1.3 Future Socio-economic Framework

12. Population, GRDP (Gross Regional Domestic Products) and GRDP per capita are used as the socioeconomic framework of the macro traffic demand forecast, because these three components are the only complete and extensive data covering not only the nation but all provinces.

13. "The Second Twenty Five Year Development Plan" contains the population and the growth rate in the final year of each Five Year Development Plan. These figures are used as control totals.

Table 1.3.1 Population and GRDP in the Second 25 Year Development Plan

	Second 25 Year Development Plan				
	6th	7th	8th	9th	10th
Total Population (Million)	204.4	219.4	233.6	246.5	258.1
GDP Growth Rate (%)	6.2	6.6	7.1	7.8	8.7

Source: Five Year Development Plan (REPLITA IV) 1994-1998

14. The population data from 1990 to 2000, which was calculated based on the 1990 census, is used to forecast the population at the target year of 2019. The numerical values mentioned in the National Space Plan (RENCANA TATA RUANG WILAYAH NATIONAL) made by BAPENAS are also adopted as control totals.

15. In Indonesia, Sumatra, Java and Bali Islands are relatively well developed, and particularly Java and Bali Islands are densely populated areas. Therefore "transmigration" is one of the important policies in Indonesia, which aims to move people from Java and Bali to less populated areas like Kalimantan, Sulawesi, Maluku and Irian Jaya.

16. The migration target is 600 (six hundred) thousand households during the Sixth Five Year Development Plan and 120 (one hundred and twenty) thousand per year on the average. The National Space Plan explains that the total forecast population at the end of the Second 25 Years Development Plan can be obtained by combining the total population growth caused by migration and the natural population growth. Therefore it can be judged that the forecast in this study includes the effect of transmigration.

17. The GRDP at the target year is also forecasted in consideration of the growth

Table 1.3.2 Population, GRDP and GRDP/cap

Province	Population			GRDP without oil and gas at 1993 constant prices			GRDP/cap without oil and gas at 1993 constant prices		
	1988	2004	2019	1988	2004	2019	1988	2004	2019
Aceh	3,262.8	4,603.3	5,629.9	8,139,397	23,033,889	75,936,164	1,023,492	2,934,176	11,470,294
North Sumatra	9,983.1	12,605.7	14,402.5	12,312,875	45,466,841	187,708,383	1,193,723	3,542,540	12,837,278
West Sumatra	3,891.0	4,889.1	5,567.5	4,330,752	14,334,971	55,411,515	1,113,009	2,929,489	9,841,232
Riau	3,019.3	5,057.6	6,732.6	13,869,156	31,503,561	84,916,957	1,291,209	3,286,978	11,501,668
Jambi	1,869.5	3,028.3	3,971.5	1,675,403	5,858,970	22,647,720	891,735	1,881,709	5,488,905
South Sumatra	5,979.4	8,795.5	11,003.5	8,682,986	24,326,844	88,019,173	1,149,733	2,369,439	7,150,282
Bengkulu	1,081.3	1,834.7	2,455.9	957,741	2,888,506	9,271,771	885,715	1,572,682	3,731,178
Lampung	5,794.9	7,792.7	9,267.8	3,659,141	14,444,043	65,356,389	631,437	1,852,257	6,975,925
Jakarta	7,896.8	10,703.1	13,145.9	33,783,263	99,015,952	289,374,042	4,278,110	9,240,209	21,749,700
West Java	33,926.2	46,011.2	56,533.9	36,390,438	92,434,790	236,021,480	987,885	1,904,978	3,968,839
Central Java	28,254.6	31,515.3	33,768.5	24,420,606	53,956,693	120,223,798	821,874	1,638,893	3,463,488
Yogyakarta	2,912.9	2,854.4	2,810.5	3,067,983	8,258,494	25,809,386	1,053,232	2,890,051	9,075,211
East Java	32,139.8	36,114.5	38,931.7	34,569,202	91,578,870	253,604,907	1,075,314	2,531,069	6,431,405
Bali	2,742.5	3,118.8	3,381.7	3,748,370	13,273,550	49,971,318	1,366,770	4,252,170	14,610,494
West Nusa Tenggara	3,279.8	4,130.7	4,827.7	1,750,517	5,345,523	17,389,144	533,733	1,292,724	3,559,979
East Nusa Tenggara	3,168.0	4,100.5	4,879.2	1,475,527	4,351,731	13,968,555	465,753	1,060,127	2,829,416
East Timor	721.9	988.5	1,217.7	325,954	1,069,713	3,433,655	451,535	1,080,994	2,786,829
West Kalimantan	3,088.2	4,373.0	5,374.2	3,749,021	16,152,926	91,102,846	1,213,966	3,692,137	16,778,694
Central Kalimantan	1,303.3	2,063.4	2,686.0	2,195,619	7,294,393	28,196,316	1,684,605	3,532,073	10,379,968
South Kalimantan	2,484.5	3,440.8	4,175.1	3,112,014	10,433,497	38,253,739	1,236,338	3,004,551	8,983,935
East Kalimantan	1,670.6	3,177.9	4,465.6	12,529,657	29,838,667	82,630,769	3,419,659	6,052,739	16,047,751
North Sulawesi	2,415.5	2,957.7	3,321.5	1,854,991	6,611,843	25,222,814	767,964	2,233,500	7,508,509
Central Sulawesi	1,607.7	2,371.6	2,981.7	1,158,001	3,863,216	13,432,366	720,294	1,627,345	4,453,235
Southeast Sulawesi	1,254.2	2,013.7	2,639.3	832,417	2,728,452	8,994,929	663,684	1,353,529	3,368,481
South Sulawesi	6,769.2	8,598.4	9,900.7	5,199,050	20,440,895	94,935,591	768,040	2,375,720	9,486,004
Maluku	1,767.0	2,502.9	3,143.5	1,776,652	6,006,397	24,153,702	993,620	2,456,132	8,096,752
Irian Jaya	1,507.5	2,506.6	3,407.5	3,012,192	9,658,057	30,183,290	1,571,593	3,728,180	8,709,570
TOTAL	173,791.6	222,149.9	260,623.1	228,578,926	641,435,466	2,036,170,717	1,150,756	2,687,195	7,544,614

Unit : Population : thousand
GRDP : million rupiah
GRDP/cap : Rupiah per person

Source : Statistics of Indonesia, Study Team

rates of each province shown in the National Space Plan. Two kinds of GRDP are calculated, with oil and gas and without oil and gas.

18. GRDP with oil and gas is used for the forecast of passenger and GRDP without oil and gas for cargo.

19. The actual and forecast results of population and GRDP are shown in Table 1.3.2. Total population in Indonesia in 2019 is 260.6 million and total GRDP with oil and gas at 1993 constant price in 2019 is 2.036 billion rupiah.

1.4 Forecast Methods

20. Demand forecast is made as to passenger and cargo respectively.

21. The following procedure is applied to make the future passenger OD in 2019.

1) Forecast of total (ferry + sea + air) passenger demand in Indonesia at the target year 2019
   a) Preparation of actual data of total passenger volume (ferry + sea + air) in Indonesia from 1988 to 1995
   b) Preparation of socio-economic indexes in Indonesia from 1988 to 1995
      Indexes : Population
      GRDP(with oil and gas, without oil and gas)
      GRDP/capita(with oil and gas, without oil and gas)
   c) Examination of relation between total passenger volume (a)) and socio-economic indexes(b)) by regression analysis
   d) Determination of demand forecast formula based on correlation coefficients, passenger volume at the target year
   e) Forecast of total passenger demand in Indonesia

2) Forecast of total (ferry + sea + air) passenger demand in each province at the target year 2019
   a) Preparation of actual data of total passenger volume (ferry + sea + air) each Province from 1988 to 1995
   b) Preparation of socio-economic indexes in each province from 1988 to 1995
      Indexes : Population
      GRDP(with oil and gas, without oil and gas)

GRDP/capita(with oil and gas, without oil and gas)

c) Determination of demand forecast formula which has the same relation as that obtained in 1) d).

d) Forecast of total passenger in each province

3) Formation of passenger OD in 2019 through the convergence calculation (Frater Method)

22. The future cargo OD in 2019 is obtained through the similar procedure described in paragraph 21.

1.5 Results of Passenger and Cargo Flow Forecast

(1) Total passenger and cargo volume in Indonesia

23. Total passenger is forecasted using the formula obtained from the relation between passenger and GRDP/capita without oil and gas, because close correlation between them is recognized (correlation coefficient: 0.9854) and because GRDP produced by oil and gas does not always contribute to an increase in passenger traffic.

$$Pi = a\,GCi + b$$

Pi : Passenger in the year i

GCi : GRDP without oil and gas / capita in the year i

a, b : constant

24. The total passenger in Indonesia in 2019 is forecasted as 409.8 million. This value is equal to 5.84 times the passenger volume in 1995 (70.23million).

25. Total cargo volume is forecasted using the formula obtained from the relation between cargo and GRDP with oil and gas. (correlation coefficient: 0.9011)

$$Ci = c\,Gi + d$$

Ci : Cargo volume (ton) in the year i

Gi : GRDP with oil and gas in the year i

c,d : constant

26. The total cargo volume in Indonesia in 2019 is estimated at 1.094 billion tons. This value is equal to 6.94 times the cargo volume in 1995 (158 million tons).

27. Most of the total cargo is carried by sea vessel. Domestic cargo transportation volume by sea vessel is 778 million tons in 2018, which is shown in the sixth Five-year Plan (REPLITA VI).

(2) Passenger and cargo flow forecast by province

28. The data of the passenger and cargo flow by province should be net flow by province in principle, because the 1988 OD is composed of net flows. However, the data are available on the passenger and cargo flow not by province but only by airports, ferry ports and sea ports. Therefore, they are used as net flow values.

29. According to the 1988 OD table, it can be understood that a large part of the passenger and cargo flow between Sumatra and Java Islands passes the Merak - Bakauheni ferry route. It is supposed that the growth rates of provinces in the southern part of Sumatra Islands are same as that of Lampung, where Bakauheni port is located.

30. Passenger volume of every province is obtained by combining the data of airports, shipping ports and ferry ports. The period of the data is limited from 1990 to 1994 because the shipping ports data is found only from 1990 to 1994.

31. The cargo volume data from 1988 to 1994 can be obtained.

32. The growth rates of passenger and cargo volume are forecasted through the procedure described in paragraph 21 b).

33. The growth rates are modified in consideration of the total passenger and total cargo volume in Indonesia in 2019 as the control totals.

34. Origin and destination volume by each Province are shown in OD table. The origin and destination volumes of the passenger and cargo at the target year are obtained by multiplying the numerical values in the 1988 OD by the growth rate.

(3) Passenger and cargo OD at the target years

35. The passenger and cargo ODs at the target years are made using the forecasted total passenger and cargo volume and are shown in Tables 1.5.1 and 1.5.2.

Table 1.5.1 Passenger OD in 2019

Province	Aceh	North Sumatra	West Sumatra	Riau	Jambi	South Sumatra	Bengkulu	Lampung	Jakarta	West Java	Central Java	Yogyakarta	East Java	Bali	West Nusa Tenggara	East Nusa Tenggara	East Timor	West Kalimantan	Central Kalimantan	South Kalimantan	East Kalimantan	North Sulawesi	Central Sulawesi	Southeast Sulawesi	South Sulawesi	Maluku	Irian Jaya	TOTAL
Aceh	1,716,783	378,815	52,800	30,409	0	11,483	0	2,544	495,113	107,651	22,993	18,360	44,194	30,680	294	2,970	487	1,298	0	867	6,812	1,168	1,358	0	9,711	115	200	2,947,307
North Sumatra	385,249	2,749,158	630,236	474,585	2,943	247,805	21,494	107,045	1,782,584	450,633	224,281	133,080	171,379	768,975	52,896	1,065	6,695	60,687	4,241	23,740	172,120	45,020	2,543	14,760	62,829	15,433	37,741	8,649,335
West Sumatra	59,631	653,296	1,928,745	328,603	0	181,907	1,337	7,504	3,593,753	985,736	237,117	121,999	98,623	65,445	30,139	5,858	0	60,719	1,531	3,904	48,731	1,635	19,201	543	176,267	10,932	32,231	8,650,236
Riau	28,139	519,675	441,772	4,301,922	127,272	492,622	10,522	6,883	884,596	271,317	243,901	77,974	564,766	134,144	74,064	38,068	183	88,578	315	37,631	29,622	664	0	307	56,399	0	32,100	8,462,423
Jambi	0	48,005	57,637	84,578	0	255,091	1,473	2,157	400,790	83,205	299,952	120,375	140,188	1,798	0	1,585	1,158	116,516	0	1,503	33,543	419	0	1,444	56,971	0	0	1,708,314
South Sumatra	46,790	223,922	226,191	277,310	345,227	4,840,636	100,884	319,756	4,008,282	1,623,524	913,691	739,354	1,079,181	136,307	39,552	16,294	0	123,860	8,999	16,801	69,936	17,185	1,412	17,268	117,275	18,537	709	15,425,914
Bengkulu	0	9,578	18,661	895	9,475	144,816	0	1,969	240,042	111,034	55,647	23,659	51,809	1,108	0	0	0	307	0	291	464	96	0	0	1,093	0	0	670,975
Lampung	2,528	4,549	17,186	29,283	109,919	305,385	313,066	0	12,274,203	9,727,338	3,292,731	1,248,919	2,155,121	641,977	103,379	30,912	0	427,159	0	6,898	8,619	64,478	287	15,054	72,743	31,614	0	30,886,331
Jakarta	539,407	1,543,913	3,921,508	886,215	581,822	3,858,621	203,414	17,025,768	0	93,789	598,880	489,081	2,217,241	2,231,304	816,942	213,333	726,964	811,735	118,728	340,979	817,940	305,581	120,037	31,543	585,303	524,334	350,619	39,956,033
West Java	125,978	391,988	1,071,306	199,677	206,103	1,922,928	134,961	11,104,211	80,677	9,920	339,631	65,277	228,038	808,921	148,578	47,287	135,792	236,077	48,729	137,263	318,472	49,330	28,214	18,122	140,648	110,668	77,321	17,986,139
Central Java	70,217	145,310	525,983	186,234	342,476	1,209,566	132,843	3,000,787	650,886	218,860	389,219	734	326,333	2,442,831	109,469	50,809	14,439	77,784	133,823	230,078	203,278	24,253	10,260	5,130	133,575	18,192	78,744	10,733,227
Yogyakarta	29,416	35,137	147,140	52,251	33,660	781,420	48,898	1,798,836	432,329	28,103	2,553	0	192,124	1,827,641	74,516	56,265	40,503	321,616	23,406	55,369	170,274	8,286	8,751	374	63,515	17,695	41,248	6,291,556
East Java	18,023	263,135	109,829	265,103	320,690	940,539	137,778	2,916,978	1,548,283	143,433	370,306	21,565	71,420,033	20,489,829	1,385,731	249,668	98,617	130,074	317,396	1,232,200	1,273,576	199,502	183,981	56,065	848,054	339,989	180,955	103,459,552
Bali	1,373	50,577	185,725	99,827	1,799	93,374	858	278,778	1,559,239	683,993	2,270,520	1,518,435	21,485,557	141,360	5,074,526	422,464	176,899	8,656	41,849	104,935	86,205	97,376	136,326	43,117	933,261	116,577	56,413	33,631,219
West Nusa Tenggara	245	17,082	0	2,741	0	92,131	0	0	807,201	70,388	69,375	153,992	1,515,635	5,595,671	5,267,189	310,811	30,373	13,995	0	39,804	9,017	8,704	7,531	4,331	229,335	526	5,088	14,251,093
East Nusa Tenggara	859	15,948	0	49,468	0	82,428	0	0	1,263,595	92,029	44,719	82,856	443,011	658,379	382,770	3,239,333	262,676	4,400	4,174	7,130	92,638	1,597	1,752	2,814	202,239	6,333	27,033	6,969,084
East Timor	474	4,518	0	168	1,210	0	0	47,458	353,230	138,574	9,338	8,963	42,953	124,465	25,627	83,699	141,372	0	0	390	931	526	460	172,963	1,016	15,164	1,175,424
West Kalimantan	1,202	63,025	137,869	245,157	143,020	49,412	342	94,822	1,230,852	275,946	153,520	51,875	169,197	9,713	13,003	3,790	0	2,308,294	866,850	165,064	120,149	610	0	155	5,378	6,527	35,041	5,452,783
Central Kalimantan	256	3,101	2,143	2,938	0	496	0	15,572	144,583	55,035	101,297	29,496	506,296	22,240	1,022	5,854	0	83,868	1,378,404	836,728	65,170	10,099	7,288	254	32,134	0	67,479	3,374,263
South Kalimantan	10,516	2,403	38,209	35,994	1,690	39,914	513	6,550	402,799	115,426	123,421	94,308	956,548	146,825	41,104	3,890	0	37,621	704,005	1,949,336	1,043,404	10,506	9,990	86,631	38,904	249,860	134,210	6,284,579
East Kalimantan	8,173	136,681	12,622	58,639	2,280	299,929	253	2,638	692,593	222,637	178,135	114,396	1,284,375	111,520	42,352	65,207	0	183,040	49,895	759,461	6,918,729	155,078	188,581	18,633	1,918,383	3,092	20,305	13,447,820
North Sulawesi	862	21,753	1,187	247	403	21,345	65	29,897	252,935	70,322	16,361	6,788	224,363	421,946	4,327	323	695	29,583	0	9,930	169,270	3,079,205	437,659	2,454	386,848	869,816	193,672	6,271,856
Central Sulawesi	635	4,521	4,512	0	0	1,011	0	160	55,423	33,422	12,603	13,324	195,833	804,645	7,836	1,328	508	0	70,261	3,491	157,535	492,751	3,528,748	20,265	712,072	24,454	4,061	3,489,296
Southeast Sulawesi	0	1,822	402	656	1,160	13,858	0	22,533	106,612	7,782	15,239	574	53,631	21,580	6,260	524	7,752	2,903	313	671	10,345	1,499	30,693	473,476	2,436,764	170,914	20,122	3,456,217
South Sulawesi	12,290	125,941	25,236	35,112	38,209	233,225	8,078	203,747	730,793	141,826	95,374	109,615	809,170	921,666	227,258	108,377	192,685	4,983	10,560	116,320	2,231,029	473,457	717,247	2,501,756	2,821,116	735,759	398,121	14,048,350
Maluku	0	53,646	114,122	209	0	1,741	0	42,157	326,354	106,625	68,642	26,143	290,671	83,885	2,887	16,479	14,065	5,582	0	127,335	9,486	804,619	37,976	149,498	552,149	29,870,214	395,135	33,099,623
Irian Jaya	241	40,609	26,831	27,550	0	20,673	0	484	369,505	126,732	77,569	28,730	198,618	35,622	10,415	6,410	854	982	602	233	21,192	152,240	16,303	23,250	414,149	431,951	3,078,614	5,110,349
TOTAL	3,044,277	7,310,231	9,698,874	7,776,073	2,270,261	16,183,437	1,316,550	37,037,252	34,687,256	15,995,320	10,036,233	5,301,082	106,862,801	38,033,217	13,942,026	4,982,594	1,852,719	5,142,719	2,954,103	6,207,968	14,087,939	6,066,499	3,516,710	3,485,704	13,169,978	33,593,451	5,283,450	409,778,435

Source : Study Team

Table 1.5.2 Cargo OD in 2019

Unit : ton

Province	Aceh	North Sumatra	West Sumatra	Riau	Jambi	South Sumatra	Bengkulu	Lampung	Jakarta	West Java	Central Java	Yogyakarta	East Java	Bali	West Nusa Tenggara	East Nusa Tenggara	East Timor	West Kalimantan	Central Kalimantan	South Kalimantan	East Kalimantan	North Sulawesi	Central Sulawesi	Southeast Sulawesi	South Sulawesi	Maluku	Irian Jaya	TOTAL
Aceh	183,139	953,299	95,261	97,446	1,790	1,983	0	0	577,988	0	10,687	0	1,313,505	0	37,738	0	0	0	0	0	0	0	0	0	0	0	0	3,274,818
North Sumatra	2,670,755	9,087,776	184,729	3,804,348	0	1,279,251	14,342	4,334,941	38,098,569	13,038,097	7,373,719	0	17,392,597	575	4,400	0	0	27,104	0	0	1,824,788	396,282	0	678	5,316,319	0	0	105,859,270
West Sumatra	134,567	23,336,117	63,232	1,869,356	0	133,057	237,246	1,804,638	5,457,160	242,720	4,881,153	0	35,128,112	163,889	91,032	0	0	0	0	37,406	207,518	0	0	0	0	0	0	73,787,203
Riau	150,744	8,011,245	1,802,877	76,192,308	775,666	379,997	38,837	5,400,439	7,461,937	896,043	346,615	0	2,779,341	36,732	2,796	0	0	39,209	0	529,367	199,599	0	4,371	1,465	33,909	0	0	105,084,337
Jambi	0	89,360	0	74,104	157,537	653,444	0	0	848,127	234,304	12,634	0	14,528	0	0	0	0	1,782,328	0	3,498	0	0	0	566	0	0	0	3,870,430
South Sumatra	24,533	1,520,423	11,157,853	388,413	476,393	43,269,796	660	15,054,474	15,858,349	5,608,034	13,050,679	0	9,737,330	19,273	0	137,062	0	4,082,637	162,116	3,618,031	1,516,141	0	0	353,485	1,607	2,324,852	0	126,362,140
Bengkulu	0	0	50,143	0	10,207	335	0	0	190,699	59,382	4,208	0	5,940	0	0	0	0	0	0	0	0	0	0	0	0	0	0	321,114
Lampung	0	2,310,703	11,961,656	58,460	0	1,792,785	7,303,113	55,019,849	13,638,511	5,528,415	330,858	13,873	8,013,130	39,538	0	0	0	65,665	0	0	0	19,706	0	1,933	7,659	0	0	106,106,896
Jakarta	299,684	12,097,399	2,645,428	3,657,868	567,200	3,604,938	251,868	7,714,466	0	590,997	28,433	2,893	320,295	1,747,017	50,522	52,415	1,707	1,230,735	40,657	434,049	1,008,929	762,878	203,940	23,075	2,115,038	310,701	1,354,459	41,114,990
West Java	1,016	124,833	93,368	157,362	6,396	7,111,638	13,013	2,219,129	8,375	24,232	438,687	0	2,260,726	558,900	311,986	40	0	237,423	3,689	242,278	955,815	230,475	1,454,637	8,644	4,971	356,594	0	16,925,227
Central Java	4,278	110,704	1,552,281	919,064	118,566	477,279	530,752	580,817	8,380,320	79,858	54,334	0	3,020,198	293,998	103,040	1,146	0	3,180,830	387,168	188,539	734,049	0	0	223	186,288	8,739	0	20,934,391
Yogyakarta	0	0	0	0	0	0	0	0	141	0	0	0	180	3,285	0	0	0	0	19	172	70	7	0	0	0	0	0	3,875
East Java	1,039,751	20,567,723	5,486,005	1,980,266	124,809	7,208,768	341,016	3,805,834	567,855	7,869,264	131,696	1,126	1,849,253	12,894,258	1,493,098	2,337,503	66,628	143,371	833,892	2,214,036	4,849,602	920,754	513,216	286,907	4,403,369	2,363,405	1,787,177	85,078,712
Bali	0	0	0	0	0	0	0	0	1,899,298	142,020	3,872,920	24,082	5,443,970	88,872	689,528	165,541	5,741	0	0	16,920	4,019	0	44,770	7,348	12,687	2,629	725	12,421,071
West Nusa Tenggara	0	0	114,024	293,949	0	52,072	0	25,819	117,465	166,147	50,758	5,122	2,702,875	906,786	349,980	692,442	94,819	26,523	0	92,199	16,017	0	35,106	37,730	47,741	44,961	0	5,803,329
East Nusa Tenggara	0	15,229	0	0	0	0	0	0	420	0	0	0	522,145	9,782	96,971	515,105	50,035	0	0	1,363	15	0	64	0	6,781	15,964	0	1,243,874
East Timor	0	0	0	0	0	0	0	0	175	0	0	0	43,666	938	0	2,690	19	0	0	0	0	0	0	0	2,177	0	0	49,665
West Kalimantan	0	56,861	0	60,848	104,740	23,776	0	41,797	8,006,592	801,637	1,554,534	0	73,784	0	0	0	0	543,425	122,375	21,383	3,477	8,452	0	0	17,838	77,040	0	11,518,361
Central Kalimantan	0	0	0	616,843	1,433,379	187,332	0	0	424,137	48,631	930,061	0	1,997,309	66,047	0	0	0	221,328	5,533,155	2,098,535	417,837	6,467	0	0	452,404	0	0	14,441,266
South Kalimantan	0	0	0	4,547	1,329	44,302	0	0	212,297	450,791	883,567	41	3,281,512	565,307	89,851	231,961	0	88,695	601,432	474,645	519,262	38	489,208	23	3,663,380	814,216	0	12,415,624
East Kalimantan	3,273,252	5,094,172	162,244	1,620,284	2,041,827	3,748,620	0	1,891,130	2,507,164	16,208,334	2,664,356	41	25,170,946	1,971,320	3,196,307	5,385,358	2,471	3,009,069	1,814,498	10,219,182	51,191,792	7,638,346	8,164,483	5,047	14,692,699	10,038,218	7,166,814	188,597,974
North Sulawesi	0	1,539	0	0	0	2,970	0	0	154,166	0	18,531	0	507,510	70	0	15,984	0	1,941	9,963	858	26,720	641,133	333,437	9,317	266,598	1,991,963	17,128	3,999,919
Central Sulawesi	11,695	2,452	0	52,138	0	0	0	2,369	58,056	6,182	0	0	797,547	221,739	1,899	47,821	0	54,579	27,939	2,650	5,849,053	162,690	372,241	2,548	1,192,029	32,729	15,369	8,913,745
Southeast Sulawesi	0	0	0	0	2,278	0	0	0	78,639	3,512	3,288	0	518,653	4,746	3,027	238,117	411	7,453	0	6,254	8,323	11,888	144,475	9,461,474	958,474	37,738	100,727	11,589,477
South Sulawesi	2,872	376,910	7,492	11,062	7,361	425,271	2,052	30,548	932,916	25,586	675,448	0	1,598,005	4,712,329	1,995,032	2,430,081	891,621	1,912,591	5,154	3,423,051	4,464,608	4,810,671	1,053,414	370,614	4,374,887	5,263,202	671,568	41,593,826
Maluku	0	0	0	3,565	0	3,473	0	0	18,568,855	0	0	0	1,672,950	9,581	4,143	100,578	0	68,023	0	4,935,329	12,823	5,375,171	96,615	26,346,891	2,232,338	12,029,959	332,893	71,793,987
Irian Jaya	14,690	0	0	2,600	0	5,077	0	5,662	182,224	0	866,817	0	836,863	149	74,175	38,211	0	0	0	2,087	846,847	5,027	23,096	2,125	227,719	7,229,564	5,817,357	16,180,400
TOTAL	7,810,376	83,758,727	35,376,694	91,784,842	5,829,568	70,407,164	8,752,899	97,934,892	124,231,436	54,021,186	38,180,983	47,177	127,013,970	24,315,351	9,595,525	13,393,095	1,113,453	16,732,730	9,552,077	28,681,653	74,667,304	20,978,985	12,931,909	36,939,537	40,220,131	43,033,397	19,289,181	1,093,586,342

Source : Study Team

Chapter 2 Future Nationwide Ferry Service Network

2.1 Basic Development Policy for Future Nationwide Ferry Network

(1) General

1. In Indonesia, the definition of the ferry service at present includes passenger or cargo only service besides car and passenger ferry service. On the other hand, PELNI, which currently operates passenger only vessels, has a plan to introduce Ro-Ro vessels.

2. In planning the future nationwide ferry network, it is important to first clarify what constitutes ferry service.

(2) Definition of ferry service

3. According to the provision of Law 21/1992, "Ferry transportation functions as a floating bridge connecting road network and railway line which are cut off because of waters".

4. In this study, ferry service is defined as a floating bridge that transports both vehicles and passengers between two terminals on a regular schedule.

(3) Classification

5. Ferry services are classified into the following categories.

Category-1: A part of national highway trunk lines including important connecting routes between major islands.
Category-2: Connection for two provincial capitals.
Category-3: Connection for small islands or isolated areas to a regional center or island waterways and river crossings.

These categories may apply separately or to two simultaneously.

(4) Demarcation between sea transportation services and ferry services

6. Differences between sea transportation services and ferry services are proposed as indicated in Table 2.1.1.

Table 2.1.1 Ferry Services and Sea Transportation Services

	Ferry Services	Sea Transportation Services
Route	Fixed route between two terminals	Fixed or unfixed route with multiple numbers of port of call
Operation	Shuttle services	Liner and tramper
Distance	Less than 550NM (1,000km) or sailing time of 20 hours	no limitation
Cargo handling	Vehicles are loaded / unloaded through boarding ramp(s) under their own power	Ship's gear, shore facilities and/or through boarding ramp(s)
Cargo	On vehicle	Directly on board a vessel and/or vehicles
Passenger Accommodation	More than the number of the vehicles on board	Multiple number of passengers and/or their vehicles accompanied

7. "Less than 550NM (1,000km) or sailing time of 20 hours" is proposed as the maximum ferry route length. The reasons are explained in the Appendices.

8. A ferry route now operated by passenger only vessel should introduce car-ferry service in the future. On the other hand, some route now classified as a ferry without car carrying facility may be reclassified as sea transportation service.

9. A roll-on roll-off vessel now dually classified as a ferry as well as cargo vessel may be reclassified either as a ferry or a cargo vessel according to availability of passenger capacity. If the passenger accommodation is less than the number of vehicles, the vessel may be classified as a cargo vessel rather than a ferry with exception of a short distance open-deck ferry which permits drivers to stay in their vehicles. In this sense, the present Jakarta-Surabaya ferry route should be regarded as a car carrier route.

10. At present most of the ferry services in Indonesia are short distance operations; the maximum distance is 184miles between Balikpapan and Mamuju. But it is anticipated that middle and long-distance ferry services will increase in the near future.

11. As for long distance ferry boat, relatively larger vessel than ones operated now should be put in service to secure high cruising speed (more than 20knots) and to keep stability in the open sea.

2.2 Forecast of the Nationwide Ferry Traffic Demand

(1) Forecast method

12. Ferry traffic demand is estimated on the basis of the result of passenger OD and cargo OD made in Chapter 1.

13. The following procedure is applied to forecast ferry passenger OD, ferry cargo OD, and two-wheel vehicle OD.

1) Forecast of ferry passenger OD
   a) Examination of shares of air and shipping including ferry
   b) Examination of the relation between sea transportation and ferry
   c) Calculation of ferry passenger share based on 1) and 2)
   d) Calculation of ferry passenger share in total passenger in 1990 OD
   e) Determination of ferry passenger share (Bigger share between c) and d) is used)
   f) Forecast of ferry passenger OD by multiplying total passenger OD and ferry passenger share
2) Forecast of ferry cargo OD
   a) Examination of the relation between ferry passenger and ferry cargo
   b) Calculation of ferry cargo OD
   c) Calculation of ferry cargo share in total cargo in 1990 OD
   d) Calculation of ferry cargo OD multiplying total cargo OD and ferry cargo share
   e) Forecast of ferry cargo OD (Bigger ferry cargo volume between b) and d) is used)
3) Forecast of four-wheel vehicle
   a) Examination of the relation between ferry cargo and ferry four-wheel vehicle
   b) Forecast of four-wheel vehicle

(2) Ferry passenger forecast

14. When forecasting ferry passenger demand at the target year, shares of air transportation and shipping including ferry should be studied first. The share of air transportation in total traffic (air + sea + ferry) in Indonesia decreased about 4% from 22.4% in 1988 to 18.4% in 1995 because of the higher growth rates of sea and ferry transportation in the short and middle distance routes. It is assumed that the share of air

transportation at the target year will be the same as its 1988 level, because air transportation is dominant among long distance routes.

15. In developed countries, transportation modes are generally selected according to fare, time and distance. But there are big differences in degrees of development among regions and transportation facilities in Indonesia. Therefore air transportation is sometimes selected despite the relatively short distance and high air fare.

16. Although there exists fairly large scattering in the relation between transportation distance and share of air transport passenger, it is observed that the share of air transport passenger increases as route distance extends. The share of air transport passenger in the total passenger (air + sea + ferry) is decided on the basis of the relation between distances and air transportation shares from Jakarta, South Sulawesi, Maluku to other provinces in the 1988 OD table. Shares at the target year are considered to be same as those in 1988.

17. Ferry passenger demand forecast is limited to the new routes whose distances are within 550NM (1,000km).

18. As discussed in Chapter 4 of Part 1, introduction of ferry services into PELNI routes increases passenger demand, and passengers will shift from PELNI to the ferry because of regular schedule and high frequency of the ferry service.

19. Ferry passengers accounted for 75.3% of the total sea transportation and ferry passengers based on the average of 8 routes in 1994. Therefore it is assumed for the macro study of formulating a nationwide ferry network in 2019 that 75% of the passengers who do not use air transportation will select ferry at the target year.

20. In the 1990 OD table, a considerable volume of ferry passenger and cargo is recorded on the routes between provinces where no ferry service exists. It can be considered that a considerable volume of passengers and cargoes carried between provinces in Sumatra and Java go by ferry between Meraku and Bakauheni. When forecasting the ferry passenger demand at the target year, it is assumed that this situation would remain unchanged.

21. The larger of the two figures obtained from the procedures described in paragraph 19 and 20 will be adopted as the ferry passenger demand in 2019. The results are shown in Table 2.2.1.

Table 2.2.1 Ferry Passenger OD in 2019

Province	Aceh	North Sumatra	West Sumatra	Riau	Jambi	South Sumatra	Bengkulu	Lampung	Jakarta	West Java	Central Java	Yogyakarta	East Java	Bali	West Nusa Tenggara	East Nusa Tenggara	East Timor	West Kalimantan	Central Kalimantan	South Kalimantan	East Kalimantan	North Sulawesi	Central Sulawesi	Southeast Sulawesi	South Sulawesi	Maluku	Irian Jaya	TOTAL
Aceh	1,605,192	0	18,058	10,035	0	0	0	0	32,182	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,665,467
North Sumatra	0	1,347,776	271,001	222,106	1,054	76,758	7,093	0	802,163	202,783	100,926	0	37,121	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,308,783
West Sumatra	18,684	280,917	1,166,891	0	0	0	587	2,910	2,443,752	670,300	161,240	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,745,280
Riau	9,286	243,208	0	2,331,642	67,200	216,206	0	2,504	398,068	122,093	108,855	39,088	254,145	0	0	0	0	36,339	0	0	0	0	0	0	0	0	0	3,824,634
Jambi	0	17,174	0	44,657	0	159,177	0	1,021	288,569	59,908	215,965	86,670	100,880	0	0	0	0	40,722	0	0	0	0	0	0	0	0	0	1,014,743
South Sumatra	0	69,329	0	165,262	216,046	3,170,617	58,336	184,899	2,885,963	1,168,937	657,858	532,333	774,130	0	0	0	0	41,060	3,908	0	0	0	0	0	0	0	0	9,928,678
Bengkulu	0	3,161	9,629	0	0	83,757	0	1,016	204,036	94,379	47,300	20,110	44,038	0	0	0	0	0	0	0	0	0	0	0	0	0	0	507,425
Lampung	0	0	6,664	10,652	52,019	176,589	161,542	0	11,967,348	9,484,155	3,210,414	1,217,695	2,101,243	628,853	0	0	0	137,622	0	2,075	0	0	0	0	0	0	0	29,176,870
Jakarta	34,411	695,662	2,666,635	398,297	418,912	2,807,007	172,902	16,600,324	0	68,231	295,547	238,798	888,003	1,238,374	195,850	0	0	299,530	40,031	112,523	0	0	0	0	0	0	0	27,171,365
West Java	0	176,395	728,488	89,853	148,394	1,381,508	114,718	10,876,615	58,693	9,920	97,742	35,278	99,881	626,914	48,695	0	0	0	16,812	46,948	0	0	0	0	0	0	0	14,510,851
Central Java	0	65,480	357,670	83,803	246,583	870,888	112,917	2,925,767	317,795	153,202	389,074	0	197,268	2,259,619	87,573	0	0	28,061	53,597	95,288	63,270	0	0	0	0	0	0	8,308,857
Yogyakarta	0	0	0	23,558	24,235	562,622	41,563	1,753,865	211,085	15,618	0	0	0	810,715	51,416	0	0	0	0	0	0	0	0	0	0	0	0	3,524,678
East Java	0	318,411	0	119,296	239,897	677,202	117,111	2,842,102	620,088	62,824	223,971	0	71,011,956	19,875,134	1,170,943	0	0	43,900	135,401	554,490	429,832	0	0	0	0	305,935	0	98,540,533
Bali	0	0	0	0	0	0	0	271,809	865,378	530,095	2,100,231	698,480	20,943,668	0	3,933,503	137,193	0	0	4,550	44,702	28,612	0	43,045	14,002	375,998	0	0	30,041,297
West Nusa Tenggara	0	0	0	0	0	0	0	0	193,728	23,070	55,500	106,254	1,280,712	4,392,602	4,740,470	116,554	9,454	0	0	16,658	3,020	0	2,475	1,494	100,405	0	0	11,042,395
East Nusa Tenggara	0	0	0	0	0	0	0	0	0	0	0	0	0	213,776	143,539	2,267,533	156,424	0	0	0	0	0	0	1,081	76,446	2,119	0	2,860,917
East Timor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8,288	49,843	0	0	0	0	0	0	0	187	63,434	407	0	122,159
West Kalimantan	0	0	0	83,292	57,280	20,679	0	34,989	454,184	0	55,382	0	57,104	0	0	0	0	1,154,147	72,329	64,499	0	0	0	0	0	0	0	2,053,886
Central Kalimantan	0	0	0	0	157	0	0	4,882	49,447	19,001	40,569	0	217,581	8,732	383	0	0	37,224	0	594,914	32,504	0	2,848	82	12,460	0	0	1,020,783
South Kalimantan	0	0	0	0	0	0	0	1,970	132,924	39,476	51,652	0	430,447	62,547	17,202	0	0	14,700	500,548	0	620,825	0	4,038	29,628	16,865	0	0	1,922,822
East Kalimantan	0	0	0	0	0	0	0	0	0	0	55,177	0	433,477	37,033	14,167	0	0	0	24,885	451,879	2,075,616	52,339	102,117	7,099	817,231	0	0	4,071,039
North Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53,129	1,588,870	186,382	959	126,789	337,194	0	2,297,322
Central Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	0	33,042	2,568	0	0	0	27,454	1,412	85,306	200,673	99,368	9,682	340,192	7,886	0	807,584
Southeast Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	0	22,923	2,156	201	3,137	0	101	229	4,143	586	14,664	285,243	2,205,271	68,091	0	2,605,766
South Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	291,908	375,104	99,539	40,957	70,667	0	4,095	50,425	950,418	155,176	342,665	2,264,089	2,326,867	242,032	0	7,213,951
Maluku	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5,512	5,633	0	0	0	0	311,991	12,247	59,874	176,826	20,650,681	186,998	21,409,762
Irian Jaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	204,421	1,077,515	1,281,936
TOTAL	1,667,573	3,217,511	5,225,026	3,582,957	1,462,619	10,206,167	786,769	35,454,472	21,925,403	12,723,993	7,867,494	2,971,705	99,203,601	30,615,387	10,566,295	2,617,805	245,334	1,853,305	884,750	2,037,037	4,350,704	2,309,634	809,848	2,673,420	6,915,721	21,512,830	1,264,513	294,980,783

Source : Study Team

Table 2.2.2 Ferry Cargo OD in 2019

Unit : ton

Province	Aceh	North Sumatra	West Sumatra	Riau	Jambi	South Sumatra	Bengkulu	Lampung	Jakarta	West Java	Central Java	Yogyakarta	East Java	Bali	West Nusa Tenggara	East Nusa Tenggara	East Timor	West Kalimantan	Central Kalimantan	South Kalimantan	East Kalimantan	North Sulawesi	Central Sulawesi	Southeast Sulawesi	South Sulawesi	Maluku	Irian Jaya	TOTAL
Aceh	648,498	0	7,295	4,054	0	0	0	0	13,002	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	672,849
North Sumatra	0	625,302	109,485	89,731	426	31,010	2,866	0	16,534,779	6,526,534	2,949,488	0	31,157	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26,900,776
West Sumatra	7,548	113,491	471,424	0	0	0	237	1,176	2,974,152	270,801	170,840	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4,009,669
Riau	3,751	98,256	0	941,983	27,149	87,347	0	1,011	671,654	80,644	43,978	14,176	102,674	0	0	0	0	14,681	0	0	0	0	0	0	0	0	0	2,087,315
Jambi	0	6,938	0	18,042	0	64,307	0	412	725,149	200,330	87,250	35,015	40,755	0	0	0	0	16,452	0	0	0	0	0	0	0	0	0	1,194,650
South Sumatra	0	28,009	0	66,766	87,282	1,280,929	23,568	74,699	2,695,919	953,366	2,218,615	215,063	312,749	0	0	0	0	16,588	1,579	0	0	0	0	0	0	0	0	7,975,132
Bengkulu	0	1,277	3,890	0	0	33,838	0	410	137,303	42,755	19,109	8,125	17,791	0	0	0	0	0	0	0	0	0	0	0	0	0	0	264,499
Lampung	0	0	2,692	4,304	21,016	71,342	65,263	0	11,183,579	4,533,300	1,297,007	491,949	848,902	254,056	0	0	0	63,679	0	838	0	0	0	0	0	0	0	18,837,928
Jakarta	13,902	5,250,271	1,441,758	329,208	484,956	1,134,031	181,343	6,706,450	0	27,566	119,401	95,473	358,754	758,205	79,123	0	0	121,010	16,189	45,459	0	0	0	0	0	0	0	17,164,102
West Java	0	71,263	294,309	36,301	59,951	1,209,148	46,345	4,373,953	23,712	4,008	39,488	14,656	40,352	296,217	19,673	0	0	0	6,792	18,965	0	0	0	0	0	0	0	6,555,135
Central Java	0	44,282	144,499	33,853	99,619	351,839	396,541	1,182,010	128,389	61,894	157,186	0	1,192,978	912,886	54,611	0	0	11,336	21,653	38,900	25,561	0	0	0	0	0	0	4,858,042
Yogyakarta	0	0	0	9,517	9,791	227,299	16,792	708,562	85,278	6,310	0	0	176	339,649	20,772	0	0	0	0	0	0	0	0	0	0	0	0	1,424,165
East Java	0	47,838	0	48,196	93,282	273,590	47,313	1,148,209	250,516	25,381	90,484	1,098	28,688,846	12,314,016	1,000,376	0	0	17,736	55,106	224,014	173,652	0	0	0	123,598	0	0	44,623,250
Bali	0	0	0	0	0	0	0	109,811	824,295	214,158	2,013,918	282,186	8,461,242	0	1,609,335	55,427	0	0	1,838	18,060	11,571	0	17,390	5,657	151,903	0	0	13,776,792
West Nusa Tenggara	0	0	0	0	0	0	0	0	78,266	9,320	26,902	42,927	1,810,926	1,774,611	1,915,150	47,088	3,819	0	0	6,730	1,220	0	1,000	604	40,564	0	0	5,759,126
East Nusa Tenggara	0	0	0	0	0	0	0	0	0	0	0	0	0	86,366	57,990	916,083	63,195	0	0	0	0	0	0	437	30,884	856	0	1,155,811
East Timor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3,348	20,136	0	0	0	0	0	0	0	76	25,627	164	0	49,352
West Kalimantan	0	0	0	33,650	23,141	8,354	0	14,136	183,490	0	22,374	0	23,070	0	0	0	0	466,275	29,221	26,057	0	0	0	0	0	0	0	829,770
Central Kalimantan	0	0	0	0	0	63	0	1,972	19,977	7,676	16,390	0	87,903	3,528	155	0	0	15,038	0	240,345	13,131	0	1,151	33	5,034	0	0	412,396
South Kalimantan	0	0	0	0	0	0	0	796	53,701	15,948	20,867	0	173,900	25,269	6,950	0	0	5,939	202,221	0	250,813	0	1,632	11,970	6,813	0	0	776,820
East Kalimantan	0	0	0	0	0	0	0	0	0	0	22,292	0	175,125	14,969	5,723	0	0	0	10,054	182,559	838,549	21,145	41,255	2,868	330,161	0	0	1,644,700
North Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23,080	641,903	75,298	387	51,223	136,226	0	928,118
Central Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	0	13,349	1,038	0	0	0	11,092	570	34,464	81,072	40,145	3,911	137,438	3,186	0	326,264
Southeast Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	0	9,261	871	81	1,275	0	41	93	1,674	237	5,924	115,238	890,930	27,569	0	1,053,133
South Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	117,931	151,542	40,214	16,550	28,550	0	1,654	20,372	383,969	62,691	138,437	914,692	940,054	97,781	0	2,914,436
Maluku	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2,227	2,276	0	0	0	0	126,044	4,948	24,189	71,438	8,342,875	75,547	8,649,544
Irian Jaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	82,586	68,407	150,993
TOTAL	673,700	6,286,926	2,475,352	1,615,609	906,614	4,773,099	780,270	14,323,607	36,583,172	12,979,991	9,315,590	1,201,667	42,485,231	16,953,925	4,815,329	1,057,593	99,115	748,735	357,439	822,963	1,757,684	933,092	327,179	1,080,062	2,805,667	8,691,183	143,954	174,994,747

Source : Study Team

(3) Ferry cargo forecast

22. Ferry cargoes are recorded among main islands (Sumatra, Java, Bali and NTB), Southeast Sulawesi - South Sulawesi and within East Java in the 1988 ferry OD. These values are rather large and the shares in the total cargo volume (air + sea + ferry) are also big. When estimating the future ferry cargo, it is assumed that these shares will be kept until the target year.

23. As for the ferry cargo demand of a route where there exists passenger records only or for a new route, a certain proportion of cargo volume is estimated in relation with the passenger volume for the future demand.

24. The larger of the two figures obtained from the procedures described in paragraph 22 and 23 will be adopted as the ferry passenger demand in 2019. The results are shown in Table 2.2.2.

(4) Forecast of four-wheel vehicle carried by ferry

25. Actual records of vehicles carried by ferry boat by each route are obtained from 1987 to 1995. But they are limited to the present routes. The future demand of vehicles is estimated from the relation between vehicles and cargoes because new ferry routes should be considered and ferry cargoes are carried on four-wheel vehicles only.

26. Cargo volume carried by one four-wheel vehicle widely fluctuated, but the average cargo volume per vehicle is within the range of 1.7 tons to 2.6 tons per vehicle and average in total is 2.16 tons per vehicle. The average weight per vehicle has tended to increase.

27. Values exceeding 6 tons in the records should be eliminated because it means that cargoes are carried on board ferry directly, not by four-wheel vehicles on board ferry. After omitting these figures, it becomes clear that the cargo volume per vehicle of the routes between regions (main islands) is larger than other routes connecting small islands or isolated areas to a regional center. The average cargo volume per vehicle between regions is 3.2 tons.

28. There is no close relation between the distances of routes and the cargo volume per vehicle.

29. The number of the four-wheel vehicles carried by ferry at the target year is estimated by taking the future increase of cargo carried by one vehicle into consideration. The result is shown in Table 2.2.3.

(5) Forecast of two-wheel vehicle carried by ferry

30. It is observed that the number of two-wheeled vehicles is closely related to the distance of ferry route and the number of passengers. The number of two-wheel vehicles per capita is in inverse proportion to the distance. The number of two-wheeled vehicles can be calculated for any ferry route, after forecasting the number of passengers.

2.3 Nationwide Ferry Network

(1) Ferry boat

31. Ferry boats of 300 to 500GRT(Gross Registered Tonnage) will continue to be used for short distance ferry routes. On the other hand, a larger boat should enter into service for long distance ferry routes.

32. According to the relation between the route distances and the boat sizes for long distance ferry routes in Japan, minimum size is nearly 3,000GRT, and most of the ferry boats are more than 10,000GRT. Cruising speeds of long distance ferry boats in Japan are more than 20 knots.

33. Larger boat is able to secure high speed and maintain stability in rough seas. On the other hand, small boat is preferable to navigate Indonesia's shallow coastal area. In addition, it is easier for small boats to enter the port, most of which are ill-equipped to accommodate larger boats. Therefore it is recommendable to introduce a high speed and middle sized boat for long distance ferry routes in Indonesia.

34. The following ferry vessel dimensions are assumed to establish whether a long distance route could be feasibly established or not.

Vessel size	: 3,000GRT
Cruising speed	: 20 knot
Passenger capacity	: 600 persons
Four-wheel vehicle capacity	: 60 (Equivalent to 8t trucks)

35. Minimum passengers for 3,000GRT ferry boat to enter service are as follows

Table 2.2.3 Vehicle Carried by Ferry OD in 2019

Province	Aceh	North Sumatra	West Sumatra	Riau	Jambi	South Sumatra	Bengkulu	Lampung	Jakarta	West Java	Central Java	Yogyakarta	East Java	Bali	West Nusa Tenggara	East Nusa Tenggara	East Timor	West Kalimantan	Central Kalimantan	South Kalimantan	East Kalimantan	North Sulawesi	Central Sulawesi	Southeast Sulawesi	South Sulawesi	Maluku	Irian Jaya	TOTAL
Aceh	202,656	0	2,280	1,267	0	0	0	0	3,096	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	209,298
North Sumatra	0	195,407	34,214	28,041	133	9,691	893	0	3,936,852	1,553,937	702,259	0	7,418	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6,468,847
West Sumatra	2,359	35,466	147,320	0	0	0	24	367	708,131	64,477	40,676	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	998,870
Riau	1,172	30,705	0	294,370	8,484	27,296	0	316	159,920	19,201	10,471	3,375	24,446	0	0	0	0	4,588	0	0	0	0	0	0	0	0	0	584,311
Jambi	0	2,168	0	5,638	0	20,096	0	129	172,654	47,698	20,774	8,337	9,704	0	0	0	0	5,141	0	0	0	0	0	0	0	0	0	292,339
South Sumatra	0	8,753	0	20,864	27,276	400,290	7,365	23,343	641,886	226,992	328,242	51,206	74,461	0	0	0	0	5,184	493	0	0	0	0	0	0	0	0	2,016,357
Bengkulu	0	399	1,216	0	0	10,574	0	128	32,691	10,180	4,550	1,934	4,236	0	0	0	0	0	0	0	0	0	0	0	0	0	0	65,909
Lampung	0	0	841	1,345	6,567	22,294	20,395	0	2,662,757	1,079,357	308,811	117,131	202,120	79,393	0	0	0	19,900	0	262	0	0	0	0	0	0	0	4,521,173
Jakarta	3,310	1,250,065	343,276	78,383	115,466	270,007	43,177	1,596,774	0	6,563	28,429	22,970	85,418	180,525	18,839	0	0	37,816	5,059	14,206	0	0	0	0	0	0	0	4,100,282
West Java	0	16,967	70,074	8,643	14,274	287,892	11,035	1,041,417	5,646	954	9,402	3,490	9,608	70,528	4,684	0	0	0	2,422	5,927	0	0	0	0	0	0	0	1,562,663
Central Java	0	10,543	34,404	8,061	23,719	83,771	94,415	281,431	30,569	14,737	37,425	0	284,042	217,354	13,003	0	0	3,543	6,767	12,156	7,988	0	0	0	0	0	0	1,163,928
Yogyakarta	0	0	0	2,266	2,331	54,119	3,998	168,705	20,304	1,502	0	0	42	80,869	4,946	0	0	0	0	0	0	0	0	0	0	0	0	339,082
East Java	0	11,390	0	11,475	22,210	65,140	11,265	273,383	59,617	6,043	21,544	261	8,273,535	2,931,909	238,185	0	0	5,542	17,221	70,004	54,266	0	0	0	39,624	0	0	12,111,643
Bali	0	0	0	0	0	0	0	26,145	196,261	50,990	479,504	67,187	2,014,581	0	383,175	17,321	0	0	574	5,644	3,616	0	5,434	1,768	47,470	0	0	3,299,671
West Nusa Tenggara	0	0	0	0	0	0	0	0	18,635	2,219	6,405	10,221	431,173	422,526	455,988	14,715	1,194	0	0	2,103	381	0	312	189	12,676	0	0	1,378,737
East Nusa Tenggara	0	0	0	0	0	0	0	0	0	0	0	0	0	26,989	18,122	286,276	19,748	0	0	0	0	0	0	136	9,631	268	0	361,191
East Timor	0	0	0	0	0	0	0	0	0	0	0	0	0	1,046	6,293	0	0	0	0	0	0	0	0	24	8,009	51	0	15,423
West Kalimantan	0	0	0	10,516	7,232	2,611	0	4,417	57,341	0	6,992	0	7,209	0	0	0	0	145,711	9,132	8,143	0	0	0	0	0	0	0	259,303
Central Kalimantan	0	0	0	0	0	20	0	616	6,243	2,399	5,122	0	27,470	1,102	48	0	0	4,700	0	75,108	4,104	0	360	10	1,573	0	0	128,874
South Kalimantan	0	0	0	0	0	0	0	249	16,782	4,984	6,521	0	54,344	7,897	2,172	0	0	1,856	63,194	0	78,379	0	510	3,741	2,129	0	0	242,756
East Kalimantan	0	0	0	0	0	0	0	0	0	0	6,966	0	54,726	4,678	1,789	0	0	0	3,142	57,050	262,047	6,608	12,892	896	103,175	0	0	513,969
North Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7,212	200,595	23,531	121	16,007	42,571	0	290,037
Central Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	0	4,172	324	0	0	0	3,466	178	10,770	25,335	12,545	1,222	42,949	996	0	101,957
Southeast Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	0	2,894	272	25	399	0	13	29	523	74	1,851	36,012	278,416	8,596	0	329,104
South Sulawesi	0	0	0	0	0	0	0	0	0	0	0	0	36,853	47,357	12,567	5,172	8,922	0	517	6,366	119,999	19,591	43,261	285,841	293,767	30,557	0	910,761
Maluku	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	696	731	0	0	0	0	39,389	1,546	7,559	22,324	713,399	23,608	809,232
Irian Jaya	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25,808	21,377	47,185	
TOTAL	209,497	1,561,863	633,625	470,859	227,692	1,253,803	192,619	3,417,422	8,729,414	4,092,232	2,224,093	286,111	11,601,389	4,078,192	1,155,159	330,498	30,973	233,980	111,700	257,176	549,276	291,591	102,243	337,519	876,771	822,245	44,986	43,122,937

Source : Study Team

on the assumption that load factor of the vessel is 0.7.

300,000 persons per year with 1 round trip a day

150,000 persons per year with 1 round trip per two days

(2) Possible ferry route in 2019

36. The possible ferry routes which meet the above requirement (of minimum passengers) are shown in the Table 2.3.1.

Table 2.3.1 Possible Ferry Routes

(Excluding routes within province)

Province		2019	Existing Ferry	Existing PELNI	Comment
North Sumatra	West Sumatra	AA		O	Road connection
North Sumatra	Riau	AA			Road connection
Riau	South Sumatra	AA		O	Road connection
Jambi	South Sumatra	AA			Road connection
South Sumatra	Lampung	AA			Road connection
South Sumatra	West Java	AA	O		
South Sumatra	DKI	AA	(O)	O	
DKI	West Kalimantan	AA		O	
DKI	South Kalimantan	A			
Central Java	Central & South Kalimantan	A		O	
East Java	Bali	AA	O		
East Java	Central Kalimantan	AA		O	
East Java	South Kalimantan	AA		O	
East Java	East Kalimantan	AA		O	
East Java	South Sulawesi	AA		O	
Bali	NTB & NTT	AA	O	O	
Bali	South Sulawesi	AA			
NTB	NTT	A	O		
NTT and TTB	South Sulawesi	AA			
NTT	East Timor	A	O		
Central Kalimantan	South Kalimantan	AA			Road connection
South Kalimantan	East Kalimantan	AA		O	Road connection
East Kalimantan	Central Sulawesi	A			
East Kalimantan	South Sulawesi	AA	O	O	
North Sulawesi	Central Sulawesi	AA	O	O	Road connection
North Sulawesi	South Sulawesi	AA			Road connection
North Sulawesi	Maluku	AA	O	O	
Central Sulawesi	South Sulawesi	AA		O	Road connection
Central Sulawesi	South Sulawesi	AA	O	O	Road connection
South Sulawesi	Maluku	AA		(O)	
Maluku	Irian Jaya	AA		O	

Note : AA : Passenger/year > 300,000

A : Passenger/year > 150,000

37. Distances of the ferry routes for the nationwide ferry network are within 550NM (1,000km).

38. As to the movement of passengers between provinces within such large islands as Sumatra, Java, Kalimantan and Sulawesi, introduction of new route service should proceed carefully, because it is highly possible that road and railway transportation will be the dominant mode.

39. It is considered that most of the ferry passengers between provinces of Sumatra and Java Islands use Meraku - Bakauheni ferry route and that this situation will continue in the future.

40. The eastern part of Indonesia lags behind in terms of economic growth and transport infrastructure. In particular, development in Maluku and Irian Jaya is quite important and the construction of several ferry routes connecting these areas should be given high priority.

(3) Nationwide ferry network

41. The following routes are selected as the nationwide ferry network trunk line in 2019.

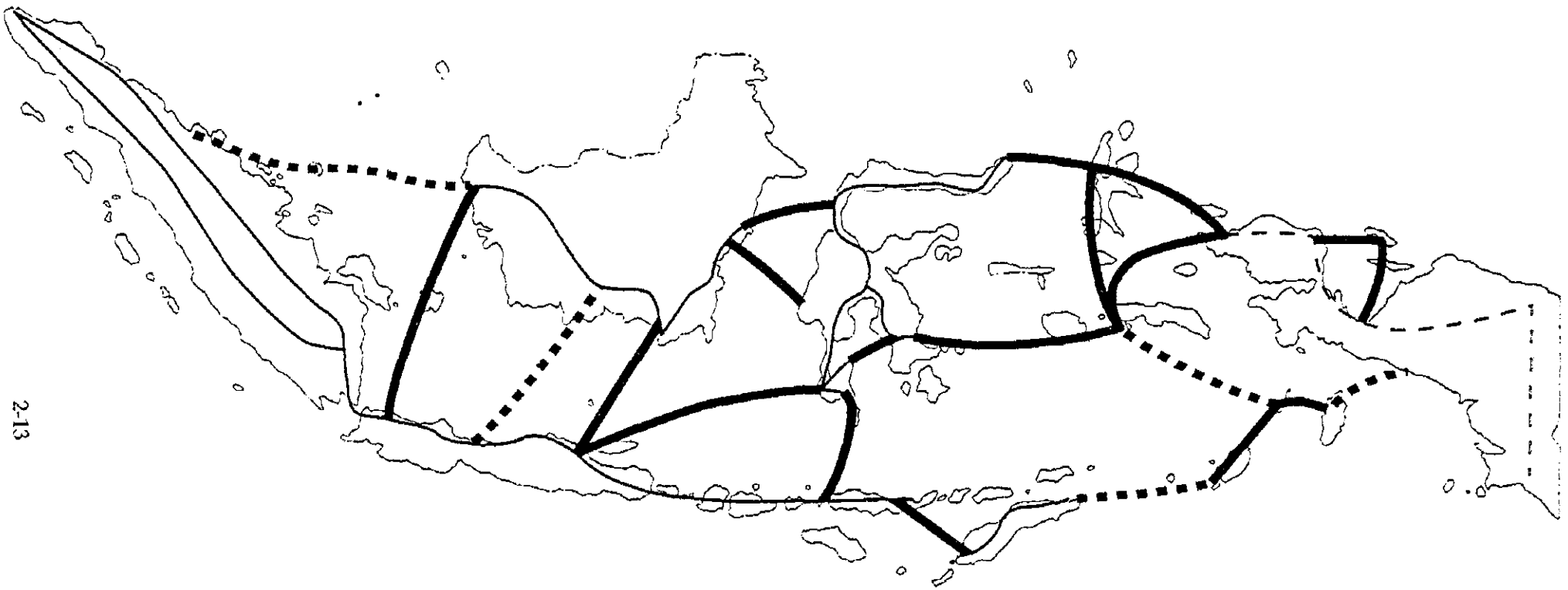
DKI - West Kalimantan
East Java - South, Central and East Kalimantan
East Java - South Sulawesi
NTT & NTB - South Sulawesi
South Sulawesi - Maluku (through Southeast Sulawesi)
Maluku - Irian Jaya

42. Several new ferry routes will enter service between Maluku and Irian Jaya.

43. In addition to the routes proposed in paragraph 40, the following routes may be included from the viewpoint of completing the nationwide trunk lines in the future network after 2019.

Riau and Jambi - West Kalimantan
East Kalimantan - Central Sulawesi
East Timor - Maluku

44. Figure 2.3.1 illustrates the Nationwide ferry network in 2019.



Legend

Ferry Network in 2019

Ferry Network in Future

Figure 2.3.1 Nationwide Ferry Network in 2019

Chapter 3 Selection of Ferry Routes for the Long-term Development Plan

3.1 Traffic Demand Forecast for the Long-term Development Plan

3.1.1 General

1. The Social and economic situation in Indonesia will change greatly with the growth of population and industries. This will lead to motorization and in turn increase the importance of ferry transportation.

2. Ferry can offer fast, regular and punctual service which is indispensable for development in Indonesia. The introduction of ferry will generate new traffic demand for the most part, rather than drawing passengers and cargoes from other transport modes.

3. Greater importance will be attached to vehicle transportation in Indonesia as in developed countries.

4. "Less than 550NM (1,000km) or sailing time of 20 hours" is proposed as the maximum ferry route length. New long distance ferry routes are selected under this condition.

5. Ferry transportation is defined as a floating bridge connecting two ferry ports. In this projection only the traffic between two ports is considered as the ferry traffic. It is anticipated that the transit traffic which stops at more than one port before its final destination will be carried by other transportation means.

6. The total transportation distances of the transit traffic are fairly long, sometimes exceeding 550NM (1,000km). On such routes in which several ports are called at to the final destination by one vessel, passengers and cargoes will not change to ferry. This type of traffic will continue to be shared by passenger vessels (PT. PELNI) and cargo vessels as at present.

7. The transit traffic accounts for a substantial part of the total traffic on all routes. For example, on Surabaya - Ujung Pandang route in the year of 1993, two-thirds of the passengers who got on a PT. PELNI vessel between two ports were transit passengers. With regard to the routes proposed as the long distance ferry routes by the Study Team, ferry companies can coexist with PT. PELNI.

8. The government of Indonesia puts emphasis on the development of the eastern part of Indonesia and is promoting transmigration to the area. New ferry routes which belong to category-3 in paragraph 5, Chapter 2 should be chosen from the eastern areas.

9. Ferry port facilities have been constructed and many ferry routes have gone into service in Nusa Tenggara region. In Sulawesi region, many ferry port facilities are under construction. Only Maluku and Irian Jaya are left behind in the development of ferry transportation. Therefore new ferry routes connecting small islands or isolated areas to a regional center are selected from Maluku and Irian Jaya in this Study.

3.1.2 Ferry Passenger

(1) Category-1 and -2 ferry route

10. To estimate ferry passenger, it is necessary to identify the hinterlands within which passenger and cargoes use the routes.

11. The hinterlands for ferry routes except Maluku and Irian Jaya are determined through comparing past records and OD data. The data on air and ferry transportation from 1988 to 1995 is obtained, but only data from 1991 to 1993 is available for PT. PELNI. Therefore 1993 OD data and 1993 records of total passenger (air + sea + ferry) are compared. The areas where passengers are equal to OD records are regarded as the hinterland of the route.

12. It is assumed that the hinterland will not change at the target year. Passenger demands of the routes between provinces are estimated by summing up the passengers of the hinterland in 2019 OD.

13. The sea (PT. PELNI) and ferry transportation passengers are calculated by multiplying total passenger demand by the share of sea and ferry transportation.

14. The ferry passenger demand of the routes is forecast considering the shares of PT. PELNI and ferry.

(2) *Category-3 ferry route*

15. The ferry passenger demand of the routes in provinces (Maluku and Irian Jaya) is directly estimated based on the relation between passenger demand and socio-

econmic indices (population and GRDP/capita).

16. Islands, counties (Kabupaten) and major cities (Kotamadya) are selected as the hinterlands for Maluku and Irian Jaya routes.

17. According to the Gravity Model, passenger demand increases as the population and/or the economic activity grows but decreases as the route distance or fare becomes greater. In this study, the population and the GRDP per capita are selected as the functions of the model formula.

18. But as for the ferry routes in Maluku and Irian Jaya which are short and middle distance ferry routes (less than 200NM), it became clear that there is no relation with distances. Therefore the distance component is excluded for these routes. The formula is shown in Appendices.

$$P\,xyi = a\,\{\,(PAxi \times PAyi\,)^{0.5} \times (GCxi + GCyi)^{0.75}\,\} + b$$

$P\,xyi$: Ferry passenger between areas x and y in the year i
$PAxi$: Population of area x in the year i
$PAyi$: Population of area y in the year i
$GCxi$: GRDP/capita of area x in the year i
$GCyi$: GRDP/capita of area y in the year i

3.1.3 Ferry Cargo

19. Ferry cargo basically increased from 1988 to 1995 with some fluctuation and cargo tonnage per ferry passenger also grew.

20. In this projection, ferry cargo for mainly long distance routes is calculated by multiplying the ferry passenger by the cargo tonnage per passenger of all ferry routes which is obtained from the average annual growth rate of the cargo tonnage per passenger from 1988 to 1995.

21. Ferry cargo for middle and short distance routes is estimated by multiplying the ferry passenger by the cargo tonnage per passenger of the ferry routes except those among main islands which is obtained from the average annual growth rate of cargo tonnage per passenger from 1988 to 1995. The cargo tonnage per passenger of the ferry route among main islands is larger than other routes.

3.1.4 Four-wheel Vehicle

22. Ferry cargo is transported by four-wheel vehicles on ferry boats. The number of vehicles carried by ferry at the target year is estimated from the cargo volume and the average annual growth rate of ferry cargo tonnage per four-wheel vehicle from 1988 to 1995.

23. The vehicles on the ferry boats which cruise between main islands, Java and Sumatra, Java and Bali etc., carry a larger volume of cargo than those on other routes.

24. The data on the four-wheel vehicle by types (trucks, buses, and sedans & pickups) are limited to seven (7) routes ; Merak - Bakauheni route, Ujung - Kamal route, Ketapang - Gilimanuk route, Patangbai - Lember route, Somber - Panajam route, Poka - Galala route and Kolaka - Bajoe route. (See Apendices)

25. As for the ferry routes in the big cities such as Ujung - Kamal route and Poka - Galala route, sedans and pick-ups are predominant, occupying more than eighty (80) percent of the total.

26. The ferry routes connecting with Bali Island have a relatively high percentage of buses. On the other hand, country side ferry routes such as Sape - Labuhan Bajo have a very small number of buses.

27. On Merak - Bakauheni route and Bajoe - Kolaka route, trucks occupy fifty (50) to fifty-five (55) percent of total vehicles. These two routes are similar to the long distance ferry routes envisaged in the future.

28. For this projection of vehicles, composition of vehicles are shown as follows.

Table 3.1.1 Composition of Vehicles

	Truck	Bus	Sedan & Pick up
Long distance route	55%	15%	30%
Middle and short distance route	55%	10%	35%

29. Data is available on the ratio of large vehicles to all on Merak - Bakauheni route. Large trucks represent sixty (60) percent of all trucks and large buses eighty-four (84) percent of all buses. In this projection, large vehicles occupy sixty-five (65) percent

of total trucks and buses.

3.1.5 Two-wheel Vehicle

30. Two-wheel vehicles are carried more by ferry boats in the shorter distance routes as well as with more ferry passengers.

31. The formula for calculating the future two-wheel vehicle demand of each route is shown in Appendices.

3.2 Selection of Ferry Routes for the Long-term Development Plan

3.2.1 Selection Conditions

32. The following items are studied as the conditions to select ferry routes for the long-term development plan.

1) Classification of ferry routes
2) Route distance
3) National Development policy and other policies
4) Population of the hinterland where ferry port is located
5) Existing roads and railways connecting ferry port
6) Demand forecast at the target year (2019)
7) Present situation of ferry port facilities
   (mooring facilities, loading facilities, possibility of extension)
8) Possibility of privatization

33. Development of ferry routes in local areas and those excluding Sumatra and Java Islands on the national trunk lines should be given high priority because transmigration and correction of economic inequality are important policies in Indonesia.

34. Ferry ports whose hinterland has a large population should be developed at an early stage. It is considered that these areas have a large potential ferry transport demand.

35. The ferry ports connected to artery roads and collector roads or railway should be given high priority.

36. The ferry demand at the target year of 2019 must be more than the minimum requirement mentioned in paragraph 35, Chapter 2, that is, passenger demand for long distance ferry routes is more than 300,000 and that for middle and short distance is more than 150,000.

37. The sites where there is no mooring facility for ferry boat or no loading facility in the port should be given high priority. In many cases where there exists a ferry port facility, an increase in operational frequency can meet greater demand on ferry routes.

38. In a ferry route where there exist a lot of passengers and where private companies can afford to construct and operate their ferry port facilities, privatization should be introduced. Although the ferry terminals of Merak IV and Bakauheni IV are being constructed by the private sector, it is generally difficult for the private sector to start a new ferry port business from the initial stage.

3.2.2 Selection of Ferry Routes for the Long-term Development Plan

39. Concerning the long distance ferry route, the new candidate routes must meet the following requirements.

1) Routes which are included in Table 2.3.1 (paragraph 36, Chapter 2)
   a) route distance is more than two hundred miles (200 NM)
   b) both sites are not connected by roads on land
   c) ferry passenger demand is more than three hundred thousand (300,000).
2) Routes between Maluku and Irian Jaya
   a) route distance is more than two hundred miles (200 NM)
   b) the route is a part of ferry network trunk line in the future

40. As for the short and middle distance ferry route, candidate routes must meet the following requirements.

1) Routes which are included in Table 2.3.1 (paragraph 36, Chapter 2)
   a) route distance is less than two hundred miles (200 NM)
   b) both areas are not connected by roads on land
   c) ferry passenger demand is more than one hundred and fifty thousand (150,000)
3) Routes in Nusa Tenggara, Maluku and Irian Jaya
   a) route distance is more than two hundred miles (200 NM)

41. The evaluation of candidate ferry routes is shown in Table 3.2.1.

Table 3.2.1 Evaluation of Candidate Ferry Route

Route		Population in 1995		Route Distance	PELNI Existing Route	Part of Trunk Line	Passenger Demand in 2019	Consideration
(unit)		(thousand)		(NM)			(thousand)	
Long Distance								
Jakarta	Pontianak	9,160	873	414	○	○	755	
Belawan	Batam	1,910	478	425	X		233	
Surabaya	Banjarmasin	2,701	2,900	256	○	○	1,857	
Surabaya	Ug Pandang	2,701	1,092	445	○	○	578	
Kendari	Ambon	606	270	362	X	○	503	
Ambon	Sorong	270	200	337	○	○	251	Maluku, Irian Jaya
Ambon	Fak-Fak	270	107	323	○	△	28	Maluku, Irian Jaya
Ambon	Ternate	270	59	348	○	○	193	Maluku
Ambon	Tual	270	74	353	○	○	120	Maluku
Dobo	Timika	57	53	210	○	△	56	Maluku, Irian Jaya
Middle and Short Distance								
Selayar	L. Bajo	100	56	135	X	○	313	
Waingapu	L. Bajo	82	56	88	X		124	
Air Buaya	Sanana	174	48	90	X		144	Maluku
Patani	Sorong	49	200	173	X	△	218	Maluku, Irian Jaya
Wahai	Babang	209	59	178	X	△	222	Maluku
Manokwari	Biak	156	86	144	○	○	255	Irian Jaya

42. Under the condition that there be eight(8), nine(9) or ten(10) routes in the long-term development plan, the long distance routes and the middle and short distance routes are evaluated separately.

43. Concerning the long distance ferry routes, the four routes whose ferry passenger demands are more than three hundred thousand (300,000) in 2019 in Table 3.2.1 and the Ambon - Sorong route whose ferry passenger demand is biggest in Maluku and Irian Jaya are proposed.

a) Surabaya - Banjarmasin
b) Jakarta - Pontianak
c) Surabaya - Ujung Pandang
d) Kendari - Ambon
e) Ambon - Sorong

44. With regard to the short and middle distance routes, the routes whose passenger demands reach the top four are proposed, that is, one in Nusa Tenggara and the remaining three in Maluku and Irian Jaya. Each has a passenger demand of more than one hundred and fifty thousand.

a) Selayar - Labuhan Bajo
b) Manokwari - Biak
c) Wahai - Babang
d) Patani - Sorong

45. The ferry routes proposed for the long-term development plan are shown in Figure 3.2.1.

3.3 Characteristics of Ferry Routes

3.3.1 General

46. The characteristics, roles and importance of the routes for the long-term development plan in the transport network in Indonesia are explained in this section.

3.3.2 Surabaya - Banjarmasin

47. Surabaya - Banjarmasin route connects Surabaya, the capital of East Java, which is second to Jakarta in size and economic activities and Banjarmasin, the capital of South Kalimantan.

48. The total number of passengers was nearly 360 thousand in 1994, which was composed of 150 thousand PT.PELNI passengers and 210 thousand air passengers. The share of sea transportation was low considering the relatively short voyage distance.

49. Banjarmasin plays an important role as an entrance to not only South Kalimantan but also Central Kalimantan and East Kalimantan. Therefore it is anticipated that passengers and cargoes from neighboring provinces will come to

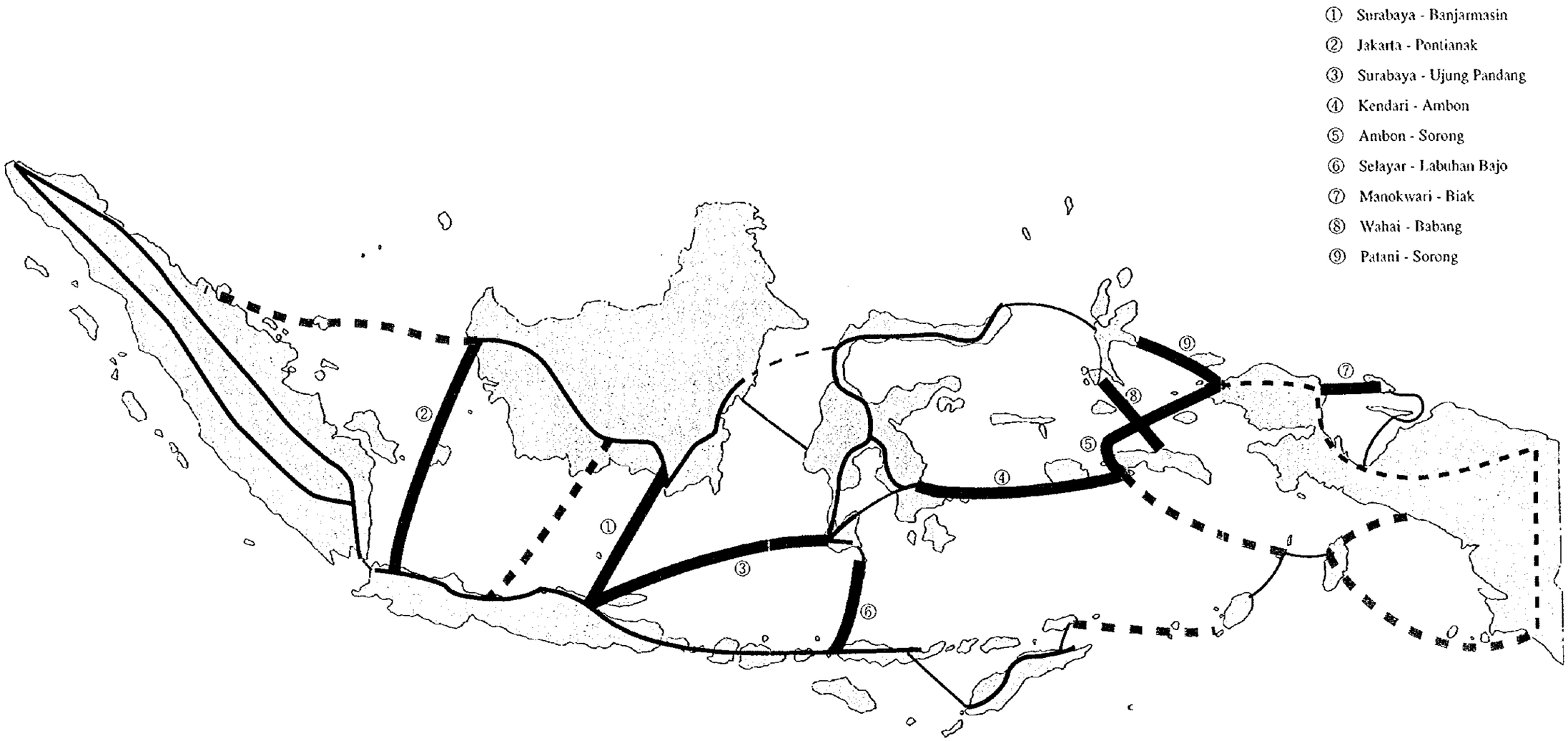


Figure 3.2.1 Ferry Routes for the Long-term Development Plan

Banjarmasin for the purpose of using ferry transport.

50. This ferry routes will be the most important North - South trunk line in Indonesia and will be indispensable to the transport network. Passenger demand including East Kalimantan is forecast to exceed 1.8 million in 2019.

3.3.3 Jakarta - Pontianak

51. Jakarta - Pontianak route connects Jakarta, the capital of Indonesia, and Pontianak, the capital of West Kalimantan.

52. Jakarta, the social, economic and cultural center of Indonesia is connected to major cities in Indonesia by air and sea transportation. Pontianak ranked 7th in air transportation and 3rd in sea transportation by PT. PELNI. The importance of this route will not change and will rather increase.

53. Sea transportation accounted for only about one fourth of all transport in 1993. It is necessary to increase sea transportation capacity because it is thought that the potential demand for sea transportation is fairly large.

54. This route will be the second most important North-South trunk route in the future transport network.

3.3.4 Surabaya - Ujung Pandang

55. Surabaya - Ujung Pandang route connects Surabaya, the capital of East Java and Ujung Pandang, the capital of South Surawesi, and is one of the important routes on the East - West trunk line at present.

56. PT. PELNI offers many vessels on this line and carries a lot of passengers including transit passengers. The shares of air and sea transportation are almost the same (50% each).

57. The importance of PT. PELNI on this route will not change. But fast and punctual transportation service on a fixed schedule will be required more than at present.

3.3.5 Kendari - Ambon

58. Kendari - Ambon route connects Kendari, the capital of Southeast Sulawesi and Ambon, the capital of Maluku.

59. Ferry service between Bajoe and Kolaka has gone into service and passengers and cargoes have been carried by buses and trucks between Ujung Pandang, the capital of Southwest Sulawesi and Kendari.

60. Kendari - Ambon route will be a part of the East - South trunk line in the Indonesian transport network. This route has short-cut effect because PT. PELNI vessels go by a roundabout route from Ujung Pandang to Ambon.

61. There is no direct flight or vessel from Kendari and Ambon at present, passengers have to go to Ujung Pandang and or Baubau. Therefore this route will eliminate such an inconvenience.

5.3.6 Ambon - Sorong

62. Ambon - Sorong route connects Ambon, the capital of Maluku and Sorong, the main gate to Irian Jaya.

63. This route is a part of the East - West central trunk line and is used by many transit passengers. About sixty percent of the total passengers from Maluku to Irian Jaya used this route in 1993.

64. The improvement of this route is required to promote industries and to assist in the development of this area.

3.3.7 Selayar - Labuhan Bajo

65. Selayar - Labuhan Bajo route connects the new port planned in Selayar Island and Labuhan Bajo located at the western tip of Flores Island.

66. Selayar Island is connected with Sulawesi main island by ferry between Bira and Pamatata. On the other hand, Labuhan Bajo which belongs to the largest Kabupaten in Flores Island is connected not only with other major cities in the island by bus or truck but also with Sumbawa Island by ferry. Therefore people and cargoes can come

and go more smoothly from South Sulawesi to East Nusa Tenggara and West Nusa Tenggara through this route.

67. People in Flores Island have historically had close relations with people in South Sulawesi. But transport is available only by PT. PELNI vessel via Bima once or twice a month at present. Therefore there is a strong demand for ferry service.

3.3.8 Manokwari - Biak

68. Manokwari - Biak route connects Manokwari, the capital of Kabupaten Manokwari in Irian Jaya and Biak in Biak Island of Irian Jaya. This route is on the way from Sorong to Jaya Pura, the capital of Irian Jaya.

69. Biak plays an important role as the center of air and sea transportation in upper Irian Jaya. And Biak is designated as one of the thirteen (13) priority areas to be developed in the Eastern Indonesian Regional Development Plan.

70. But it is inconvenient for people living in Manokwari to go to other places in upper Irian Jaya because there are only a small number of flights and ships. Therefore it is important to start service on this route and then people in Manokwari can visit other places via Biak more smoothly.

3.3.9 Wahai - Babang

71. Wahai - Babang route connects Wahai located on the north coast of Seram Island, the second largest island in Maluku province, and Babang on the east coast of Bacan Island.

72. Seram Island is designated as one of the thirteen (13) priority areas to be developed in the Eastern Indonesian Regional Development Plan. And Wahai is the main town on the north coast of the island.

73. Seram Island belongs to "Ambon Influence Area" and Babang Island "Ternate Influence Area". At present, there is no direct public transportation means between these two islands. But this route will play an important role as a part of the North-South trunk line connecting Ambon with Ternate in the future.

74. Wahai may also be a base for ferry boats to connect Seram Island with Sorong

in Irian Jaya.

75. Presently the road connecting Wahai with the other part of Seram Island is in poor condition. Therefore development of a good road network in the island is indispensable to this project.

3.3.10 Patani - Sorong

76. Patani - Sorong route connects Patani, situated at the eastern tip of Halmahera Island and Sorong, the main gate to Irian Jaya.

77. This route will be an important part of the northern East-West trunk line from Bitung to Jaya Pura because it has a short-cut effect compared with the present PT. PELNI route between Ternate and Sorong. According to the 1993 PT. PELNI OD data, the number of passengers between Bitung and Sorong is almost the same as that between Ambon and Sorong.

78. The road condition is very poor in the central part of Halmahera Island at present. Therefore the success of this route depends on the improvement of the present road.

Chapter 4 Natural Conditions of Ferry Terminal Sites and Sea Conditions of Ferry Routes

4.1 Natural Conditions of Ferry Terminal Sites

4.1.1 Surabaya - Banjarmasin

(1) Surabaya (Lamong Bay site)

(Oceanographic conditions)

1. Madura Island is located in the north of the proposed site. Therefore, there is no wave that will pose any problem to ferry operation. The difference between HWS and LWS is 3.10m.

(Topographic conditions)

2. The proposed site is located in the future expansion area of Surabaya port in Lamong Bay between Surabaya City and Gresik City. The slope of seabed in Lamong Bay is very gentle and six rivers flow into Lamong Bay. The water depth of 5m below LWS is obtained around 2 - 3km offshore.

(Land use conditions and others)

3. There are salt field, container yards and plywood factories in the Lamong Bay area. The shore area is covered by mangrove and there are many fish traps in Lamong Bay. It is considered that there is no problem in water and electric supply in this area.

(2) Banjarmasin (next to Trisakti Terminal of Banjarmasin Port)

(Oceanographic conditions)

4. Proposed site is located on the left bank, approximately 30km up-stream from the river mouth of Barito River. Therefore, there is no wave that will pose any problem to ferry service. The difference between HWS and LWS is 2.40m at the site.

(Topographic conditions)

5. Proposed site is located on the right bank of Teluk Dklam River which is a branch of Barito River, and the existing passenger terminal of Banjarmasin Port is located on the opposite side of Teluk Dklam River. The land in the vicinity of the proposed site is flat. The water depth at around 50m from the riverbank is estimated to be approximately 10m below LWS.

6. The roads to the proposed site from the center of Banjarmasin City do not have enough width and capacity. Therefore, it is considered that expansion of road width at some sections will be necessary.

(Land use conditions and others)

7. The proposed site is currently possessed by the Indonesia Army and an Indonesia private company. At present, an Indonesian private company is using this land and neighboring water area as shipping yard of timber and coal. Water and electricity supplies are available in this area.

4.1.2 Jakarta - Pontianak

(1) Jakarta (Tanjung Priok Port site)

(Oceanographic conditions)

8. From November to March, the waves of maximum 2 - 3m high attack the north coast area of Java from north-west direction. However, the proposed site is located in the future expansion area of Tanjung Priok Port. Therefore, no wave problem is anticipated. The difference between HWS and LWS is about 1.2m.

(Topographic conditions)

9. In the vicinity of Tanjung Priok Port, the slope of seabed is very gentle and the water depth of 5m below LWS is obtained around 4 - 5km offshore. Since the site will be obtained by the land reclamation, the proposed site should be flat land.

(Land use conditions and others)

10. At present, the proposed site is in the sea area. Access from Jakarta city and surrounded area is considered very easy, and the availability of other infrastructures has no problem.

(2) Pontianak (Kapuas Kecil River site)

(Oceanographic conditions)

11. The proposed site is situated on the left bank of the Kapuas Kecil River. Therefore, the influence of sea waves is considered negligibly small. The tidal range between HWS and LWS is about 1.80m.

(Topographic conditions)

12. The land around the proposed site is flat. The water depth of 5m below LWS will be obtained 20 - 30m from the riverbank.

(Land use conditions and others)

13. Upstream side next to the proposed site is the new "rakyat" ship port. The proposed site and the down-stream side are presently empty low land covered by mangrove and bush. In the vicinity, a new bridge, which cross the Kapuas Kecil River, is planned to be constructed.

14. Access from Pontianak city is only 5 - 6km. Other infrastructures, such as water supply and electricity supply system, can be available easily.

4.1.3 Surabaya - Ujung Pandang

(1) Ujung Pandang (inside of Ujung Pandang "Makasar" Port)

(Oceanographic conditions)

15. From November to March, the waves of maximum 2 - 3m height attack from north-west direction. However, the proposed site is located in the future expansion area of Ujung Pandang Port. Therefore, it is considered that there is no wave that will pose any problem to ferry service. The difference between HWS and LWS is about 1.8m.

(Topographic conditions)

16. The proposed site is located in the future port expansion area of Ujung Pandang port. Since the port will be expanded by land reclamation, the proposal site should be flat land.

(Land use conditions and others)

17. At present, the proposed site is in the sea area. It is considered that water and electricity supply is available in this area.

4.1.4 Kendari - Ambon

(1) Kendari (existing ferry terminal site)

(Oceanographic conditions)

18. The proposed site is located within Kendari Bay and approximately 4km from

the bay mouth. Therefore, waves are negligibly small. The difference between HWS and LWS is 2.60m.

(Topographic conditions)

19. The proposed site is located 150m west of Kendari Port in Kendari City. There is a Central market on the backside of the proposed site. Therefore, countermeasures for traffic congestion will be necessary.

20. At the proposed site, the ferry terminal for Kendari City and Wowoni Island route is now under construction and ferries are being operated by PT. ASDP using a temporary jetty. The water depth on the tip of ferry terminal now being constructed is approximately 5m below LWS.

(Land use conditions and others)

21. Ferry terminal now under-construction is managed by DGLT and surrounding area is used by small private ships. Water and electric supply are available in this area.

(2) Ambon (Hunimua Ferry Terminal site)

(Oceanographic conditions)

22. There is no wave that will pose any problem on ferry service. The difference between HWS and LWS is about 2.2m. There are developed coral reefs along the shore of the proposed site. The water depth of 5m below LWS is obtained at 50 - 60m off the shore and steep slope starts from there.

(Topographic conditions)

23. The proposed site is located approximately 40km from Ambon City and the road condition is fairly good. The proposed site is the existing ferry terminal for Ambon Island and Seram Island route. The area behind the existing ferry terminal is the airfield that was used in World War II.

(Land use conditions and others)

24. There are few houses around the proposed site and the nearest village is located approximately 3km from the proposed site. North side of the proposed site is designated as a resort area and used as a seaside park and a sea bathing area. The land of west of the proposed site belongs to the Indonesia Air Force. However, there is no facility at present. The surrounding area of the proposed site is grassland or cultivated land.

25. There is a small wooden jetty on the south side of the proposed site. Water supply and electricity supply is available.

4.1.5 Ambon - Sorong

(1) Sorong (Klademak II; existing ferry terminal site)

(Oceanographic conditions)

26. The proposed site is located on the shore that is opened to the south. Generally, the wave becomes higher in the afternoon than in the morning. The difference between HWS and LWS is about 2.0m.

(Topographic conditions)

27. The proposed site is the existing ferry terminal for Sorong City and Jefman Island route. The ferry service is operated by PT. ASDP. The proposed site is flat land reclamation area and there is one wooden jetty. The water is deeper in the western side of wooden Jetty than in the eastern side. The water depth at approximately 25m off the tip of the wooden jetty is about 6m below LWS.

(Land use conditions and others)

28. The proposed site is the existing ferry terminal and the area is approximately 2ha. However, there is only one office building in this area and the remaining area is not used because ferries do not transport vehicles now. The backside of the existing ferry terminal is the housing area. The access road from main road to the ferry terminal is narrow and like a maze. Therefore, it is considered that road improvement or construction of new access road between main road and proposed ferry terminal will be necessary.

29. There is no problem for water and electricity supply.

4.1.6 Selayar - Labuhan Bajo

(1) Selayar (Bukumbarung site)

(Oceanographic conditions)

30. The proposed site is located in an inlet and the influences of sea wave are considered negligibly small during the whole year around. The difference between HWS and LWS is about 2.0m.

(Topographic conditions)

31. The proposed site is an approximately 1 hour drive from Benteng Town. The road from Benteng Town is steep, narrow and rough. Therefore, improvement will be required.

32. The inlet is approximately 210m in width and 600m in length and there are sandbars on both sides of the mouth. Both sides of this inlet are steep slopes of the mountain. Approximately 3 - 4ha flat area exists on back of this inlet. The water depth at the center of this inlet is approximately 6m below LWS.

(Land use conditions and others)

33. The waterfront of the inlet is swampy mangrove area. Coconut trees are planted on the flat area in the back of the inlet. There are few houses surrounding the proposed site. No village exists near the proposed site. It is necessary to include water and electric supply in the ferry terminal construction plan.

(2) Labuhan Bajo (existing ferry terminal site)

(Oceanographic conditions)

34. There are islands just in front of the proposed site. Therefore, there are no waves that will pose any problem to ferry operation. The difference between HWS and LWS is about 1.8m.

(Topographic conditions)

35. The proposed site is the existing ferry terminal which is located on the edge of the town of Labuhan Bajo and it is several minutes drive from the Center of the town. The condition of the road from the town is good. The water depth at the end of the jetty of the existing terminal is 5m below LWS.

(Land use conditions and others)

36. Many houses occupy the South side of the proposed site. There is a warehouse of Fishery Department on the north side next to the proposed site. However, this warehouse has not been used for its original purpose.

37. The existing ferry terminal was constructed in 1992/1993 and movable bridge was constructed in 1995/1996. Water and electric supply are available.

4.1.7 Manokwari - Biak

(1) Manokwari (south side of Sowi Bay)

(Oceanographic conditions)

38. The proposed site is located at the back of a bay. Therefore, there is no wave that will pose any problem to ferry operation. The difference between HWS and LWS is about 2.2m.

(Topographic conditions)

39. The proposed site is located approximately 5km south-west from Manokwari Town and it takes approximately 15 minutes by vehicle. The road condition is very good. The vicinity of the proposed site is flat and covered by bush. The water depth of 10m below LWS is obtained at approximately 75m offshore. There is a developed coral reef along the shore of the proposed site.

(Land use conditions and others)

40. The proposed site is located along the main road that is running in parallel with the shoreline. The width of the proposed site is approximately 200m. There are few houses around the proposed site. It is necessary to include water and electric supply in the ferry terminal construction plan.

(2) Biak (Mokmer; existing ferry terminal site, under construction)

(Oceanographic conditions)

41. The site is open to SW waves. The maximum height of waves is assumed to be about two meters. The difference between HWS and LWS is about 1.6m.

(Topographic conditions)

42. The proposed site is the ferry terminal now being constructed by DGLT and is located approximately 20 minutes from Biak Town by vehicle. The water depth at the end of the jetty is estimated to be approximately 5m below LWS.

(Land use conditions and others)

43. The size of the ferry terminal area still under construction is approximately 100m x 60m and located at the center of Mokmer village. Fishponds are located on both sides of the ferry terminal now under construction. There is no problem in water and electric supply in the area.

4.1.8 Wahai - Babang

(1) Wahai (next to the existing Wahai Port)

(Oceanographic conditions)

44. The proposed site is located on the shore of a bay. Therefore, there are no waves that pose any problem to ferry service. The difference between HWS and LWS is about 2.2m.

(Topographic conditions)

45. The proposed site is located approximately 3km east from Wahai Town which is the largest town on the north coast of Seram Island. The proposed site is the adjacent area of the harbor that is under-control of KANWIL and this harbor was renovated this year.

46. The proposed site is located in the recess of winding shore. The site is flat. Flat areas also exist to the west and north of the site. Steep cliff exists to the south. Sand bar also exists in the water off the steep cliff. The water depth of 5m below LWS is obtained at approximately 100m offshore.

(Land use conditions and others)

47. The proposed site is covered by bush and coconut trees at present. There are only a few houses around the proposed site. There is no problem for water and electric supply.

(2) Babang (existing PT. Kayu Manis site in Babang Bay)

(Oceanographic conditions)

48. The proposed site is located in the back of bay. Therefore, there are no waves that will pose any problem to ferry service. The difference between HWS and LWS is about 1.2m.

(Topographic conditions)

49. The proposed site is located approximately 16km east from Labuha Town which is the largest town in Bacan Island. An Indonesian private company on the proposed site executed Land reclamation. However, this area is not being used at present. The water depth of 10m below LWS is obtained at approximately 20m offshore.

(Land use conditions and others)

50. The proposed site is abandoned reclamation area and covered by grass. There is a nursery operated by an Indonesian private company on the northwest side of this area. There is no problem for water and electric supply.

4.1.9 Patani - Sorong

(1) Patani (Sif site)

(Oceanographic conditions)

51. The proposed site is surrounded by coral reef. Therefore, influences of sea waves are negligibly small. The difference between HWS and LWS is about 1.6m.

(Topographic conditions)

52. The proposed site is located approximately 13km west from Patani Town. The road condition from Patani Town to proposed site is very bad. This road is impassable except by motor bicycle.

53. A timber company up to approximately 1983 for shipping timber used the proposed site. The diameter of this anchorage is approximately 200m and there is approximately 50m width channel at the center of this anchorage. The depth of water at the center of anchorage is 10m below LWS.

(Land use conditions and others)

54. More than 10 houses exist along the shore. Coconut trees are planted in the back of these houses. A small river is flowing into the sea at the eastern edge of the proposed site. It is necessary to include water and electric supply plan in the ferry terminal construction plan. Improvement of the roads between proposed site and Patani City will be necessary.

4.2 Sea Conditions of Ferry Routes

55. The sea conditions of the water area relevant to the planned ferry routes are described here in accordance with the descriptions of the latest edition of INDONESIA PILOT (published by the Hydrographer of the Navy, UK) and SAILING DIRECTIONS - Southeast Asia; 4th Edition (published by Defense Mapping Agency, United States Government).

56. The ferry routes and their points of terminal are as follows;

Route No.	1.	Surabaya	-	Banjarmasin
	2.	Jakarta	-	Pontianak
	3.	Surabaya	-	Ujung Pandang
	4.	Kendari	-	Ambon
	5.	Ambon	-	Sorong
	6.	Selayar	-	Labuhan Bajo
	7.	Manokwari	-	Biak
	8.	Wahai	-	Babang
	9.	Patani	-	Sorong

4.2.1 Western Sea Area (relevant to the Route 2; Jakarta - Pontianak)

(1) General

57. The Western Sea Area is a wide sea area surrounded by the west coast of Kalimantan, the north coast of West Java and the southeast coast of Sumatra and stretches about 400km from east to west and 700km from north to south. The coastline is a low, flat, wooded and occasionally swampy and lacking prominent feature in the north coast of Java. It should be noted that rivers flowing into the sea on the north coast of Java bring a great deal of sediment that is deposited along the shoreline.

(2) Climate and weather

58. Along the East Coast of Sumatra and the western part of Java Sea, the SE monsoon prevails from April until November. During the SE monsoon season the weather is good with much sunshine and clear skies. The NW monsoon, in progress by December, gives N- NW winds until February, and the strongest winds occur in January.

59. The period from October to April can be very wet. Exceptionally heavy rainfalls are reported along the coast, and visibility is frequently reduced temporarily below fog limits.

(3) Currents

60. In the open sea the direction of the predominant surface current generally sets

in the same direction to which the monsoon wind is blowing. Except under the Sumatra coast, the horizontal movement of the water in Java Sea is mainly caused by the wind, and is, therefore, monsoon current; the maximum rate of which is 2kn.

61. In the open sea under the north coast of West Java the water movement is almost entirely caused by the monsoons, and the rate never exceeds 2kn.

(4) Tides and tidal stream

62. In this sea area the tides are predominantly diurnal, and on the north coast of Java the range seldom exceeds 0.5 m. On the east coast of Sumatra and the coasts of neighboring islands, the range is mostly between 1.0 and 1.5m. On the south and west coasts of Kalimantan, the range of the tide seldom exceeds 1.0m.

63. Under the Sumatra coast there is a weak diurnal tidal stream that runs N with the rising tide and S with the falling tide; and monsoon currents modify the directions of these streams.

(5) Sea and swell

64. The heights of sea waves are frequently less than 1m throughout the year. During the transitional months between the SE and NW monsoons (April and late October to November), moderate or higher seas are reported on less than 3% of occasions.

65. In January moderate or higher seas are reported on around 10 to 14% of occasions in the extreme north and southeast of the area, and about 4 to 8% in central areas.

66. Considerable swell comes from the China Sea, particularly during the strength of the NW monsoon, from November to March. In the north off the area in January, swell waves from between N and NE are not uncommon, although swells of 2m and over are only reported on about 5 to 8% of occasions. In central areas swell waves are most frequent from between N and NW, and in the southeast of the area from WNW. Swell heights of 2m and over are reported on around 5 to 10% of occasions in the south and southeast of the area.

4.2.2 Eastern Portion of Java Sea, Makasar Strait and Flores Sea Area (relevant to the Routes 1, 3 and 6)

(1) Ocean features

67. Bottom conditions in the eastern part of the Java Sea, and in the shallow western part of Makasar Strait fronting the east coast of Kalimantan, are dominated by the processes of the shallow water deposition of river borne sediments. The seabed consists mainly of mud, or mixture of mud and sand, overlain in places by beds of shell.

(2) Climate and weather

68. The climate is hot and humid, with high rainfall. Except for local squalls, strong winds are rare. Some of the squalls are violent and may develop quite suddenly causing a temporary hazard to smaller vessels.

(3) Tides and tidal streams

69. Tidal streams throughout the area have a strong diurnal inequality. This is especially marked on the coasts of Kalimantan and Java bordering the Java Sea, where the tides are predominantly diurnal. The range of the tides is between 1 and 2m though at some places on the East Coast of Kalimantan and on Flores it reaches 2 - 5m.

(4) Currents in Java Sea and Flores Sea

70. In the northwest monsoon the current sets in a predominantly ESE direction through the Java Sea, and E through the Flores Sea. The ESE to E current sets along the north coast of Java and Nusa Tenggara at a rate of about 1 to 1.5kn, whereas the mean rates elsewhere are about 3/4kn.

71. During the southeast monsoon the current pattern over the greater part of the area is reversed. The predominant directions of the currents are WNW-going through the Java Sea, and W-going through the Flores Sea. The mean rates are about 3/4kn in the south and 1kn in the north. The maximum rate lies in the range of 2 to 3kn.

(5) Currents in Makasar Strait

72. Over the great part of Makasar Strait the predominant current direction is

towards the south, with moderate constancy in all months of the year. The mean rate of the south current is about 3/4kn during the northwest monsoon, increasing to about 1kn in the southeast monsoon. Current up to 3kn may occasionally be experienced, more particularly during the southeast monsoon.

(6) Sea and swell

73. Sea disturbance and swell is slight or moderate in all portions of the area for most of the year. The main exceptions are occasional heavy sea and swell in exposed anchorage on the north coast of Sulawesi during the Barat, strong west winds during the northwest monsoon.

4.2.3 Banda Sea Area (relevant to the Route 4)

(1) Ocean features

74. The submarine features of the seas of the Eastern Archipelago are relatively little known. The Banda Sea is enclosed on its south side by a chain of active and extinct volcanoes forming the Inner Banda Arc.

75. The bottoms of the western part of Molucca sea, Banda Sea and Flores Sea are known partly covered with blue or green mud, of both terrigenous and volcanic origin, the proportion of volcanic material being highest in the vicinity of active or recently active volcanoes.

(2) Climate and weather

76. All coasts north of 5° S experience a typical equatorial maritime climate with comparatively uniform high temperatures and abundant rainfall. In this region winds rather than temperature mark the change in seasons --- the prevailing winds changing from the north-west monsoon (November - March) to the south-east monsoon (May - September).

77. Rainfall is abundant with the average annual rainfall everywhere exceeding 1,000mm. Most coastal areas receive over 2,000mm and locally on the south coast of Seram the average exceeds 4,000mm.

(3) Currents in Banda Sea

78. The general flow is in broad accordance with the monsoon winds; E-going during the north monsoon (when winds locally blow from NW or WNW) and W-going during the south monsoon (with local winds from SE). In both seasons most of the flow is in the north part of Banda Sea; in the south rates are weak and the direction of set is very variable.

(4) Tides and tidal stream

79. Tidal range in this area is for the most part between 1 and 1.5m.

(5) Sea and swell

80. Seas from between E and S prevail over the area from about the end of May until late August or early September when the area is dominated by the southeast monsoon. In the area north of about 5° S the seas are from SE to S, mostly slight to moderate but occasionally becoming rough.

4.2.4 Eastern Sea Area and North Coast of Irian Jaya
(relevant to the Routes 5, 7, 8 and 9)

81. Concerning Ocean Features, Climate and Weather, please refer to the previous sub-section.

(1) Currents in Seram Sea

82. The strongest and most consistent flows in Serani Sea are set to the north and west (December - February, NE-going; April - October, SW-going). Currents setting SW are strongest during July and August when they may exceed 2kn at times.

(2) Currents in Northward of Irian Jaya

83. Currents flow parallel to the coast, i.e. WNW-going during March to October and ESE-going during November to February. The strongest currents are likely during July and August when rates may exceed 3kn at times in the WNW-going current.

(3) Tides and tidal stream

84. There is considerable diurnal inequality within this area. This is least on the coasts of Halmahera and Sulawesi and the islands in Celebes Sea, where the tides are classified as semi-diurnal despite the inequality; and greatest on the south-west coast of Irian Jaya, the tide is usually diurnal. The tidal range is for the most part between 1 and 1.5m.

(4) Sea and swell

85. Seas from between E and S prevail over the area from about the end of May until late August or early September when the area is dominated by the SE monsoon. In the area north of about 5° S the seas are from SE to S, mostly slight to moderate but occasionally becoming rough. In the area south of 5° S, the E to SE seas are often only slight to moderate but may be rough or very rough on up to 10% of occasions.

86. As the south-east monsoon weakens and recedes S to be followed by the north-west monsoon, seas from between NW and NE in response to this change of regime gradually extend south to most parts, reaching the south of the area by December. Wave heights are mainly moderate or slight but rough or very rough seas are not uncommon. These NW to NE seas continue through March and then the southeast monsoon spreads north again, sometimes proceeded by a few weeks of less well-defined seas.

87. On the rare occasions when a tropical storm affects the area the seas become high and confused and steady swell from these storms affects the area. The north shores exposed to the Pacific Ocean also experience considerable swell from December to February, during the northwest monsoon.

Chapter 5 Ferry Operation Planning

5.1 Operation Planning Method in the Long-term Development Plan

5.1.1 Study Flow

1. Objective of operation planning in the Long-term Development Plan is mainly to set up the operation program of each route including selection of optimum boat size, trip frequency, time of trip and number of boat to cope with the future ferry transportation demand. For this purpose, many factors such as transportation demand and its daily fluctuation, planning peak-day demand, load factors, route distance, boat size and loading capacity, cruising speed and so on must be studied. The flow of operation planning study is shown in Figure 5.1.1.

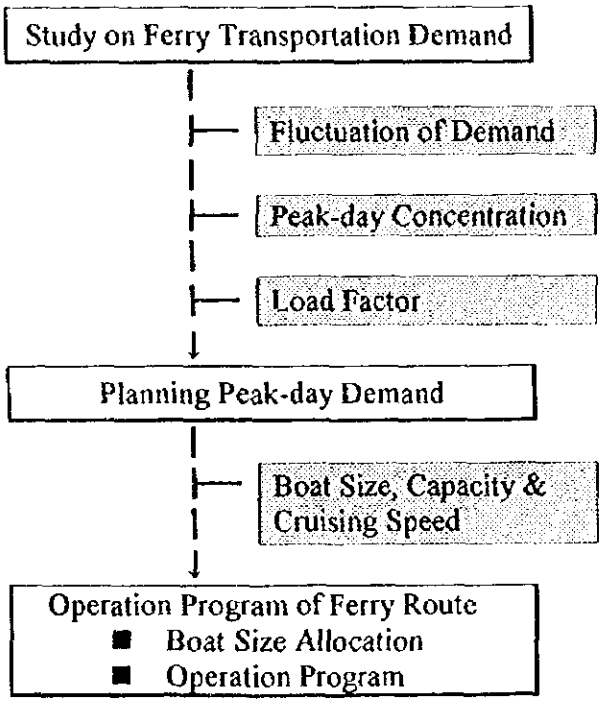


Figure 5.1.1 Operation Planning Study Flow

5.1.2 Planning Factors

(Transportation Demand)

2. The annual demand of ferry transportation described in Chapter 3 of Part 2. The demand should be broken down into peak-day demand and are used as a basic data for operation planning.

(Fluctuation)

3. In general, transportation volume usually fluctuates month by month and also day by day to a certain extent, reflecting changes in social customs and activities throughout a year. Peak periods for ferry transportation in Indonesia, include Ramadan and the summer holidays.

(Planning Peak-day Demand)

4. To cope with the fluctuation in demand, it's desirable to use "Planning Peak-day Demand" as a target demand instead of the average daily demand. The peak-day demand is estimated by peak-day concentration ratio which is determined considering the target service level and operation efficiency and does not necessarily represent the actual peak-day demand.

(Load Factor)

5. Load factor is a ratio of actual transported volume to the transportation capacity. It is very important to achieve a reasonable load factor; that is, a high load factor contributes to economic efficiency, but a ratio that is too high may cause constant congestion, and resulting in a low service level.

(Boat Size Allocation)

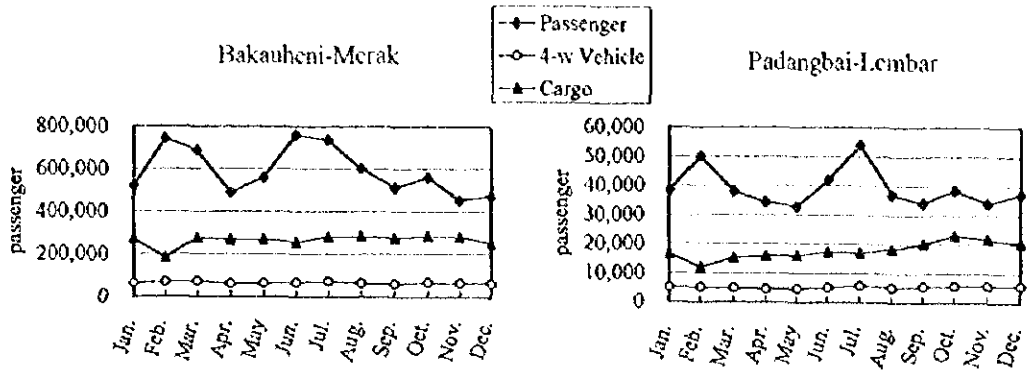
6. It is necessary for the planning to select the optimum size of ferry boat considering the demand of each route, boat capacity, performance, route distance and load factors.

5.2 Analysis of Demand Characteristics

5.2.1 Fluctuations

7. Ferry transportation volume in Indonesia is fluctuates greatly throughout the year. Overview of monthly change in ferry transportation is given in Figure 5.2.1. The highest peak appears in Ramadan season and school summer vacation. According to the

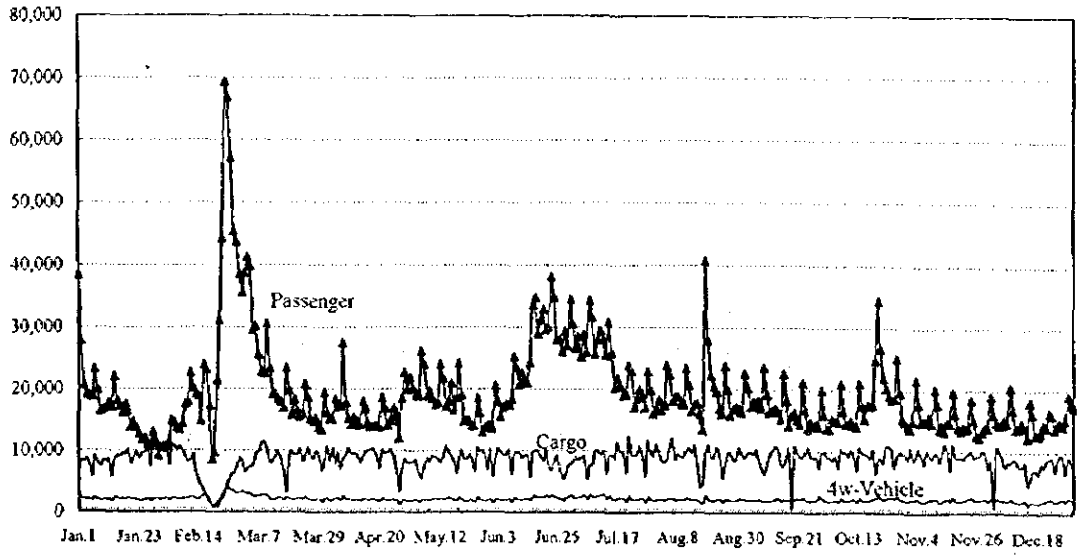
1996 transportation record on several routes, peak months were February and July.



Note: This figure is based on data from PT. ASDP.

Figure 5.2.1 Monthly Change in Ferry Transportation Volume

8. Figure 5.2.2 shows the daily change of transportation volume on the Merak - Bakauheni route in 1996. The daily traffic volume is greatly fluctuated. The peak-day volume is 3.5 times greater than the average day, while the least day volume is about 1/5 of the peak-day. The fluctuation seen in other routes is generally similar, but the fluctuations tend to be smaller on the routes which are used for daily life such as Ujung - Kamal and river crossing routes.



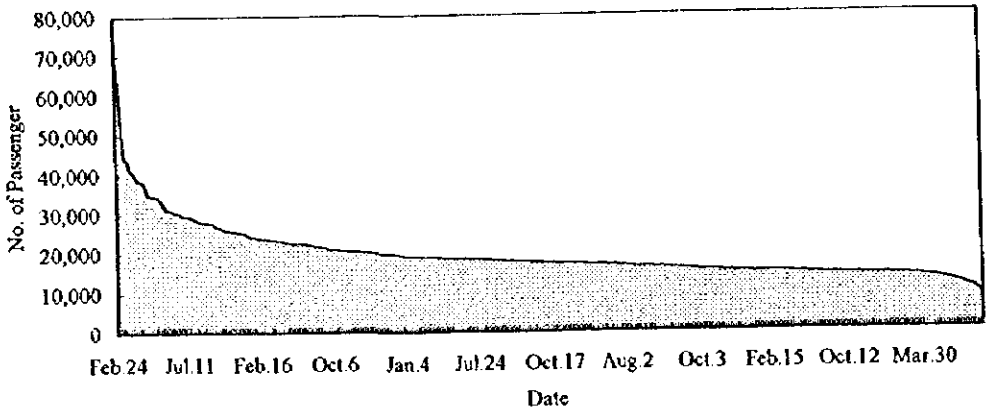
Note: This figure is based on data from PT. ASDP.

Figure 5.2.2 Daily Change of Transportation Volume on Merak - Bakauheni

5.2.2 Peak-day Concentration Ratio

9. In master planning, the target volume should be set to estimate the suitable size of transportation facilities and equipment. In case the demand fluctuates to a great extent, the target volume should be set up not by the actual peak-day, but on a day in which demand is more concentrated than the average day which is called "Planning Peak-day Volume". This is because, coping with the actual peak demand would be unreasonable and inefficient from an economic point of view while a plan based on average (or the lower) demand would cause terrible congestion during the high season.

10. The fluctuation in transportation volume can be also explained by the curve in which daily volume is rearranged in order from top to bottom throughout a year as shown in Figure 5.2.3(Merak - Bakauheni case). The number of crowded days can be estimated from the curve according to the target day volume. The target day volume is usually set just over the turning point to reduce number of crowded days and at the same time to avoid inefficient development cost.



Note: This figure is based on data from PT. ASDP.

Figure 5.2.3 Top to Bottom in Daily Volume

11. To break down the annual demand to peak-day volume, method of peak-day concentration ratio is often applied. The ratio indicates a concentrating degree to the day in a year which is calculated by dividing a day volume by annual volume.

12. The Study Team has set "the Planning Peak-day Volume" based on the concentration ratio to average day of the actual peak month. According to this ratio, the planning peak-day stands around forty or the fifty on the curve shown in Figure 3.2.3 ; this means 40~50 days may be crowded in a year.

13. The actual results of the peak-day concentration ratio on several routes are shown in Table 5.2.1.

Table 5.2.1 Peak-day Concentration Ratio of Ferry Transportation in 1996

Route	Passenger		Vehicle-4		Cargo	
	(A)	(B)	(A)	(B)	(A)	(B)
Bakauheni - Merak	1/103	1/277	1/208	1/338	1/259	1/346
Padangbai - Lembar	1/102	1/270	1/102	1/338	1/214	1/291
Meulaboh - Sinabang	1/131	1/252	1/91	1/274	1/77	1/240
Penajam - Balikpapan	1/70	1/209	1/194	1/330	1/171	1/303
Kamal - Ujun	1/213	1/332	1/180	1/336	1/213	1/294
Galala - Poka	1/240	1/304	1/154	1/282	1/51	1/190
Waiprit - Hunimua	1/177	1/302	1/87	1/321	1/187	1/275
Average	1/148	1/278	1/145	1/317	1/167	1/277

Note: (A) is the concentration ratio of actual peak-day to annual volume.
(B) is the concentration ratio of average day of peak month to annual volume.
This table is based on data from PT. ASDP.

14. In conclusion, the planning peak-day concentration ratio in operation planning is set as follows.

Passenger	1/280
Vehicle-4	1/330
Cargo	1/280

5.2.3 Planning Peak-day Demand

15. The planning peak-day demand is estimated by the annual demand forecast referred to in Chapter 1 and the planning peak-day concentration ratio. The results are shown in Table 5.2.2.

Table 5.2.2 Planning Peak-day Demand in 2019

Route	Annual Demand			Planning Peak-day Demand		
	Pax.*	Car	Cargo	Pax.	Car	Cargo
Surabaya- Banjarmasin	1,856,500	234,860	750,000	6,630	710	2,680
Jakarta- Pontianak	754,700	95,480	304,900	2,700	290	1,090
Surabaya-UjungPandang	578,500	73,190	233,700	2,070	220	840
Kendari - Ambon	502,900	63,620	203,200	1,800	195	730
Ambon - Sorong	251,200	31,780	101,500	900	95	360
Selayar - Labuhan Bajo	313,000	33,950	91,100	1,120	105	330
Manokwari- Biak	255,200	27,670	74,300	910	85	270
Wahai - Babang	222,100	24,090	64,600	790	75	230
Patani - Sorong	217,500	23,580	63,300	780	70	230

Note: Pax. is passenger.

5.2.4 Load Factor

16. Load factor is not so high in Indonesian ferry transportation according to the actual results on several routes (See Table 5.2.3).

Table 5.2.3 Load Factor on Several Routes

(Result on 30th April 1997)

Route		Transportation Volume		Capacity		Load Factor (%)	
		Pax.	V-4	Pax.	V-4	Pax.	V-4
1	Merak - Bakauheni	18,460	2,674	28,400	4,648	65.0	57.5
2	Ujun - Kamal	20,580	1,614	29,400	1,960	70.0	82.4
3	Ketapang - Gilimanuk	6,409	1,228	27,900	2,790	23.0	44.0
4	Kayangan - Pototano	668	53	2,250	104	29.7	50.8
5	Bajoe - Kolaka	1,031	102	2,573	127	40.0	80.0
6	Padangbai - Lembar	1,593	255	6,000	450	25.9	56.7
Average						42.3	61.9
Maximum						70.0	82.4

Source: DGLT

Note: Pax is Passenger, V-4 is 4wheel Vehicle

17. The load factor should be increased for efficient operation. In the master planning, the target load factor is assumed as follows considering past maximum record.

Passenger: 70%, Car: 80%

5.3 Study of Ferry Boat

5.3.1 Relationship among Boat Size, Traffic Demand and Route Distance

18. Allocation of boat size is closely related to the volume of the traffic demand and distance of the route. Sometimes boat size is restricted by port conditions such as berth length and depth and navigational condition such as crossing rough sea . For example, Merak - Bakauheni route and Ujun - Kamal route are quite different in boat size allocation although both routes transport more than 10 million passengers a year: that is, Merak - Bakauheni route is operated using large boats (more than 5,000GRT) and on the other hand, smaller boats (less than 1,000GRT) are operated on the Ujun - Kamal route with very high frequency.

19. Table 5.3.1 shows the present situation of boat size allocation in Indonesia

related to transportation volume and route distance. (This table shows only tendencies of ferry boat size allocation. There are many exceptions.)

Table 5.3.1 Boat Size, Traffic Demand and Route Distance at Present

Volume (,000Pax.)	1-10NM	11-30NM	31-50NM	51-100NM	101NM and over
10,000, and over	1,000 Ujun-Kamal	5,000 Merak - Bakauheni	5,000	5,000	5,000
1,000, - 10,000,	1,000 Ketapang- Gilimanuk	1,000	1,000 Padanbai -Lembar	3,000	5,000
500, - 1,000,	300 Balikpapan -Panajam	500 Lombok - Pototano	1,000	3,000	3,000
100, - 500,	200 Batulicin - T.Serdang	500 Hunimua - Waiprit	500 Kupang - Roti	1,000 Bajoe -Kolaka	1,000
10, - 100,	150 BauBau - Tolandona	150 Tolobul -Tampo	300 Jankar -Kalianget	500 Gorontaro - Pagimana	500 Bitung - Ternate
10, and below	100	150 Larantuka - Waiwerang	300 Luwik - Salakan	500 Karabahi - Atapupu	500 Bitung - Pananaro

Note: 000 is boat size in GRT, routes are given as examples.
Source: Table 4.2.1 in Chapter 4 of Part 1.

5.3.2 Dimensions of Boat and Loading Capacity

20. The ferry boat size varies widely from 30GRT to 5,600GRT and dimensions of boat are different even among the boat of the same tonnage in Indonesia. In the master planning, four boat size classes (5,000, 3,000, 1,000 and 500GRT) are set up to cope with demand of future routes considering present variations in Indonesian ferry boats.

21. Table 5.3.2 shows the ferry boat dimension of each class which are arranged by referring to the maximum value of each class of boat currently operated in Indonesia. As for the loading capacity, passengers are estimated according to average capacity of the present ferry boat variations and vehicles are estimated by the following expression.

$$\text{Vehicles' Capacity} = \frac{\text{(Effective deck area)}}{\text{(Average necessary space for a car)}}$$

where, Effective deck area : (0.7) x (Length) x (Breadth)

Average necessary space of a car: 16.5m²

*Assumptions: Large vehicles (8t truck and bus) Space: 25 m²/car, Share: 45%
: Small vehicle (2t truck and sedan)Space: 9.5 m²/car, Share: 55%

Table 5.3.2 Loading Capacity and Dimensions of Ferry Boat

Boat Size (GRT)	Loading Capacity		Dimensions (m)		
	Passenger	Car	Length	Breadth	Draft
5,000 class	800	76	100.0	18.0	4.9
3,000 class	600	61	90.0	16.0	3.9
1,000 class	500	42	70.0	14.0	3.7
500 class	400	26	50.0	12.0	2.5

22. Transportation capacity of one round trip and annual capacity by 1 round trip per day is estimated in Table 5.3.3.

23. The time of trip can be formulated as follows.

$$\text{Time of trip(hour)} = \frac{\text{Route distance(NM)}}{\text{Cruising speed (knot)}} + 0.5 \text{ hour}$$

* Cruising speed of each class is estimated as follows or less from the present ferry boat performance in Indonesia.
3,000-5,000GRT: 20~24knot, 1,000GRT: 17knot, 500GRT: 15knot
* 0.5 hour is maneuvering loss time in and around port.

Table 5.3.3 Transportation Capacity of Trip

Boat Size (GRT)	Loading Capacity		Load Factor		Capacity of 1 Round Trip		Annual Transportation Capacity	
	Pax.	Car	Pax.	Car	Pax.	Car	Pax.	Car
5,000 class	800	76	70%	80%	1120	122	408,800	44,530
3,000 class	600	61	70%	80%	840	98	306,600	35,770
1,000 class	500	42	70%	80%	700	68	255,500	24,820
500 class	400	26	70%	80%	560	42	204,400	15,330

5.4 Operation Programs

5.4.1 Operation Program of Each Route

24. Operation program includes the suitable boat size, trip frequency, time of trip and number of boats for each route by the target year. The programs should be set up based on the planning peak-day demand and ferry boat conditions mentioned above.

25. For setting up the ferry operation programs, the following viewpoints are to be considered in addition to demand and transportation capacity of each class of boat.

1) To secure the navigation safety of ferry, a larger boat is better when making a long range trip and crossing rough sea.
2) To achieve a reasonable service frequency as public transportation, two round trips at least per day is preferable to once a day by larger boat.
3) For operation efficiency, a higher speed boat is better when one way trip or one round trip can be made in a day by introducing them. And to avoid inefficient operation, increasing of the target load factor can be acceptable within around 10%.
4) From the viewpoint of operation reliability, more than two boats for one route is desirable to conduct boat maintenance and deal with unexpected situations (machine trouble, accident, etc). Maintenance and docking of boats should be carried out during the low season.

26. The results of the study on the operation programs of 9 routes are shown in Table 5.4.1. As the route distance, trip hours have been roughly estimated, further studies should be carried out in the Feasibility Study once the navigation routes, port and berth conditions, etc are finalized.

Table 5.4.1 Operation Program of Each Route in 2019

Route	Distance (NM)	Peak-day Demand		Boat (GRT)	Fre-quency	Trip Hour	No. of Boat
		Pax.	Car				
Surabaya-Banjarmasin	256	6,630	710	5,000	6/day	12.0h	8
Jakarta - Pontianak	417	2,700	290	5,000	3/day	19.5h	6
Surabaya-Ujung Pandang	445	2,070	220	5,000	2/day	21.0h	4
Kendari - Ambon	362	1,800	195	3,000	2/day	17.0h	4
Ambon - Sorong	337	900	95	1,000	2/day	20.5h	4
Selayar - Labuhan Bajo	135	1,120	105	1,000	2/day	10.0h	2
Manokwari - Biak	144	910	85	1,000	2/day	10.0h	2
Wahai - Babang	178	800	75	1,000	1/day	13.0h	2
Patani - Sorong	173	780	70	1,000	1/day	13.0h	2

5.4.2 Required Berths for Ferry Operation

27. Required number of berth for planned ferry routes at each site should be estimated according to not only the concerned route but also to other planned routes and existing ones. The existing routes which should be studied in relation to planned nine routes are as follows: i.e. Sape - Labuhan Bajo, Hunimua - Waiprit, Kendari - Wawoni,

Biak - Serui, Sorong – Fakfak.

28. The demand forecast and future operation of the related five routes are roughly estimated as shown in Table 5.4.2. (Future boat size is assumed to be the same as at present.)

Table 5.4.2 Demand Forecast and Estimation of Related Existing Routes

Route	Annual Demand		Peak-day Demand		Boat (GRT)	Fre-quency
	Pax.	Car	Pax.	Car		
Sape -Labuhan Bajo	358,630	38,890	1,281	118	500	3/day
Hunimua - Waiprit	1,099,650	119,240	3,927	361	526	9/day
Kendari - Wawoni	89,980	9,760	321	30	300	1/day
Biak - Serui	219,080	23,760	782	72	300	2/day
Sorong - Fakfak	162,240	17,590	579	53	500	1/day

Source: Study Team

29. As a result, the required number of berth for planned ferry routes are estimated as shown in Table 5.4.3.

Table 5.4.3 Required Ferry Berth at Each Site in 2019

Terminal Site	Destination	Required Ferry berth		
		Size: GRT	No.	Note
Surabaya	- Banjarmasin	5,000	2	*3 berths in total
	- Ujung Pandang	5,000	1	
Banjarmasin	- Surabaya	5,000	2	
Jakarta	- Pontianak	5,000	1	
Pontianak	- Jakarta	5,000	1	
Ujung Pandang	- Surabaya	5,000	1	
Kendari	- Ambon	3,000	1	*A new berth should be shared with Wowoni route.
	- Wawoni	300		
Ambon	- Kendari	3,000		*combined use is possible *2 berths will be necessary for existing route.
	- Sorong	1,000	1	
	- Waiprit	500	2	
Sorong	- Ambon	1,000		*A new berth should be shared with 3 routes.
	- Patani	1,000		
	- Fakfak	500	1	
Selayar	- Labuhan Bajo	1,000	1	
Labuhan Bajo	- Selayar	1,000	1	*The extended berth should be shared with Sape route.
	- Sape	500	1	
Manokwari	- Biak	1,000	1	
Biak	- Manokwari	1,000	1	*A new berth should be shared with Serui routes.
	- Serui	300	1	
Wahai	- Babang	1,000	1	
Babang	- Wahai	1,000	1	
Patani	- Sorong	1,000	1	

5.4.3 Operational Safety

30. Taking account of the increasing demand in ferry transportation, operator of ferry and MOC should increase operational safety by the following means.

1) Operation by Ro-Ro type boat and loading on and off by movable bridge.
2) Navigational aid system development including lighting system and radio information for night cruising which will increase in near future to cope with demand of long distance route.
3) Setting of safe navigation routes.
4) Improvement of lifesaving equipment.

Chapter 6 Ferry System Management

6.1 Management and Operation of Ferry transportation in the Long-term Development Plan

6.1.1 General

1. Ferry transportation service in Indonesia is offered by the public corporation PT. ASDP as well as private operators. In the long-term stage, DGLT has to establish an effective system to supervise their activities in accordance with the Government Regulation No.12 promulgated in January of 1998. To this end DGLT should cooperate with MOC and DGSC in defining the ferry transportation to distinguish it from other services in order to realize better services for the future.

6.1.2 Ferry Operation and License System in the Future

2. A shipping company must obtain two types of licenses before it may begin its activities. One is a license for the establishment of a company a so-called "Business License", which limits the extent of an company's activity. A prospective company must apply to MOC for this license. The other one is an "Operational License", which is required to apply for it within three months after being granted a business license. It is not until both licenses are granted that the shipping company can start its operational activity. The details of this license system for ferry transportation service including its purpose, rough definition and so on are given in the Ministerial decree No.27, 1990.

3. This license system narrows the scope of activities of shipping companies such as PT. ASDP and PT. PELNI by strictly defining their business field. In other words, they are hardly allowed to advance beyond the licensed territory. For this reason, PT. ASDP is specialized in ferry transportation and PT. PELNI offers passenger and general cargo transportation. If PT. ASDP would like to start passenger only vessel operation or a new service in which several calls are made, it has to change the aim of the company and apply for a new license to DGSC. The same situation happens when PT. PELNI starts a ferry service for the transport not only of passengers but also vehicles.

4. Some examples of unusual shipping services arising from the present license system are given below.

a) Indonesian Government has decided to purchase five passenger-vessels from

Germany and would like PT. ASDP to begin operating these vessels by the end of this year if possible. Because of the license problem, it is assumed that these five vessels will be put on long-distant ferry transportation routes that offer "shuttle service" linking only two terminals. In this sense, PT. PELNI might be able to start a new service which transports vehicles together with passengers on condition that more than three calls are made.

b) PT. ASDP used to have a special service connecting several ports (Surabaya-Banjarmasin-Sampit-Kumai-Semarang) using boats that the State Railway Company owned before. However, as several calls were made in one service, the boats were operated flying the PT. PELNI flag.

c) The Ro-Ro service between Tanjungpriok and Surabaya by PT. UTAMA should be under control of DGLT considering its original purpose of connecting two cities. But the company is also licensed by DGSC because it uses PELINDO's sea ports. Ministerial decree No.27 stipulates that ferry boat basically has to operate flying the Indonesian flag, however, this service is being offered with Panamanian flag because of the reason mentioned above.

5. These samples are peculiar because of the license system, and it will not be until demarcation between transportation service under control of DGLT and that of DGSC becomes clearly defined that this problem can be solved.

6.1.3 Improvement of Subsidy System for Ferry Transportation

6. On pioneer routes, a subsidy is granted by the Government to the break-even point until operation becomes profitable. In most cases, PT. ASDP operates pioneer routes from a point of view that 1) In pioneer routes, there are not a few of important service because of a legional development policy, 2) PT. ASDP as a public corporation, and 3) boats put on a route are provided free of charge by the Government.

7. Most ferry routes operated by PT. ASDP are pioneer routes; 63 of 86 routes are pioneer, 23 commercial as of September, 1997. It seems that PT. ASDP does not always endeavor to make a profit because a subsidy is given from the government in the case of a loss. Although PT. ASDP's branch office submits a financial statement, this does not always seem to function as a determination system whether a subsidy is required or not (excluding several routes which are especially important to the public benefit despite the low demand). In order for PT. ASDP to be competitive with private operators and gain a

sense of business management, the Government should not only require reports from PT. ASDP but establish a strict investigation system into the financial and accounting system of branch offices to determine "if a subsidy is actually needed", "how can shipping management be made profitable", etc.

8. Though most newly opened routes are first regarded as pioneer routes, in the future, these routes should be considered as commercial routes. Then, the subsidy should be granted to the operator only in exceptional cases such as route operation is estimated to be obviously unprofitable.

9. It should be noted from the view point that private ferry companies, which have to purchase boats by themselves, are enjoying better business performance in commercial routes than public corporation PT. ASDP. In this sense, the Government should supervise shipping operations by PT. ASDP in order for them to work in harmony with governmental policy on shipping management and operation, and to safeguard the national interests of the Republic of Indonesia, because more than 70% of services are being granted a subsidy from the government. To this end a rationalization scheme should be adopted including a radical reform of the organization of PT. ASDP. Since the amount of subsidy is equal to the balance between revenue and expense, the Government should give PT. ASDP proper guidance for a better business management system in order to realize an increase in revenue.

6.1.4 Improvement of the Shipping Tariff System

10. Transportation fees on passengers, bicycle, motorcycle and six types of vehicles are determined in the shipping tariff by Ministerial decree No.17, 1996. Shipping tariff for economy class as aforementioned is determined by the Government through an analysis by DGLT and issued by Ministerial decree, and are the same by service route regardless of who operates it.

11. At this stage, for relatively wealthy people and tourists, non-economy class is prepared. On the other hand, ordinary people and passengers on business who frequently use ferry service usually choose economy class. From a different angle, it may be said that so called "Tariff discrimination system" is introduced on a few routes like Merak/Bakauheini transportation service where different types of boat with different shipping tariff such as regular ferry boats and speed boats are prepared. In addition, tariff discount can be given to some extent in the case of emergency such as disaster relief by the army.

12. However, from a point of view of relief for poor people and of discount for those who use ferry service as a lifeline, tariff discrimination is not available yet. Considering the improvement of nation-wide ferry network service in the future, it should be introduced at the early stage. Then, it is recommended that specially considered tariff be prepared and a season commuter pass be given to people who use a specific ferry route as something indispensable to everyday life.

13. Ferry service may be in competition with PT. PELNI service in the middle and long-distance route in which traffic will be in great demand. In this sense, the ferry tariff should be comparable to that of PT. PELNI service.

14. In order to secure higher profitability which make it possible for a pioneer route to be transferred to a commercial one, it might be necessary to rationally determine the tariff based on the operation expense in future. On a route where the passenger tariff is Rp.500 for example, there would not necessarily be a decrease in demand or any hardship for users even if it were raised to Rp.1,000 (daily users mentioned above would be exempt). But, in this case, it is needless to say that adequate research such as financial analysis of ferry operator and economic analysis of people in the region is indispensable.

15. It is also recommended that shipping tariff which is determined by the Government at this stage be freely set up by ferry operating companies according to their own management policy.

6.1.5 Improvement of Safety Certification System of Ferry Boat

16. There is no law which regulates the service life of ferry boat, although it used to be regulated by Ministerial decree. But even now, when it comes to calculating shipping tariff, the service life of a ferry boat is set up as twenty-five years. On the other hand, DGSC's decree No.67, 1993 obliges general ships including ferry boat to be put into dock for safety certification every twelve months. It is a fact that many ferry boats now in operation are older than twenty years (including 27.6% of PT. ASDP's fleet).

17. In Japan, the legal service life of a ferry boat depends on the distance of service route. For instance, for boats whose service distance is less than 100km, the service life is twenty-five years, while it is fifteen years for those serving on routes between 100 and 300km. In addition to service life, it is also regulated by law that every ferry boat has to be put into dock every twelve months. In the long-term stage until the year of 2019, in consideration that middle and long-distant ferry service network will be established, more

strict safety certification system should be prepared. In the case of PT. ASDP, newly built boats are mostly provided by the Government. But, paying attention to the fact that most ferry boats in service of private ferry operators are secondhand, legal service life of boats should be set up considering how many years have passed since the building year.

18. In general, secondhand ferry boats that Indonesian private operators purchase from Japanese ferry operating companies are beyond legal service life prescribed in Japan. Therefore, even if yearly docking is obligatory, remaining service life may be at most an additional ten years.

19. Efficient ferry operational system while a boat is in dock should be established. When a boat in a certain route is being put into dock, other boats on the same service route raise their net working rate. A problem arises, however, when the sole boat on a pioneer route is in dock: ferry service is interrupted for up to two or three weeks. What is most important for transportation service is to offer reliable service to users, so that DGLT should take measures to deal with this situation in the future.

6.1.6 Introduction of "On-line System"

20. In fact, not only the service schedule but terminals to call, even operation routes are sometimes changed, but an effective system to correct and provide real-time information has not been established yet. This is because an on-line system connecting regional shipping offices and the central office or DGLT is not always prepared. Therefore, in order to prevent the congestion and the confusion that could arise from the changes mentioned above, the importance of this system becomes obvious. In addition, the middle and long-distance route service actually requires it as the seat-reservation system may be introduced. In this sense, when a ferry network service covers a number of islands in the future, the system may require a computer network to ensure that real-time information is always available.

21. In the long term stage, the Planning Bureau of MOC will be required to grasp the current conditions of maritime transportation service in Indonesia including ferry service as well as that of passenger only vessel at each route using computer; in particular, data by operator, data by shipping route and data by users should be outputted on a real-time basis. This system should be established and controlled not by DGLT or DGSC but by the relative governmental agencies, because the necessary data pertains to both ferry service and passenger service.

6.1.7 Ideal Style of Ferry Transportation Service in the Future

22. On maritime transportation in Indonesia, "ferry transportation" is not clearly defined as aforementioned. Roughly speaking, according to the Navigation Law No.21, ferry transportation offers shuttle service connecting two terminals, and if several calls are made in a route, the service is regarded as a general maritime transportation which is under control of DGSC in spite of similarity of service style.

23. In other words, as for ferry transportation, there is nothing to regulate the object to be transported. In this sense, it can be said that PT. PELNI can transport vehicles together with passengers (which is regarded as ferry service in many countries of the world) provided it connects more than three terminals. As aforementioned, PT. ASDP is actually planning to start a new passenger transportation service between two terminals, such as Surabaya and Banjarmasin, etc.

24. Then, there may come a time when not only demarcation between PT. ASDP's service and that of PT. PELNI but jurisdiction between DGLT and DGSC should be clearly defined. When it comes to thinking of maritime transportation policy in the future, what the government has to do is not to try to squeeze all users needs into two categories, "ferry" under DGLT and "passenger vessel" under DGSC, but to reconsider how to provide better transportation service to customers. In order to respond to their diversifying needs, it is recommended that the Government should coordinate with DGLT and DGSC to consider a suitable type of ship, ideal operation style, service schedule, reasonable tariff level, and even an appropriate operator on each route, when a new service is to be planned.

25. If the license system is not revised, another idea would be for ferry operators and passenger transportation companies to collaborate with each other in operation, so that they can use either ferry terminals or sea port terminals depending on the situation.

26. Of course, such a practice might contravene the Navigation Law No.21 which divides maritime transportation of Indonesia into three categories. However, in the long-term stage, a new concept of maritime transportation might be established from a point of view that everything afloat is a sea vessel, even if it is a substitute for land transportation.

6.2 Terminal Management and Operation in the Long-term Development Plan

6.2.1 General

27. In Indonesia, ferry terminals have been managed and operated by KANWIL or PT. ASDP to date. In the long-term stage until the year of 2019, aiming for more efficient and comfortable terminals for users, improvement of terminal management and operation style should be executed. In this regard, the possible introduction of privatization needs to be considered.

6.2.2 Improvement of Terminal Management Transfer System

28. In order to realize more effective terminal management for the future, the introduction of a privatized management system may be the answer. At this stage, in consideration that KANWIL's terminal management would be transferred to the control of PT. ASDP if it were to become profitable, the Government should make a long-term plan to transfer all terminal management in Indonesia to the control of PT. ASDP. Furthermore, if it is expected that a terminal management will become profitable in the future as a result of demand forecast, PT. ASDP should take it over even before the terminal status to show a profit. This may give PT. ASDP a sense of the impending crisis in the management, because the subsidy would no longer be granted.

29. In addition, as mentioned later, the system to make it possible for even a private management body to participate in the terminal management and operation should be established including an amendment of relevant law.

30. The transfer of terminal management changes the social status of terminal staff. If a terminal management was transferred from KANWIL to PT. ASDP, terminal staff as public official became staff of public corporation, where the salary is higher. In this sense, as terminal management is increasingly transferred to PT. ASDP, more smooth and effective transfer system be required even from a point of view of personnel management.

31. As for ferry transportation system, PT. ASDP can be granted a management right of a terminal which is profitable, so that it can collect the terminal service charge. However, there is no legal system that passenger vessel operator PT. PELNI can be responsible for the terminal management, so that PT. PELNI is obliged to pay berthing fee without exceptions. No terminal management can be transferred from the port authority PELINDO to PT. PELNI, even if profitable management is expected. As

aforementioned in 6.1.7, as jurisdiction between ferry transportation service and that of passenger might be taken away in the future, it is recommended that PT. PELNI be granted management right on the profitable or potentially profitable terminals to realize a balance.

6.2.3 Improvement of Terminal Operation

32. In establishing the future ferry terminal operation system, "efficiency" and "security" should be given priority. The following are the necessary incidental businesses to terminal operation.

a) Service for ferry boat at berthing: operation of the movable bridge, mooring service, bunkering service, guidance for vehicles and passengers in and out of the boat, terminal cleaning service, etc.
b) Service for Customers: commercial service at the terminal such as ticket selling, ticket collection, information, first-aid service, luggage service, etc.
c) Business for the terminal building and other facilities: management and operation of the office building, restaurant, stand in the terminal
d) Management of the parking area
e) Other service: a pick-up bus service to and from the terminal, etc.

33. In terminal operation in Indonesia, most of above services are available. However, the terminal staff are not efficiently allocated to each activity, which has a negative influence on profitability.

34. In the long-term stage, as terminal operational style may be different depending on regions because of the opening of long distant routes, introduction of privatization, etc., terminal operation should be carried out based on the long-term terminal operation plan considering "what kinds of activities are needed, and the number of staff members to be placed on each activities."

35. In terminal operation in Japan, as most business activities are concentrated when a ferry boat enters in and leaves the terminal (it is not very busy in the interim), each employee usually has multiple tasks in terminal operation. This makes it possible to operate a terminal in which more than 10,000GRT ferry boats call with a staff of only ten per shift.

36. Since the personnel cost at most public terminal forms more than 40% of its

annual expense, it is recommended that efficient placement of staff be conducted. However, security should not be jeopardized.

37. Furthermore, in order for the terminal operator to be responsible for operational safety of each terminal, it is recommended that the self safety control system be established in accordance with DGLT's requirement, in which safety countermeasures of terminal operation can be discussed at regular intervals.

6.2.4 Improvement of Terminal Service Tariff System

38. Terminal service tariff system is divided into two types, one is tariff for terminals managed by MOC/KANWIL and the other one is that for those of PT. ASDP's management. The former is regulated by Ministerial decree No.18 in which all terminal service is unified, while No.21 regulates the different service tariff by each terminal in consideration of regional differences.

39. In the future, "Tariff discrimination system" should be introduced in consideration of future demand and regional situation of each terminal. In addition, the discrimination should be carried out through liberation of tariff in which private terminal operators can set up a tariff by their own management policy. As well as a shipping tariff, it is recommended that a season commuter pass, which is available only for terminal employees at present, should be prepared for customers who use the terminal with high frequency.

6.2.5 Introduction of Privatization into Terminal Construction, Management and Operation

40. As aforementioned, introduction of privatization system may be the best way to realize efficient terminal management and operation, which is now available only in Merak/Bakauheini service. Based on the concession contract between the private shipping operator PT. INFINITI IDO SAKTI and the Indonesian Government, the company has already started the construction of terminal No.4 on a Built Operate Transfer (BOT) basis. Terminal operation is estimated to start in cooperation with PT. ASDP in 1998, because Navigation Law No.21 provides that a private company can manage and operate a terminal, but it has to be in collaboration with a Government owned company.

41. In the long-term stage, a system that allows a private company to participate in the terminal management and operation regardless of cooperation with public sectors

should be introduced.

42. There are basically two types of privatized terminal management and operation systems which may be introduced to Indonesia.

a) The Government constructs terminals and other basic infrastructures. A private company enters a lease contract with MOC/KANWIL to be granted the management right and pays a leasing fee in return.
b) Based on the concession contract with the MOC/KANWIL on a BOT basis, a private management company is granted the right to construct, manage and operate terminals. In return, the company pays a concession fee to MOC/KANWIL.

43. At this stage, pattern b) can be seen in Merak/Bakauheini service as aforementioned. Pattern a) has not been introduced yet into terminal management in Indonesia, but since it is easier to introduce because there is no need for terminal construction, it should be considered as a primary step for pattern b). In this case, the concessionaire does not always have to be a shipping operator. For example, in the case that the suitable site proposed for the terminal is already occupied by a certain user with vested rights, it may be one idea that MOC/KANWIL enters a lease contract with that user according to the pattern a), instead of asking for removal and looking for another suitable operator.

44. When it comes to introducing privatized terminal management and operation, it is recommended that a system to supervise the activities of the private sector be established. The Government has to determine its policy on roles it should play, and to make its stance clear to private sectors.

45. Once port management by the private sector on concession contract begins, more systematic management would be required. For concession development by private operator and for subsequent development plans in the future, a public sector should possess the function to check the development plans of a terminal area including back yard.