69	1,369	1,438	2,876
1996	24,768	2.5%	12,384	2.5%	12,384	2.5%	3,535	14.27%	1,768	22.9%	0	1,768	92	1,676	1,768	3,535
1997	25,388	2.5%	12,694	2.5%	12,694	2.5%	4,320	17.01%	2,160	22.2%	0	2,160	119	2,041	2,160	4,320
1998	26,022	2.5%	13,011	2.5%	13,011	2.5%	5,241	20.14%	2,621	21.3%	0	2,621	150	2,470	2,621	5,241
1999	26,673	2.5%	13,336	2.5%	13,336	2.5%	6,310	23.66%	3,155	20.4%	0	3,155	187	2,968	3,155	6,310
2000	27,340	2.5%	13,670	2.5%	13,670	2.5%	7,531	27.55%	3,766	19.3%	0	3,766	229	3,536	3,766	7,531
2001	28,023	2.5%	14,012	2.5%	14,012	2.5%	8,902	31.77%	4,451	18.2%	0	4,451	277	4,175	4,451	8,902
2002	28,724	2.5%	14,362	2.5%	14,362	2.5%	10,415	36.26%	5,208	17.0%	0	5,208	329	4,879	5,208	10,415
2003	29,442	2.5%	14,721	2.5%	14,721	2.5%	12,054	40.94%	6,027	15.7%	0	6,027	385	5,642	6,027	12,054
2004	30,178	2.5%	15,089	2.5%	15,089	2.5%	13,795	45.71%	6,898	14.4%	0	6,898	445	6,452	6,898	13,795
2005	30,932	2.5%	15,466	2.5%	15,466	2.5%	15,611	50.47%	7,806	13.2%	0	7,806	508	7,298	7,806	15,611
2006	31,706	2.5%	15,853	2.5%	15,853	2.5%	17,471	55.10%	8,735	11.9%	0	8,735	572	8,164	8,735	17,471
2007	32,498	2.5%	16,249	2.5%	16,249	2.5%	19,344	59.52%	9,672	10.7%	0	9,672	636	9,035	9,672	19,344
2008	33,311	2.5%	16,655	2.5%	16,655	2.5%	21,202	63.65%	10,601	9.6%	0	10,601	700	9,901	10,601	21,202
2009	34,144	2.5%	17,072	2.5%	17,072	2.5%	23,023	67.43%	11,511	8.6%	0	11,511	763	10,748	11,511	23,023
2010	34,997	2.5%	17,499	2.5%	17,499	2.5%	24,789	70.83%	12,394	7.7%	0	12,394	824	11,570	12,394	24,789
2011	35,872	2.5%	17,936	2.5%	17,936	2.5%	26,489	73.84%	13,244	6.9%	0	13,244	883	12,362	13,244	26,489
2012	36,769	2.5%	18,384	2.5%	18,384	2.5%	28,118	76.47%	14,059	6.1%	0	14,059	939	13,120	14,059	28,118
2013	37,688	2.5%	18,844	2.5%	18,844	2.5%	29,675	78.74%	14,837	5.5%	0	14,837	992	13,845	14,837	29,675
2014	38,630	2.5%	19,315	2.5%	19,315	2.5%	31,163	80.67%	15,582	5.0%	0	15,582	1,044	14,538	15,582	31,163
2015	39,596	2.5%	19,798	2.5%	19,798	2.5%	32,589	82.30%	16,295	4.6%	0	16,295	1,093	15,202	16,295	32,589
2016	40,586	2.5%	20,293	2.5%	20,293	2.5%	33,960	83.67%	16,980	4.2%	0	16,980	1,140	15,840	16,980	33,960
2017	41,601	2.5%	20,800	2.5%	20,800	2.5%	35,284	84.82%	17,642	3.9%	0	17,642	1,186	16,456	17,642	35,284
2018	42,641	2.5%	21,320	2.5%	21,320	2.5%	36,569	85.76%	18,285	3.6%	0	18,285	1,230	17,055	18,285	36,569

Source : PERUMUKA, Estimated by The Study Team

Table 3.99 Tatistics for Rambipuji Dry Port

			1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994/2000	1994/2001	1994/2002	1994/2003	94/04
Rambipuji																		
Export	Cargo Volume	Ton							2,590	3,030	3,993	5,057	15,508	10,000	18,114	9,840	13,977	3,280
	Loaded	20 Feet							9	80	69	121	322	400	554	301	427	138
		40 Feet					7	25	250	244	284	400	936	900	915	497	700	228
		TEU	25	213	202	302	545	403	259	324	353	521	1,258	1,300	1,469	798	1,134	366
		Ton/TEU							10.00	11.20	11.31	10.86	12.33	12.3	12.33	12.33	12.33	8.96
	Empty	20 Feet																
		40 Feet																
		TEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Subtotal	TEU	25	213	202	302	545	403	259	324	353	521	1,258	1,300	1,469	798	1,134	366
Import	Cargo Volume	Ton																
	Loaded	20 Feet																
		40 Feet																
		TEU	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		Ton/TEU																
	Empty	20 Feet					7	25	9	80	69	121	322	400	554	301	427	138
		40 Feet					538	378	250	244	284	400	936	900	915	497	700	228
		TEU	25	213	202	302	545	403	259	324	353	521	1,258	1,300	1,469	798	1,134	366
	Subtotal	TEU	25	213	202	302	545	403	259	324	353	521	1,258	1,300	1,469	798	1,134	366
	Total	TEU	50	426	404	604	1,090	806	518	648	706	1,042	2,516	2,600	2,939	1,596	2,268	732
	Cargo Volume	Ton							2,590	3,030	3,993	5,057	15,508	10,000	18,114	9,840	13,977	3,280

Source : PERUMKA

Table 3.100 Estimation for Container Volume at Rembipuji Dry Port

(Scenario 3)

	Jember						Rambipuji		Export				Import			Total
	Total TEU	Increa %	Export TEU	Increa %	Import TEU	Increa %	Total TEU	Portion %	Loaded TEU	Increa %	Empty TEU	Total TEU	Loaded TEU	Empty TEU	Total TEU	
1983	17,968	2.5%	8,984		8,984		50	0.28%	25		0	25	0	25	25	50
1984	18,417	2.5%	9,208		9,208		426	2.31%	213	752%	0	213	0	213	213	426
1985	18,877	2.5%	9,439		9,439		404	2.14%	202	-5%	0	202	0	202	202	404
1986	19,349	2.5%	9,675		9,675		604	3.12%	302	50%	0	302	0	302	302	604
1987	19,833	2.5%	9,916		9,916		1,090	5.50%	545	80%	0	545	0	545	545	1,090
1988	20,329	2.5%	10,164		10,164		806	3.96%	403	-26%	0	403	0	403	403	806
1989	20,837	2.5%	10,418		10,418		518	2.49%	259	-36%	0	259	0	259	259	518
1990	21,358	2.5%	10,679		10,679		648	3.03%	324	25%	0	324	0	324	324	648
1991	21,892	2.5%	10,946		10,946		706	3.22%	353	9.0%	0	353	0	353	353	706
1992	22,439	2.5%	11,220		11,220		1,236	5.51%	521	47.6%	0	521	0	521	521	1,042
1993	23,000	2.5%	11,500		11,500		2,516	10.94%	1,258	******	0	1,258	0	1,258	1,258	2,516
1994	23,575	2.5%	11,788		11,788		2,600	11.03%	1,300	3.3%	0	1,300	0	1,300	1,300	2,600
1995	24,164	2.5%	12,082	2.5%	12,082	2.5%	2,615	10.82%	1,308	0.6%	0	1,308	60	1,248	1,308	2,615
1996	24,768	2.5%	12,384	2.5%	12,384	2.5%	2,997	12.10%	1,498	14.6%	0	1,498	73	1,425	1,498	2,997
1997	25,388	2.5%	12,694	2.5%	12,694	2.5%	3,378	13.31%	1,689	12.7%	0	1,689	86	1,603	1,689	3,378
1998	26,022	2.5%	13,011	2.5%	13,011	2.5%	3,751	14.41%	1,875	11.0%	0	1,875	99	1,776	1,875	3,751
1999	26,673	2.5%	13,336	2.5%	13,336	2.5%	4,108	15.40%	2,054	9.5%	0	2,054	111	1,943	2,054	4,108
2000	27,340	2.5%	13,670	2.5%	13,670	2.5%	4,445	16.26%	2,223	8.2%	0	2,223	123	2,100	2,223	4,445
2001	28,023	2.5%	14,012	2.5%	14,012	2.5%	4,761	16.99%	2,380	7.1%	0	2,380	134	2,247	2,380	4,761
2002	28,724	2.5%	14,362	2.5%	14,362	2.5%	5,055	17.60%	2,527	6.2%	0	2,527	144	2,383	2,527	5,055
2003	29,442	2.5%	14,721	2.5%	14,721	2.5%	5,328	18.10%	2,664	5.4%	0	2,664	153	2,511	2,664	5,328
2004	30,178	2.5%	15,089	2.5%	15,089	2.5%	5,583	18.50%	2,792	4.8%	0	2,792	162	2,629	2,792	5,583
2005	30,932	2.5%	15,466	2.5%	15,466	2.5%	5,823	18.82%	2,912	4.3%	0	2,912	170	2,741	2,912	5,823
2006	31,706	2.5%	15,853	2.5%	15,853	2.5%	6,050	19.08%	3,025	3.9%	0	3,025	178	2,847	3,025	6,050
2007	32,498	2.5%	16,249	2.5%	16,249	2.5%	6,267	19.29%	3,134	3.6%	0	3,134	186	2,948	3,134	6,267
2008	33,311	2.5%	16,655	2.5%	16,655	2.5%	6,477	19.45%	3,239	3.3%	0	3,239	193	3,046	3,239	6,477
2009	34,144	2.5%	17,072	2.5%	17,072	2.5%	6,682	19.57%	3,341	3.2%	0	3,341	200	3,141	3,341	6,682
2010	34,997	2.5%	17,499	2.5%	17,499	2.5%	6,883	19.67%	3,441	3.0%	0	3,441	207	3,234	3,441	6,883
2011	35,872	2.5%	17,936	2.5%	17,936	2.5%	7,082	19.74%	3,541	2.9%	0	3,541	214	3,327	3,541	7,082
2012	36,769	2.5%	18,384	2.5%	18,384	2.5%	7,281	19.80%	3,640	2.8%	0	3,640	221	3,420	3,640	7,281
2013	37,688	2.5%	18,844	2.5%	18,844	2.5%	7,480	19.85%	3,740	2.7%	0	3,740	228	3,512	3,740	7,480
2014	38,630	2.5%	19,315	2.5%	19,315	2.5%	7,680	19.88%	3,840	2.7%	0	3,840	234	3,606	3,840	7,680
2015	39,596	2.5%	19,798	2.5%	19,798	2.5%	7,883	19.91%	3,941	2.6%	0	3,941	241	3,700	3,941	7,883
2016	40,586	2.5%	20,293	2.5%	20,293	2.5%	8,089	19.93%	4,044	2.6%	0	4,044	249	3,796	4,044	8,089
2017	41,601	2.5%	20,800	2.5%	20,800	2.5%	8,298	19.95%	4,149	2.6%	0	4,149	256	3,893	4,149	8,298
2018	42,641	2.5%	21,320	2.5%	21,320	2.5%	8,510	19.96%	4,255	2.6%	0	4,255	263	3,992	4,255	8,510

Source : PERUMUKA, Estimated by The Study Team

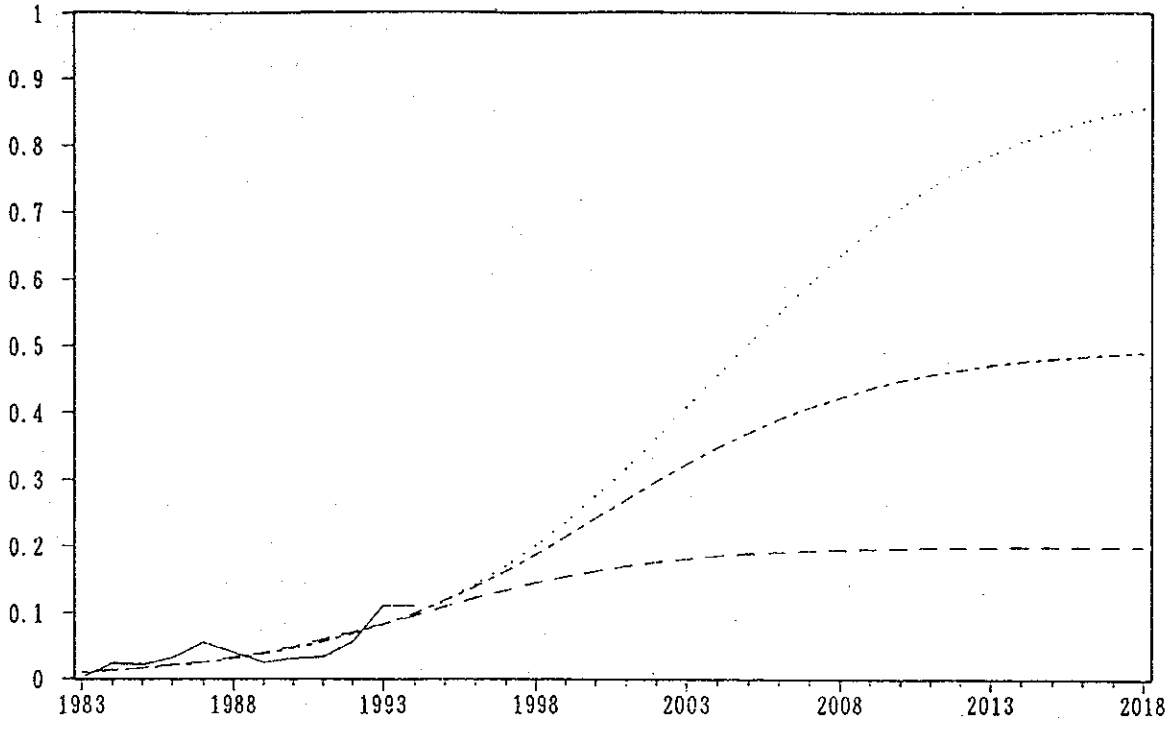


Fig. 3.29 Estimation for Share of Dry Port in Jember for Container

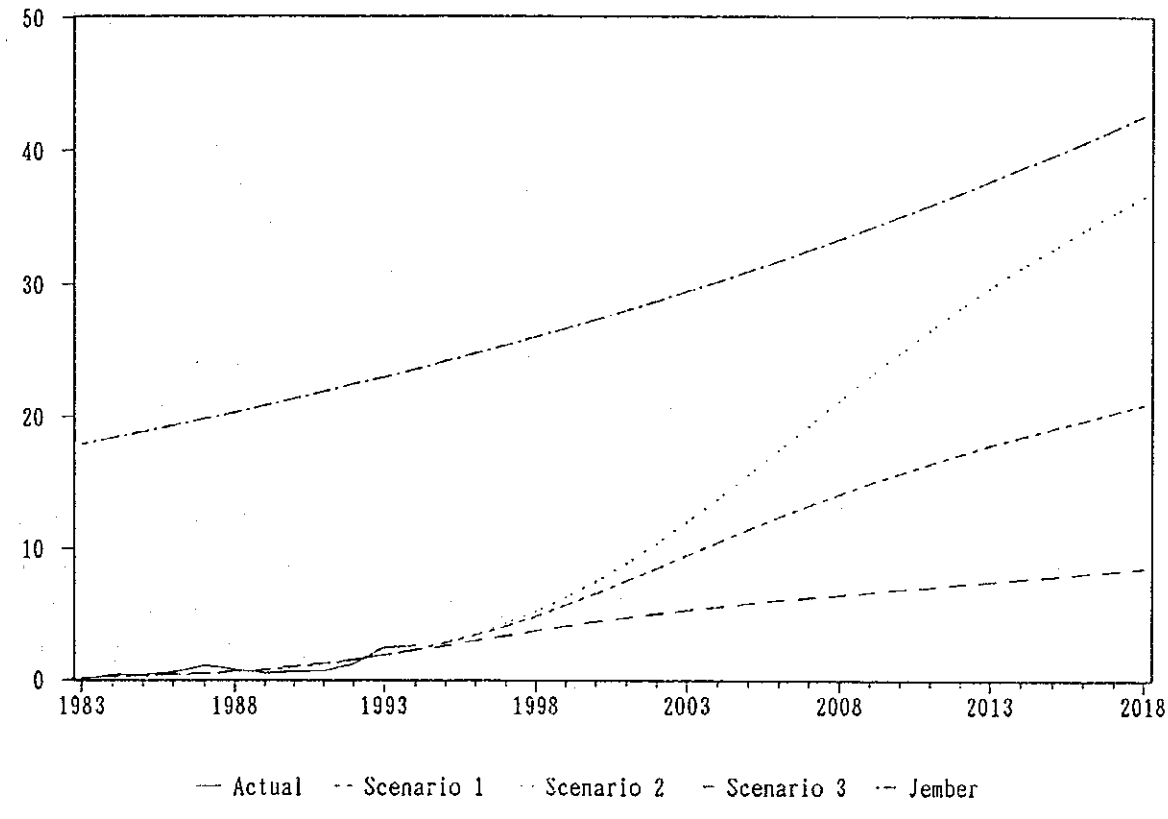


Fig. 3.30 Estimation for Container Vol. Rambipuji Dry Port
(Unit: 1,000T'

4. FORMULATION OF THE DEVELOPMENT STRATEGY OF CONTAINER CARGO TRANSPORTATION

4.1 General

1. So far, various features of the existing socioeconomic situation of Indonesia and the present conditions of the container cargo handling facilities at major ports and railways were reviewed in Chapter 2. In Chapter 3, the container cargo traffic is forecasted on the basis of three scenarios: moderate, optimistic and conservative, respectively. The container cargo traffic forecast has been done with a hypothesis that the Indonesian ports will not functionally impose any restriction on the increasing container traffic, which will be generated as the consequence of the economic growth of the hinterland and the whole country. In other wards, the current study does not assume the Indonesian ports to be bottle necks in both international and domestic cargo flow in the coming years. Since it is expected that container transportation is becoming one of the major forms of the international trade together with liquid bulk and dry bulk transportation, the port facilities have to provide more efficient services toward the future.

2. Thus, it should be recognized as a fundamental requirement that the container handling facilities be so developed that they possess enough capacity to meet the traffic demand. This end cannot be achieved by the expansion of so-called hard ware only. Managerial and operational improvements are also indispensable.

3. In this chapter, key factors to be taken into consideration during the stage of the master plan of the container handling ports are discussed, and a strategy is formulated for the national container port network.

4. The study strategy entitled "The Development Strategy for the National Container Ports Network of Indonesia". The major characteristics of the Network, which is to be examined in more detail in Section 4.2.1, is a triangle formation made by three ports namely, the POrt of Batam, Tanjung Priok and Tanjung Perak. Thus, this study is also reffered to as the "National Triangle Policy",

4.1.1 Container cargo service network expected in the future

(1) Main corridors of world trade routes

5. First of all, it is indispensable to forecast how the container carriers will serve in the world trade in the coming decades. The container service network at present is reviewed in Chapter 2. It is observed that mother vessels plying in the Intra-Asia routes are calling on the major ports in Indonesia and that some of the shipping lines engaged in the Intra-Asia routes tend to introduce Post Panamax container carriers in their world sea routes, namely, Far East - North America, Far East - Europe and North America - Europe. At the same time, it is anticipated that these shipping lines will operate their newly built Post Panamax container carriers most effectively, i.e., to cover large share with minimum number of vessels. This might lead to the change of the ship route and, as a consequence, these Post Panamax container carriers will call on only selected major ports along the routes. These major ports are referred to as "Trunk Ports" and the concept is known as "Trunk Line Policy" in general. When the policy is put into practice, the mother vessels tend to avoid the deviation from the East-West Corridors.

6. In the light of above, it is unlike by that any of the major ports in Indonesia invite mother ships of Post Panamax size plying in the three corridors except Batam, while the latter can be expected to serve as one of the trunk ports together with Singapore if the port can collect as much volume of container cargoes and the facilities there provide as efficient service to the calling container carriers as Singapore.

7. Apart from the trend among the major shipping lines to employ Post Panamax size container carriers, it might be quite prospective that some other shipping lines rather provide more frequent container service with medium size or Panamax size container carriers, which are so-called the container carriers of the second and the third generation, respectively, in the main corridors. These vessels may stop by other ports as well as Trunk Ports even though the routes deviate from the main corridors, provided that substantial volumes of container cargoes await there.

(2) Intra-Asia Routes

8. As reviewed in 2.3.1.(2), all the major ports of Indonesia are called on by medium sized container carriers plying Intra-Asia routes, namely, Japan/Korea, Kaohsiung/Keelung, Hong Kong and Australia/New Zealand via Singapore/Indonesia. Among Indonesian ports, Tanjung Priok and Tanjung Perak are visited by more vessels than other major ports, this is because there are more container cargoes at the formers than the latter. Since the container traffic demand is expected to be higher at both Tanjung Priok and Tanjung Emas than other ports, it is reasonable to consider that the existing situation that two ports serve as the principal gateways to Intra-Asia trade and are visited by more vessels than other ports will remain unchanged for the coming decades.

9. With respect to the sizes of container carriers employed in Intra-Asia routes, it is also expected that some shipping lines deploy larger-sized carriers than at present. This is quite probable because, replaced by Post Panamax size container carriers, large sized container carriers, i.e., Panamax size, tend to be employed to other sea routes. The Intra-Asia routes will be possible alternative routes for these vessels. Thus, it seems to be very prospective that Panamax size container carriers will call on Ports of Tanjung Priok and Tanjung Perak in the near future, if proper facilities are available for these vessels at the two ports.

(3) Feeder service routes

10. As a part of Trunk Line Policy when it is put into practice, the feeder services between the Trunk Ports and other ports in nearby countries are expected more strengthened by the shipping lines engaged in the container service in main corridors. Thus, more container carriers are expected to serve in the existing feeder service route between Indonesia and Singapore and other Trunk Ports in Asia. It is also expected that, as the container traffic grows, container carriers having as large capacities as those presently employed in Intra-Asia routes will be introduced in shorter feeder service routes: between Singapore and Indonesian ports.

(4) Domestic container service routes

11. In accordance with the economic growth of Indonesia, domestic cargoes volumes are also expected to increase. With respect to domestic trade, almost all commodities, including liquid cargoes, have the potentiality to be containerized. However, the containerization of domestic cargoes highly depend on the government policy: how the government of Indonesia makes efforts to promote the containerization in the domestic trade. Recently enforced "Foreign Investment Reform Package (PP 20/1994)" might be an example to exhibit the government's intention to promote shipping and port operation businesses among others. Port business at major economic regions and shipping businesses interconnect these regions may look attractive to the investors. It can be expected that the container handling facilities will be constructed by private sector as well as government affiliated corporation, if certain tax and tariff scheme is introduced in favor of the investors. However, it is also quite vital for the promotion of the domestic container service that the roads in the hinterland be upgraded to provide easy and economical access to the ports.

12. In the light of the Long-term Development Plan II and Repelita VI of the Ministry of Communications, the promotion of the container transportation, both international and domestic is one of the priority items. Thus, it is assumed that the containerization in the domestic trade is also expanded in accordance with the growth of the international container traffic.

13. For domestic container service, it seems to be quite reasonable to assume the major ports, which are located in highly populated regions and have function as the gateways of the principal economic regions, will play a role of hub ports. Thus, at the major ports, domestic container terminals will be also required as well as international container terminals.

4.1.2 The roles of major ports in Indonesian foreign and domestic trade

14. On the basis of the discussion above, the functions of the major ports of Indonesia tend to be as follows toward 2010:

Batam: International hub port

Tanjung Priok and Tanjung Perak: Principal Container Ports

Gateways of West Java and East Java, respectively to Far East (Japan, Korea, China, Taiwan) and Oceania (Australia and New Zealand), also serve as feeder ports of Singapore, and as hub ports of domestic container service.

Belawan, Panjang, Tanjung Emas, and Ujung Pandang:

Major Container Ports

Gateways of North Sumatra, South Sumatra, Central Java and South Sulawesi, respectively, to Singapore, also serve as hub port in the domestic container services.

15. **Figure 4.1** schematically shows the container service network expected in 2010. In this figure, the size of the container carriers expected to be employed in each routs are also shown.

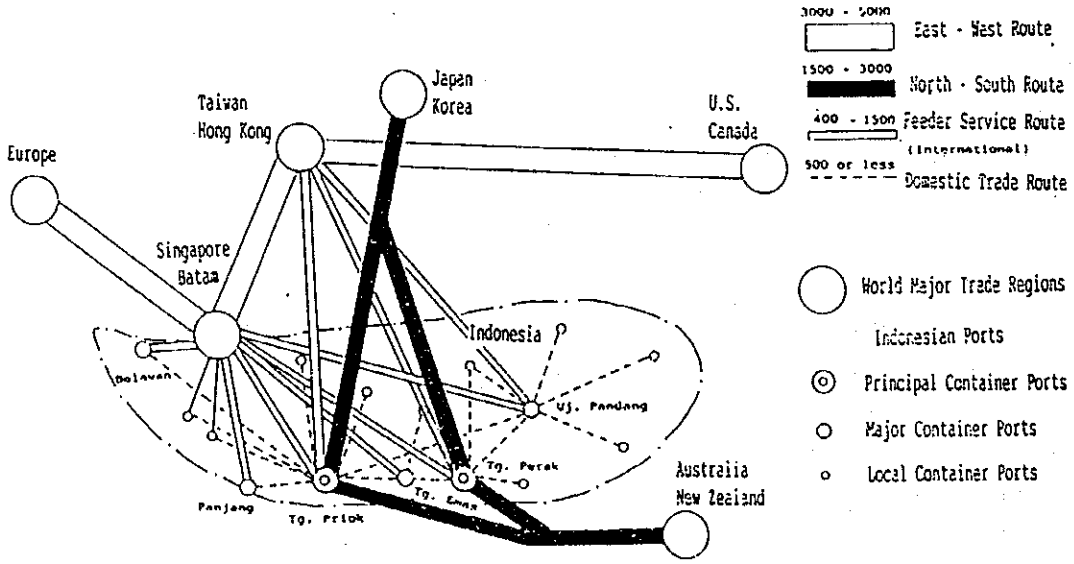


Fig. 4.1 World Container Service New Work with relation to Indonesian Trade and Ship Size Anticipated in 2010

4.1.3 Assumptions and conditions introduced

(1) Assumptions regarding calling ships

16. This study is intended to formulate a development strategy for the national network of container port and railway facilities. Effort is made to recognize the general characteristic features of the Indonesian ports in the main stream of the container cargo traffic and the way of handling.

17. For example, in addition to the major ports discussed in this study, some local ports such as Bitung and Kupang handle international container cargos exported to the Philippines and Australia, respectively. In Sumatra, feeder service to Singapore is available at Palembang and Jambi. At Tanjung Perak, an ocean going vessel of Ro/Ro type is calling once a week. These aspects should be given due consideration during the stage of master planning of individual ports.

18. With respect to the operational aspects, the situations of Belawan, Tanjung Priok and Tanjung Perak, which have full container terminal presently operational, are quite different from each other: the traffic volumes, which, in turn, lead to the difference in the numbers of berths and units of container handling equipments.

19. These various aspects are the items which should be given due considerations during the stage of planning of respective ports. In this study, simplification and standardization are introduced, where necessary, in order to depict the important elements.

20. The sizes of the container carriers presently deployed and expected to be deployed in 2010 in various world sea routes are summarized in **Table 4.1**. The calling ships at present and those expected to call on Indonesian ports are summarized in **Table 4.2**.

Table 4.1 Ship sizes employed in various sea routes

International Sea Routes	1993		2010	
	Ship Size in TEU	Generation	Ship Size in TEU	Generation
US-Far East-SIN Europe-SIN/Batam-Far East	2000 - 4500	II & III	3500 & over	III & IV
Far East - SIN/Batam Far East-Aust, NZ	600 - 1500	I & II	1500 & 3500	II & III
SIN - Indonesia HK,KAO-Indonesia	300 - 700	I	600 - 1500	I
Far East -Sin/Batam -Indonesia-M. East	1000 - 1200	II	1500 - 3500	II & III
Inter-island	50 - 120	-	50 - 600	- I

Table 4.2 Classification of Indonesian Ports

Port	1993		2010		
	Mother vessel	Feeder	Mother Vessel	Feeder	Generation
Belawan	Yes (to ME)	Yes	Yes	Yes	I & II
Panjang	-	Yes	-	Yes	I & II
Tanjung Priok	Yes	Yes	Yes	Yes	I,II & III
Tanjung Emas	Yes(to FE)	Yes	Yes	Yes	I & II
Tanjung Perak	Yes	Yes	Yes	Yes	I,II & III
Ujung Pandang	-	-	Yes(to FE)	Yes	I & II

(2) Assumptions of ship sizes

21. The size of the container carriers which are expected to call on the respective ports are forecasted in (1). On the basis of this, the dimensions of the berth for each type of the container carriers are discussed here.

22. With respect to berth dimension, several criteria are presented. The Standard

Design Criteria For Ports in Indonesia give dimensions of container carriers of various sizes for the design of port facilities in Indonesia as shown in **Table 4.3.** However, no standard criteria for the berth dimensions are given.

Table 4.3 Criteria of container carriers

Class Generation	Capacity (TEUs)	DWT	LOA (m)	Draft (m)	Beam (m)
1st Gen.	750 - 1000	- 15,000	180 - 200	- 9.0	27
2nd Gen.	1500 - 1800	20,000 - 30,000	225 - 240	10.5 - 11.0	30
3rd Gen.	2400 - 3000	35,000 - 45,000	275 - 300	11.5 - 12.0	32
4th Gen.	3500 - 4000	50,000 - 60,000	300 -	12.5 - 13.0	37

(Source: Standard Design Criteria, For Ports in Indonesia)

23. The Technical Standard for Port and Harbour Facilities in Japan recommend the dimensions given in **Table 4.4**, for the standard design of container berths.

Table 4.4 Standard criteria of container berth

Ship Size (DWT)	Berth Length (m)	Berth Depth (m)
20,000	250	12.0
30,000	300	13.0
40,000	330	14.0
50,000	350	15.0

Technical Standard for Port and Harbour Facilities in Japan

24. From the analysis of the container carriers visiting and expected to visit ports in Indonesia, the size of the container carriers, in terms of Generation, to be considered in the master plan of respective ports are assumed as listed in **Table 4.2.** It is in turn necessary to define specific size for the container carriers of the first, the second and the third generations. Taking into account of the size of the container carriers presently plying in various routes, it seems to be reasonable to assume the size of the 1st, 2nd and 3rd generations to be 750 TEUs, 1,500 TEUs and 3,000 TEUs, respectively. It also

seems to be quite probable that in the domestic container service is also assumed that feeder container ships having as much capacity as those presently plying in Indonesia-Singapore route will be used in the domestic container service routes as the container traffic grows. Thus, the size of the domestic container ships is assumed to be 500 TEUs at the maximum.

25. On the basis of **Table 4.3 and 4.4,** the DWTs of the container carriers of each generation and the feeder container vessels for domestic container service are assumed to be 40,000, 25,000, 15,000 and 10,000, respectively. The dimensions of the container carriers and the berth dimensions correspond to each size are listed in **Table 4.5.**

26. In the table, there are two possible ship dimensions are shown for the larger ship sizes, i.e., 40,000 and 25,000 DWTs. The values shown upper row are the largest values (or the value which covers about 94 % ships) observed among the ships of respective class, and those shown in lower raw are the average of the class.

27. The length and the depth of the berth given in the table are calculated in the following manner:

Berth length; (Ship length) + 1.7 x (Beam),
Berth depth ; (Draft of ship) x 1.1.

28. The berth lengths and depths appear in the table are round numbers of the results of above calculation.

29. with the consideration of the criteria used for the container berths which are being constructed in Indonesia, i.e., Panjang, Tanjung Emas and Ujung Pandang, it was concluded that the values shown in lower row for larger ships, which are the berth criteria on the basis of the average ship dimensions, be employed in the master plan of this study.

Table 4.5 Berth Dimension

Type	TEU	DWT	Ship			Berth	
			Length	Breadth	Draft	Length	Depth
A-1	3,000	40,000	263	33.5	12.4	320	-14
			250	32	11.6	300	-13.5
A-2	1500	25,000	219	28.9	11.1	270	-13.0
			195	28	10.3	250	-12.0
A-3	750	15,000	162	24	8.7	200	-10
B-1	500	10,000	137.5	21	7.5	170	-9

30. Incidentally, the code appears in the column of extreme left is given to classify the berth type: berth type suits for the 1st generation container carrier is hereafter called Type A-1, and berths for the 2nd and the 3rd are called Type A-2 and A-3, respectively. Type B-1 is given to the domestic container berth which serves for domestic container ships having the capacity of 500 TEUs and under.

(3) Assumption of the composition of the calling vessels

31. In order to determine the numbers of berths required for the container traffic in the future, it is necessary to estimate the composition of the various sizes of the container carrier calling Indonesian ports. In consequence, it is assumed that the percentiles of the container cargoes shared by the 1st, the 2nd and the 3rd generations be 35%, 42.5% and 22.5%, respectively.

32. The following is the background to yield this assumption.

33. The destinations of export and the origin of import cargoes of Indonesia are shown in **Table 4.6** together with the cargo volumes (including non-containerized cargos). On the basis of the share in the year and the prospect in the future trade of Indonesia, the shares among the regions are estimated and shown in round numbers in

the same table.

34. Since **Table 4.6** does not give detailed breakdown of the cargo share for the countries in Asia, the statistical data published in International Container Transportation Handbook regarding container cargo movement in Asia are supplementally used. **Table 4.7** shows the container cargo movement between Indonesia and Asian countries, and the re-evaluated cargo shares among world economic regions and Asian countries.

35. Since the size of the container carriers used in each sea routes has been analyzed as shown in **Table 4.1.** the sizes of the container carriers expected to be employed in the trade between respective countries are given as **Table 4.8.**

36. Thus, cargo share carried by container carriers having different carrying capacities is approximately exhibited as exhibited in **Table 4.9.**

Table 4.6 Major destination and origin of the foreign trade of Indonesia (1992)

	Export			Import		
	Cargo 1000 t	%	2010 (Guess)	Cargo 1000 t	%	2010 (Guess)
Asia	52,212	81.0	80	19,662	60.5	70
ASEAN	27,897	43.3	30	7,273	20.5	20
Hong Kong	3,036	4.7		246	0.7	
Japan	9,725	15.1	20	2,014	5.7	15
Rest	11,554	17.9	30	11,942	33.6	35
Africa	416	0.6	Join to Europe	722	2.0	Join to Europe
America	2,809	4.3	5	25,734	17.1	10
USA	2,412	3.7		2,715	7.6	
Canada	238	0.4		1,476	4.2	
Rest	159	0.2		1,881	5.3	
Oceania	1,245	1.9	5	3,702	10.4	10
Australia	1,165	1.8		3,412	9.6	
Rest	80	0.1		290	0.8	
Europe	7,768	12.1	10	3,523	9.9	10
EC	7,430	11.5		1,945	5.5	
Russia	104	0.2		178	0.5	
Rest	264	0.4		1,400	3.9	
Total	64,479	100	100	35,494	100	100

Cargo data source Indonesia DGSC Statistics

Table 4.7 Container Cargo Movement in Asia (Unit: TEU)

Origin and Destination	in Asia						World	
	Export			Import			Ex.	Im.
	TEU	Share %	Apx %	TEU	Share %	Apx %	Apx %	Apx %
ASEAN	48,000	26.6	25	38,500	17.2	20	20	15
Vietnam	200	0.1	-	400	0.2	-	-	-
Japan	65,000	36.1	35	65,000	29.0	30	30	20
Taiwan	32,000	17.8	20	36,000	16.1	15	15	10
China(HK)	19,000	10.5	10	31,000	13.8	10	5	10
Korea	16,000	8.9	10	53,000	23.7	25	10	15
Total	180,200	100	100	233,900	100	100	80	70
America							5	10
Europe & Africa							10	10
Oceania							5	10
Total								

(Source: International Container Transportation Handbook '94,Ocean Commerce, Ltd.)

Table 4.8 Allocation Ship Size to cargos bound for America, Europe, Africa and ASEAN are carried by feeder vessels.

	Share (%)		Probable ship size deployed
	Export	Import	
Asia	80	70	
ASEAN	20	15	Type - I, Feeder vessel
Japan	30	20	Type - II & III, Mother vessel Type - II & III,
Korea	10	15	Mother vessel
China	20	20	Type - II, Direct service
Oceania	5	10	Type - II & III, Mother vessel
America	5	10	Type - I, Feeder vessel
Europe & Africa	10	10	Type - I, Feeder Vessel
Total	100	100	

Table 4.9 Cargo share by size of container carriers

	Export	Import
1. Feeder, Type I	35 %	35 %
ASEAN	20	15
America	5	10
Europe & Africa	10	10
2. Type II		
China	20	20
3. Type II & III		
Japan	30	20
Korea	10	15
Oceania	5	10

Table 4.10 Container carrier operators in Intra-Asia routs and their carrying capacity

	Operator	Port Call	Freq.	Cap.	Cap (TEU/w)	Share
Intra Asia + US,Europe Route						
(1)	Cho Yang					
	A.	JKT/HK,Keel,KAO,BUS	2/m	1200	600	
	B.	JKT/HK,BUS	1/w	1177	1177	15.6
(2)	COSCO	JKT,SBY,SMA/J	2/m	720	360	3.2
(3)	Hajin/Dogma	JKT/J,HK,SIN,Busan	1/w	1150	1150	10.1
(4)	MOL(KL/MISC)	J,HK,SIN,P.Klg	1/w	1800	1800	15.8
(5)	TSK/MOL/NYK/Samudera					
	A.	JKT/SIN,HK,Keel	1/w	1300	1300	
	B.	JKT/SIN,HK,KAO,Keel	1/w	1300	1300	22.8
		Sub total				67.5
Intra Asia & Feeder						
(1)	Cheng Lie(Chuwa)	JKT,SBY/KAO,HK,SIN	1/w	800	800	7.0
(2)	Djakarta Lloyd(PIL)	JKT,SBY/SIN,KAO	2/m	800	400	3.5
(3)	Heung-A	J,HK,Haiphon	1/w	200	200	1.7
(4)	Nantai	J,HK,KAO	1/w	430	430	3.7
(5)	Wan Hai,(Main G.)					
	A	J,Kl,KAO,HK,BKK	1/w	700	700	
	C	J,P.Klg,SIN,HK	1/w	1200	1200	16.6
		Sub total				32.5
		Total	11.5		11417	100

Operators who have many 3000 TEU Class Vessels are Hanjing, NYK(TSK) and MOL/KL
Total share of these three operators to the Total Service Capacity of Intra Asia Service;48.7 %

37. For the category 3., the following assumption is further introduced:

Korea & Japan - Indonesia Route;

Containers which are presently carried by three major shipping lines, i.e., Hanjing, NYK(TSK) and MOL/KL, will be carried by Type III vessels. A hypothesis that the cargo sharing presently observed among the shipping lines in Intra Asia routes will remain unchanged is also introduced.

Presently, three operators hold 48.7 % cargo share in the route of present interest(See Table 4.1.3-(10)). Therefore, 50 % of Containers transported to and from Japan and Korea is assumed to be carried by Type III Vessels.

In the same manner Containers to and from Oceania is divided into to categories: 50 % by Type II & 50 % by Type III.

38. Thus, the category 3 is further divided as follows:

Table 4.11 Cargo share by ship size

	Type II		Type III	
	Export	Import	Export	Import
Japan	15 %	10 %	15	10
Korea	5 %	7.5 %	5	7.5
Oceania	2.5	5	2.5	5

39. Consequently, the container cargo share among the 1st, 2nd and 3rd generations are assumed to be as follows:

Table 4.12 Average of Cargo share by Ship Size

		Export	Import	Average
Type I		35 %	35 %	35 %
Type II		42.5	42.5	42.5 %
	China	20 %	20 %	
	Japan	15	10	
	Korea	5	7.5	
	Oceania	2.5	5	
Type III		22.5	22.5	22.5 %
	Japan	15	10	
	Korea	5	7.5	
	Oceania	2.5	5	

4.2 Development Strategy for the National Network of Container Cargo Handling Ports

4.2.1 National network

(1) Container traffic expected in 2010

40. On the basis of the functions of the container handling ports described in 4.1 above, the main stream of the container flow is characterized as follows;.

41. The National Network of Container Handling Ports comprises Tanjung Priok, Tanjung Perak, the principle ports, and Belawan, Panjang, Tanjung Emas and Ujung Pandang, the Major ports, and other local ports. In the Network Batam Port would share the function of as the transhipment port of Southeast Asia in the Europe-Far East-North America corridor, the port is, thus, can be named as the International Transhipment Port.

42. The ports of Tanjung Priok and Tanjung Emas serve as the calling ports in the Intra-Asia routes, and they are called the Principal Container Ports. Possible course of the actual voyage in this route are Far East - Tanjung Perak - Tanjung Priok - Far East and vice versa. Belawan, Panjang, Tanjung Emas and Ujung Pandang are called by feeder vessels to Singapore and they serve as the hub ports for other local port in the domestic container services, thus these ports are called The Major Container Ports.

43. All the container handling ports of Indonesia, thus, are directly or indirectly interconnected to the world trade, and the strategy to develop the National Network is reffered to as the "Multi-gate Container Network (MUGNET) Policy.

4.2.2 Container handling facilities of individual ports

44. In order to comply with the functions in the National Triangle Network, these ports are developed so that their container handling facilities to meet the requirement (see **Table 4.2**).

4.3 Development Strategy of Container Cargo Handling Facilities of Dry Ports and Connecting Railways

4.3.1 General

45. Generally speaking, the selection of transport means by customers is subject to free competition. In particular, railroads must provide the service superior to road transport in order to survive.
Container transport is no exception to the above rule, and railway must consider the following points to be more competitive.

i) The total amount of required costs must be lower than road transport.
ii) It must be quick and punctual in accordance with port loading / unloading schedules.
iii) Concerning i), railways are operated with heavy facilities, they request mass transportation to be efficient.
iv) Railway and port facilities must be organically connected.

46. The team considers the following criteria for M/P assessment, after the above conditions are materialized according to Indonesian topographical and economical circumstances.

47. (1) One of the important conditions for dry port establishment depends on the minimum distance between the dry port and the port.
In contrast to road transport that enables direct delivery of containers from harbor to factory, railway transport is burdened by the task of transferring containers at both dry ports and port stations. Saved transport cost must compensate this loss in order that railway transport is to be profitable. Section 3.5 concludes that the limited travel distance for producing profits is about more than 100 km.

48. (2) At least one through container train must travel to the port, and if possible two trains are necessary for prompt service.
A yard system relaying and shunting trains cannot provide prompt and punctual service operations corresponding to shipping schedules.
Moreover, mass transport is a prerequisite for container trains to be practical. (Applies to ii and iii above).

49. (3) More than two through container trains must be operated for employed heavy handling machines at the dry port to be profitable. (Refer to Appendix 4.3.1). As a rule, marine containers are packed at factories or warehouses. Furthermore, the present each container train can carry about 2 TEUs * 17 cars = 34 TEUs at a time.

50. Manual loading at the railway station bring twice wasteful work, unadaptable for mass transportation in any cases.
On the other hand, machines are expensive but provide excellent handling capacity. (The top lifter can handle 40 ft containers every 2.5 minutes).

51. (4) The handling platform and the sidings should be next to the container marshalling yard.
If a container ship primarily carries railway containers, these should be directly unloaded onto the freight car on the track. If primarily for road containers, they should be directly unloaded onto the truck chassis.
Since road transport plays a considerable role in this plan, the team considers the track layout for direct chassis unloading.

52. (5) This plan will be practical as long as background and the industries can provide enough demand for mass transport.
Generally speaking, the export industries making major resource of the demand, are normally located around ports. So they are found in inland regions as special case.

53. (6) Customer services such as documentation (for tariffs, banks, etc.) or empty container delivery should all finish in the same office to promote sales.

4.3.2 Individual Dry Ports and Connecting Railways

54. **Fig. 4.2** portrays a 1 : 1 transport route with single arrival and departure points at both ends. The railway allocated rate in accordance with pier capacity will regulate port track and dry port handling capacity, where both should preferably be equal. If trains are increasing to reinforce the transport, the team has to check whether enough track capacity on the transport route to support this increase is provided or not.

55. (1) Railway route improvement for upgrading transport ability involves doubling

track as a radical measure, and station improvement as an additional emergency measure.
Indonesia has a superior plan for long-term operations and a general plan to be implemented in the near future. The contents of these plans should be organized by specifically focusing on functions imperative for container transport.

56. (2) The scale, content and investment propriety of long-term dry port construction policy will be determined by long-term demand forecasts based on container O/D at surrounding industrial zones. Therefore, these factors will be reconfirmed both through review of the long-term plan designed by Indonesia and through discussions with Indonesian officials.
There must be enough demand to operate two container trains at least even if a dry port is to be improved, otherwise it will be difficult to adopt expensive unloading machines.
The container platform at each dry port except Gdb is elevated platform that has adequate length and width dimensions to facilitate container handling. The only required task is to provide heavy handling machines. The main problem lies in other locations except Gedebage. These locations are in long initial stage prior to achieve full operations such that container trains are needed. This results in imbalanced cost difference between handling and investment.
Track layout is not suitable because of transfer operations to freight cars in initial stage. Profitability will require manual container packing at the stations. However, such a primitive handling method will probably interfere the inclusion of new transport demand and not bearable to handle a lot of containers in future. Therefore it is important to decide the time when heavy handling machines should be incorporated.

57. (3) The initial environment assessment in the master plan is conducted through discussions with the counterpart team for environmental impact evaluation.
Since railways utilize existing lines, the team studies only unusual points in the railway improvement budget. Because the environment of dry port area will not differ from their current status as long as major improvement or new construction is not executed.

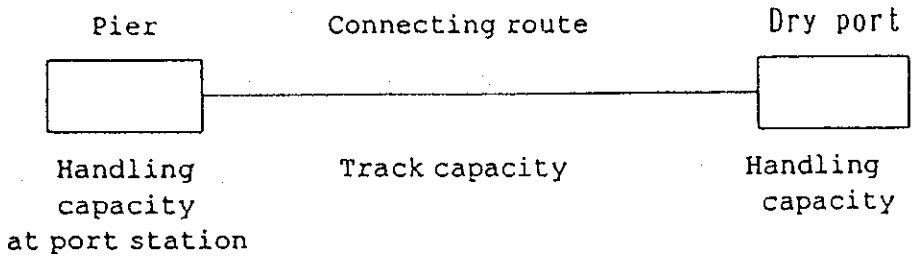


Fig. 4.2 The transport route

5. LONG-TERM DEVELOPMENT PLAN OF PORTS

5.1 CRITERIA FOR PORT CONTAINER CARGO HANDLING FACILITIES

1. In order to determine the quantitative scale of container terminal facilities required at both major port terminals and relatively small scale local-port terminals throughout Indonesia in the year 2010, it is first necessary to design standard container terminal models and to specify the necessary items, contents and handling capacities of the container terminal facilities.

5.1.1 Standard models of container terminals

2. The main factors that determine the scale of container terminals are three-fold, as described below. The planning of container terminal facilities begins with the determination of these three factors.

(1) Main characteristics of the calling ships

3. The primary factors that determine the scale of container terminals at a port are the characteristics of the ships that call at the port including length overall, extreme breadth, full load draft, the presence or absence of on-board ship gear, and other relevant characteristics. These characteristics in turn determine the wharf length, the depth of water, the scale of the wharf, the reach of the quay cranes and other terminal specification.

4. The cargo handling capacity of the wharfs is influenced not so much by the type of ships as by the ship call schedule and by the number of loading and unloading container boxes per ship call. Those factors affect the operating rate of the wharfs, namely the occupancy ratio (BOR) and the effective time ratio (ETR).

5. The wharf capacity is thus determined by the operating rate of the wharf, the loading and unloading handling efficiency of the quay cranes, and the number of cranes in operation. A detailed descriptions of these issues is provided in the following sections.

(2) Annual container handling volume

6. The second factor that determines the scale of the container terminal is the number of containers handled per year.

7. Generally, in the planning of container terminal facilities, the annual container handling capacity per unit berth is assumed based on the throughput. The number of necessary berths, the scale of the marshaling yard, and the number of units of handling equipment are then calculated based on this annual container handling capacity per berth.

8. The determination of the annual handling capacity per berth is one of the major goals of this study. Thus, it is practically impossible to provide, from the very beginning, a concrete, annual, per berth handling capacity. Here the berth facility configuration, equipments, and operational conditions are set to maximize the container handling capacity per berth. On this basis, the yard facility configuration and operational conditions are studied, the annual handling capacity of the terminal is determined, and the overall facility configuration and operational conditions of both the berths and the yards are kept in balance.

9. Among the factors that impact the storage capacity of the container yard are the configuration of the handling equipment used, namely the container handling system, and the period of container storage in the yard, namely the container dwelling time. In particular, the container handling system of yard determines the yard area efficiency, which is a function of the number of stacking tiers, the extent of trailer passage and the expanse of the operation area of the yard. In short, the required area of the yard relative to the annual handling container volume is primarily dependent on the container handling system adopted.

(3) Container yard cargo handling system

10. The third factor that determines the scale of container terminals is the handling system at the container yard.

11. There are several handling systems for yard container handling including the on-chassis system (OCS), the top-lift track system (TLT), the straddle carrier system (SCS)

and the rubber tire gantry crane system (RTG). The relative efficiencies of these systems are compared in Appendix 5.1.1.

12. Container terminals in Indonesia are restrained by the site conditions, including topography and port area. Moreover, the cargo storage capacities in their hinterlands is relatively small. For this reason, in many cases, container handling capacity is constrained at the terminals, bottlenecked by yard capacity shortfalls. In planning container terminals, therefore, it is important to choose container handling systems that ensure the maximum area storage efficiency at the container yards.

13. It is also important to reduce the downtime and maintenance costs of yard cargo handling equipment.

14. Based on these factors, for Indonesia, the TLT system is most suitable for those container terminals with relatively small handling volume, and the RTG system is recommended for those terminals with a larger container throughput.

(4) Standard models of container terminals

15. In light of the above, various container terminals were studied and compared, as a result of which what seem to be standard models for Indonesian container ports have been built.See **Table 5.1.**

5.1.2 Berth

(1) Major specifications of berths

1) Design depth of water

16. Generally, the full load draft of the calling vessels, multiplied by 1.1 is set as the design depth of water at their berths. Among the many container ports, however, there are some where the tide frequently falls below the reference depth or where the wharfs are affected by high waves and swells. In such cases, of course, these effects must be taken into account. By contrast, at some intermediate ports, it may be apparent that the draft of all ships when calling and leaving the ports is invariably less than their full load draft. In this case, the maximum actual draft at their entry into or departure from

the port can be substituted for the full load draft of the vessels.

2) Berth length

17. Theoretically, berth length is determined by considering the full berth length which is necessary for the ships calling to moor alongside the berth. In practice, however, berth length is determined by the direction in which the bow line and the stern line are extended relative to the wharf. Normally, the angle between the lines and the wharf ranges from 30 to 45 degrees.

Generally, berth length is calculated using the following equation.

$$L = La + 1.7B$$

where L : Berth length
La: Length overall (LOA) of the calling vessels
B : Maximum Beam of the calling vessels

3) Number of berths (total length of berths)

18. As far as public wharfs for conventional ships are concerned, it is not at all extraordinary to calculate the necessary number of berths based on queuing theory. However, it is economically not efficient to keep expensive container ships waiting in the offing. Moreover, it is now a common practice to adjust the speed of container ships. The fact that is container ships today are mostly run on a periodic basis, and hence it is not appropriate to calculate the necessary number of berths based on a probability distribution.

19. Generally, for container wharfs, the number of necessary berths is calculated from the quantities of cargoes to be handled (or from the numbers of containers to be handled) and the container handling capacity per berth. In this case, it is necessary to determine the container handling capacity of the berth.

(2) Container handling capacity at berths

20. The container handling capacity of berths, namely the quantity of containers which can be loaded and unloaded per unit berth per year, is determined based on the container handling time at berths per year and the container handling efficiency

(production throughput) per unit time of container cranes or of ship cranes and, as such, it is expressed by the following relational expression.

Container handling capacity
= Annual container handling time
x Container handling efficiency of berth

21. In the above relational expression, the elements (terms) that comprise it are determined based on the following concepts.

1) Annual container handling time (hours/year)

22. Net annual container handling time is determined by the berth occupancy ratio (BOR), namely the proportion of the time when ships calling at the port can effectively moor at the berth to the annual operating time of the berths at the port concerned, and by the effective time ratio (ETR), namely the ratio of the time required for net container loading and unloading work to the time during which the berth is occupied. This is expressed by the following relational expression.

Annual container handling time (hours/year)
= Annual operating time of berth(hrs/yr) x BOR x ETR

23. At Terminal-1 of Tg Priok Port, where the BOR is said to be almost at its upper limit, the BOR stands at 70 percent based on the 1993 performance record, and the waiting time during the same period averaged three hours. Reports (UNCTAD; Port development, 1985) have it that as far as general cargo ships are concerned, where ships are assumed to arrive at random according to Earlang's distribution, the upper limit of the BOR as a premise of berth capacity study ranges from 50 percent (one berth) to 70 percent (four berths), depending on the number of berths. In the case of container terminals, for which the periodic operation of ships is the established practice, the speed of ships is adjusted, and hence it is reasonable to adopt a set ratio of 70 percent for the BOR.

24. On the other hand, the ETR is the ratio of the crane's container loading and unloading time to the berthing time (BT) of the ship calling at the port. As such, the ETR largely depends on the average quantities of containers loaded and unloaded per

ship and on the container handling efficiency (production throughput per hour) of the cranes used. The EOR factors can be expressed by the following relational expressions. For the design values of nonoperation time (NOT) and idle time (IT) within the berthing time, the actual values recorded at Tg Priok Port in 1993 are adopted.

ETR (Effective Time Ratio: hours/vessel)=ET/BT=(NOT+ET+IT)
NOT (Not Operation Time)=4.0(1993 performance record at Tg Priok Port)
IT (Idle Time)=1.6(1993 performance record at Tg.Priok Port)
ET (Effective Time)=(Average number of handling containers (unit/vessel))/(Container Handling Efficiency at Berth(unit/Hr))

2) Container handling efficiency (units/hour)

25. The container handling efficiency (production throughput per hour) of berths, namely the container handling efficiency of the berths as a whole, is determined by the number of container cranes or ship cranes that actually operate at the berths.

26. During loading and unloading operations at berths, the installed cranes are not all deployed simultaneously in the container handling work. Rather, because of mutual interference, their effective rate of operation (rate of net working cranes to installed cranes) normally drops to between 70 and 80 percent. For Terminal-1 of Tg Priok Port where two cranes operate per berth, the effective rate of operation in 1993 stands at 80 percent. When three cranes operate per berth, and concentrate on one container ships, the effective rate falls to approximately 70 percent.

27. As for the container handling efficiency of quay cranes in Indonesia, the actual value at various container terminals ranges from 15 to 23 (units/hour/crane). The design value for the planned terminals is at 25 U/HC, on average. For ships cranes, at actual value of 9 U/HC is adopted.

Container handling efficiency(units/hr) of berth
=Containerhandling efficiency (units/hr/crane) of each crane
x Effective number of container cranes in operation

Effective number of container cranes in operation