Short Cut Link

66. Tubod - Tangub link and Cavite City - Mariveles link are considered short cut links. In the case of Tubod - Tangub link, the cargo traffic volume calculated by actual traffic data from the field survey is nearly equal to the volume estimated using the gravity model of inter island link. Therefore, for estimating the traffic volume of Cavite City - Mariveles link, the gravity model of inter island link can be utilized. The estimation method is shown in Note A-1-8-2 of the Appendices.

D. Target Year Link Traffic

Population

67. Using the population growth rate of 1980-1990 according to the census, it is possible to make population projections based on three assumptions; a high growth rate, a medium growth rate, or a low growth rate. If the assumed rates of growth remain stable until 2010, then the growth rate until 2010 can be estimated. In this study, the average annual growth rate is estimated for five year intervals, as population projections are released every five years, in 1990, 1995, 2000, 2005 and 2010. The estimation of the average annual growth rate of population by port, based on the hinterland of each province, is shown in Table A-1-8-31 of the Appendices.

User Number

(1) Inter-Island Link

68. User mumber of the link is calculated by the total hinterland population of both ports. The population of the hinterland of each port, in intervals of five years, 1995, 2000, 2005 and 2010, is estimated using the actual population in 1990 and the estimated growth rate. And annual growth rate of user is estimated from the total population of both hinterlands. In this study, it is assumed that the hinterland is the nearest province. The annual growth rate of user is shown in Table A-1-8-32 of the Appendices.

(2) Solitary Island Link

69. In the case of a solitary island link, it is guessed that traffic is affected by economic activities and personal activities which occur at each solitary island. Consequently, it is considered that the annual growth rate of the user is equal to the annual growth rate of the population for each solitary island. The annual growth rate of the user is shown in Table A-1-8-32 of the Appendices.

Per Capita Personal Consumption Expenditure

70. The target average annual growth rates of personal consumption expenditure from 1992 to 2010 are presented in Long-Term Projections made by NEDA. Similarly, the estimated annual growth rate of population is presented in those projections. Based on the above-mentioned estimation, the annual growth rates of per capita personal consumption expenditure can be estimated (Table 8-15).

Table 8-15 Average Annual Growth Rate of Per Capita Personal Consumption Expenditure

(unit: Percent)

Period	P.C.E	Population	P.C.P.C.E
1992-1995	5.73	2.30	3.35
1996-2000	5.50	2.14	3.29
2001-2005	6.02	2.06	3.88
2006-2010	6.44	1.86	4.50

Source: JICA Study Team based on Long-Term Projections

71. Based on the actual results, each region's per capita personal consumption expenditure is assigned one of three ranks; the high rank(A), the medium rank(B) or the low rank(C). The medium rank for growth rate of per capita personal consumption expenditure is assumed equal to national value, the high rank is assumed plus one percent of national value and the low rank is assumed minus one percent. The results stated above are shown in Table 8-16. The reference data of classification for per capita personal consumption expenditure is shown in Table A-1-8-30 of the Appendices.

Table 8-16 Average Annual Growth Rate of Per capita Personal Consumption Expenditure (In Pesos at Constant 1972 Prices)

(unit: Percent)

Region		Rank	Period 1990 : 1995	1996 : 2000	2001 : 2005	2006 : 2010
Philippines			3.5	3.5	4.0	4.5
III	Central Luzon	A	4.5	4.5	5.0	5.5
IV	Southern Tagarog	B	3.5	3.5	4.0	4.5
V	Bicol	A	4.4	4.5	5.0	5.5
VI	Western Visayas	A	4.5	4.5	5.0	5.5
VII	Central Visayas	B	3.5	3.5	4.0	4.5
VIII	Eastern Visayas	A	4.5	4.5	5.0	5.5
IX	Western Mindanao	C	2.5	2.5	3.0	3.5
X	Northern Mindanao	B	3.5	3.5	4.0	4.5
XI	Southern Mindanao	C	2.5	2.5	3.0	3.5
XII	Central Mindanao	C	2.5	2.5	3.0	3.5

Source: JICA Study Team

Traffic Growth Rate

72. The traffic growth rate is calculated based on the population (user number) growth rate and the growth rate of per capita personal consumption expenditure, as shown in "Methods of Demand Forecast".

73. Since it is recognized that most cargoes carried by Ro/Ro vessels or conventional ferry vessels are consumer goods, the elasticity value for cargo is utilized in this reports, namely 1.2.

74. The elasticity of passenger traffic in the seven-year period between 1983 and 1990 has a somewhat higher value than 1.5. In this study, the elasticity value is utilized, namely 1.5.

75. Growth rates of cargo and passenger traffic are shown in Table 8-17.

Table 8-17 Annual Growth Rates of Cargo and Passenger Traffic

(unit: Percent)

No.	Link		Cargo				Passenger			
			1990-1995	1996-2000	2001-2005	2006-2010	1990-1995	1996-2000	2001-2005	2006-2010
1	Matnog	- Allen	7.51	7.13	7.54	8.19	8.89	8.50	9.06	9.86
2	Matnog	- San Isidro	7.51	7.13	7.54	8.19	8.89	8.50	9.06	9.86
3	Batangas City	- Calapan	6.37	6.12	6.53	6.37	7.44	7.19	7.75	7.59
4	Liloan	- Lipata	6.95	6.58	7.01	7.63	8.17	7.80	8.38	9.16
5	Argao	- Loon	6.16	6.01	6.46	6.89	7.23	7.08	7.67	8.26
6	Escalante	- Tuburan	6.71	6.40	6.81	7.34	7.93	7.62	8.18	8.85
7	Carmen	- Isabel	6.59	6.37	6.83	7.35	7.81	7.59	8.20	8.87
8	Tandayag	- Bato	6.14	5.91	6.34	6.82	7.21	6.98	7.56	8.19
9	Tubod	- Tangub	5.74	5.50	5.94	6.45	6.66	6.41	7.01	7.66
10	Iloilo City	- Bacolod	7.28	6.94	7.35	7.88	8.65	8.31	8.87	9.55
11	Iloilo City	- Pulupandan	7.28	6.94	7.35	7.88	8.65	8.31	8.87	9.55
12	Iloilo City	- Jordan	7.44	7.26	7.69	8.11	8.82	8.63	9.21	9.79
13	Toledo	- San Carlos	6.71	6.40	6.81	7.34	7.93	7.62	8.18	8.85
14	Cebu City	- Tubigon	6.16	6.01	6.46	6.89	7.23	7.08	7.67	8.26
15	Dumaguete	- Santander	6.14	5.91	6.34	6.82	7.21	6.98	7.56	8.19
16	Dumaguete	- Dapitan	5.21	4.82	5.26	5.90	6.12	5.73	6.32	7.11
17	Jagna	- Cagayan de Oro	6.26	6.02	6.45	6.93	7.33	7.09	7.66	8.30
18	Zamboanga City	- Basilan	4.79	4.40	4.84	5.46	5.56	5.16	5.75	6.52
19	Zamboanga City	- Jolo	5.00	4.84	5.24	5.64	5.76	5.61	6.15	6.70
20	San Jose	- Puerto Princesa	6.84	6.59	6.96	7.37	7.91	7.66	8.18	8.75
21	Cavite City	- Mariveles	8.08	7.64	7.93	8.28	9.32	8.87	9.31	9.81
22	Batangas City	- Abra de Ilog	6.36	6.14	6.55	6.97	7.43	7.21	7.77	8.34
23	Lucena	- Balanacan	5.71	5.34	5.75	6.38	6.78	6.40	6.96	7.74
24	Tabaco	- Virac	6.93	6.56	7.02	7.74	8.30	7.92	8.53	9.41
25	Bulan	- Masbate	7.20	6.80	7.24	7.93	8.58	8.17	8.76	9.60
26	Milagros	- Estancia	7.35	7.11	7.55	8.05	8.72	8.48	9.07	9.72
27	San Jose	- New Washington	6.55	6.11	6.54	7.22	7.77	7.33	7.90	8.74
28	Cebu City	- Ormoc	6.59	6.37	6.83	7.35	7.81	7.59	8.20	8.87
29	Ubay	- Maasin	6.64	6.52	7.00	7.49	7.87	7.74	8.37	9.02
30	Davao City	- Babak	5.47	5.17	5.51	5.82	6.24	5.94	6.42	6.88
31	Roxas	- Odiongan	5.83	5.73	6.15	6.51	6.89	6.80	7.37	7.87
32	Roxas	- New Washington	6.69	6.26	6.69	7.35	7.91	7.47	8.05	8.87
33	Matnog	- Masbate	7.20	6.80	7.24	7.93	8.58	8.17	8.76	9.60
34	Cebu City	- Talibon	6.16	6.01	6.46	6.89	7.23	7.08	7.67	8.26
35	Jagna	- Mambajao	5.13	5.08	5.64	6.20	6.19	6.13	6.85	7.56
36	Benoni	- Balingoan	5.13	5.08	5.64	6.20	6.19	6.13	6.85	7.56
37	San Jose	- El Nido	6.84	6.59	6.96	7.37	7.91	7.66	8.18	8.75
38	Cebu City	- Tagbilaran	6.16	6.01	6.46	6.89	7.23	7.08	7.67	8.26
39	Lucena	- Sta. Cruz	5.71	5.34	5.75	6.38	6.78	6.40	6.96	7.74
40	Dumaguete	- Larena	5.53	5.24	5.72	6.36	6.60	6.30	6.93	7.72
41	Guihulngan	- Dumanjug	6.14	5.91	6.34	6.82	7.21	6.98	7.56	8.19
42	Ajuy	- Manapla	7.28	6.94	7.35	7.88	8.65	8.31	8.87	9.55

Soruce: JICA Study Team based on
1) Philippine Population Projections 1980 - 2030
National Economic and Development Authority
2) Long-Term Projections
National Economic and Development Authority

Target Year Link Traffic

76. Cargo traffic and passenger traffic by link in the target year 2010, calculated using base year traffic and the traffic growth rate, is shown in Table 8-18.

Table 8-18 Forecast of Cargo Traffic and Passenger Traffic by Link

No.	Link		Cargo (Metric Ton) 1990	Cargo (Metric Ton) 2010	Passenger 1990	Passenger 2010
1	Matnog	- Allen	36,338	157,017	177,600	1,009,386
2	Matnog	- San Isidro	22,619	97,740	207,268	1,178,004
3	Batangas City	- Calapan	240,744	824,315	527,444	2,237,295
4	Liloan	- Lipata	15,710	61,271	76,212	380,818
5	Argao	- Loon	8,830	30,416	11,074	47,562
6	Escalante	- Tuburan	12,572	46,990	74,166	355,023
7	Carmen	- Isabel	1,869	6,947	6,010	28,623
8	Tandayag	- Bato	5,958	20,226	107,922	457,077
9	Tubod	- Tangub	40,784	128,522	27,679	105,793
10	Iloilo City	- Bacolod	118,171	489,238	783,843	4,268,976
11	Iloilo City	- Pulupandan	24,870	102,962	70,475	383,823
12	Iloilo City	- Jordan	20,000	86,950	487,807	2,790,401
13	Toledo	- San Carlos	43,003	160,732	214,954	1,028,960
14	Cebu City	- Tubigon	28,869	99,446	194,878	836,952
15	Dunaguete	- Santander	19,939	67,691	92,215	390,552
16	Dunaguete	- Dapitan	7,924	22,246	75,521	257,198
17	Jagna	- Cagayan de Oro	5,812	20,153	54,045	233,625
18	Zanboanga City	- Basilan	18,092	46,847	412,836	1,259,686
19	Zanboanga City	- Jolo	25,310	69,492	40,818	132,253
20	San Jose	- Puerto Princesa	2,580	9,872	7,754	36,982
21	Cavite City	- Mariveles	12,796	59,445	56,408	335,652
22	Batangas City	- Abra de Ilog	8,004	28,226	32,534	143,079
23	Lucena	- Balanacan	33,944	104,716	130,442	501,843
24	Tabaco	- Virac	14,808	57,966	55,085	283,608
25	Bulan	- Masbate	6,320	25,825	19,615	105,504
26	Milagros	- Estancia	2,138	9,106	7,016	39,297
27	San Jose	- New Washington	2,626	9,436	8,999	41,431
28	Cebu City	- Ormoc	19,080	70,916	184,323	877,833
29	Ubay	- Maasin	8,630	32,849	35,577	173,633
30	Davao City	- Babak	10,000	29,135	28,900	99,367
31	Roxas	- Odiongan	2,118	6,863	11,957	48,314
32	Roxas	- New Washington	1,822	6,726	5,837	27,582
33	Matnog	- Masbate	4,308	17,606	15,833	85,162
34	Cebu City	- Talibon	14,060	48,433	53,445	229,529
35	Jagna	- Manbajao	1,317	3,850	28,511	103,931
36	Benoni	- Balingoan	3,394	9,926	157,214	573,095
37	San Jose	- El Nido	1,356	5,190	4,175	19,914
38	Cebu City	- Tagbilaran	51,330	176,818	154,459	663,363
39	Lucena	- Sta. Cruz	15,261	47,080	66,417	255,523
40	Dunaguete	- Larena	2,217	6,733	20,925	79,269
41	Guihulngan	- Dunanjug	19,234	65,296	24,985	105,817
42	Ajuy	- Manapla	10,456	43,289	44,034	239,820

Remark: Traffic volumes represent one way traffic only

Source: JICA Study Team

Passenger Number Using Ro/Ro Vessel in Target Year

77. In this study, a ratio of passenger number or cargo volume carried by Ro/Ro vessel to the total passenger or cargo volume is conveniently called "Ro/Ro ratio".

(1) Links except Iloilo City - Bacolod Link

78. It is considered that Ro/Ro vessels will begin to operate on existing links replacing conventional vessels and will also begin to operate on currently non-existing links. Therefore, in this study, it can be assumed that most of the passengers of each link will use Ro/Ro vessels. In other words, Ro/Ro Ratio of passenger is assumed at 100 percent in 2010. Passenger number using Ro/Ro vessel in 2010 is shown in Table 8-29.

(2) Iloilo City - Bacolod Link

79. Passenger number of Iloilo City - Bacolod link in 2010 is estimated as 4,268,976. However, this figure includes passengers using BACOLOD EXPRESS. When considering the number of passengers using Ro/Ro vessels, users of BACOLOD EXPRESS should be excluded.

80. User of BACOLOD EXPRESS from Iloilo City to Bacolod City is estimated as follows:

Load Factor = 95 percent

Estimation value of passenger number in 2010

= 258 persons(capacity) × 95 % × 340 days × 5 trips/dir.

= 416,670 persons

81. Passenger number using Ro/Ro vessels from Iloilo City to Bacolod is estimated as follows:

4,268,976 - 416,670 = 3,852,306 persons

Cargo Volume carried by Ro/Ro Vessel in Target Year

(1) Links except Iloilo City - Bacolod Link

82. For links shown in below, Ro/Ro vessels, landing craft transport(LCT) or landing craft mechanized(LCM) have already been operating, thus the Ro/Ro ratio of Cargo is estimated at 100 percent in 2010. Cargo volume carried by Ro/Ro vessel in 2010 is shown in Table 8-29.

Link No. 1	Matnog	-	Allen
Link No. 2	Matnog	-	San Isidro
Link No. 3	Batangas City	-	Calapan
Link No. 4	Liloan	-	Lipata
Link No. 6	Escalante	-	Tuburan
Link No. 8	Tandayag	-	Bato
Link No. 9	Tubod	-	Tangub
Link No.22	Batangas City	-	Abra de Ilong
Link No.23	Lucena	-	Balanacan

83. For links shown in below, most of the cargo being carried by conventional vessels at present are daily necessities. Therefore, the Ro/Ro ratio of cargo can be assumed at 100 percent in 2010. Commodity classification of each link is shown in Figure A-1-8-4 in the Appendices.

Link No.13	Toledo	-	San Carlos
Link No.14	Cebu City	-	Tubigon
Link No.16	Dumaguete	-	Dapitan
Link No.17	Jagna	-	Cagayan de Oro
Link No.18	Zamboanga City	-	Basilan
Link No.24	Tabaco	-	Virac
Link No.25	Bulan	-	Masbate
Link No.28	Cebu City	-	Ormoc
Link No.34	Cebu City	-	Talibon
Link No.38	Cebu City	-	Tagbilaran
Link No.39	Lucena	-	Sta. Cruz
Link No.40	Dumaguete	-	Larena
Link No.41	Guihulngan	-	Dumanjug

84. For Iloilo City - Pulupandan link, 68 percent of the two way traffic cargo is comprised of sugar and fertilizer, while 60 percent of the total cargo carried from Iloilo City to Pulupandan was comprised of sugar and fertilizer in 1989. In this study, the Ro/Ro ratio of this link is assumed to be 50 percent in 2010. (Figure A-1-8-4(4))

Cargo volume carried from Iloilo City to Pulupandan
by Ro/Ro vessel
= 102,962 metric ton × 50 %
= 51,481 metric ton

85. For Zamboanga City - Jolo link, 46 percent of the total cargo was copra in 1990. Considering present port facility of Jolo Port and convenience of cargo handling by Ro/Ro vessel, the Ro/Ro ratio of this link can be assumed at 100 percent in 2010. (Table A-1-8-4(10))

86. In the case of non-existing links, if Ro/Ro vessels are in operation link, the Ro/Ro ratio is 100 percent in 2010.

(2) Iloilo City - Bacolod Link

1) Cargo Volume in 1990 by Item

87. From PPA Monthly Report, JICA Study Team has been able to get annual cargo volume data of 1990 for ferry vessels operated from Iloilo to Banago. However, data of cargo volume carried by general cargo vessels and bulk carrier operated from Iloilo to Banago or reclamation area, has been obtained only for half a year from January to June. A ratio of cargo volume carried from January to June to annual volume is estimated using data for ferry vessels. For Iloilo to Banago, 55 percent of annual cargo volume in 1990 was carried from January to June (Table A-1-8-35). From this ratio, annual cargo volume of 1990 carried by general cargo vessels and bulk carriers is estimated. Cargo volume by commodity carried by ferry vessels in 1990 is shown in Table 8-19. Cargo volume by commodity carried by general cargo vessels and bulk carriers from January to June in 1990 is shown in Table 8-20. And total cargo volume carried from Iloilo to Banago and reclamation area is shown in Table 8-21. (Table A-1-8-36)

Table 8-19 Cargo Volume Carried by Ferry Vessel from January to December in 1990

unit: Metric Ton

No.	Production	Iloilo City to Bacolod City	Bacolod City to Iloilo City	Total
1	Rice	4,289	92	4,381
2	Corn	299	10	309
3	Sugar	80	121	201
4	Copra	0	0	0
5	Logs	24	21	45
6	Beer and Soft Drinks	22	4	26
7	Pulp and Paper	0	0	0
8	Iron and Steel	10	82	92
9	Fertilizer	3	47	50
10	Cement	0	0	0
11	Fruits and Vegetables	4,954	600	5,554
12	Mineral Oil	111	577	688
13	Rest Group	11,654	15,670	27,324
	Total	21,446	17,224	38,670

Source: JICA Study Team based on PPA Monthly Report
Philippine Ports Authority

Table 8-20 Cargo Volume Carried by General Cargo Vessel and Bulk Carrier from January to June in 1990

unit: Metric Ton

No.	Production	Iloilo City to Bacolod City	Bacolod City to Iloilo City	Total
1	Rice	7,047	12	7,059
2	Corn	206	0	206
3	Sugar	0	17,368	17,368
	Molasses	0	12,130	12,130
4	Copra	0	0	
5	Logs	58	0	58
6	Beer and Soft Drinks	780	0	780
7	Pulp and Paper	0	0	0
8	Iron and Steel	451	0	451
9	Fertilizer	35,397	144	35,541
10	Cement	1,177	120	1,297
11	Fruits and Vegetables	62	60	122
12	Mineral Oil	6	0	6
13	Rest Group	7,295	3,582	10,877
	Total	52,479	33,416	85,895

Source: JICA Study Team based on PPA Monthly Report
Philippine Ports Authority

Table 8-21 Total Volume Carrid by Ferry Vessel and by General Cargo Vessel and Bulk Carrier

unit: Metric Ton

No.	Production	Ferry Vessel	General Cargo Vessel and Bulk Carrier	Total
1	Rice	4,381	12,835	17,216
2	Corn	309	375	684
3	Sugar	201	31,578	31,779
	Molasses	0	22,055	22,055
4	Copra	0	0	0
5	Logs	45	105	150
6	Beer and Soft Drinks	26	1,418	1,444
7	Pulp and Paper	0	0	0
8	Iron and Steel	92	820	912
9	Fertilizer	50	64,620	64,670
10	Cement	0	2,358	2,358
11	Fruits and Vegetables	5,554	222	5,776
12	Mineral Oil	688	11	669
13	Rest Group	27,324	19,776	47,100
	Total	38,670	156,173	194,843

Source: JICA Study Team based on PPA Monthly Report
Philippine Ports Authority

88. In 1990, 56 percent of the total cargo volume carried by ferry vessels was carried from Iloilo to Banago. From this ratio, cargo volume carried from Iloilo to Banago and reclamation area, or from Banago and reclamation area to Iloilo, is calculated and is shown in Table 8-22. In this study, lumping corn, copra, logs, pulp and paper, iron and steel, cement, mineral oil and rest group together are conveniently named "Other Cargo". Cargo volume of the six items is shown in Table 8-23.

Table 8-22 Cargo Volume Carried by Ferry Vessel and General Cargo Vessel and Bulk Carrier

unit: Metric Ton

No.	Production	Iloilo City to Bacolod City	Bacolod City to Iloilo City	Total
1	Rice	17,216	0	17,216
2	Corn	383	301	684
3	Sugar	0	31,779	31,779
	Molasses	0	22,055	22,055
4	Copra	0	0	0
5	Logs	84	66	150
6	Beer and Soft Drinks	1,444	0	1,444
7	Pulp and Paper	0	0	0
8	Iron and Steel	511	401	921
9	Fertilizer	64,670	0	64,670
10	Cement	1,320	1,038	2,358
11	Fruits and Vegetables	5,776	0	5,776
12	Mineral Oil	391	308	699
13	Rest Group	26,376	20,724	47,100
	Total	118,171	76,672	194,843

Note : Iloilo to Bacolod = Total × 56 %
Bacolod to Iloilo = Total × 44 %

Source: JICA Study Team based on PPA Monthly Report
Philippine Ports Authority

Table 8-23 Cargo Volume

unit: Metric Ton

No.	Production	Iloilo City to Bacolod City	Bacolod City to Iloilo City	Total
1	Rice	17,216	0	17,216
2	fruits and Vegetables	5,776	0	5,776
3	Sugar	0	31,779	31,779
	Molasses	0	22,055	22,055
4	Fertilizer	64,670	0	64,670
5	Beer and Soft Drinks	1,444	0	1,444
6	Rest Group	26,376	20,724	47,100
	Total	118,171	76,672	194,843

Source: JICA Study Team based on PPA Monthly Report
Philippine Ports Authority

2) Demand Forecast of Cargo Volume by Item

(a) Rice

89. In the commodity classification of 13 items, palay is included as part of rice. Palay is the major by-product of rice, and palay and rice is the surplus commodity in Panay Island and the deficit commodity in Negros Island. From the NSO statistics, rice is transferred from the Panay Island to Negros Island. Therefore, cargo volume of rice in 2010 is estimated by supply and consumption analysis.

90. For the production of rice, the following formula is obtained from the time series analysis of historical production of rice in Western Visayas(Source: JICA Study Team based on Estimated Production, Area Harvested and Yield per Hectare, by Crop Type, Western Visayas).

Panay Island : $Y = -2,630,565 + 1,756\ X$

Negros Occidental: $Y = 2,803,197 - 1,290\ X$

where Y: Production volume (metric ton)

X: Year

Production volume of rice in 2010 is estimated as follows:

Panay Island : Y(2010) = 898,995 metric ton

Negros Occidental: Y(2010) = 210,297 metric ton

91. The consumption volume of rice in 2010 is estimated from per capita consumption and population number. The average annual consumption volume of rice from 1985 to 1988 was 94.07 kilogram/capita(Source: JICA Study Team based on Supply and Utilization Accounts of Selected Agricultural Foods and Animal Food Items, BOAS 1989). The average annual growth rate of rice consumption is expected to be 0.75 percent.

Per capita consumption volume of rice in 2010

$= 94.07$ kilogram/capita $\times (1 + 0.75\ \%)^{22\ \text{year}}$

$= 111$ kilogram/capita

The production and consumption of rice in 2010 is estimated in the following table. (Table A-1-8-37)

Table 8-24 Production and Consumption of Rice in 2010

District	Production Volume (Metric Ton)	Population	Consumption Volume (Metric Ton)	Surplus/Deficit Volume (Metric Ton)
Panay Island	898,995	4,063,422	451,040	+447.272
Negros Occidental	210,297	2,878,996	319,569	-109,272

Source: JICA Study Team

92. For the distribution pattern of rice and palay transported in Bacolod Port, about 80 percent of the total rice and palay transported from Negros Occidental to other districts was transported to Iloilo City (Source: NSO Statistics,1989). The rice volume transported from Iloilo City to Bacolod City in 2010 is estimated as follows:

Rice volume transported from Iloilo City to Bacolod City in 2010
= 109,272 metric ton × 80 %
= 87,418 metric ton

(b) Sugar and Molasses

93. Sugar is the main commodity produced in Negros Island and it is exported from Iloilo Port. The volume of sugar is estimated utilizing the production time series analysis.

94. The production growth rate of sugar cane in Western Visayas from 1984 to 1990 showed no consistent pattern, randomly increasing and decreasing. By the historical production statistics of the entire country from 1970 to 1984, the future production volume of sugar is estimated using the following formula.

Philippines: $Y = -31,406 + 17.1 X$

where Y: Production volume (metric ton)
X: Year

Source: JICA Study Team based on 1983/84 Statistics Yearbook
International Economic and Social Affairs
Statistics Office, United Nations

95. Based on above formula, production volume in 1970 and 1984 are calculated and the average annual growth rate of production of sugar from 1970 to 1984 is calculated, which is 0.72 percent. Assuming the growth rate in Negros Occidental to be the same as the entire country, the annual growth rate can be assumed as follows:

Average annual growth rate of production of sugar
in Negros Occidental from 1990 to 2010: 0.72 percent

The following can be assumed also.

Average annual growth rate of volume of sugar
from Bacolod City to Iloilo City from 1990 to 2010: 0.72 percent

(c) Fertilizer

96. Fertilizer is used for sugar and other agricultural production. Fertilizer is imported at the port of Iloilo and is distributed to the other provinces in Western Visayas Region. The growth rate of fertilizer volume transported from Iloilo City to Bacolod City is expected to increase in line with the increase in sugar production. Then, the following can be assumed.

Average annual growth rate of fertilizer
from Iloilo City to Bacolod City from 1990 t0 2010: 0.72 percent

(d) Beer and Soft Drinks

97. Beer and soft drinks are transported mainly from Iloilo to Bacolod. This movement is expected to continue in the future. The traffic volume is estimated by the annual growth rate analysis, same as daily necessities.

98. In addition, a new beer factory began operation in Bacolod City from January 1991. This factory intends to supply the beer to Iloilo Province. Thus the link cargo volume is estimated by the annual growth rate analysis plus the shipment from this factory to the port of Iloilo. The annual growth rate of production volume is expected to be in proportion to the annual growth rate of population of Iloilo Province. In this study, this beer cargo is called "New Bottled Cargo".

Shipment from this factory to port of Iloilo in 1991

= 10,368 metric ton

Beer Cargo in 2010

= 10,368 metric ton × population growth rate of Iloilo Province

= 14,185 metric ton

(e) Fruits and Vegetables and Other Cargo

99. The traffic volume is estimated by the annual growth rate analysis, the same as daily necessities.

(f) Annual Growth Rate

100. The annual growth rate of cargo volume by item is shown in Table 8-25.

Table 8-25 Annual Growth Rate of Cargo Traffic on Iloilo City - Bacolod Link

No.	Production	Annual Growth Rate (percent) 1990-1995	1996-2000	2001-2005	2006-2010
1	Rice	-	-	-	-
2	Fruits and Vegetables	7.28	6.94	7.35	7.88
3	Sugar	0.72	0.72	0.72	0.72
3	Molasses	0.72	0.72	0.72	0.72
4	Fertilizer	0.72	0.72	0.72	0.72
5	Beer and Soft Drinks	7.28	6.94	7.35	7.88
6	Other Cargo	7.28	6.94	7.35	7.88

Source: JICA Study Team

101. By utilizing above annual growth rate, the future cargo volume carried between Iloilo City and Bacolod City is estimated and each cargo volume in 2010 is shown in the following tables. (Table A-1-8-38)

Table 8-26(1) Cargo Volume in 2010
from Iloilo City to Bacolod City

unit: Metric Ton

No.	Production	Cargo Volume 1990	2010	1990-2010
1	Rice	17,216	87,418	70,202
2	Fruits and Vegetables	5,776	23,914	18,138
3	Sugar	0	0	0
	Molasses	0	0	0
4	Fertilizer	64,670	74,648	9,978
5	Beer and Soft Drinks	1,444	5,979	4,535
6	Other Cargo	29,065	120,331	91,266
	Total	118,171	312,290	194,119

Source: JICA Study Team

Table 8-26(2) Cargo Volume in 2010
from Bacolod City to Iloilo City

unit: Metric Ton

No.	Production	Cargo Volume 1990	2010	1990-2010
1	Rice	0	0	0
2	Fruits and Vegetables	0	0	0
3	Sugar	31,779	36,683	4,904
	Molasses	22,055	25,457	3,402
4	Fertilizer	0	0	0
5	Beer and Soft Drinks	0	0	0
	New Bottled Cargo	0	14,185	14,185
6	Other Cargo	22,838	94,552	71,714
	Total	76,672	170,877	94,205

Source: JICA Study Team

3) Cargo Volume Carried by Ro/Ro Vessel in 2010

102. The ratio of cargo volume of each commodity carried by Ro/Ro vessels to the total cargo(Ro/Ro ratio)is estimated as follows:

103. Rice is classified as suitable Ro/Ro cargo. There exist many small shippers or consignees in Iloilo City. They will use Ro/Ro service in the future because of its faster loading/unloading service compared to using their trucks. Thus about 70 percent of the cargo volume may transfer to Ro/Ro vessels.

Ro/Ro ratio of rice: 70 percent

104. Fruits and vegetables are perishable cargo. These cannot be stored, and therefore daily service is required. Thus the Ro/Ro ratio is considered as 100 percent.

Ro/Ro ratio of fruits and vegetables: 100 percent

105. The present transport situation of sugar sees it transported from the reclamation area of Bacolod City to the River Port of Iloilo City mainly by barges. The storage facility for sugar exists near the River Port but will become too old for use. Considering the present port facility of the River Port and convenience of cargo handling by Ro/Ro vessel, the Ro/Ro ratio of sugar is expected to be 50 percent in 2010.

Ro/Ro ratio of sugar: 50 percent

106. The future fertilizer volume transported by Ro/Ro vessel will be 50 percent of the total volume in 2010, the same as in the case of sugar.

Ro/Ro ratio of fertilizer: 50 percent

107. Bottled cargo is also classified as suitable Ro/Ro cargo. It consists of beer and other bottled cargo for the link. Beer is efficiently transported from reclamation area of Bacolod City to the River Port of Iloilo City by barge of Sanmiguel corporation. Based on interviews with the Sanmiguel corporation, the potential for cargo transport to shift to Ro/Ro is not high. By contrast, other bottled cargo is expected to be transported by Ro/Ro vessel. The Ro/Ro ratio of other bottled cargo is assumed to be the same as Other General Cargo.

Ro/Ro ratio of bottled cargo: 80 percent

108. Half of the total amount of Other General Cargo was transported by ferry vessel in 1990. This percentage is expected to increase in the future with the beginning of Ro/Ro operation. The exchange ratio to Ro/Ro vessel is considered to run parallel with the logistic curve. The formula and the expected Ro/Ro ratio is shown in Figure 8-5.

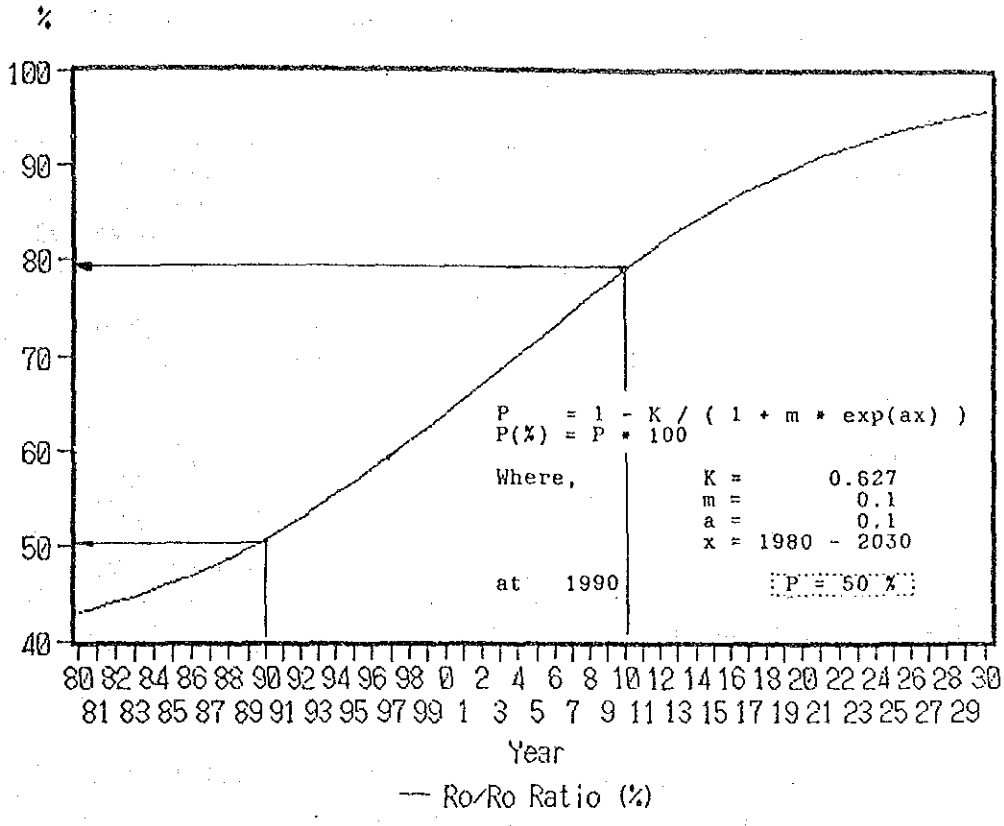


Figure 8-5 Logistic Curve of Ro/Ro Ratio of General Cargo
Source: JICA Study Team

109. The cargo volume carried by Ro/Ro vessel is estimated as in the following tables.

Table 8-27 Cargo Volume Carried by Ro/Ro Vessel in 2010 from Iloilo City to Bacolod City

No.	Production	Cargo Volume (Metric Ton)	Ro/Ro Ratio (Percent)	Cargo Volume Carried by Ro/Ro Vessel (Metric Ton)
1	Rice	87,418	70	61,193
2	Fruits and Vegetables	23,914	100	23,914
3	Sugar	0	-	0
	Molasses	0	-	0
4	Fertilizer	74,648	50	37,324
5	Beer and Soft Drinks	5,979	80	4,783
6	Other Cargo	120,331	80	96,265
	Total	312,290	-	223,479

Source: JICA Study Team

Table 8-28 Cargo Volume Carried by Ro/Ro Vessel in 2010 from Bacolod City to Iloilo City

No.	Production	Cargo Volume (Metric Ton)	Ro/Ro Ratio (Percent)	Cargo Volume Carried by Ro/Ro Vessel (Metric Ton)
1	Rice	0	70	0
2	Fruits and Vegetables	0	100	0
3	Sugar	36,683	50	18,342
	Molasses	25,457	-	0
4	Fertilizer	0	-	0
5	Beer and Soft Drinks	0	80	0
	Mew Bottled Cargo	14,185	-	0
6	Other Cargo	94,552	80	75,642
	Total	170,877	-	93,984

Source: JICA Study Team

Table 8-29 Cargo Volume Carried by Ro/Ro Vessel in 2010 between Iloilo City and Bacolod City

unit: Metric Ton

No.	Production	Iloilo City to Bacolod City	Bacolod City to Iloilo City	Total
1	Rice	61,193	0	61,193
2	Fruits and Vegetables	23,914	0	23,914
3	Sugar	0	18,324	18,324
	Molasses	0	0	0
4	Fertilizer	37,324	0	37,324
5	Beer and Soft Drinks	4,783	0	4,783
	New Bottled Cargo	0	0	0
6	Other Cargo	96,265	75,642	171,907
	Total	223,479	93,984	317,463

Source: JICA Study Team

Table 8-30 Cargo Volume and Passenger Number
Using Ro/Ro Vessel in 2010

No.	Link		Cargo (Metric Ton) 1990	Cargo (Metric Ton) 2010	Passenger 1990	Passenger 2010
1	Matnog	- Allen	36,338	157,017	177,600	1,009,386
2	Matnog	- San Isidro	22,619	97,740	207,268	1,178,004
3	Batangas City	- Calapan	240,744	824,315	527,444	2,237,295
4	Liloan	- Lipata	15,710	61,271	76,212	380,818
5	Argao	- Loon	8,830	30,416	11,074	47,562
6	Escalante	- Tuburan	12,572	46,990	74,166	355,023
7	Carmen	- Isabel	1,869	6,947	6,010	28,623
8	Tandayag	- Bato	5,958	20,226	107,922	457,077
9	Tubod	- Tangub	40,784	128,522	27,679	105,793
10	Iloilo City	- Bacolod	118,171	223,479	783,843	3,852,306
11	Iloilo City	- Pulupandan	24,870	51,481	70,475	383,823
12	Iloilo City	- Jordan	20,000	86,950	487,807	2,790,401
13	Toledo	- San Carlos	43,003	160,732	214,954	1,028,960
14	Cebu City	- Tubigon	28,869	99,446	194,878	836,952
15	Dumaguete	- Santander	19,939	67,691	92,215	390,552
16	Dumaguete	- Dapitan	7,924	22,246	75,521	257,198
17	Jagna	- Cagayan de Oro	5,812	20,153	54,045	233,625
18	Zamboanga City	- Basilan	18,092	46,847	412,836	1,259,686
19	Zamboanga City	- Jolo	25,310	69,492	40,818	132,253
20	San Jose	- Puerto Princesa	2,580	9,872	7,754	36,982
21	Cavite City	- Mariveles	12,796	59,445	56,408	335,652
22	Batangas City	- Abra de Ilog	8,004	28,226	32,534	143,079
23	Lucena	- Balanacan	33,944	104,716	130,442	501,843
24	Tabaco	- Virac	14,808	57,966	55,085	283,608
25	Bulan	- Masbate	6,320	25,825	19,615	105,504
26	Milagros	- Estancia	2,138	9,106	7,016	39,297
27	San Jose	- New Washington	2,626	9,436	8,999	41,431
28	Cebu City	- Ormoc	19,080	70,916	184,323	877,833
29	Ubay	- Maasin	8,630	32,849	35,577	173,633
30	Davao City	- Babak	10,000	29,135	28,900	99,367
31	Roxas	- Odiongan	2,118	6,863	11,957	48,314
32	Roxas	- New Washington	1,822	6,726	5,837	27,582
33	Matnog	- Masbate	4,308	17,606	15,833	85,162
34	Cebu City	- Talibon	14,060	48,433	53,445	229,529
35	Jagna	- Mambajao	1,317	3,850	28,511	103,931
36	Benoni	- Balingoan	3,394	9,926	157,214	573,095
37	San Jose	- El Nido	1,356	5,190	4,175	19,914
38	Cebu City	- Tagbilaran	51,330	176,818	154,459	663,363
39	Lucena	- Sta. Cruz	15,261	47,080	66,417	255,523
40	Dumaguete	- Larena	2,217	6,733	20,925	79,269
41	Guihulngan	- Dumanjug	19,234	65,296	24,985	105,817
42	Ajuy	- Manapla	10,456	43,289	44,034	239,820

Remark: Traffic volumes represent one way traffic only

Source: JICA Study Team

[References]

1. Philippine Yearbook 1989, National Statistics Office.

2. 1990 Philippine Statistics Yearbook
National Statistical Coordination Board
National Economic and Development Authority.

3. Philippine 1980
Population, Land Area, and Density: 1970, 1975, and 198
National Census and Statistics Office
National Economic and Development Authority.

4. 1990 Census of Population and Housing
Report No.2-A: Population by Province, City,
Municipality and Barangay, National Statistics Office.

5. Philippine Population Projections 1980-2030,
National Economic and Development Authority.

6. Economic and Social Indicators
National Statistical Coordination Board.

7. Medium-Term Philippine Development Plan 1989-1992,
National Economic and Development Authority.

8. Updates of the Philippine Development Plan 1990-1992,
National Economic and Development Authority.

9. Macro Development Framework 1993-1998,
National Economic and Development Authority.

10. Long-Term Projection 1993-2010,
National Economic and Development Authority.

11. National Transportation Planning Projects, Final Report,
Part V. Ports and Shipping, NEDA, MOTC, MPWH, PNR, PPA, MARINA,

August 1992.

12. Road Feasibility Study III, Final Report, Aug. 1981.

13. Updating of the Ferry Study Under the Road Feasibility Studies III, volume I, MPWH.

14. Feeder Ports Study, Final Report, Volume I, DPWH, October 1989.

15. Fourth IBRD Ports Ports Project, Identification of Additional Ports, PPA, June 1988.

16. Master Plan Report (under package I), Master Planning, Detailed Engineering and Construction Feeder Ports Program, DPWH, January 1991.

17. Commodity Flow Analysis 1987, National Roll-On, Roll-Off Transport System Development Study, August 1990.

18. Highway Planning Manual, Volume 1 and 3, Ministry of Public Works and Highways, October 1982.

19. Cargo Tonnage, Volume and Freight Charges of PSCC Items, Ports of Origin and Destination, National Statistics Office, 1989.

20. Ship, Cargo, and Passenger Traffic Classified by Ports of Origin and Destination and Type of Service, National Statistics Office, 1989.

21. Monthly Report, 1990, Philippine Ports Authority.

22. Profile of Philippine Ports 1989, Philippine Ports Authority.

23. PPA Annual Statistical Report 1989
Philippine Ports Authority

24. PPA Annual Statistical Report 1990
Philippine Ports Authority

25. Statistical Data of St. Bernard Shipping Corporation.

26. Estimated Production, Area Harvested and Yield per Hectare, by Crop Type, Western Visayas.

27. Supply and Utilization Accounts of Selected Agricultural Foods and Animal Food Items, BOAS 1989.

28. 1983/84 Statistics Yearbook
International Economic and Social Affairs, United Nations.

Chapter 9 Development Policy for Ro/Ro Ferry Ports

A. Functions of Ports in General

1. Ports have been playing an indispensable role in support of the foundation of national economy, particularly in archipelagic countries like the Philippines, where domestic shipping is so vital. Prior to discussing the development policy for Ro/Ro ferry ports, it is worthwhile to review the roles and functions of ports in general because a ferry port is only one component of the total port system.

2. The first and fundamental function of ports is a distribution link. The smooth functioning of ports as the junction between water and land transportation results in a stabilized and abundant consumer life for the people of the country and substantively helps the nation's economic growth by increasing its trade. Even in the early stages of human existence, ports played a vital role by improving the water transportation network, which eventually led to trade among neighboring areas. Lower transfer costs made it possible for early settlers to trade commodities in other areas.

3. The second function of ports is to promote industrial development in the vicinity of the ports. As per capita income grows, people reach a point beyond which additional income is not used primarily to purchase agricultural products but is increasingly utilized to acquire manufactured goods. This development phase requires the intensive utilization of regional and imported mineral resources. One of the critical factors necessary for advancement into this phase is the existence of good transfer facilities like ocean ports. And total transfer costs associated with production at transshipment points are often less than or equal to total transfer costs realized at alternative production locations. Thus, some ocean ports have become important production centers.

4. As economic activities intensify in and around port areas, more and more people from rural areas are drawn to the city. Then, as demand for consumption goods increases in the city, production activities also intensify and consequently cargo throughput at the port increases. A port and city thus affect each other. In the stage of port planning, it is necessary to

take into consideration not only the various factors related directly or indirectly to distribution and production but also to those factors which influence the city as a whole. It cannot be overemphasized that one of the related functions of ports is the promotion of urban development.

5. Historically speaking, we can see how the role of ports has evolved from its basic function as a link for physical distribution to being a catalyst for industrial development and finally to becoming the hub of people's urban activities. In each era, the port has adapted to the basic requirements of the nation's economy and its people. High linkage effects have been generated at good ocean port locations where the assembly of inputs, transfer cost advantages, and market potential have combined to create a favorable environment for the continuous healthy growth of human activities.

B. Roles of Long-Term Port Development Plan

6. Port development plans can be classified by both objectives and by time-frames in the following manners:

(i) Classification by objectives
- National port plan
- Regional port plan
- Individual port plan

(ii) Classification by time-frame of
- Long-term plan
- 5-year port improvement plan
- Single fiscal year work plan

7. As demonstrated above, port development plans are diverse and can be classified into many categories. However, the most important classification is the long-term plan concerns port development, utilization and conservation, which determines the basic policies and strategies to be implemented to cope with future requirements of the port.

8. The long-term plan --- the "master plan" as it is often called --- attempts to assess the future situation of the port by taking into account a series of individual developments that are scheduled to be carried out. The master plan will be set within the framework of the national economic development plan and in turn will provide a framework within which medium-term plans can be drawn up and specific projects defined.

9. The long-term plan provides a consistent picture of the future situation, even if there can be no certainty that it does not contain fallible predictions. The long-term plan will place more emphasis on what is desirable than on what the trends seem to show to be likely.

10. In many cases, ports are located in major urban areas, and the orderly development of the port must be fully coordinated with other social and economic activities in the adjacent urban areas. Thus, it is very important to inform the general public and private sector of the future framework for the port area as it is a multi-functional waterfront space integrating a wide range of urban functions.

C. Objectives in Formulating the Development Policy

11. Although Ro/Ro services on the Philippine domestic routes are in an early stage of development compared with that of containers, the potential efficiency and cost-effectiveness of Ro/Ro transport systems have been increasingly recognized.

12. Some of the Ro/Ro links have successfully attracted more cargo and passenger traffic than expected and shown a steady increase in demand since its inception. Recently, several trial runs were made to ascertain the demand for this type of transportation in other areas by plying Ro/Ro vessels on links such as Bulan--Masbate. Further, one shipping operator has submitted a proposal to install Ro/Ro ramps at ports at his own expense to accommodate their recently acquired Ro/Ro vessel.

13. Ro/Ro transportation is a system which improves the linkage between road transport and coastal shipping, the dominant modes in intra-island and inter-

island freight / passenger movements, respectively. As stated in the previous section, a shipping operator has demonstrated the interest and willingness of the private sector to invest in Ro/Ro vessels and to provide Ro/Ro ferry services.

14. The national government, which is responsible for the utilization of national resources including waterfront space and also responsible for guarding against over-investment, is requested to establish a coherent and rationalized program for the development of Ro/Ro facilities. What in effect needs to be established is the framework within which all subsequent Ro/Ro projects will be identified, studied, prioritized and implemented.

D. Development Policy for Ro/Ro Ferry Ports

15. The Ro/Ro ferry ports should facilitate an efficient and effective transport network through development of the western corridor route. At present, the Pan-Philippine Highway is the most important trunk line traversing the entire area of the archipelagoes. Through this highway, the eastern route has been greatly improved. What is presently needed is to develop another national trunk route which will interconnect several main islands such as Mindoro, Panay, Negros, Cebu and Mindanao.

16. The Ro/Ro ferry ports should contribute to the promotion of accelerated economic development and self-reliant regional economies. There remain several islands which are not interconnected by an efficient and effective transportation system although neighboring islands can be reached after a voyage of several hours. The development of Ro/Ro ferry ports should promote better inter-regional access, communication, and trade cooperation and socio-cultural understanding among all sectors in the country.

17. The Ro/Ro ferry ports should contribute to the promotion of urbanization. A city is a center of social and economic activity in the region. In the process of regional economic development, cities are expected to play vital roles in providing necessary social and economic services to the surrounding areas. The early traditional ports were generally located close to or were part of a coastal city. Their function was to serve that

city and, secondarily, inland areas and town. This is the case for many of our study ports. In the selection of Ro/Ro ports, priority should be given to ports which have been promoting, and are expected to enhance, urbanization of the adjacent and hinterland areas.

18. In the development of Ro/Ro ferry ports, maximum utilization of the infrastructure facilities already in existence should be pursued, and priority shall be given to the use of simple and inexpensive vessels and infrastructure facilities. Since there are many potential Ro/Ro links, it is anticipated that a large number of facilities need to be developed, which underscores the need to keep investments relatively low, depending on the expected level of patronage.

[References]

1. Inception report, National roll on roll off transport system development study, IATCTP, October 1989.

2. A concept paper, Ro/Ro facilities for certain major islands in the Philippines.

3. Interisland sea passenger survey, NTPP, 1981.

4. Review of transport projects in the MTPIP 1987-1992.

5. Brief summary of feeder ferry development project.

6. Port planning and development, OCDI, Oct. 1990.

7. Report of the international study commission on the standardisation of Roll-on/Roll-off ships and berths 1978, Permanent International Association of Navigation Congress.

8. Port development, UNCTAD, 1985.

Chapter 10 Ro/Ro Ferry Transport Network Plan

A. Preliminary Screening of the Candidate Links

1. The candidate links on the long list explained in Chapter 3, Vol. I, which was initially proposed by IATCTP and revised later by JICA study team, have a variety of different aspects. They can be classified into several groups according to traffic volume, or categorized by types of present shipping status. One of the significant categories consists of classifying the candidate links by link distance.

2. According to a PPA study report, Ro/Ro shipping routes fall into the two categories described below:

(i) Long-distance Ro/Ro route (e.g. Manila-Cebu)

(ii) Ferry-distance Ro/Ro route (e.g. Batangas-Calapan)

Ferry-distance routes refer to those pairs of ports located at two contiguous islands that are accessible to each other within a sailing time of two (2) to three (3) hours.

3. The inception Report of IATCTP in October 1989 introduces previous studies undertaken to identify the feasibility of sea route connections between islands with potentials for Ro/Ro services. In 1982, the National Transportation Planning Project (NTPP) reviewed seven (7) possible Ro/Ro links and accepted three (3) links, i.e., Iloilo-Bacolod, South Cebu-South Negros and San Carlos-Toledo.

The Road Feasibility Studies III conducted in 1978 covered seven (7) ferry routes such as San Carlos-Toledo and Cebu-Ormoc. The Ro/Ro Facilities Development Study of PPA identified five (5) sea routes including Escalante-Tuburan and Guihlngan-Dumanjug that had potential for Ro/Ro services. Further, the Fourth UNDP Road feasibility Study has identified four (4) road projects which may have a large impact on inter-island traffic between Panay and Negros.

It is to be noted that all of the above sea routes studies are ferry-distance routes.

4. This particular study, the nationwide roll-on roll-off transport system development study, follows the stream of the preceding studies, and should deal with ferry-distance links only as long-distance Ro/Ro vessels are larger than

ferry-distance Ro/Ro vessels and therefore, require a different design for a Ro/Ro facility.

5. The rational outcome from the statement of the previous paragraph is to exclude long-distance links from the list of the candidate links. The first task to be done is to establish a definition of long-distance links. How can the boundary between "long distance" and "ferry distance" be determined?

6. According to information released from CISO, some members of the Conference own and operate Ro/Ro vessels, 21 in total. Their shipping routes are shown in Figure 10-1, and maximum size of the vessels reaches 13,705 grt. Photo 10-1 shows one of the long-distance Ro/Ro vessels at Port of Cebu. Judging from the Figure mentioned above, it is clear that most of these Ro/Ro vessels call at several ports, as opposed to going back and forth between just two. For example, one Ro/Ro vessel has an approved shipping route of Manila-Dumaguit-Palompon-Cube-& vice versa.

7. Figure 10-2 shows the frequency distribution of link distance of Ro/Ro vessels operated by CISO members. Link distance is defined as the shipping distance between two (2) consecutive calling ports. Figure 10-2 indicates that a shipping route is composed of a main link and sub-links. In general, the former has link distance of more than 150 nautical miles. In the example shown in the previous paragraph, Manila-Dumaguit link can be considered as a main link, and both Dumaguit-Palompon and Palompon-Cebu can be regarded as sub-links.

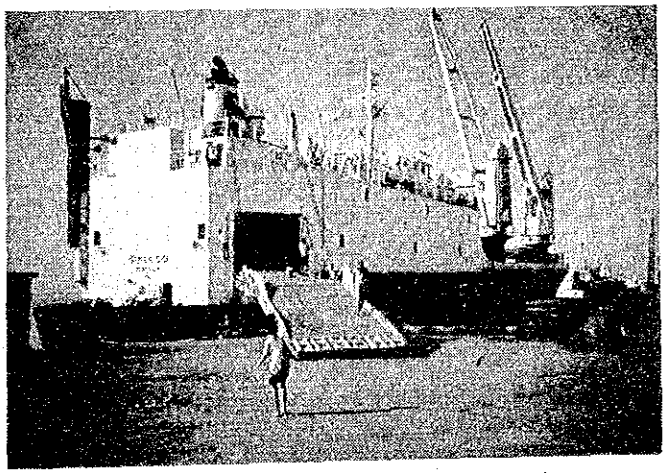


Photo 10-1 Long - Distance Ro/Ro Vessel at Port of Cebu

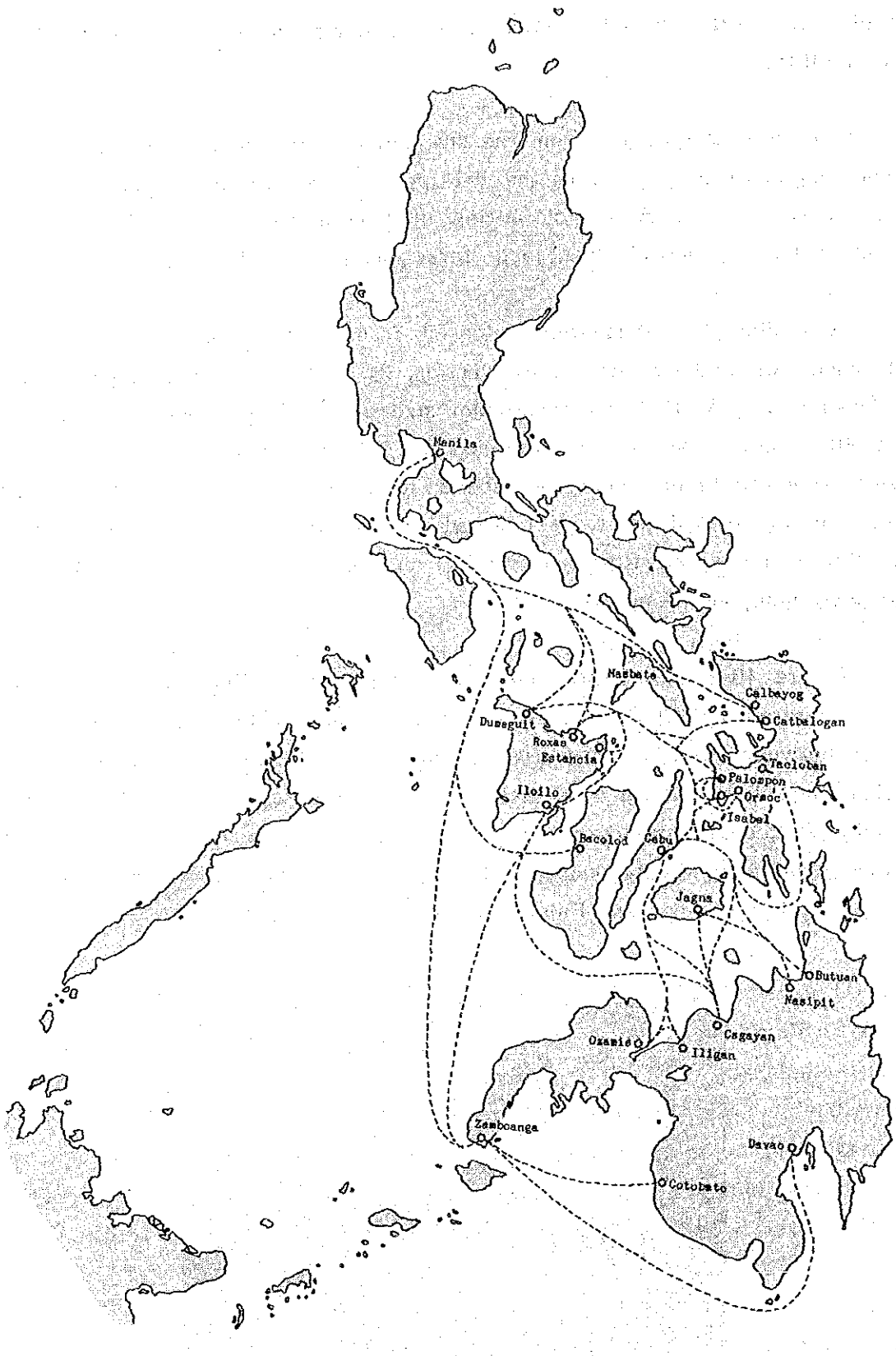


Figure 10-1 Existing Shipping Route of Ro/Ro Vessels Owned by CISO Members
Source: JICA Study Team,
Compiled from CISO Document

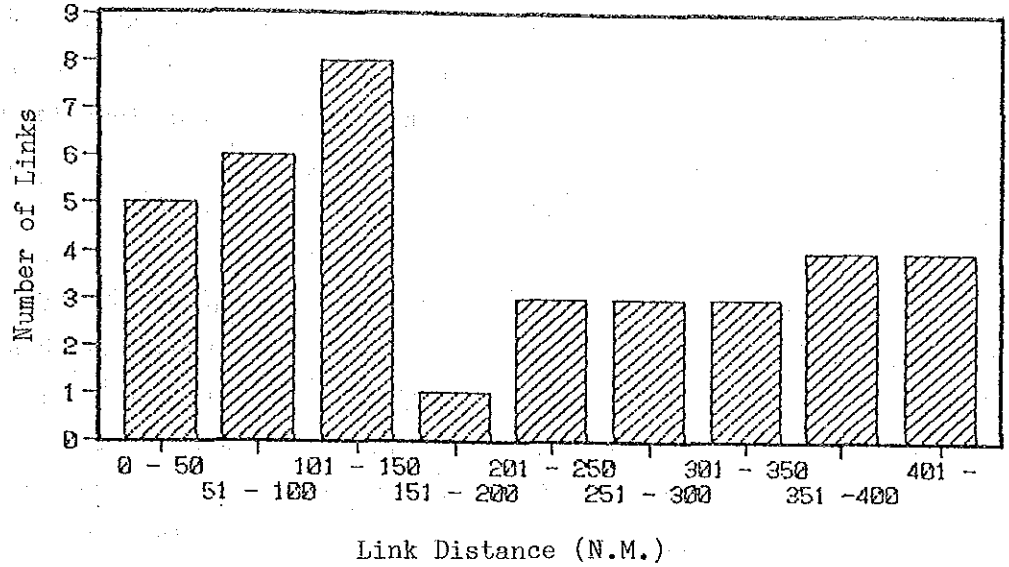


Figure 10-2 Frequency Distribution of Link Distance of Ro/Ro Shipping Routes Operated by CISO Members
Source: JICA Study Team, Compiled from CISO Document

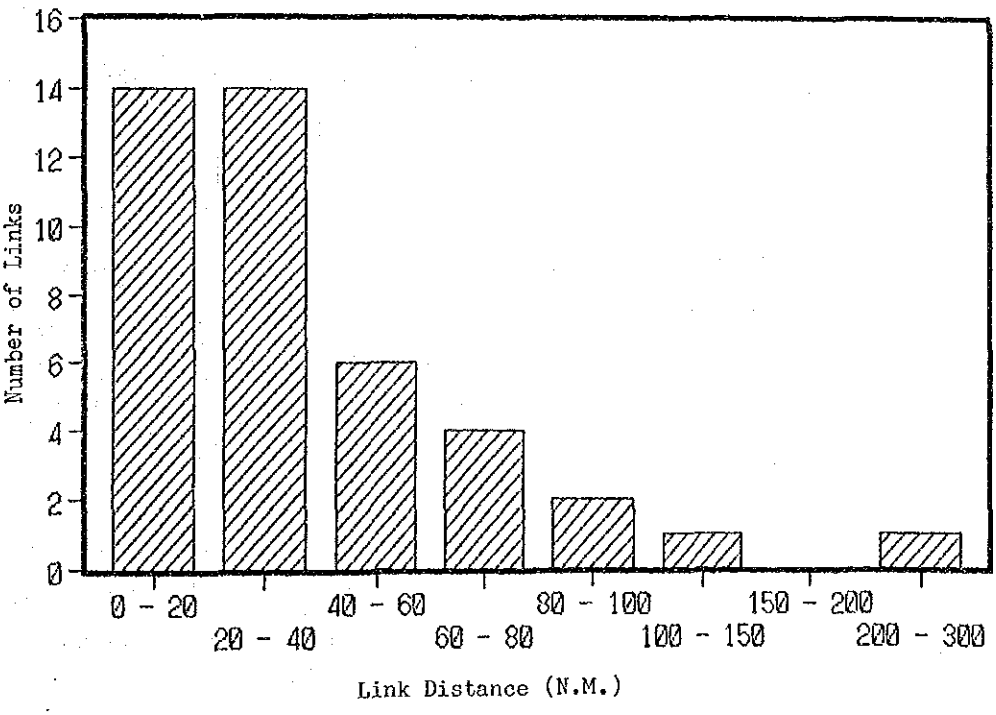


Figure 10-3 Frequency Distribution of Link Distance of the Candidate Links on the Long List
Source: ITACTP Inception Report

8. On the other hand, Figure 10-3 shows the frequency distribution of link distance of the candidate links on the long list. Many links fall into categories of less than 40 n.m., the shipping time of which is less than four (4) hours. However, two (2) links have a link distance of more than 100 NM, with the longest one having a distance of 233 NM.

9. If the link distance is more than 100 NM, it is quite difficult for a vessel to make more than one (1) round trip a day under normal conditions of vessel operation. The Ro/Ro shipping routes operated by CISO members shown in Figure 10-1 and 10-2 are usually conceived as long-distance routes. Based on these facts, a long-distance link is defined in this study as a shipping link with more than 100 NM link distance.

10. From the definition above, the following two (2) links

20. San Jose - Puerto Princesa (233 NM)

37. San Jose - El Nido (135 NM)

fall into the category of long-distance links, and therefore should be examined separately from this study.

B. Prioritization Criteria

General

11. There are many potential routes as Ro/Ro links, and a large number of facilities need to be developed. However, resources to be allocated to these projects are limited. One of the major purposes of NRTSDS is to identify and prioritize projects which should be materialized as soon as possible while keeping investments as reasonably low as possible depending on the expected level of patronage.

12. Prioritization criteria will serve as the general bases for the selection and identification of sites as Ro/Ro ports for repair, rehabilitation and/or development generally, serving as linkage areas between shipping and land transportation, particularly for commodity movement.

The prioritization criteria were derived and established by the joint efforts of IATCTP and JICA study team, and reflect the general requirements needed to qualify as Ro/Ro ports.

Major Fields for Prioritization Criteria

1) Mobility in the Hinterland

13. Before going into the items of the prioritization criteria, it is worthwhile to review the historical trend of car ownership in the Philippines because Ro/Ro transportation inevitably requires vehicles as its main patronage. If no vehicles exist in the hinterland region, there is no call for Ro/Ro transport.

14. Figure 10-4 shows the historical development of car ownership in the Philippines while that in Japan serves as a comparison. As of 1988, 22 out of every one thousand people owned cars in the Philippines compared to 330 in Japan. Presently car ownership in the Philippines is less than one tenth of that in Japan.

There is no theory which explains the level of car ownership required to ensure the success of the Ro/Ro transportation system. However, experience in

Japan provides some indications. Figure 10-5 Shows the historical trend of newly developed Ro/Ro links in Japan each year.

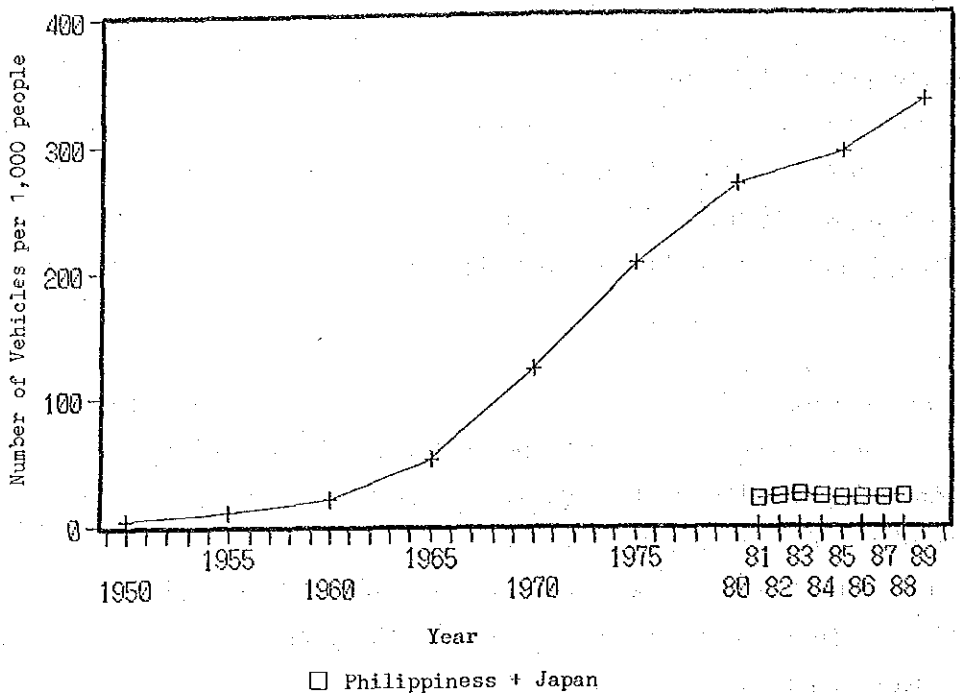


Figure 10-4 Car Ownership in the philippines and Japan
Source: Philippine Year Book and Land Transportation Year Books in Japan.

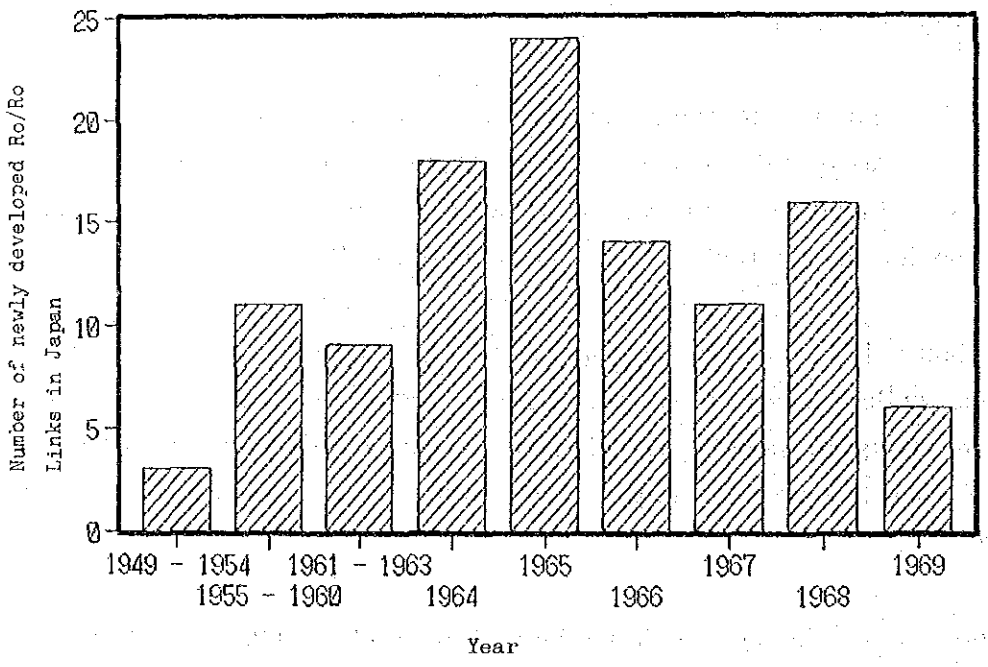


Figure 10-5 Development of Ro/Ro Ferry Links in Japan
Source: Study on Car Ferry

15. In 1949 the first Ro/Ro link was developed between Sakurajima and Kagoshima in Kagoshima Prefecture. Since then a few links have been developed yearly; and especially rapid growth was observed in 1964 and 1965 when 18 and 24 Ro/Ro links began operation, respectively. The car ownership at that time in Japan was around 50 vehicles per one thousand people.

Considering the recent growth of car ownership in the Philippines, it is good time to study and prepare for Ro/Ro transportation system development in this country.

16. As explained previously, car ownership in the hinterland region of the study ports is one of the most important factors to assess the potential of the candidate links. The car ownership of the link is determined by averaging the number of vehicles per one thousand people in the two provinces which are connected by the link. Data on the number of vehicles registered at each district office were given from Land Transportation Office.

Figure 10-6 shows car ownership in the areas of the candidate links. Nearly half of the vehicles are registered in the National Capital Region. Figure 10-6 shows most of the study links have car ownership ratio of less than 20 vehicles per one thousand people.

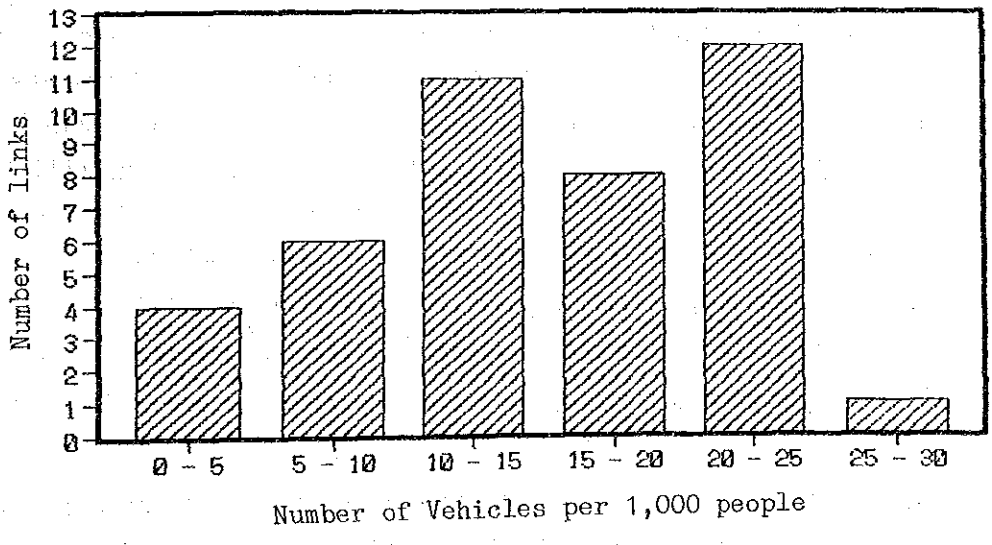


Figure 10-6 Car Ownership Ratio of the Study Links

Source: LTFRB

17. Road condition also constitutes an essential part for evaluation of potential of the study links. If road condition is poor, vehicles cannot be fully utilized. Consequently, Ro/Ro transportation would show poor performance even if it is developed.

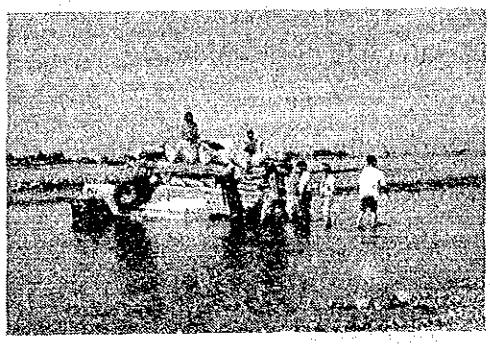


Photo 10-2 Trouble for crossing the river (Mindoro Is.)

The field survey gave a good picture of the situation on the road condition in the hinterland region of the study ports visited. One example is shown in Photo 10-2. DPWH provided JICA study team with detailed information about road network and its surface condition. Because it is quite difficult to estimate the road condition of hinterland region of the study ports in the year 2010, present road condition was instead taken to evaluate the potential of the candidate links.

18. The benefits of ferry-distance are derived mainly from the "through" services made available by Ro/Ro vessels which connect the road systems of contiguous islands. More benefits are derived by Ro/Ro transportation system as commodities or passengers originate or are destined for areas outside the vicinities of terminal points. In Other words, Ro/Ro transportation services are no longer needed if traffic originates from a port and terminates at another port.

JICA study team conducted an origin-destination survey for existing ferry-boat passengers. From the interview records, the "through traffic rate" can be derived. The higher the "through traffic rate" is, the more potential the candidate link has.

The "through traffic rate" is defined as:

Through Traffic Rate = 1 - MM

Where, MM is percentage of inter-municipality trip. If all trips generate from a municipality where a port is located and terminate at another municipality where the other end-port of the link is located, then MM is equal to one (1).

Figure 10-7 shows the "through traffic rates" of the candidate links.

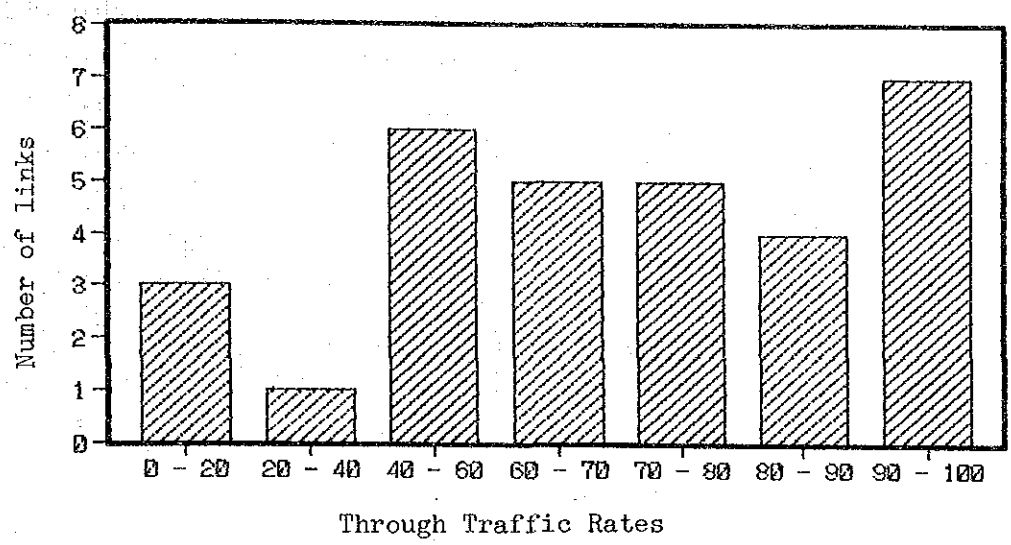


Figure 10-7 Frequency Distribution of Through Traffic Rates
Source: JICA Study Team

19. Ro/Ro transportation is one form of shipping services for ferry-distance links, and can be regarded as an advanced one. There are several other shipping modes in the candidate links proposed in this study. For example, there are no regular shipping services between San Jose and New Washington. Bancas are main shipping mode for the link of Iloilo-Jordan.

It can be said that present form of shipping services itself reflects the potential of each candidate link. If there is no regular shipping service, the potential of this link as a Ro/Ro link may be poor. By contrast, if cargo/passenger ferryboats are plied regularly on a link, then this link can be said to have a high potential as a Ro/Ro transportation service.

2) Traffic demand

20. Future traffic demand is the most important factor in prioritizing the candidate links. Ro/Ro transportation network should be basically developed in accordance with the magnitude of future demand of cargo and passenger traffic. It could be a waste of resources to develop a a Ro/Ro transportation service on a link where very little future traffic is forecast.

21. Among cargo and passenger traffic, the former is more important than the latter. The main benefit derived from the introduction of a Ro/Ro transportation system is the reduction of time and cost required for cargo handling at the quay side since ownership of passenger cars in 2010 is forecast to be still relatively low in the Philippines.

Figure 10-8 and 10-9 show the frequency distribution of forecast one-way traffic volume of cargo and passenger, respectively, in the year 2010. These figures reveal that the forecast link traffic varies widely.

22. It should be noted that future traffic demand is forecast using social and economic indicators, and therefore can be conceived as a combined factor which assesses the potential of each link.

As explained previously, traffic forecasts for each link employed in this study are generally obtained by applying annual growth rates to base year traffic. The annual growth rates are calculated by the following formula:

$$T = \left\{(E \times I / 100 + 1) \times (P / 100 + 1) - 1\right\}$$

Where:

T = the traffic growth rate per annum
E = the transport demand-income elasticity
I = the growth rate for per capita income in constant prices
P = the average population growth rate per annum

Magnitude of the forecast traffic demand is determined both by the number of people who will get benefits from Ro/Ro operation and by which province is likely to have future prosperity due to economic growth.

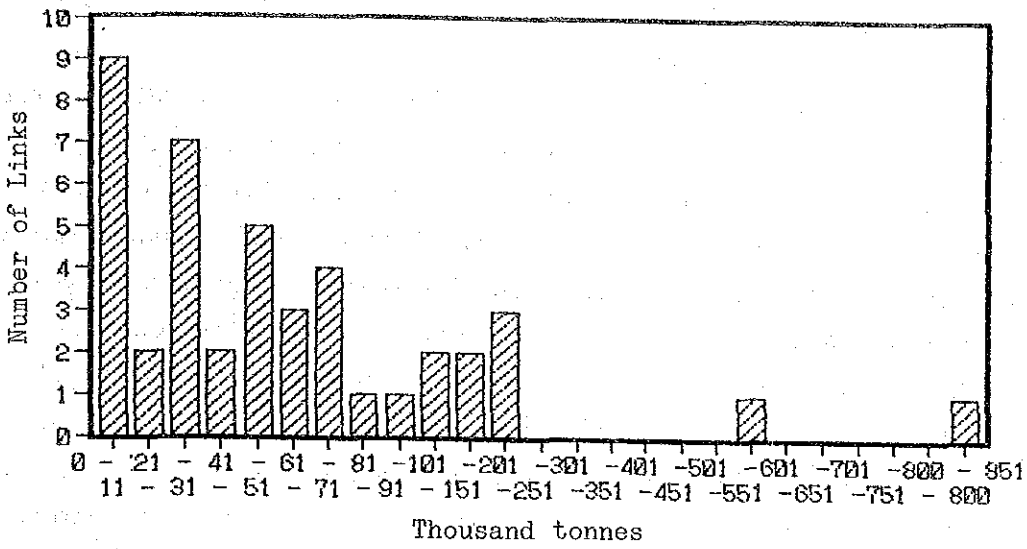


Figure 10-8 Forecast of Cargo Traffic of 2010

Source: JICA Study Team

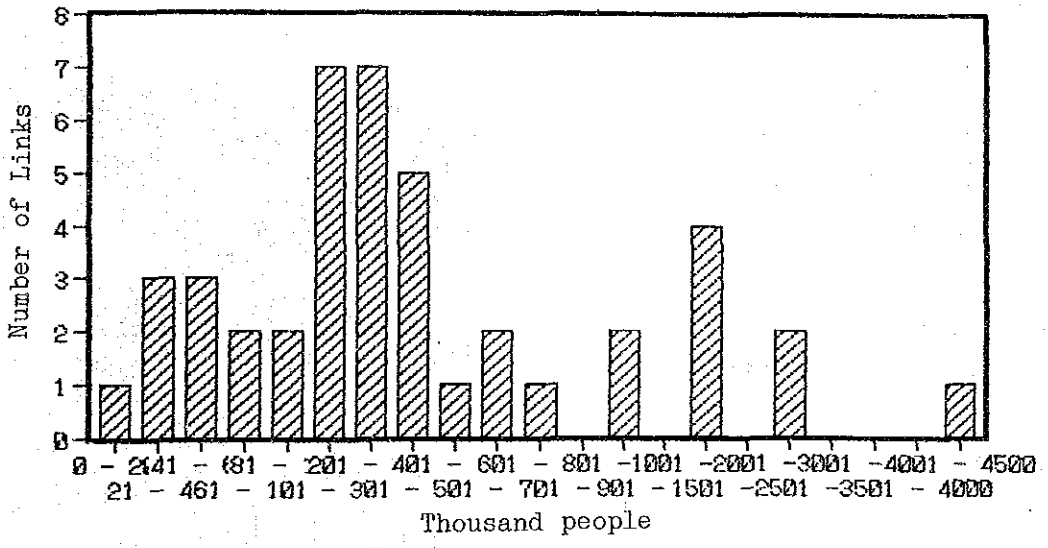


Figure 10-9 Forecast of Passenger Traffic in 2010

Source: JICA Study Team

3) Cost

23. Under conditions of limited resources, one method for allocation is to pay regard to public opinion. This methodology supports the idea that if people assess port facilities and shipping services of a particular link as very satisfactory, then much investment to improve the link is not needed in near future. On the other hand, if public opinion shows that the particular link is in a very poor and displeasing condition, then the necessary resources should be allocated to this particular link to improve it.

24. The JICA study team has conducted passenger interviews as a part of its on-site traffic survey to assess existing shipping services. Facilities, frequency, comfort, speed and punctuality of each existing link were evaluated and summarized. Among the items above, the passengers gave their lowest rating to facilities, and among the existing links, Tubod-Tangub link received the poorest evaluation while Liloan-Lipata link was most satisfactory to the majority of the passengers.

25. No matter whether it is fixed or movable, a shore ramp is one of the core facilities at ports for Ro/Ro transportation. If a shore ramp has been constructed at a port, this fact itself indicates that circumstances around the port are ripe for the development of Ro/Ro transportation, and utilization of the existing facilities leads to the effective utilization of the limited resources.

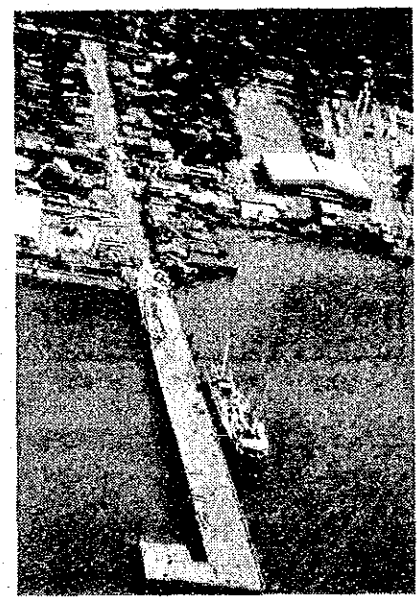


Photo 10-3 Ro/Ro Ramp at Port of Toledo

PPA has been constructing shore ramps at several PPA ports including the Port of Toledo, shown in Photo 10-3. Ports with shore ramps are advantageous for the development of Ro/Ro transportation.

26. The development of Ro/Ro transport is expected to reap the most possible benefits while keeping investment to in as low a level as possible. Therefore, preference is given to projects which require the least investment. A preliminary cost estimation was carried out based on the information on both required level and present state of port facilities. Natural conditions around the study ports such as water depth are indispensable information for the cost estimation. Information and data needed for this task have been collected through field reconnaissance, aerial photographs and several publications. Constituent organizations of NRTSDS have been also cooperative in providing the JICA study team with necessary informtion and data.

4) Formation of Transport Network

27. A trunk transportation network that will traverse the entire archipelago, connect major islands and link 54 million Philippines, is the single most important factor necessary to achieve the country's unification and integration of all economic and developmental activities.

28. At present, the Pan-Philippine Highway is the most important trunk line traveling the entire archipelago. It extends from Allacapan at the northern tip of Luzon to Davao City in the eastern coast of Mindanao, accounting for a total length of bout 2,100 kilometers. The highway traverses the four main islands of Luzon, Samar, Leyte and Mindanao. Each island is connected by ferry service. Through this highway, the eastern route has been greatly improved.

29. There remain, however, several islands which are not interconnected with an efficient and effective sea transportation system, especially in the western part of the country in the vicinity of the Visayas. The present transport connection to these islands is provided mainly via unreliable means of sea transport. Consequently, socio/economic activities in these areas have lagged behind the rest of the country. The full economic potentials of these areas have not, consequently, been fully realized.

30. The main purpose of this study is to spur regional development and promote national integration. In this sense, the highest priority should be given to the developed or proposed national trunk links e.g., Luzon-Mindoro-Panay-Negros-Cebu-Mindanao. Other inter-provincial links such as Bohol-Leyte are also considered to be important links.

Although proposed Ro/Ro links which connect a detached island with a main island play a significant role in improving living conditions of residents in small islands, the magnitude of effects influencing national and regional economy would be smaller than those of the national trunk links. The effects of the introduction of Ro/Ro transportation system to short-cut links would be the same as or less than those of the detached island links because alternative modes of transportation exist in the former links.

Figure 10-10 shows classification of the study ports from the view points of both national integration and regional development.

31. A considerable portion of the national population is living in rural areas. They desire services and markets where they can ship their products. One of the important goals in the national and regional development policy in the Philippines is to promote urbanization and aid regional economic growth and social centers.

The development of Ro/Ro ports could contribute to the goal above together with other port functions. To facilitate the stated goal, a higher priority should be given to the links which connect municipalities with highly populated areas.

Photo 10-4 A Port can be a Charm of Cities

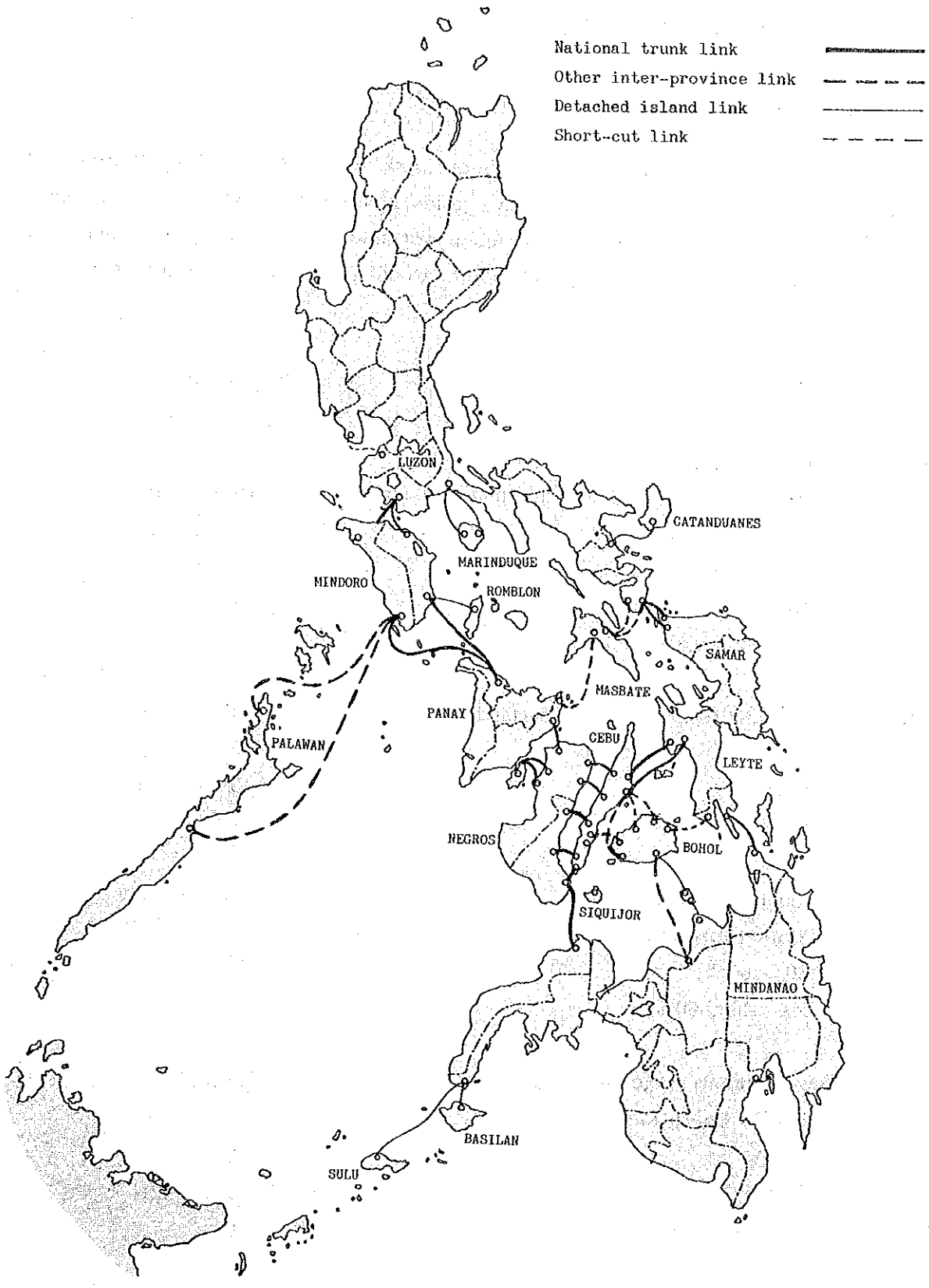


Figure 10-10 Development Policy on Ro/Ro Transportation Network

Source: JICA Study Team

C. Prioritization of the Ro/Ro Ferry Links

Point Mark System

32. The potential of the each candidate link is going to be evaluated and prioritized according to the four (4) categories mentioned above. Each category is composed of several variables, and each variable has a weighted numerical value. A candidate link amassing 100 points would represent a prefect score.

1) Mobility in the Hinterland		(25 points)
33.	Car ownership	(10 points)
	More than 23 vehicles/thousand population	10
	20 - 23 vehicles	8
	15 - 20 vehicles	6
	10 - 15 vehicles	4
	less than 10 vehicles	2
34.	Road conditions in the hinterland	(5 points)
	Good	5
	Fair	3
	Poor	1
35.	Through-traffic rate	(5 points)
	More than 80%	5
	80 - 60 %	3
	less than 60%	1
36.	Development stage of shipping	(5 points)
	Ro/Ro operation	5
	Ferry	3
	Banca	1
	No regular service	0

2) Traffic Demand (35 points)

37. Cargo (25 points)

More than 150,000 M.T.	25
80,000 - 150,000	20
50,000 - 80,000	15
20,000 - 50,000	10
less than 20,000	5

38. Passenger (10 points)

More than 1,000,000	10
500,000 - 1,000,000	8
300,000 - 500,000	6
100,000 - 300,000	4
less than 100,000	2

3) Cost (20 points)

39. Passenger's Assessment (5 points)

More than 20%	5
10 - 20 %	3
Less than 10%	1

40. Links with Ro/Ro Ramps at Ports (5 points)

Completed/on going	5
No plan	0

41. Preliminary Cost Estimate (10 points)

Low	10
Medium	5
High	0

4) Formation of Transport Network (20 points)

42.	Development Policy on Ro/Ro Ferry Network	(15 points)
	National trunk link	15
	Other inter-province link	10
	Detached island link	5
	Short-cut link	3
43.	Promotion of Regional Center Development	(5 points)
	Cities with population of 200,000 or more	5
	Others	0

Priority Ranking

44. Table 10-1 is the format for link prioritization criteria. Batangas-Calapan link achieved the highest point total and Jagna-Mambajao and Milagros-Estancia links the lowest.

The candidate links can be categorized into the following three (3) groups in terms of priority;

65 - 100 pts	1st priority
45 - 64 pts	2nd priority
< 45 pts	3rd priority

Figure 10-11 and Figure 10-12 show the links of the 1st and the 2nd priority group, respectively.

Please refer to Table A-1-10-1 through Table A-1-10-13 in Appendices for the detailed link values relating to the variables.

Table 10-1 Priority Ranking of the Study Ports

Existing and Possible Ro/Ro Routes		Car Ownership	Road Condition	Through Traffic	Shipping	Cargo	Passenger	Passenger's Request	Ro/Ro Ramps	Const. Cost	Sub Total	Dev't. Policy	Regional Center	Total Points
3. Batangas City	Calapan	4	4	5	5	25	10	1	5	5	64.0	15	0	79.0
13. Toledo	San Carlos	10	4	3	3	25	10	3	5	0	63.0	15	0	78.0
1. Matnog	Allen	2	5	5	5	25	10	1	5	5	63.0	15	0	78.0
2. Matnog	San Isidro	2	5	5	5	20	10	1	5	10	63.0	15	0	78.0
38. Cebu City	Tagbilaran	8	4	1	3	25	8	3	2.5	10	64.5	10	2.5	77.0
10. Iloilo City	Bacolod	6	5	1	3	25	10	1	0	0	51.0	15	5	71.0
4. Liloan	Lipata	2	5	5	5	15	6	1	5	10	54.0	15	0	69.0
28. Cebu City	Ormoc	8	3	3	3	15	8	5	0	5	50.0	15	2.5	67.5
14. Cebu City	Tubigon	8	3	3	3	20	8	5	0	5	55.0	10	2.5	67.5
8. Tandayag	Bato	10	3	3	5	10	6	1	2.5	10	50.5	15	0	65.5
6. Escalante	Tuburan	10	3	5	5	10	6	3	3.5	5	50.5	15	0	65.5
41. Guihulngan	Dumanjug	10	2	5	3	15	4	1	0	10	50.0	15	0	65.0
15. Dumaguete	Santander	10	3	3	0	15	6	3	2.5	5	47.5	15	0	62.5
12. Iloilo City	Jordan	4	4	1	1	20	10	3	0	10	53.0	5	2.5	60.5
9. Tubod	Tangub	6	3	3	5	20	4	1	5	10	57.0	3	0	60.0
16. Dumaguete	Dapitan	4	3	3	3	10	4	5	2.5	10	44.5	15	0	59.5
11. Iloilo City	Pulupandan	6	5	3	0	15	6	1	0	5	41.0	15	2.5	58.5
22. Batangas City	Abra de Ilog	6	3	3	0	10	4	5	5	5	41.0	15	0	56.0
17. Jagna	Cagayan de Oro	6	4	5	3	10	4	3	2.5	5	42.5	10	2.5	55.0
23. Lucena City	Balanacan	2	3	5	5	20	8	1	0	0	44.0	5	0	49.0
18. Zamboanga City	Basilan	4	1	3	3	10	10	5	0	5	41.0	5	2.5	48.5
19. Zamboanga City	Jolo	2	1	1	3	15	4	5	0	10	41.0	5	2.5	48.5
36. Benoni	Balingoan	6	3	5	3	5	8	3	0	10	43.0	5	0	48.0
24. Tabaco	Virac	4	3	5	3	15	4	3	0	5	42.0	5	0	47.0
34. Cebu	Talibon	8	3	1	3	10	4	3	1.0	0	33.0	10	2.5	45.5
25. Bulan	Masbate	2	3	3	3	10	4	3	2.5	5	35.5	10	0	45.5
21. Cavite City	Mariveles	10	5	3	0	15	6	1	0	0	40.0	3	0	43.0
33. Matnog	Masbate	2	3	3	0	5	2	3	5	10	33.0	10	0	43.0
42. Ajuy	Manapla	6	3	1	1	10	4	3	0	0	28.0	15	0	43.0
30. Davao	Babak	8	3	1	1	10	2	5	0	5	35.0	5	2.5	42.5
27. San Jose	New Washington	4	2	3	0	5	2	1	2.5	5	24.5	15	0	39.5
5. Argao	Loon	8	3	3	0	10	2	3	0	0	29.0	10	0	39.0
32. Roxas	New Washington	4	2	3	0	5	2	3	0	5	24.0	15	0	39.0
39. Lucena City	Santa Cruz	2	3	1	3	10	4	5	0	5	33.0	5	0	38.0
29. Ubay	Maasin	4	1	3	3	10	4	3	0	0	28.0	10	0	38.0
7. Carmen	Isabel	8	2	3	0	5	2	3	0	0	23.0	15	0	38.0
40. Dumaguete	Larena	6	2	1	1	5	2	3	2.5	10	32.5	5	0	37.5
31. Roxas	Odiongan	2	1	1	1	5	2	5	0	10	27.0	5	0	32.0
35. Jagna	Mambajao	4	2	3	0	5	4	3	0	5	26.0	5	0	31.0
26. Milagros	Estancia	2	1	3	3	5	2	5	0	0	21.0	10	0	31.0

Source: JICA Study Team

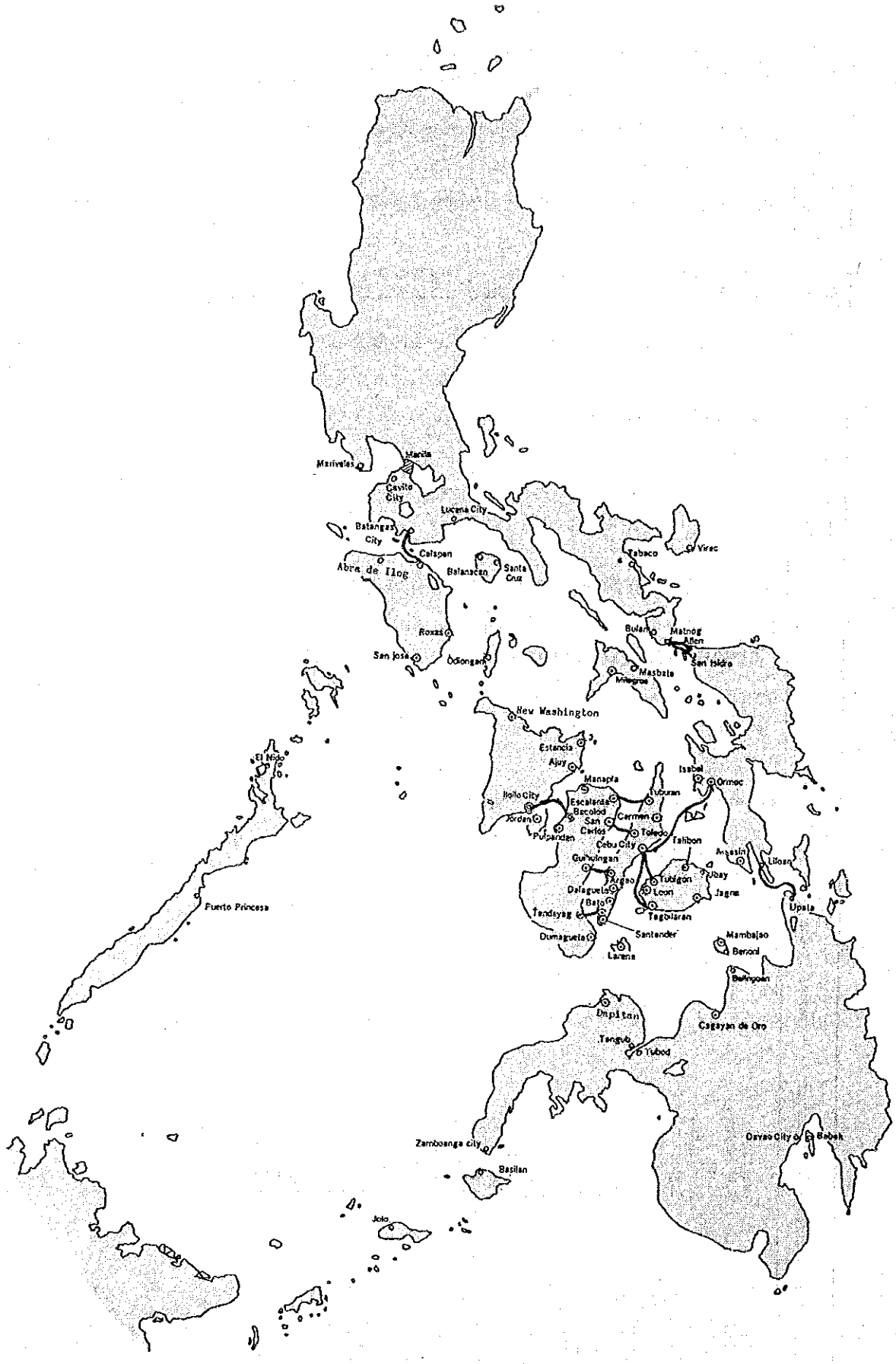


Figure 10-11 Links with 1st Priority

Source: JICA Study Team

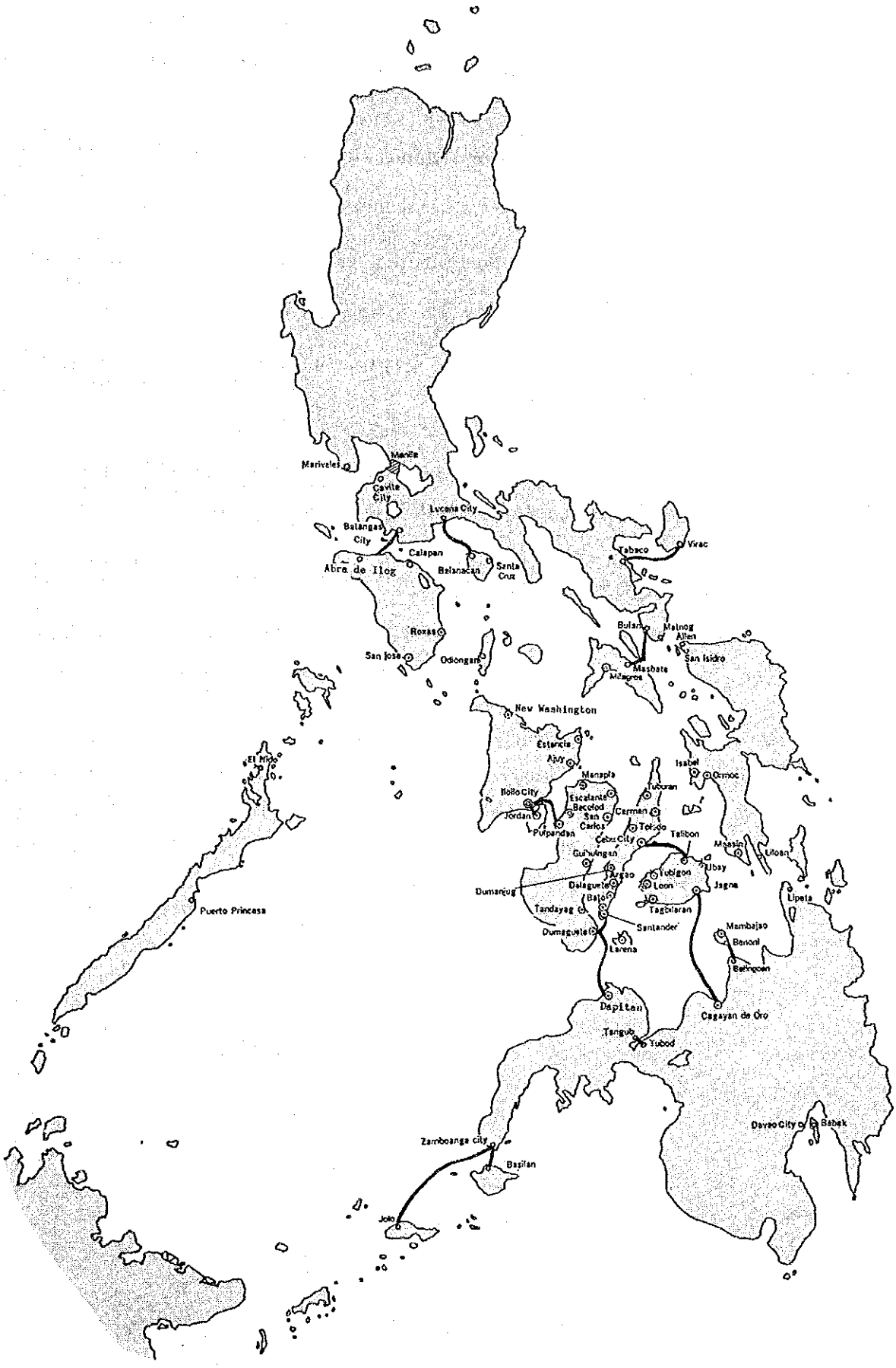


Figure 10-12 Links with 2nd Priority

Source: JICA Study Team

[References]

1. Ro-Ro facilities for certain major islands in the Philippines, a concept paper, PPA.

2. Inception report, National roll on roll off transport system development study, IATCTP, October 1989.

3. Review of Transport Projects in the MTPIP 1987-1992. Vol. II-Detailed Project Reviews, January 1988.

4. Master Planning, detailed engineering and construction feeder ports program, Master plan report (under package I), DPWH, January 1991.

5. Study on car ferry, Transportation Economy Research Center, Tokyo, March 1970.

Chapter 11 Ro/Ro Ferry Port Development Plan

A. General

1. A conceptual network plan for Ro/Ro transportation system development in the year 2010 is proposed based on the prioritization criteria of the previous Chapter.

In this Chapter, a Ro/Ro vessel operation plan and corresponding port facility plan are presented. Further, construction cost and procurement plan for the port facilities are proposed.

B. Planned Ro/Ro Vessel Size

2. Many Ro/Ro vessels operating in the Philippines are second hand and imported from Japan. As it is expected that Japan will remain as the main supplier of the Philippine Ro/Ro fleet, it is worthwhile to take a look at the present situation of the Ro/Ro fleet in Japan.

3. Figure 11-1 and Figure 11-2 show frequency distribution of size and age of the total (487) Ro/Ro vessels in Japan. Vessels less than 1,000 GRT account for two thirds (2/3) of the total Ro/Ro fleet in Japan. With respect to their age, vessels older than 15 years account for 36 per cent while vessels less than five (5) years old account for 29 per cent. Overall, it can be said that any size or any age can be found in the Ro/Ro fleet market in Japan.

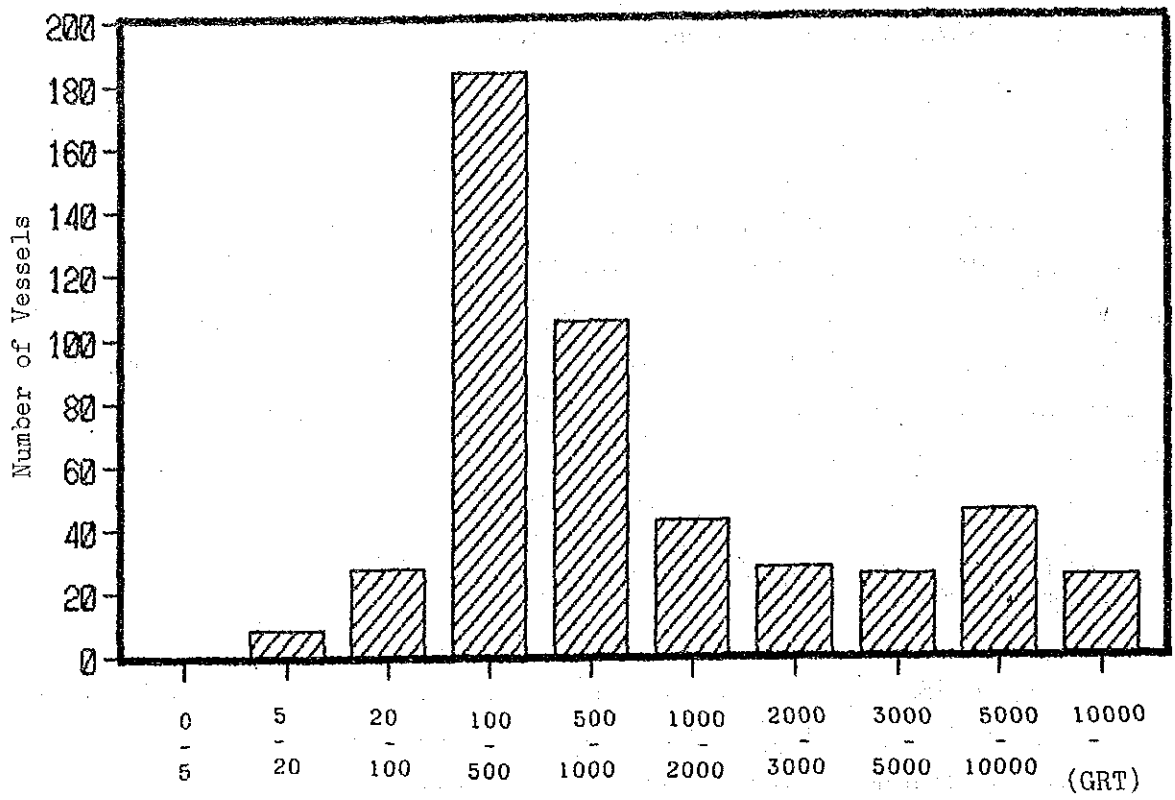


Figure 11-1 Size of Ro/Ro Vessels in Japan

Source: Japan Passenger Vessel Operators Association

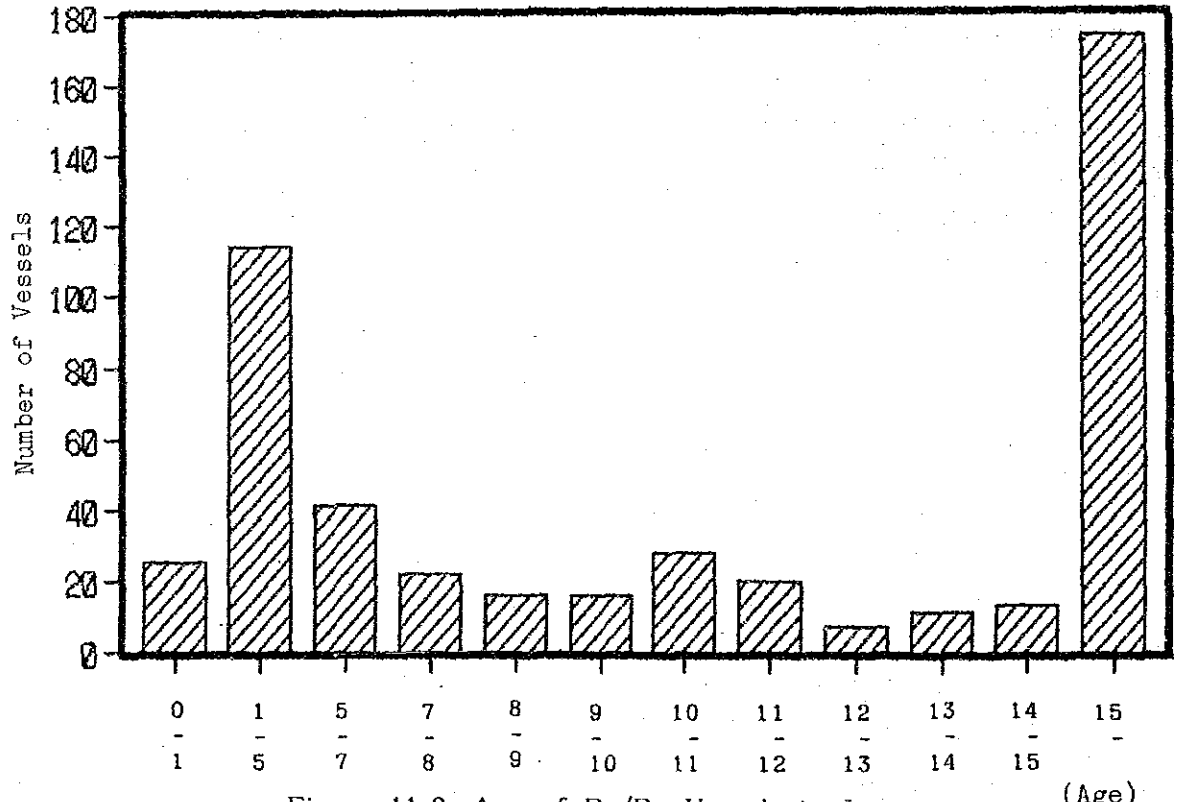


Figure 11-2 Age of Ro/Ro Vessels in Japan

Source: Japan Passenger Vessel Operators Association

4. The relationship between Ro/Ro vessel size and sailing distance in Japan is shown in Figure 11-3. Although deviations are observed in the samples to some extent, it can be stated that a correlation exists between the two variables.

As the link distance increases, the per centage of on-board time during the total trip time also increases. Therefore, time spent on board becomes significant for passengers and commodities. Efforts to reduce sailing time are welcome, and larger vessels are preferred because they are generally faster than a smaller ones.

Although there is no direct cause and effect relationship between the vessel size and the sailing distance, it is understandable that a correlation exists between the two given the above statements.

5. Figure 11-4 shows the relationship between size of existing ferry vessels and link distance in the Philippines. Although a larger variance is observed, a general relationship still exists between the two. Where link distance is short, a small vessel is plied on the link. On the other hand, larger vessels are plied on links with a long sailing distance.

6. Port facilities should be constructed to accommodate the maximum sized vessel expected to call. The technical standard enforced in Japan indicates the size for Ro/Ro vessels plying ferry-distance links while the corresponding berth length and required water depth are shown in Table 11-1.

Table 11-1 Standard Berth Length and Water Depth of Ro/Ro Ferry Wharf

Vessel Size (GRT)	Berth Length (m)	Water Depth (m)
300	60	3.0
500	70	3.5
900	90	4.0
1,000	95	4.5
2,000	115	5.5

Source: Technical Standards for Port and Harbour Facilities (Japan)

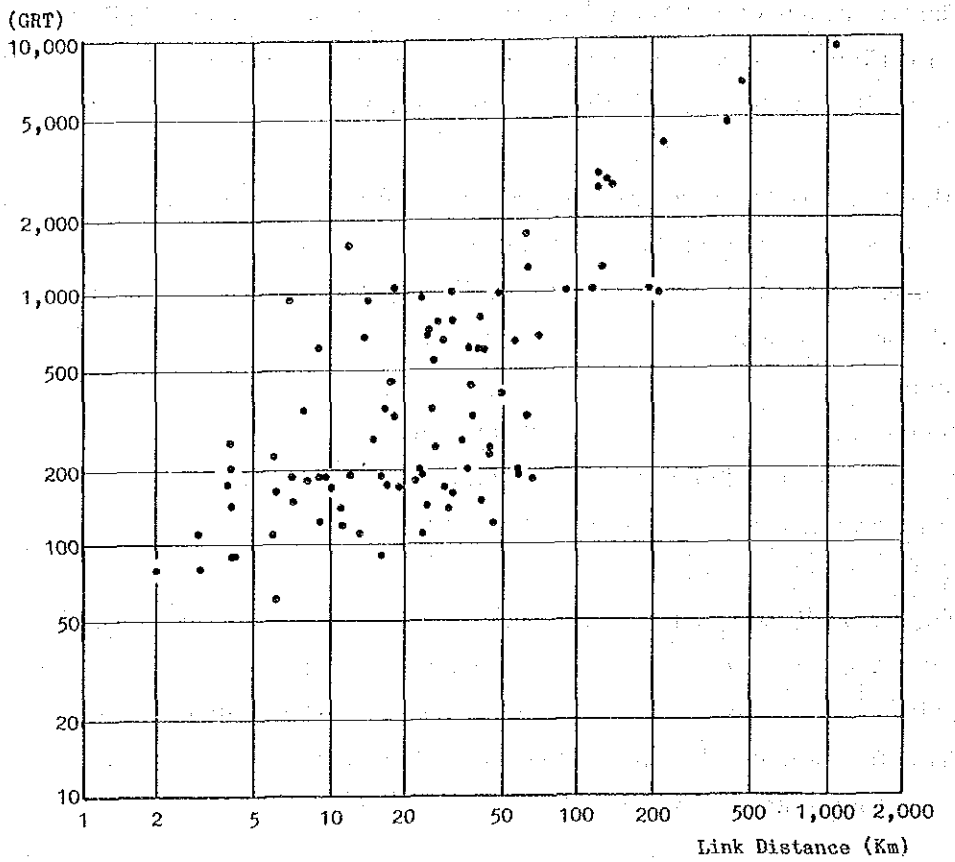


Figure 11-3 Relation between Ro/Ro Vessel Size and Link Distance in Japan
Source: Study on Car Ferry

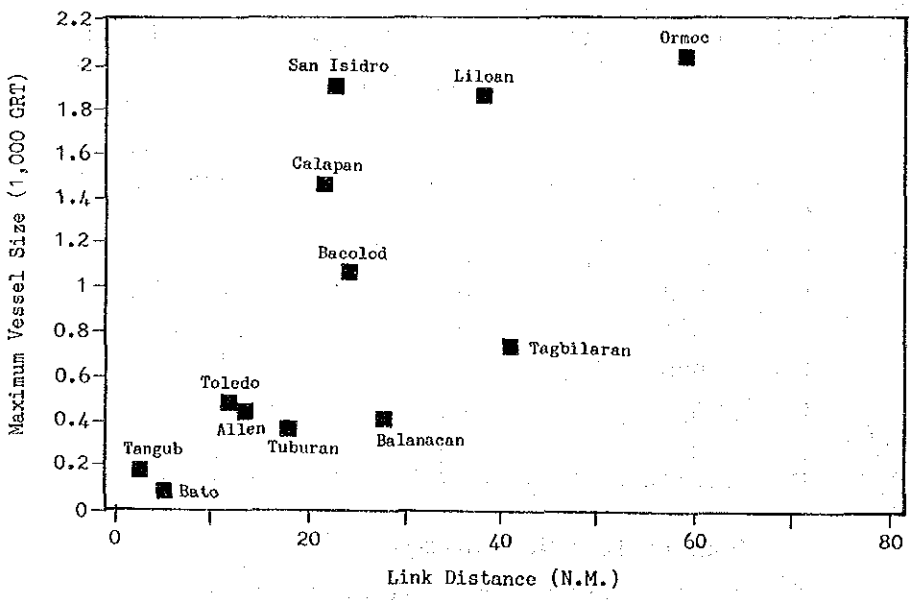


Figure 11-4 Relation between Ferry Vessel Size and Link Distance in the Philippines
Source: JICA Study Team

7. The Ro/Ro candidate ports shall be classified into four (4) groups with respect to the maximum vessel size to be accommodated; 300 grt, 500 grt, 1,000 grt, and 2,000 grt.

As stated earlier, it is observed that large vessels have been plied on long-distance links. JICA study team proposes that the Ro/Ro terminal ports with link distances of more than 50 NM have berths that can accommodate 2,000 grt.

8. For the ferry-distance links, service frequency should be increased. It can be safely assumed that the percentage of on-board time during total trip time is small or the total trip time itself is small for the ferry-distance passengers. Therefore, the passengers will be irritated when they are kept waiting. Good service for passengers of the ferry-distance links requires an increase in service frequency, rather than an increase in vessel capacity.

JICA study team suggests that Ro/Ro terminal ports with link distances of less than ten (10) NM have berths that can accommodate 300 grt.

9. Vessel size also has a relationship with the volume of traffic demand as shown Figure 11-4. For Ro/Ro ports with links between 10 NM and 50 NM, it is suggested that the planned vessel size varies according to the volume forecast.

The Ro/Ro vessel size for the purpose of port facility planning is summarized as shown in Table 11-2.

Table 11-2 Proposed Standard on Ro/Ro Vessel Size

(GRT)

Distance / Cargo Volume (MT)	less than 10 NM	10 - 50 NM	more than 50 NM
More than 100,000	300	2,000	2,000
20,000 - 100,000		1,000	
Less than 20,000		500	

Source: JICA Study Team

10. Figure 11-5 shows the ranges in size of the planned vessels derived from Table 11-2 and existing vessel size on a plane with two axes, i.e., link distance and cargo volume.

It is clear from the Figure that the proposed standard reflects the existing situation or suggests one rank higher for almost all cases.

11. For some cases, however, the existing vessel size is larger than the proposed one. For example, a 1,866 grt Ro/Ro vessel has been plied on Liloan-Lipata link while Table 11-2 proposes a 1,000 grt Ro/Ro vessel for the said link in light of its traffic volume.

It is neither practical nor wise to replace the existing vessel with a smaller vessel. Also, it should be noted that the proposed standard cannot reflect all the items to be considered. Each link has its own characteristics.

JICA study team suggests, therefore, to compare the existing vessel size with the proposed one derived from Table 11-2, and adopt the larger size as the planned vessel size for the purpose of port facility planning.

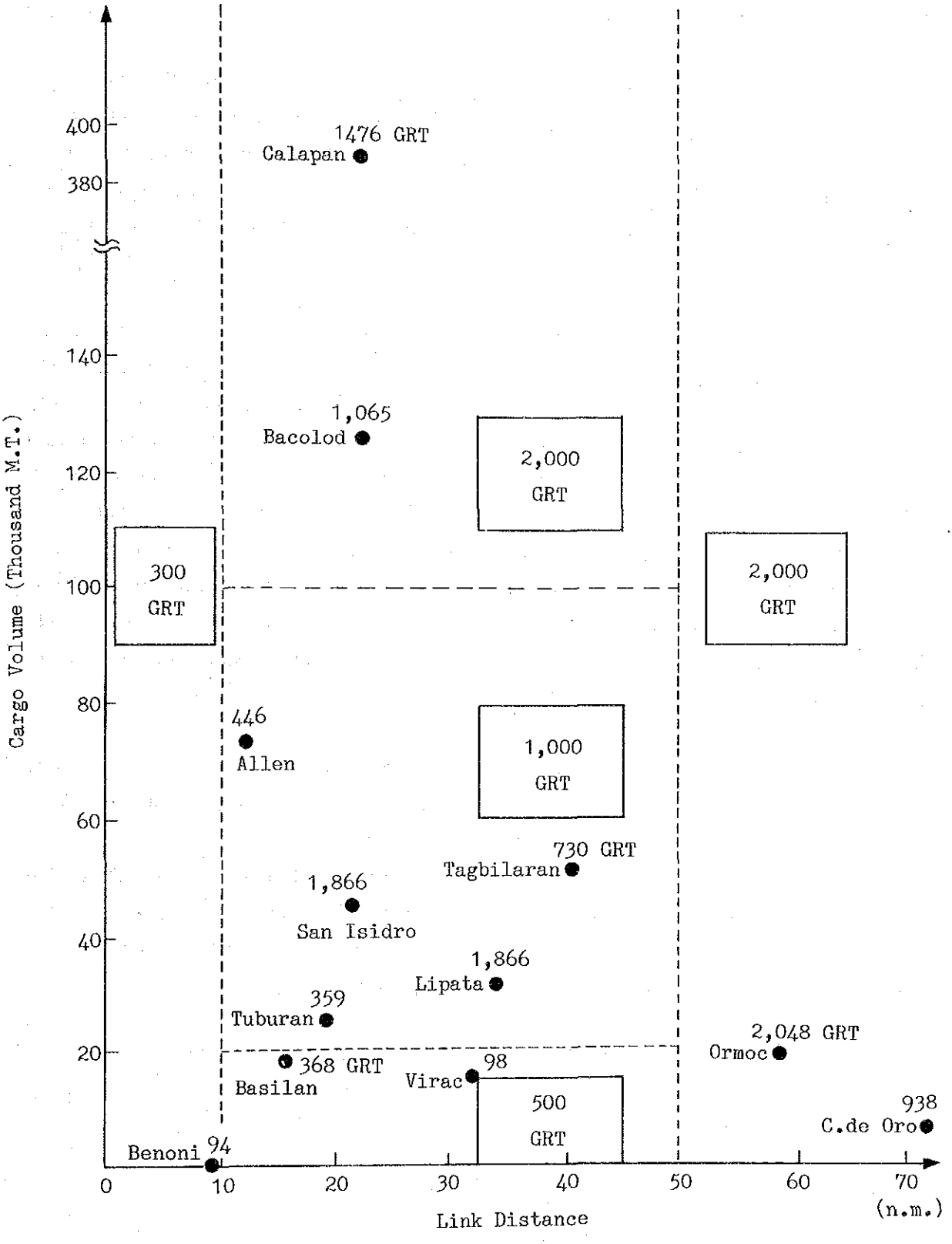


Figure 11-5 Comparison of the planned and Existing Vessel Size in the Philippine

Source: JICA Study Team

C. Capacity of Ro/Ro Vessels by Size

12. It is necessary to set up cargo and passenger capacity of Ro/Ro vessels by size to propose vessel operation plans and port facility plan. Number of voyages is directly linked with the vessel capacity if traffic demand is given. Size of the port facility is also linked with vessel capacity. For example, required area of passenger terminal should reflect the passenger capacity of the calling vessel.

13. One of the reliable methods in determining the vessel capacity is to examine the capacity of the present fleet of the same type. However, little information exists on the net cargo capacity of Ro/Ro vessels because available port statistics usually count weights of transportation equipment as cargo and therefore are misleading.

14. Only Batangas PMO has been publishing cargo statistics which separate net cargo weights from empty vehicle weights. It is reported that the Batangas-Calapan route captured a large amount of freight as well as passenger traffic. Therefore, it is appropriate to analyze the Batangas-Calapan link to ascertain freight capacity of Ro/Ro vessels.

15. JICA study team analyzed the shipping and cargo statistics of the first 50 vessels that called Calapan Port from Batangas Port in March 1990 to determine the net freight capacity of Ro/Ro vessels.

The results of the analysis are shown in Table 11-3. Discharged and loaded cargo tonnages at Calapan Port are almost even, and net cargo accounts for about 50 percent of the total cargo tonnage recorded. A 1,000 class Ro/Ro vessel is transporting about 54 tons of net cargo per voyage.

Table 11-3 Net Cargo Tonnage Transported by Ro/Ro Vessel

(Unit: ton)

GRT	Nr. of Vessels	Total Cargo Tonnage		Empty Vehicle		Net Cargo	
		in	out	in	out	in	out
~ 500	14	51	55	24	25	28	30
~ 1,000	25	130	117	66	53	64	63
~ 1,500	11	107	103	44	38	63	65

Source: JICA Study Team,
Compiled from PPA Monthly Report of Calapan Port.

16. It is also possible to estimate the net cargo tonnage transported by a Ro/Ro vessel per voyage.

Figure 11-6 shows an empirical relationship between GRT and the car deck area in Japanese Ro/Ro fleet. In this study the car deck areas by vessel size are assumed as shown in Table 11-4.

Table 11-4 Car Deck Area

GRT	Car Deck Area
300	300 m^2
500	400 m^2
1,000	600 m^2
2,000	900 m^2

Source: JICA Study Team

17. JICA study team assumes the following allocation ratio among car types of the car deck of the Ro/Ro vessel in the year 2010, putting on emphasis on freight traffic;

Bus	20 %
Passenger Car	20 %
Truck (8 ton)	30 %
Jeepney	30 %

Jeepnies are considered to be cargo transport equipment based on the actual practice observed in the Philippines as shown in Photo 11-1.

Photo 11-1 Jeepnies are Main Means for Cargo Transport (Batangas Port)

The car deck area of each car type can be divided according to the occupancy area of each car type shown in Table 11-5 to get the possible number of cars on the deck. Then, the maximum amount of cargo loaded on the vehicles on the deck can be calculated. 65 percent is adopted as an average annual load factor. Table 11-6 summarizes this calculation, and the proposed figures in the Table are basically in agreement with the recorded figures on the Batangas-Calapan link shown in Table 11-3.

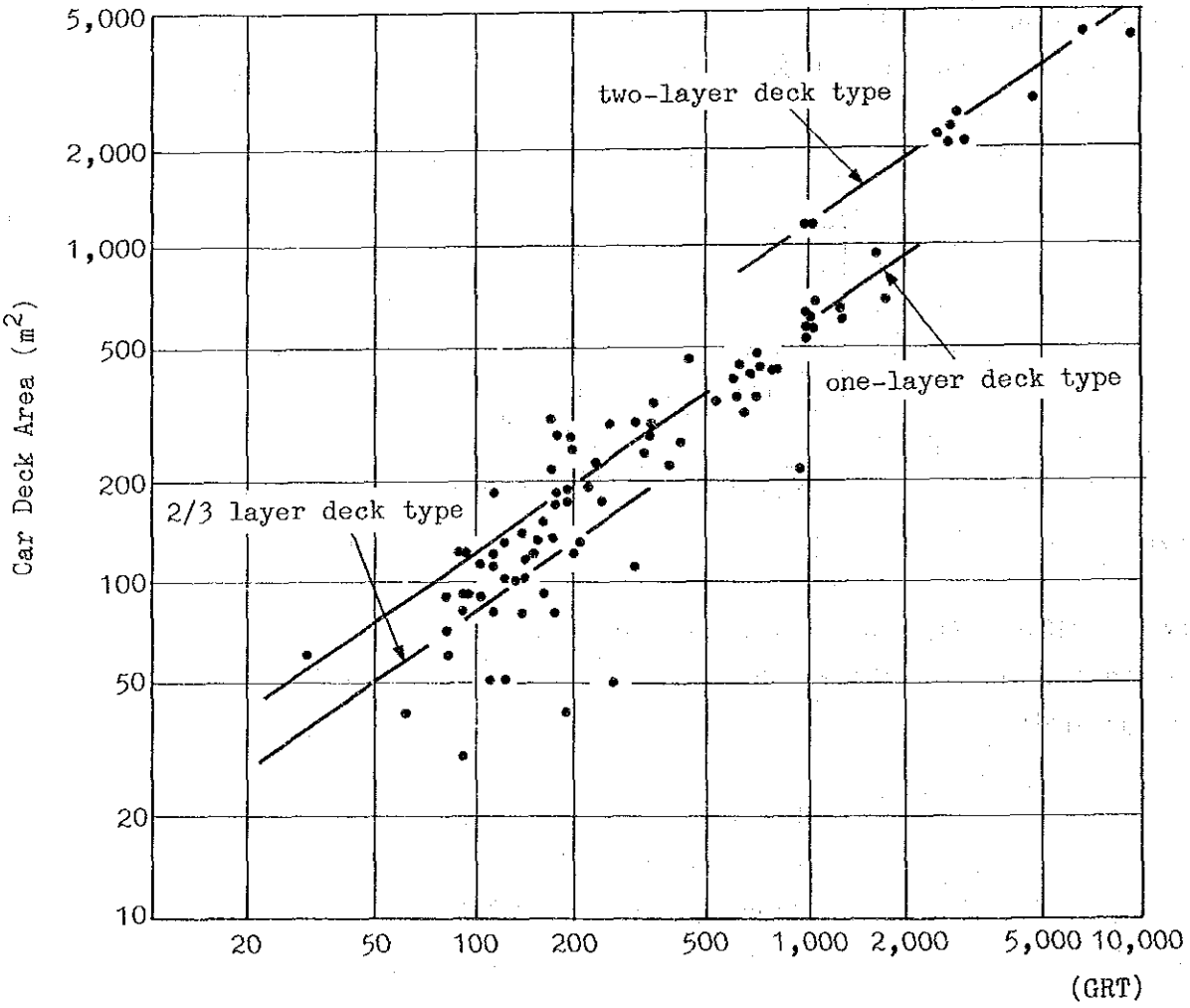


Figure 11-6 Relation between GRT and Car Deck Area
Source: Study on Design Conditions of Car Ferries

Table 11-5 Occupancy Area by Car Type

Car Type	Length x Width (m)	Occupancy Area (m^2)	Ratio
Bus	10.5 x 2.5	32.4	1.13
Passenger Car	4.7 x 1.7	11.0	0.38
Mini Car	3.0 x 1.3	5.9	0.21
Small Truck	4.7 x 1.7	11.0	0.38
Truck 8 ton	10.0 x 2.5	30.9	1.00
Truck 6 ton	8.5 x 2.5	26.4	

Source: Study on Design Conditions of Car Ferries

Table 11-6 Planned Net Cargo Transported by a Ro/Ro Vessel

(Unit: ton)

	300 GRT	500 GRT	1,000 GRT	2,000 GRT
Car Deck Area (m^2)	300	400	600	900
Bus (m^2)	60	80	120	180
Passenger Car (m^2)	60	80	120	180
Truck 8 ton (m^2)	90	120	180	270
Jeepney (m^2)	90	120	180	270
Number of Vehicles by Type				
Bus	2	3	4	6
Passenger Car	6	7	11	16
Truck (8 ton)	3	4	6	9
Jeepney (2 ton)	9	11	16	25
Maximum Cargo loaded	42t	54t	80t	122t
65% Load Factor	27.3t	35.1t	52.0t	79.3t

Source: JICA Study Team

18. Regarding the passenger capacity, sufficient information is not available because many Ro/Ro vessels operating in the Philippines are plied on long-distance links, and their size are usually over 2,000 GRT.

Information on passenger capacity of Ro/Ro vessel in Indonesia is, therefore, supplemented and shown in Figure 11-7, together with the Philippine counterpart.

JICA study team assumes the passenger capacity of the Ro/Ro vessels by size as follows;

300 GRT	300 passengers
500 GRT	500 passengers
1,000 GRT	800 passengers
2,000 GRT	1,000 passengers

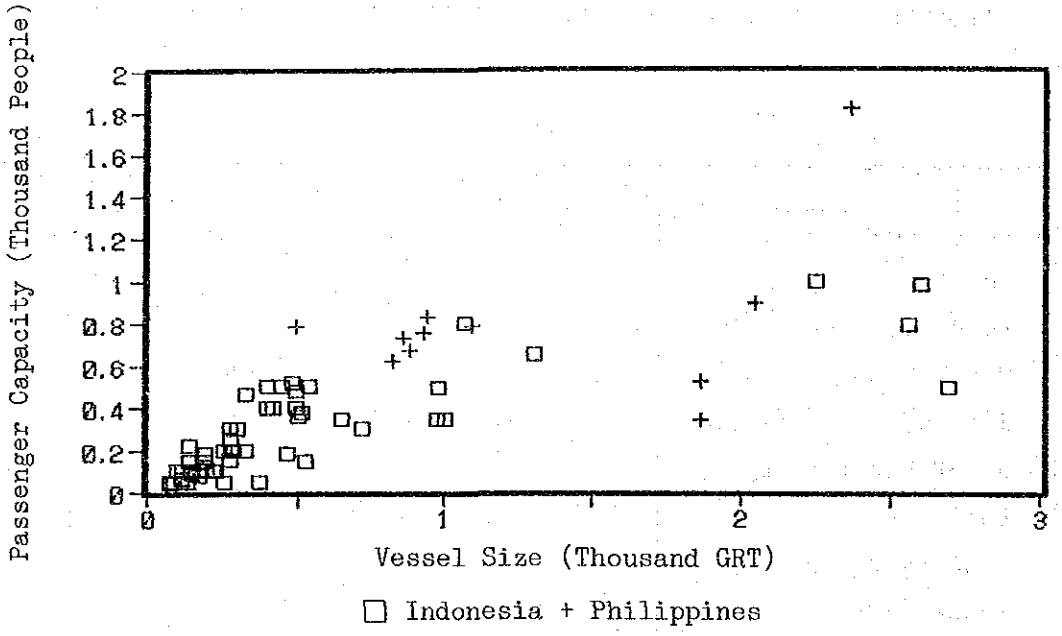


Figure 11-7 Passenger Capacity

Source: JICA Study Team

D. Evaluation of the Study Links

19. As discussed in the previous chapter, the 42 candidate links are classified into three (3) groups based on the point-mark system.

A new problem to be defined is whether all of the 42 candidate links have high potential as Ro/Ro links. This is especially serious for links in the 3rd priority.

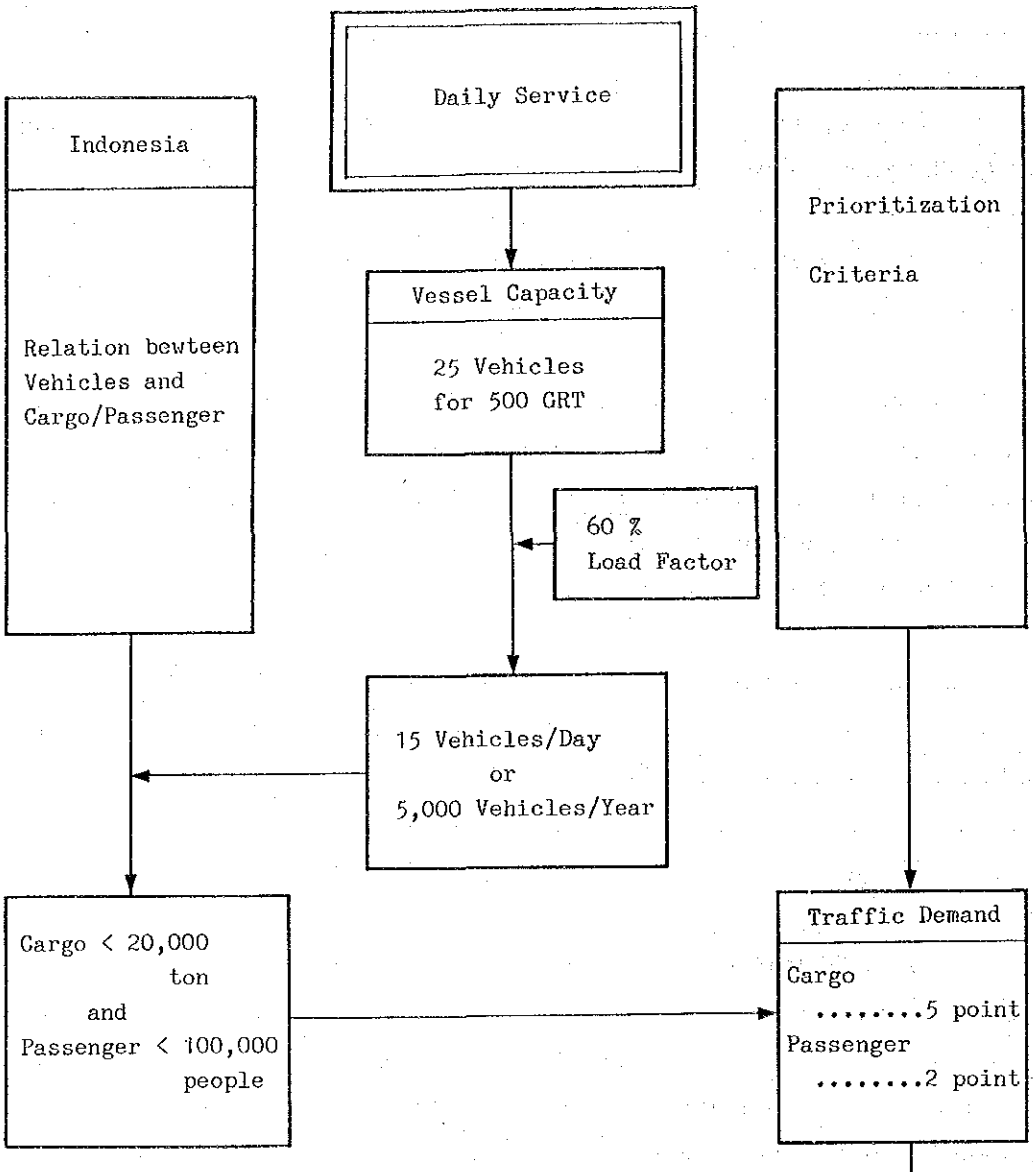
20. It is quite difficult and time consuming work to appraise each link from the view point of feasibility and profitability of the project. However, some empirical data and careful analysis can be helpful to get a preliminary indication about necessary conditions for the feasibility of the project if a consensus can be reached on the basic assumptions.

21. One basic assumption is that Ro/Ro ferry links should have a minimum daily service. Customers prefer daily service to non-daily service, as it makes scheduling much more convenient. Each link of the Ro/Ro ferry network should at least offer daily service. The assumptions and process of the analysis are shown in Figure 11-8.

22. A 500 GRT Ro/Ro vessel, which is the smallest size used for a shipping distance of more than ten (10) NM in this particular study, has a boarding capacity of 25 vehicles as shown in Table 11-6. Using a 60 per cent load factor, 15 vehicles are on board on average. The number of vehicles per year transported by a vessel offering one round trip a day is about 5,000 one way, or 10,000 return.

23. According to a report compiled by a JICA adviser to Indonesia, a total of 35 ferry links as shown in Figure 11-9 were in operation as of 1990 in Indonesia. Numbers of vehicles transported by ferry vessels on each link as well as passenger and cargo traffic have been investigated and presented in Figure 11-10. Numerical numbers placed above the circles and triangles in the Figure represent vehicles transported on each link.

24. The next step in the analysis is to find a relationship between vehicle traffic and cargo/passenger traffic. In the Figure 11-10, all of the links which have a vehicle traffic of less than 10,000 fall in the area of less than 40,000 tonnes of cargo on the x-axis and less than 200,000 passengers on the y-axis.



The 3rd Priority Group			
21. Cavite	Mariveles	15	6
33. Mathog	Masbate	5	2
42. Ajuy	Manapla	10	4
30. Davao	Babak	10	2
27. San Jose	New Washington	5	2
5. Argao	Loon	10	2
32. Roxas	New Washington	5	2
39. Lucena City	Santa Cruz	10	4
29. Ubay	Maasin	10	4
7. Carmen	Isabel	5	2
40. Dumaguete	Larena	5	2
31. Roxas	Odiongan	5	2
35. Jagna	Mambajao	5	4
26. Milagros	Estancia	5	2

Figure 11-8 Evaluation Process for Daily Service

Source: JICA Study Team

25. Traffic on each link is expressed by the two-way traffic in the Figure 11-10. One-way traffic can be approximated by halving these figures. Therefore, it can be said that if the forecast one-way link traffic falls into the following category, then it is difficult for the link to economically maintain daily service by a 500 GRT Ro/Ro vessel;

Cargo < 20,000 tonnes/year

and

Passengers < 100,000 people/year

26. The criteria on cargo and passenger traffic discussed in the foregoing paragraph coincides with the lowest class in the traffic demand in the prioritization criteria discussed in the paragraphs 37 and 38 in Chapter 10.

Five (5) points are given to links with less than 20,000 tonnes of cargo, and two (2) points to links with less than 100,000 passengers.

27. The links which received five (5) points for cargo traffic and two (2) points for passenger traffic can be found in the Table 11-1. Seven (7) links, such as Milagros-Estancia and Roxas-Odiongan, meet the above mentioned criteria.

All seven (7) links fall under the 3rd priority group, which is comprised of 14 links each with a total of less than 45 points.

28. JICA study team has declined to propose the 12 links of the 3rd priority group as prosperous Ro/Ro links to be developed by the year 2010. One the other hand, the links of the first priority group should be developed or improved because they are highly favored as Ro/Ro links.

As to the links belonging to the 2nd priority group, further careful appraisal is recommended. Some links of this group will play very important roles in formulating a nationwide Ro/Ro network such as Dumaguete-Dapitan link. On the other hand, a considerable investment will be required to develop all of the links in this class. Therefore, careful investigation on future traffic demand and change of people's preference about traffic mode is suggested.

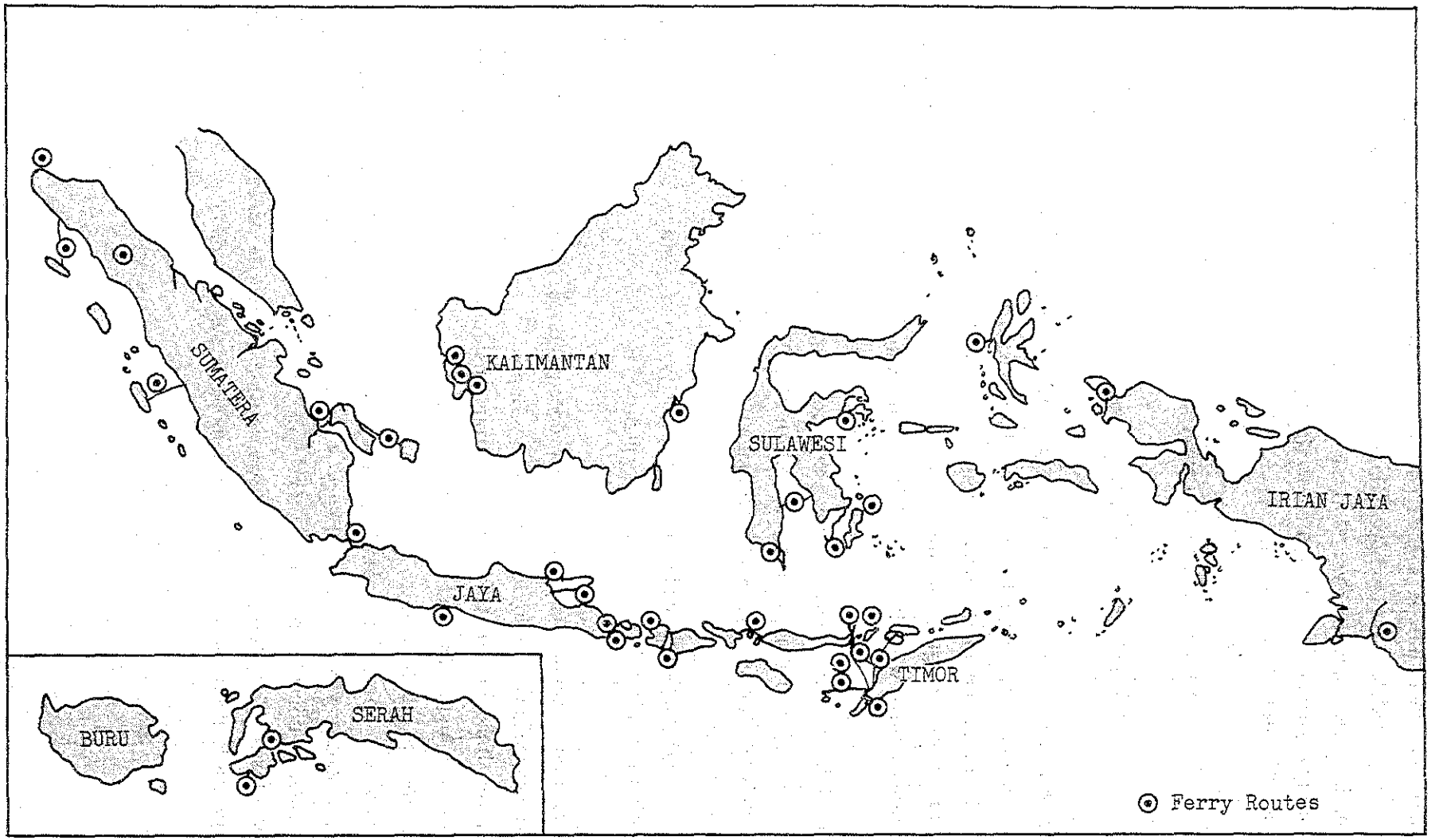


Figure 11-9 Ferry Links in Indonesia

Source: Ferry Transportation in Indonesia
JICA Adviser's Report, 1990

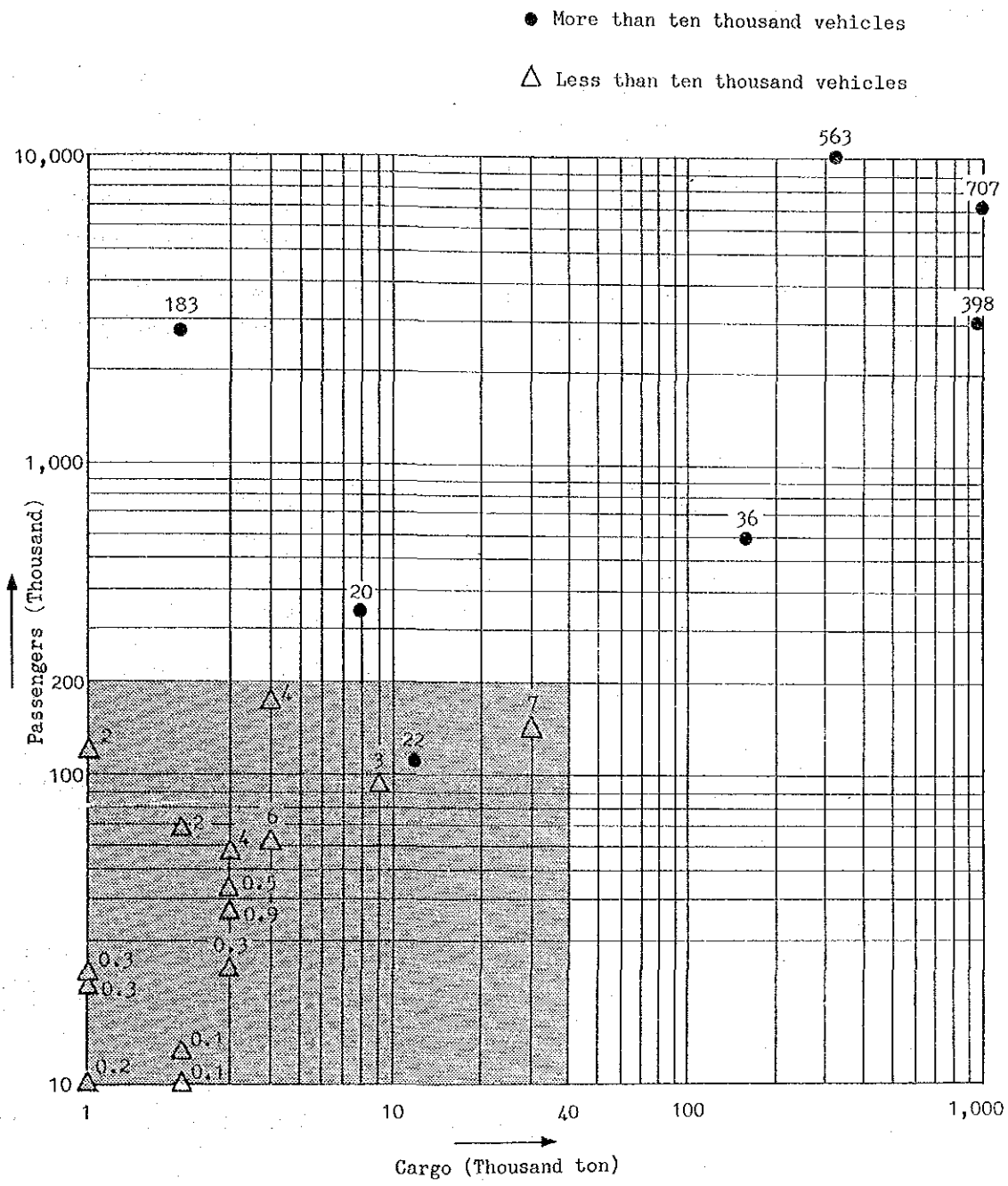


Figure 11-10 Vehicle, Cargo and Passenger Traffic on Ro/Ro Links in Indonesia
Source: Compiled from Ferry Transportation in Indonesia

E. Ro/Ro Vessel Operation Plan

Factors in Forming Operation Plan

29. In this section Ro/Ro vessel operation plan which will be set forth as a premise of facility planning is described. This operation plan is stereotyped model based on the vessel sizes and capacity which were discussed in Section B and C. Taking main items described above into consideration, JICA study team establish following criteria in forming an operation plan of vessels which serve each link.

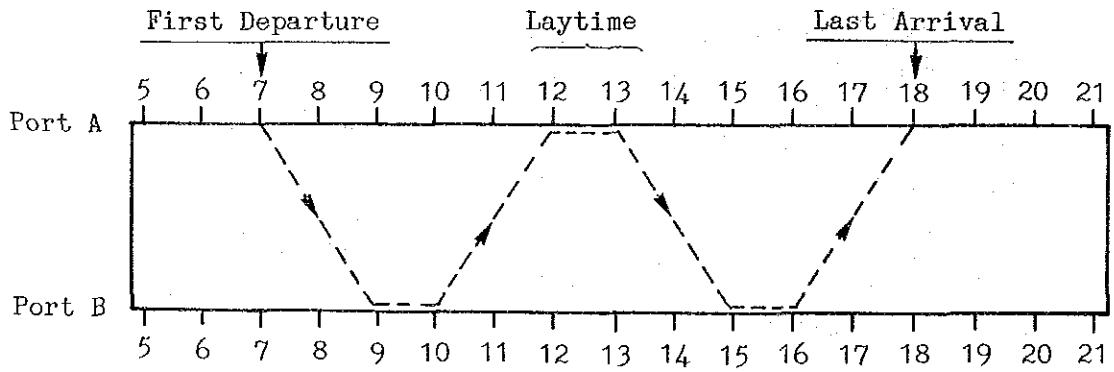
1) Service speed and lay time:

grt.	service speed	lay time
2,000	14KT	60 minutes
1,000	13	40
500	12	30
300	11	30

2) Service frequency:
show daily number of one way voyages form Port A to Port B offered for each link.

3) Working days:
show total number of annual available working days for each vessel. JICA study team set it for 340 days per year,which means 25 days will be docking term for inspection and/or repairing and others.

4) Sailing schedule:
will be indicated using a diagram for each link in Table A-1-11-1 in Appendices. A model of the diagram is shown below.



Operation Plan of Each Link

30. Details of operation plan of vessels which serve each link are indicated in Table 11-7 and Table 11-8. These tables indicate the volume of cargo and passenger to be handled by each link including the number of vessels and berths that will be needed in the services. Where there are many discrepancies between the volume of cargo and passenger to be carried on certain links, transportation of cargo is given priority over that of passenger so as to make the sailing schedule since overflown passengers may be carried by conventional passenger vessels.

Table 11-7 Ro/Ro Vessel Operation Plan(1)

Service Links		Distance n.m	Frequency	First departure/Last arrival time	time
1.Matnog	Allen	13.5	7.0	07:00x2	20:00x2
2.Matnog	San Isidro	22.0	4.0	05:00	22:40
3.Batangas	Calapan	22.0	31.0	see attached diagram	
4.Liloan	Lipata	38.0	2.5	05:00	22:45
6.Escalante	Tuburan	18.0	3.0	07:00	19:20
8.Tandayag	Bato	4.5	2.5	10:00	14:30
9.Tubod	Tangub	3.0	14.0	07:30x2	18:40x2
10.Iloilo	Bacolod	24.0	12.0	05:00x2	20:00x2
				06:20x2	21:20x2
11.Iloilo	Pulupandan	25.0	3.0	07:30	22:50
12.Iloilo	Jordan	4.5	10.0	07:00x2	16:30x2
13.Toledo	San Carlos	12.0	6.0	08:00x2	19:00x2
14.Cebu City	Tubigon	22.0	7.0	05:00x2	21:50x2
15.Dumaguete	Santander	4.5	8.0	06:00	20:30
16.Dumaguete	Dapitan	43.0	2.0	06:00	21:20
17.Jagna	Cagayan de Oro	72.0	1.0	07:00	18:20
18.Zamboanga	Basilan	16.0	3.0	08:00	17:20
19.Zamboanga	Jolo	83.0	3.0	05:00	18:00
				06:00	19:00
				07:20	20:00
21.Cavite	Mariveles	26.0	3.0	07:00x2	17:00x2
22.Batangas	Abra de Ilog	25.0	2.0	08:00	18:00
23.Lucena	Balanacan	28.0	4.0	07:00x2	18:00x2
24.Tabaco	Virac	34.0	4.0	06:00x2	18:40x2
25.Bulan	Masbate	43.0	2.0	07:00	18:20
28.Cebu City	Ormoc	59.0	3.0	05:00x2	20:15x2
30.Davao	Babak	6.0	4.0	08:30x2	16:10x2
34.Cebu City	Talibon	30.0	3.0	08:00	16:20
36.Benoni	Balingoan	8.0	2.0	09:00	12:15
38.Cebu City	Tagbilaran	41.0	8.0	05:00x2	20:00x2
				07:00x2	22:00x2
41. Guihulngan	Dumanjug	9.0	8.0	08:00x2	18:10x2

Source: JICA Study Team

Table 11-8 Ro/Ro Vessel Operation Plan(2)

Service Links		Cargo(mt)	Passenger	Note
1.Matnog	Allen	188,734	2,380,000	2 vessels
2.Matnog	San Isidro	107,848	1,360,000	
3.Batangas	Calapan	835,822	10,540,000	10 vessels/3 berths
4.Liloan	Lipata	67,405	850,000	
6.Escalante	Tuburan	53,040	816,000	
8.Tandayag	Bato	23,205	255,000	
9.Tubod	Tangub	129,948	1,428,000	2 vessels
10.Iloilo	Bacolod	323,544	4,080,000	4 vessels/2 berths
11.Iloilo	Pulupandan	53,040	816,000	
12.Iloilo	Jordan	92,820	1,020,000	2 vessels
13.Toledo	San Carlos	161,772	2,040,000	2 vessels
14.Cebu City	Tubigon	123,760	1,904,000	2 vessels
15.Dumaguete	Santander	74,256	816,000	
16.Dumaguete	Dapitan	35,360	544,000	
17.Jagna	Cagayan de Oro	26,962	340,000	
18.Zamboanga	Basilan	53,040	816,000	
19.Zamboanga	Jolo	80,886	1,020,000	3 vessels
21.Cavite	Mariveles	70,720	1,088,000	2 vessels
22.Batangas	Abra de Ilog	35,360	544,000	
23.Lucena	Balanacan	107,848	1,360,000	2 vessels
24.Tabaco	Virac	70,720	1,088,000	2 vessels
25.Bulan	Masbate	35,360	544,000	
28.Cebu City	Ormoc	80,886	1,020,000	2 vessels
30.Davao	Babak	37,128	408,000	
34.Cebu City	Talibon	53,040	816,000	2 vessels
36.Benoni	Balingoan	18,564	204,000	
38.Cebu City	Tagbilaran	215,696	2,720,000	4 vessels
41.Guihulngan	Dumanjug	74,256	816,000	2 vessels

Source: JICA Study Team

F. Ro/Ro Port Facility Plan

General

31. In this section, planning guidelines are presented. Although each study port has its own site conditons, traffic characteristics and other factors affecting the port master plan, standardized planning guidelines shall be applied to each port.

32. The purpose of the port facility planning is not to set up future development plan of Ro/Ro facilities at each port in detail, but to facilitate the cost estimation of the conceptual nationwide Ro/Ro transport network plan.

33. A port facility plan for each individual port should be carried out separately based on the latest information on socioeconomic indicators and accurate data on natural conditions when circumstances have matured.

Photo 11-2 Busy Pier on Arrival of a Ro/Ro Vessel (Port of Abra de Ilog)

34. The planning guidelines presented here are to serve as standards in determining the scale and dimension of Ro/Ro facilities. The size of each facility shall be in accordance with the dimensions of vessels to be accommodated.

35. Considering characteristics of Ro/Ro traffic in the Philippines, the guidelines are designed to meet normal traffic rather than peak-period traffic. Photo 11-2 and 11-3 show some characteristic of this type of transportation.

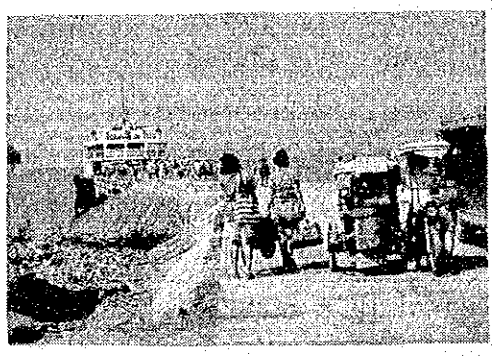


Photo 11-3 After ten (10) Minutes (Port of Abra de Ilog)

Pier

36. Pile supported concrete structure is used for berthing facilities with the width of superstructure by 10 m and 12 m for 300/500 grt vessel and 1,000/2,000 grt vessel, respectively. Basic dimensions of pier for scheduled vessels are shown in Table 11-1. The width of the pier is determined in the following manner;

37. (Width of vehicle lane)

According to the design standard of the Philippine (NSCP; National Structural Code of the Philippines), clearance and road lane width is defined as 3.05 m for one lane. Where two lanes for the passage of a vehicle are required, 6.10 m (3.05 m $\times$ 2 lane) is applied for the vehicle lanes.

38. (Width of passenger way)

Number of passengers varies according to the size of Ro/Ro vessels. A bigger vessel will transport a larger number of passengers, thus the width of passenger way is classified into two (2) groups : 1.5 m for 300/500 grt vessels and 3.0 m for 1,000/2,000 grt vessels.

39. (Structural clearance)

Bitts and bollards will be installed on top of the superstructure of berthing pier. Structural clearance for these accessories is given as 1.0 - 1.5 m from the face line of pier.

40. (Fender)

Rubber fenders will be provided to absorb berthing energy of vessels. Size of fender is 300H, 300H, 400H and 500H for 300grt, 500grt, 1000grt and 2000grt vessel respectively.

41. (Clearance for safety)

For the sake of safety of vehicle movement on the RC deck of the pier, clearance in set at 1.0 -1.5 m

42. Standard section of RC pier for 300/500 grt and 1,000/2,000 grt are shown in Figure 11-11.

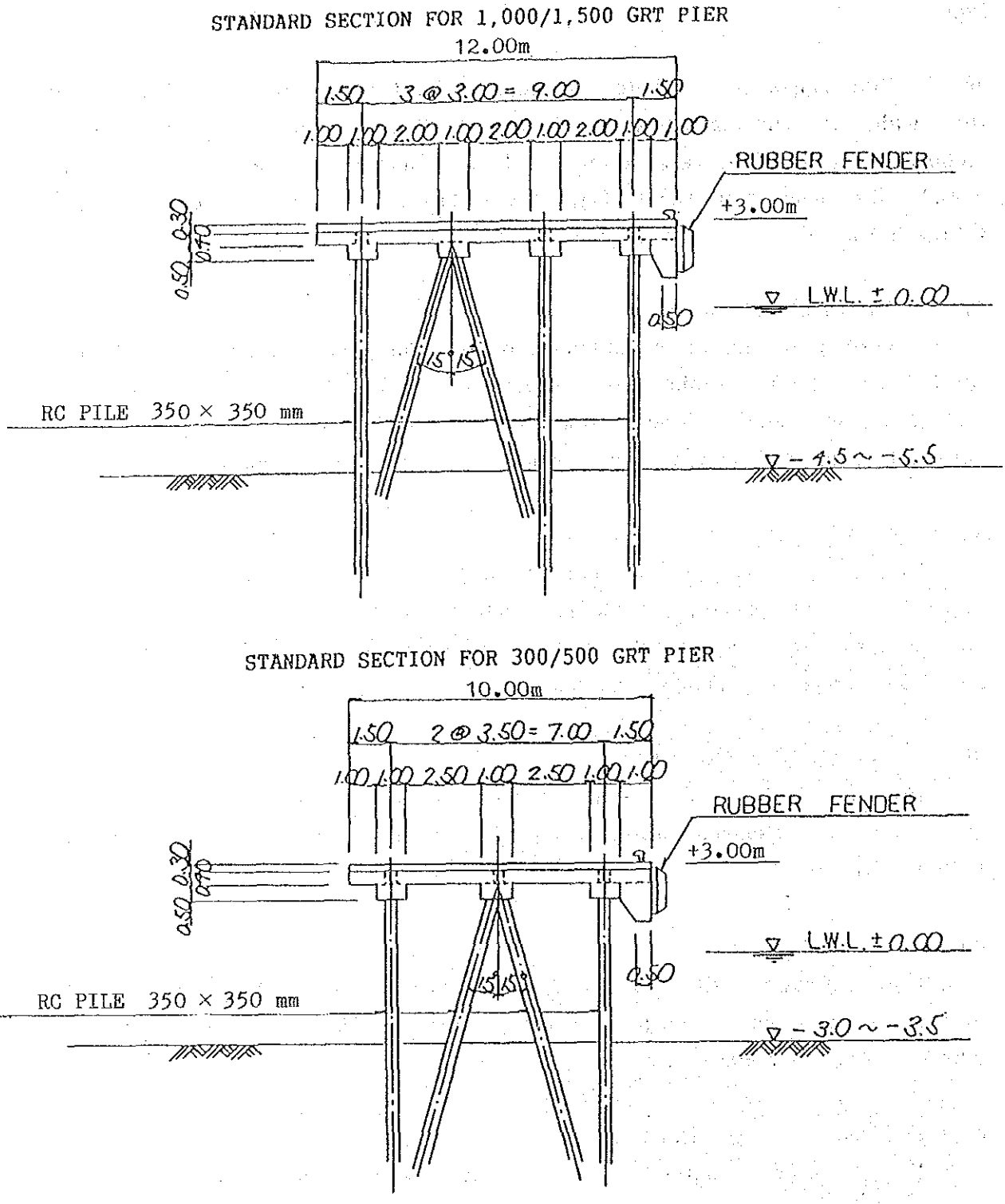


Figure 11-11 Standard Section of RC Pier
Source: JICA Study Team

Ro/Ro Ramp

43. Ro/Ro ramps can be classified into two(2) types, namely fixed type and movable type. According to the International Study Commission of PIANC, some indexes are specified in the recommendations as follows:

- Connection between Ship and Terminal
  - i) Where the water level variation is less than ±0.75m from the Mean Water Level (MWL), provide fixed shore ramp or incline for receiving ship ramp, where necessary.
  - ii) Where the water level variation exceeds ±0.75 m from MWL, provide shore facilities such as bridge ramp and ancillary equipment to reduce the net range of water level / bridge ramp variation.
  - iii) The maximum gradient of the bridge ramp or fixed shore ramp should not exceed 1 in 10 (or 1 in 8, in exceptional circumstances).
  - iv) The clear width of the bridge ramp between curbs should not be less than:
    for single lane traffic 5.0 m
    for two lanes traffic 7.0 m

- Fendering

  Adequate fendering on the berthing face should be provided to ensure the vessels can berth and lie alongside safely.

44. The major item for selection of structural type of shore ramp is the water level variation. As an application of the above mentioned reference, it is necessary to provide the movable shore ramp to study ports where water level variation is more than 1.5 m (±0.75 m). Fixed shore ramp, however, can be applied by the following relation (shown in the Figure 11-12) to a water level variation of more than 1.5m. Usually, a fixed ramp is cheaper and its maintenance is easier than a movable ramp. Therefore, a fixed ramp is adopted for each Ro/Ro study port.

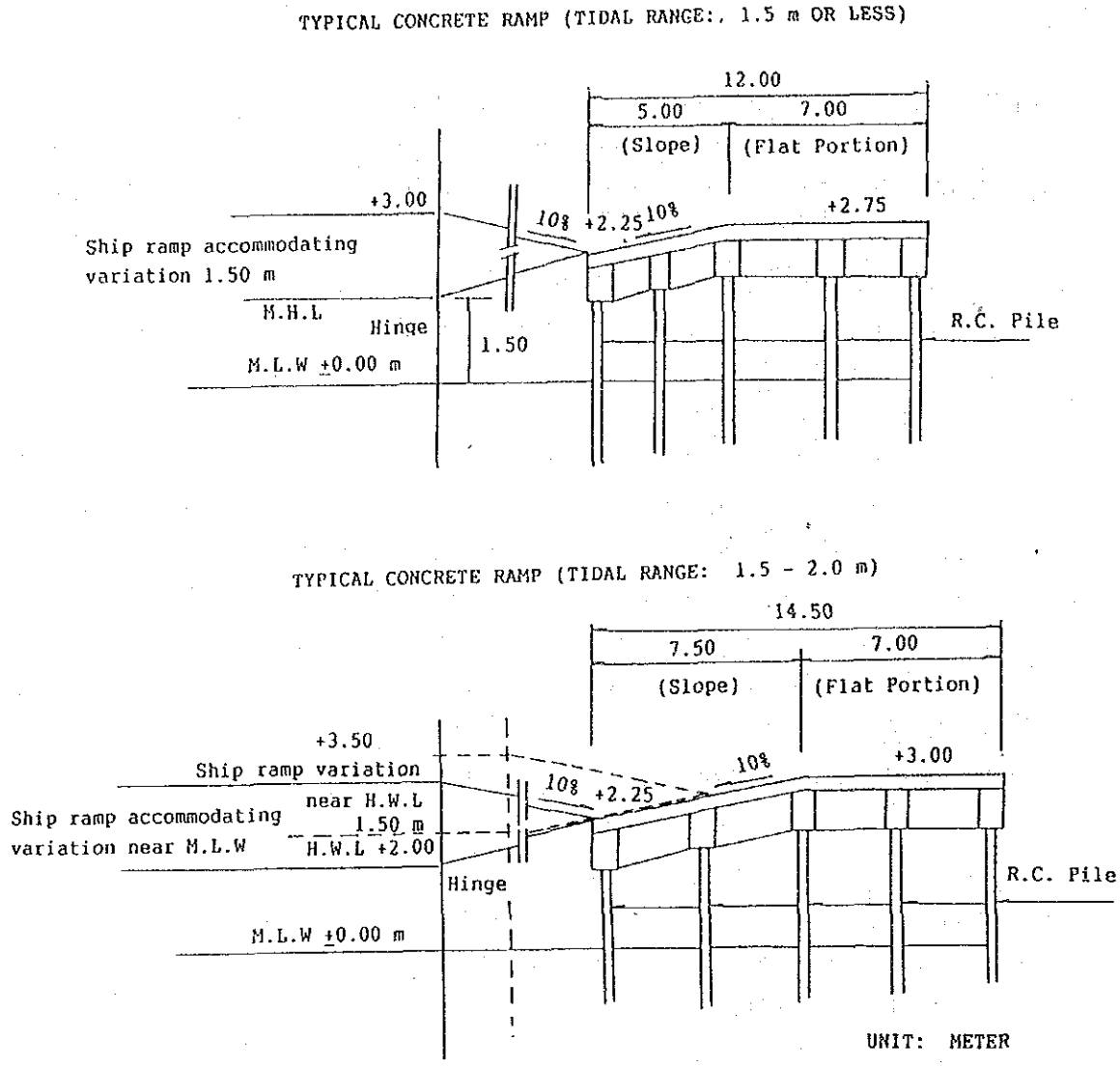


Figure 11-12 Sketch of the Application of Fixed Ramp
Source: JICA Study Team

45. For the length of the flat portion of fixed ramp, Japanese standard was applied. This length is also able to accommodate the vehicle which specified in NSCP as a design condition. The length of the vehicle is 4.27 m at its wheel base. Location and width of the shore ramp were examined considering the size of the vessel, the dimensions of ship ramp and height of the fender on the berthing pier.

46. This study introduce four vessel sizes: 300, 500, 1,000 and 2,000 grt, widths of which are 10.5 m, 12.3 m, 14.3 m and 17.1 m, respectively.

47. Figure 11-13 shows the relation between berthing pier and Ro/Ro vessel. Location of the center line of the shore ramp, that is, the distance between center line of shore ramp and face line of the berthing pier is defined as 1/2 width of vessel plus fender height.

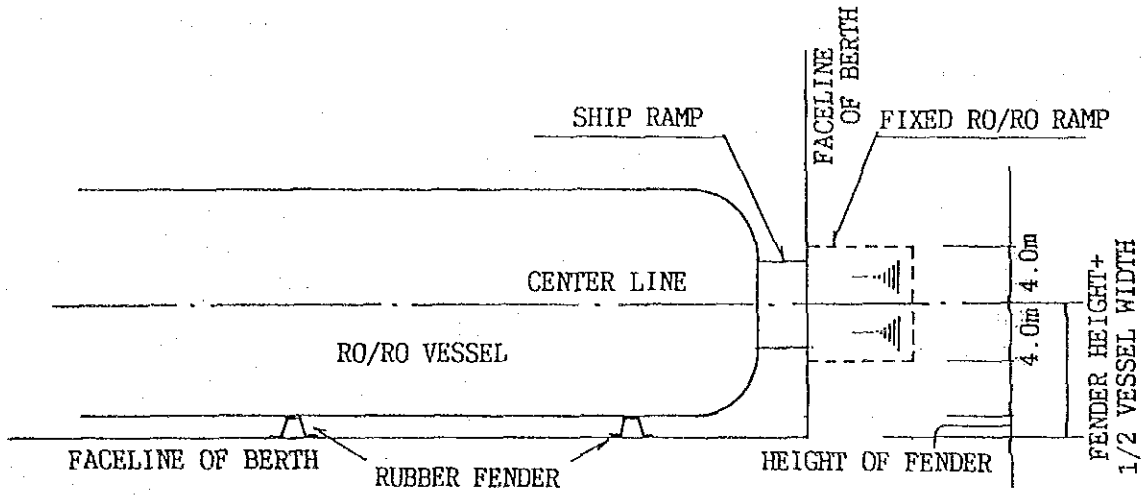


Figure 11-13 Sketch of the Required Width of Ro/Ro Ramp
Source: JICA Study Team

48. Width of the shore ramp is determined by the size of ship ramp. The width of ship ramp varies from ship to ship and there is no general relation between the size of veseel and ship ramp width. To analyze this point, widths of ship ramps of Ro/Ro vessels which currently call on Iloilo port are shown below:

Table 11-9 Dimensions of Ro/Ro Ship Ramps

Vessel name	Length	Beam	Ro/Ro Ramp			
			AFT		FORE	
			L	W	L	W
STA ANA	188.0	20.4	7.3	6.0	6.0	3.7
STA FLORENTINA	108.0	20.6	5.2	7.2	10.7	4.2
STA MARIA	68.8	12.6	5.2	7.5	Closed	
SUPER FERRY	132.0	20.0	15.0	4.5	7.5	5.6

Source: PMO PPA Iloilo survey

49. Maximum width of ship ramp on the above reference is 7.50 m. Other examples in Japan and Asian countries also show that vessels usually have a ship ramp with a width of equal or less than 7.5m. Thus, the width is set at 8.0 m including allowance.

Dimensions of the Ro/Ro shore ramp are shown in Table 11-10 corresponding to the planned vessel sizes.

Table 11-10 Dimension of Ro/Ro Ramp

Size of vessel (GRT)	Dimension of Ro/Ro ramp	
	Width(m)	Length(m)
300	11.05	14.5
500	11.95	14.5
1000	13.05	14.5
2000	14.55	14.5

Source: JICA Study Team.

50. (Waterway)

Waterway consists of a channel and water basin for maneuvering of vessels. Required water depth for each class of scheduled vessels is as follows;

Planned Vessel Size (GRT)	Required water depth (from MLLW)
300	-3.0 m
500	-3.5 m
1,000	-4.5 m
2,000	-5.5 m

51. (Access way)

Access ways to connect the Ro/Ro terminal land area and offshore berthing facilities are provided where necessary. Structural type of access way is rock causeway or RC trestle (pile supported structure), one or both are applied to the structure depending on the sea bed condition. The width of the access way is defined as 7.0 m with two vehicle lanes (3.05 m x 2 = 6.10 m) plus a passenger way (about 1 m).

52. (Terminal Building)

Terminal building includes passenger waiting area for departure, office and others such as canteen, public toilet and ticketing booth. Taking into consideration the load factor, utilization rate and other factors, the proposed areas for passenger terminals are presented below. A waiting shed is necessity for passangers, both in rainy season and summers seasons, as shown in Photo 11-4

Photo 11-4 Shade for Passengers (Port of Benoni)

Planned vessel (GRT)	Required area (m^2)
300	250
500	400
1,000	500
2,000	600

53. Detailed process for calculation of the terminal building is presented in Table A-1-11-2 in Appendices.

54. (Parking Area)

Parking lots should have sufficient area both for vehicles ready for rolling on and for vehicles waiting for landing passengers. As shown in Photo 11-5, shortage of parking space sometimes adversely affects the port operation. Required parking area for the different classes of vessels are as follows;

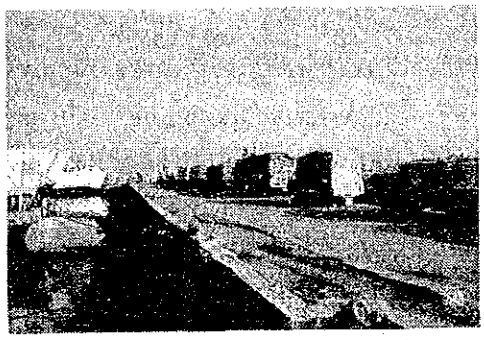


Photo 11-5 Vehicles Parked on the Pier (Port of Batangas)

Planned Vessel Size (GRT)	Required area (m^2)
300	700
500	1,000
1,000	1,500
2,000	2,000

The detailed process for calculation of the parking areas is presented in Table A-1-11-3 through Table A-1-11-6 in Appendices.

55. (Access road)

Access road to port area is one of the major components in entire Ro/Ro transportation system because Ro/Ro traffic can not be considered without vehicle. In this connection, planning and implementation work of Ro/Ro terminal facilities should be coordinate with that of access road in order to develop the advantages and characteristics of Ro/Ro transportation completely.

56. Access road in this study is defined as a road to connect national city/barangay road with port area. National road, provincial road and municipal road which aim to serve residents are not considered as access roads even if they are connected directly with the port. According to the port reconnaissance survey, some access roads are unpaved, while on some the pavement is delapidated. Those access roads are to be rehabilitated based on the DPWH standard.

57. (Electricity, Water supply)

Electricity including lighting for access road and port area, is considered to be provided from the city. Cost of electricity includes construction cost for electricity posts, wiring and small light beacon placed at the edge of berthing pier. Water is also considered to be supplied through the city pipe line. Construction cost includes cost for placing of pipes in the port area. Although fuel supply is important for port operation, fuel will be supplied by a fuel truck outside the port. Cost for the delivery of fuel is not included in the Ro/Ro port facility plan.

Existing Facilities and Required Facilities

58. In order to prepare the development plan for the Ro/Ro ports, present conditions of existing facilities were inspected through the port reconnaissance survey. All of facilities to be rehabilitated or to be newly constructed or to be additionally developed will be evaluated based on the conditions of existing facilities and magnitude of facilities required.

59. The port development outline for each ferry terminal port is examined considering number of links to be serviced. Of all the study ports, followig ports have more than two destinations.

Port (Links)	Destination
Batangas (2)	- Calapan, Abra de Ilog
Matnog (2)	- Allen, San Isidro
Dumaguete (2)	- Dapitan, Santander
Iloilo (3)	- Bacolod, Jordan, Pulupandan
Cebu (4)	- Tagbilaran, Ormoc, Talibon, Tubigon
Zamboanga (2)	- Jolo, Basilan

60. Among these ports, Ro/Ro facilities for Cebu - Ormoc link (for 2000 GRT vessel) can be utilized for Cebu - Talibon link (for 1000 GRT vessel) by adjustment of Ro/Ro vessel operation. Thus, in Cebu port, one berth will be constructed to accomodate vessels both for Cebu-Ormoc and Cebu-Talibon link.

61. Port facilities under other development projects are regarded as being existing and excluded from the list of facilities to be constructed in the Ro/Ro Study. For example, Batangas port will be developed by the OECF project so that additional dredging only will be estimated to provide under this study. Tagbilaran port is also developing under 4th IBRD project, required facilities for this port is prepared to use the existing development plan.

62. Escalante port was found to be duplicated for the nomination by the other projects, and comfirmed to be implemented under Feeder Port Project. Implementation program for Escalante port proposed by Feeder Port Project entails repairing and improving the grouted rock and two Ro/Ro ramp (3.0 m ×

3.0 m × 5.0 m). Although existing Ro/Ro ramp will be rehabilitated by the feeder port project, new fixed Ro/Ro ramp will be scheduled under this study because the existing ramp is located on the beach where water depth is too shallow to accommodate the scheduled vessel (1,000 grt) in this study.

63. The summary of existing and newly required facilities under the Ro/Ro ports study are shown in Table A-1-11-7 in Appendices.

G. Cost Estimation

64. Project cost for each ferry port terminal of links in the Nationwide Master Plan is summarized in Table 11-13 based on the Ro/Ro port facility explained in the foregoing section. Project cost was prepared as follows:

(1) Direct cost; based on the unit price on July 1991, direct constructin cost was computed with the share of foreign currency portion and local currency portion.
(2) Overhead; 6% to the direct cost
(3) Contractor's profit; 10% to the direct cost

Overhead and profit is based on the DPWH Department Order No.30.

(4) V.A.T.; 10% of the total of (1), (2) and (3)
(5) Detail design; Engineering services for detailed design, 8% of the total of (1), (2), (3) and (4)
(6) Supervisory work; Engineering Services for construction supervision, 10% of the total of (1), (2), (3) and (4)

Consultant cost is based on the NEDA BOARD RESOLUTION No.23.

(7) V.A.T.; 10% against the local currency portion of the total

(8) Physical contingency; This item shall be devided into two (2); one is for the

construction, 15% of total of (1), (2), (3) and (4), the other is for the engineeering service, 5% of the total of (5), (6) and (7).

(9) Price escalation is excluded.

65. The assumed shares of foreign and local currency conponents in direct cost are shown in Table 11-12.

Table 11-12 Share of Foreign Portion and Local Portion

Item	Foreign Portion	Local Portion
Berthing	4	6
Waterway	3.5	6.5
Ro/Ro Ramp	4	6
Access Way	4	6
Passenger Shed	3	7
Parking Space	3.5	6.5
Access Road	3.5	6.5
Water supply	5	5
Electricity	4	6

Source: JICA Study Team.

Table 11-13 Summary of Project Cost

(unit in Mil. Pesos)

LINK No.	PORT NAME	CONSTRUCTION COST			E/S *1	PHISICAL CONTI.	FOREIGN CURRENCY	LOCAL CURRENCY	SUB-TOTAL (by LINK)	TOTAL COST
		DIRECT COST	OVERHEAD etc	V.A.T.						
3	BATANGAS	0.8	0.1	0.1	0.2	0.2	0.4	0.9	1.3	2.6
	CALAPAN	0.8	0.1	0.1	0.2	0.2	0.4	0.9	1.3	
10	ILOILO	52.1	8.3	6.0	12.7	10.6	31.7	58.1	89.8	275.3
	BACOLOD	107.6	17.2	12.5	26.3	21.9	72.2	113.2	185.5	
13	TOLEDO	61.1	9.8	7.1	14.9	12.4	39.0	66.4	105.4	178.1
	SAN CARLOS	42.2	6.8	4.9	10.3	8.6	26.1	46.7	72.7	
8	TANDAYAG	19.3	3.1	2.2	4.7	3.9	12.3	20.9	33.2	70.4
	BATO	21.6	3.4	2.5	5.3	4.4	13.7	23.4	37.2	
38	CEBU	18.8	3.0	2.2	4.6	3.8	12.7	19.8	32.5	69.2
	TAGBILARAN	21.3	3.4	2.5	5.2	4.3	12.5	24.1	36.7	
28	CEBU	18.8	3.0	2.2	4.6	3.8	12.7	19.8	32.5	119.0
	ORMOC	50.1	8.0	5.8	12.3	10.2	31.2	55.3	86.5	
3	BATANGAS	0	0	0	0	0	0	0	0	97.9
	CALAPAN	56.8	9.1	6.6	13.9	11.6	34.8	63.1	97.9	
10	ILOILO	52.1	8.3	6.0	12.8	10.6	31.8	58.1	89.9	137.5
	BACOLOD	27.6	4.4	3.2	6.8	5.6	19.0	28.6	47.6	
6	ESCALANTE	31.6	5.1	3.7	7.7	6.4	20.1	34.4	54.5	128.4
	TUBURAN	42.8	6.9	5.0	10.5	8.7	27.3	46.5	73.8	
14	CEBU	15.7	2.5	1.8	3.9	3.2	10.6	16.6	27.1	110.4
	TUBIGON	48.3	7.7	5.6	11.8	9.8	30.8	52.4	83.3	
41	GUIHUKUNGUN	17.6	2.8	2.0	4.3	3.6	10.8	19.5	30.3	64.4
	DUMANJUG	19.8	3.2	2.3	4.8	4.0	12.6	21.5	34.1	
2	MATNOG	19.7	3.1	2.3	4.8	4.0	13.1	20.8	33.9	43.4
	SAN ISIDORO	5.5	0.9	0.6	1.4	1.1	3.5	6.0	9.5	
1	MATNOG	19.7	3.1	2.3	4.8	4.0	13.1	20.8	33.9	106.1
	ALLEN	41.9	6.7	4.9	10.2	8.5	26.5	45.7	72.2	
4	LILOAN	11.9	1.9	1.4	2.9	2.4	7.9	12.7	20.6	41.1
	LIPATA	11.9	1.9	1.4	2.9	2.4	7.9	12.7	20.6	
16	DUMAGUETE	16.1	2.6	1.9	3.9	3.3	10.7	17.0	27.7	62.6
	DAPITAN	20.2	3.2	2.3	4.9	4.1	12.9	22.0	34.9	
17	JAGNA	38.6	6.2	4.5	9.4	7.9	24.5	42.1	66.6	80.5
	C. de ORO	8.0	1.3	0.9	2.0	1.6	5.4	8.5	13.9	
22	BATANGAS	0.5	0.1	0.1	0.1	0.1	0.3	0.6	0.9	75.7
	ABLA de ILOG	43.4	6.9	5.0	10.6	8.8	27.2	47.6	74.9	
9	TUBOD	18.5	3.0	2.1	4.5	3.8	11.7	20.1	31.8	68.0
	TANGUB	21.0	3.4	2.4	5.1	4.3	13.4	22.8	36.2	
23	BALANACAN	65.3	10.4	7.6	16.0	13.3	40.9	71.7	112.5	197.6
	LUCENA	49.3	7.9	5.7	12.1	10.0	31.3	53.8	85.1	
18	ZAMBOANGA	11.9	1.9	1.4	2.9	2.4	8.0	12.5	20.5	94.6
	BASILAN	42.9	6.9	5.0	10.5	8.7	27.0	47.1	74.1	
15	DUMAGUETE	15.6	2.5	1.8	3.8	3.2	10.5	16.5	27.0	95.8
	SANTANDAR	39.9	6.4	4.6	9.8	8.1	26.2	42.7	68.9	
11	ILOILO	22.5	3.6	2.6	5.5	4.6	15.1	23.7	38.8	109.3
	PULUPANDAN	40.9	6.5	4.7	10.0	8.3	25.6	45.0	70.5	
34	CEBU	0	0	0	0	0	0	0	0	112.5
	TALIBON	65.2	10.4	7.6	16.0	13.3	42.1	70.4	112.5	
25	BULAN	33.9	5.4	3.9	8.3	6.9	21.0	37.5	58.5	118.0
	MASBATE	34.5	5.5	4.0	8.4	7.0	21.7	37.7	59.4	
12	ILOILO	16.3	2.6	1.9	4.0	3.3	10.9	17.1	28.1	64.7
	JORDAN	21.2	3.4	2.5	5.2	4.3	13.7	22.9	36.6	
19	ZAMBOANGA	13.3	2.1	1.5	3.3	2.7	8.9	14.0	23.0	51.4
	JOLO	16.5	2.6	1.9	4.0	3.4	10.9	17.5	28.4	
36	BENONI	18.2	2.9	2.1	4.5	3.7	11.1	20.4	31.5	62.9
	BALINGOAN	18.2	2.9	2.1	4.5	3.7	11.3	20.1	31.5	
24	TABACO	25.0	4.0	2.9	6.1	5.1	16.5	26.6	43.1	84.0
	VIRAC	23.8	3.8	2.8	5.8	4.8	14.9	26.1	41.0	
									TOTAL	2721.2

Note: Price contingency is excluded
*1: E/S denotes engineering service including detailed design and supervisory work

SOURCE: JICA Study Team

H. Construction Schedule

66. A construction schedule is prepared taking into consideration the following.

i) Prior to the implementation, feasibility studies should be carried out for each ferry link so as to reveal both technical soundness and economic/financial viability.

ii) Construction schedule is prepared taking into consideration the five-year-package program including the preparatory work, detailed design and construction.

iii) Ports of first priority links will be constructed first and then ports of second priority links will follow.
(First and second priority are described in Chapter 10 Volume I).

iv) Terminal ports of the links with first and second priority will be completed and in operation by the year 2010.

v) Among the ports of first priority links, ports which are not under Ro/Ro operation at present will be constructed earlier than the ports which are under Ro/Ro operation. The sequence of the construction among the second priority group will be the same as that of the first priority group. Some links such as Dumaguete- Dapitan link of second priority group are expected to play very important roles in formulating the nationwide Ro/Ro trunk corridor.

vi) Construction sequence of the ports of links will be set-up, to the maximum extents, to formulate the Nationwide Ro/Ro Network at each stage.

Table 11-14 shows the links in each package. Table 11-15 shows the schedule of implementation.

Table 11-14 Implementing Priority by Package

Package		Link
A-1	1) Batangas	- Calapan (Phase I)
	2) Iloilo	- Bacolod (Phase I)
	3) Toledo	- San Carlos
	4) Tandayan	- Bato
	5) Cebu	- Tagbilaran
	6) Cebu	- Ormoc
A-2	1) Batangas	- Calapan (Phase II)
	2) Iloilo	- Bacolod (Phase II)
	3) Escalante	- Tuburan
	4) Cebu	- Tubigon
	5) Guihulngan	- Dumanjug
	6) Matnog	- San Isidro
	7) Matnog	- Allen
	8) Liloan	- Lipata
B-1	1) Dumaguete	- Dapitan
	2) Jagna	- C. de Oro
	3) Batangas	- Abra de Ilog
	4) Tubod	- Tangub
	5) Balanacan	- Lucena
	6) Zamboanga	- Basilan
	7) Dumaguete	- Santander
	8) Iloilo	- Pulupandan
B-2	1) Cebu	- Talibon
	2) Bulan	- Masbate
	3) Iloilo	- Jordan
	4) Zamboanga	- Joro
	5) Benoni	- Balingoan
	6) Tabaco	- Virac

Table 11-15 Project Implementation Schedule

NAME OF PORT		PROJECT COST (Mil. pesos)			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	TOTAL FOR WORK ITEM (Mil Pesos)		TOTAL OF PACKAGE (Mil. P)
		FOREIGN	LOCAL	TOTAL	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010			
					PACKAGE A-1					PACKAGE A-2					PACKAGE B-1					PACKAGE B-2					
1 BATANGUS	CALAPAN	0.9	1.7	2.6	47.3	detailed design																	DETAILED DESIGN	47.3	
2 ILOILO	BACOLOD	105.4	169.9	275.3				construction																	
3 TOLEDO	SAN CARLOS	65.1	113.0	178.1		152.0	152.0	152.0	152.0														CONSTRUCTION	608.0	714.4
4 TANDAYAG	BATO	26.0	44.3	70.3																					
5 CEBU	TAGBILARAN	41.4	27.8	69.2		14.8	14.8	14.8	14.8	supervisory work													SUPERVISORY WORK	59.1	
6 CEBU	ORMOC	27.5	91.4	119.0																					
1 BATANGUS	CALAPAN	34.9	63.0	97.9						48.3	detailed design												DETAILED DESIGN	48.3	
2 ILOILO	BACOLOD	42.0	95.5	137.5				---->																	
3 ESCALANTE	TUBURAN	48.8	79.5	128.4				ILOILO-BACOLOD				construction													
4 CEBU	TUBIGON	42.1	68.3	110.4				LINK START			155.1	155.1	155.1	155.1									CONSTRUCTION	620.5	729.2
5 GUIHULNGUN	DUMANJUG	23.6	40.9	64.5				OPERATION																	
6 MATNOG	SAN ISIDORO	16.7	26.8	43.5								supervisory work													
7 MATNOG	ALLEN	43.9	62.1	106.0							15.1	15.1	15.1	15.1									SUPERVISORY WORK	60.3	
8 LILOAN	LIPATA	15.7	25.4	41.0																					
1 DUMAGUETE	CAPITAN	23.6	39.0	62.6											51.9	detailed design							DETAILED DESIGN	51.9	
2 JAGNA	C. de ORO	29.9	50.6	80.5																					
3 BATANGUS	ABRA de ILOG	27.3	48.4	75.7													construction								
4 TUBOD	TANGUB	25.2	42.9	68.1												166.8	166.8	166.8	166.8				CONSTRUCTION	667.4	784.2
5 BALANACAN	LUCENA	72.2	125.4	197.6																					
6 ZAMBOANGA	BASILAN	34.9	59.6	94.5													supervisory work								
7 DUMAGUETE	SANTANDAR	36.7	59.2	95.9												16.2	16.2	16.2	16.2				SUPERVISORY	64.9	
8 ILOILO	PULUPANDAN	43.6	65.6	109.3																					
1 CEBU	TALIBON	51.3	61.2	112.5															32.7				DETAILED DESIGN	32.7	
2 BULAN	MASBATE	42.6	75.2	117.9																209.9	209.9		CONSTRUCTION	419.9	493.4
3 ILOILO	JORDAN	24.6	40.1	64.7																					
4 ZAMBOANGA	JOLO	19.8	31.6	51.4																20.4	20.4		SUPERVISORY WORK	40.8	
5 BENONI	BALINGOAN	22.2	40.8	62.9																					
6 TABACO	VIRAC	31.3	52.7	84.0																					
A CONSTRUCTION COST																									
ESTIMATED DIRECT COST						103.6	103.6	103.6	103.6		105.7	105.7	105.7	105.7		113.7	113.7	113.7	113.7	143.1	143.1			1578.2	
OVERHEAD + PROFIT						16.6	16.6	16.6	16.6		16.9	16.9	16.9	16.9		18.2	18.2	18.2	18.2	22.9	22.9			252.5	
V.A.T						12.0	12.0	12.0	12.0		12.3	12.3	12.3	12.3		13.2	13.2	13.2	13.2	16.6	16.6			183.1	
TOTAL of A						132.2	132.2	132.2	132.2		134.9	134.9	134.9	134.9		145.1	145.1	145.1	145.1	182.6	182.6			2013.8	
B ENGINEERING SERVICE																									
DETAIL DESIGN																									
SUPERVISION																									
V.A.T(LOCAL PORTION)																									
TOTAL of B					45.0	14.1	14.1	14.1	14.1	46.0	14.4	14.4	14.4	14.4	49.4	15.5	15.5	15.5	46.6	19.4	19.4			386.0	
C PHISICAL CONTINGENCY					2.3	20.5	20.5	20.5	20.5	2.3	21.0	21.0	21.0	21.0	2.5	22.5	22.5	22.5	24.1	28.4	28.4			321.4	
TOTAL of (A+B+C)				2721.2	47.3	166.8	166.8	166.8	166.8	48.3	170.2	170.2	170.2	170.2	51.9	183.1	183.1	183.1	215.7	230.4	230.4			2721.2	2721.2
FOREIGN PORTION		1019.2			15.5	62.7	62.7	62.7	62.7	15.9	62.9	62.9	62.9	62.9	17.1	68.4	68.4	68.4	79.2	86.2	86.2			1008.0	
LOCAL PORTION			1702.0		31.8	104.1	104.1	104.1	104.1	32.4	107.3	107.3	107.3	107.3	34.9	114.6	114.6	114.6	136.6	144.2	144.2			1713.2	

NOTES: 1 ▯▯▯▯▯▯▯▯ ; shows construction period
2 -------- ; shows engineering servise period
3 Number in the table shows the cost for each items (unit in Mil. pesos)

Source; JICA Study Team

[References]

1. Annual report on scheduled shipping services for passenger and vehicle transportation, Japan Passenger Vessel Operators Association, April, 1990.

2. Technical standards for port and harbour facilities in Japan, The Overseas Coastal Area Development Institute of Japan, Tokyo, 1991.

3. Study on Car ferry, Transportation Economy Research Center, Tokyo, March 1970.

4. Study on costs for car ferry transportation, Transportation Economy Research Center, Tokyo, March 1974.

5. Study in design conditions of car ferries, Transportation Economy Research Center, Tokyo, March 1970.

6. Ferry transportation in Indonesia, JICA Adviser's Report, 1990.

7. Interisland sea passenger survey, NTPP, 1981.

8. Brief summary of feeder ferry development project.

9. Report of the international study commission on the standardization of Roll-on/Roll-off ships and berths 1978, Permanent International Association of Navigation Congress.

10. National Structural Code of the Philippines, Association of the Structural Engineering of the Philippines, 1987.

11. DPWH Department Order No.30, DPWH, 1990

12. NEDA Board Resolution No.23, NEDA, 1987