CHAPTER 6
TRAFFIC FORECAST

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This Chapter aims at forecasting the cargo volume and passenger traffic volume which will pass through Batangas Bay in 1990 and 2000. First, we outline the basic concepts which are used in making the forecast. Then, we make forecasts for Batangas Port (the base port). Finally we mak forecasts for the private ports located along Batangas Bay.

6.1 Basic Concepts

6.1.1 Hinterlands

We consider the hinterlands of Batangas Port and of the private ports separately.

(1) Hinterlands of Batangas Port

Port hinterlands are the origins and destinations of cargoes which pass through ports. Depending on the characteristics of cargo flow through each individual port and the purpose of the study, a given port may be considered to have numerous hinterlands, for example different hinterlands for import, export, and domestic trade, and different hinterlands for each commodity, or group of commodities, which passes through the port. Generally, most ports have a primary hinterland, an area where most of the cargo passing through the port originates, or is delivered.

In the case of Batangas, most of the cargoes handled at the Port appear to be simply transported to and from the Metro Manila Zone. Actually, the movement of cargo through Batangas is quite complicated and difficult to analyze because of the proximity of the Port to Metro Manila. The preliminary survey indicates that the volume and direction of cargo movement through the Port varies greatly by commodity.

Furthermore, the future development of the transportation network in and around the Batangas area will facilitate the flow of cargo to and from increasingly distant destinations. Changes in the transportation network will significantly alter the flow of cargo. Cargo movement will also become more complicated than at present. As the flow of cargo varies greatly by commodity, it is not reasonable to assume that a common hinterland would cover the movement of all the cargoes which are handled at Batangas Port.

Thus, the study of the hinterlands of Batangas Port should be carried out by main commodity. For some commodities, the hinterland will be determined considering the commodity flow throughout Luzon Island, or throughout the entire country. Development policies and the future functions of the Port will also be considered when forecasting the future hinterlands and movement of cargoes.

(2) Hinterlands of the Private Ports Along Batangas Bay

The hinterlands of the ports located along the Bay vary primarily by commodity. Table

6.1.1 lists the hinterlands by commodity. The destinations of cargo vary from the Batangas area (for soybeans) to the whole country (for petroleum products). Unlike the hinterlands of the base port, the hinterlands of the private ports located along Batangas Bay are not expected to change in the near future.

Table 6.1.1 Origins & Destinations of the Main Cargoes Passing Through The Private Ports Along Batangas Bay

Commodity	Origin	Destination
Crude Oil and Petroleum Products Relatdd to Oil Refining	Import: Saudi Arabia, Kuwait, Dubai, China, Indonesia	The whole country
Wheat	Import: U.S.A., Canada	Flour: The whole island of Luzon
Soy Beans	Import: U.S.A.	Soy Beans: Batangas
Palay/Rice	Mindoro	Batangas, Manila Area
Coconut Oil and Coconut-based chemicals related to UNICHEM	Coconut Oil: Visayas	Coconut-based chemicals Export: Japan, Australia Domestic: Manila Area
Coal	Import: Australia, China, Canada Domestic: Cebu	The whole island of Luzon
Chemicals	Import: U.S.A., Canada, Japan	Manila, Laguna
Coconut Products (Coconut Oil, Copra Cake/Pellets)	Laguna	Coconut Oil: U.S.A., Europe Copra Cake/Pellets: Europe

6.1.2 Basic Concepts for the Cargo Forecasts

Cargo volumes for the base port and the private ports are forecast separately. In addition to the commodities presently handled at these ports, some new commodities are expected to pass through Batangas Bay in the future.

The cargo forecast for the private ports includes the commodities that will be handled at new private ports which are currently under construction. These commodities are expected to be handled there by 1990.

The cargo forecast for the base port includes some new commodities which will be handled in the future in accordance with the basic concepts underlying base port development.

6.1.3 Socio-economic Frame for Traffic Forecast

As for the devleopment of Region IV, the "Five Year Regional Development Plan 1983 to 1987" issued by NEDA in 1982 and the "Long Term Philippine Development Plan up to the Year 2000" issued by NEDA in 1976 are both related to our study. However, as the economic situation in the Philippines has changed since 1983, mainly due to a negative trade balance and increasing foreign indebtedness, NEDA issued an "Updated Philippine Development Plan 1984

to 1987" in September of 1984. The five year regional development plan is also currently being revised.

The Updated Plan seems to most accurately reflect the present situation in the Philippines. Thus, we use information from the Updated Plan in making our projections of the future national economic indicators, and from the five year plan which is being revised for regional indicators.

Table 6.1.2 shows the projections of GRDP, population, and per capita GRDP in Region IV from 1983 to 1987. These are new figures from the five year regional plan which is currently under revision.

Table 6.1.2 Projected GRDP, Population and Per Capita GRDP (Region IV) (1983 ~ 1987)

Year	GRDP		Total Population		Per Capita GRDP	
	Million ₱ at 1972 Prices	Growth Rate (%)	('000 Persons)	Growth Rate (%)	₱ at 1972 Prices	Growth Rate (%)
1983	13,766		6,703		2,054	
1984	13,077	-5.0	6,895	2.7	1,897	-7.6
1985	13,243	1.3	7,089	2.8	1,868	-1.5
1986	13,745	3.8	7,287	2.8	1,886	1.0
1987	14,330	4.3	7,488	2.7	1,914	1.5
Compound Annual Growth Rate (%) 1984 ~ 1987	–	3.1	–	2.8	–	0.3

Source: Revised figures from NEDA Regional Development Plan (currently under revision)

Table 6.1.3 presents our projections of the compound growth rate of GRDP, population, and per capita GRDP from 1988 through the year 2000 for Region IV. (It also lists these growth rates from 1984 ~ 1987 from the Regional Plan which is under revision). Table 6.1.4 lists these same projected rates for the entire nation.

Based on the above estimated growth rates, Table 6.1.5 lists actual figures from 1972 through 1983 and the estimated figures through the year 2000 for Region IV and for the entire nation. Figure 6.1.1 shows graphically the growth of GRDP in Region IV and the projected growth through the year 2000.

Table 6.1.3 Regional Projected Growth Rate of GRDP, Population and Per Capita GRDP (Region IV)

(%)

	Compound Growth Rate		
	GRDP	Population	Per Capita GRDP
*1 1984 ~ 1987	3.1	2.8	0.30
*2 1988 ~ 1990	3.1	2.32	0.44
*3 1990 ~ 2000 (I)	3.1	1.73	1.35
(II)	5.0		3.22
(III)	7.0		5.18

*1 Revised figures from NEDA Regional Development Plan (currently under revision)
*2 GRDP: Same compound annual growth rate as from 1984 ~ 1987
Population: NEDA Statistical Year Book 1984
*3 GRDP (I) : Same compound annual growth rate as from 1984 ~ 1987
(II) : Middle rate between I and III
(III) : Same annual growth rate as between 1972 ~ 1980
Population: NCSO Population Projections 1980 ~ 2000

Table 6.1.4 National Projected Growth Rate of GDP, Population and Per Capita GDP

(%)

	Compound Growth Rate		
	GDP	Population	Per Capita GDP
*1 1984 ~ 1987	3.0	2.44	0.55
*2 1988 ~ 1990	3.0	2.34	0.68
*3 1990~ 2000 (I)	3.0	1.5	1.56
(II)	4.75		3.29
(III)	6.5		5.02

*1 Updated Philippine Development Plan 1984 ~ 1987
*2 Same compound annual growth rate as from 1984 ~ 1987
*3 Refer to Table 6.1.3, Note (3).

Table 6.1.5 Actual and Estimated GDP/GRDP, Population and Per Capita GDP/GRDP, 1972 ~ 2000

	National					Region IV				
	Population (million persons)	GDP				Population ('000 persons)	GRDP			
		GDP		Per Capita GDP			GRDP		Per Capita GRDP	
		At Current Prices (billion ₱)	At 1972 Prices (billion ₱)	At Current Prices (₱)	At 1972 Prices (₱)		At Current Prices (million ₱)	At 1972 Prices (million ₱)	At Current Prices (₱)	At 1972 Prices (₱)
Actual										
1972	38.92	56.1	56.1	1,441	1,441	4,771	7,751	7,751	1,625	1,625
1973	40.01	71.8	60.9	1,795	1,552	4,924	10,241	8,541	2,080	1,735
1974	41.12	99.6	64.1	2,422	1,588	5,080	14,083	8,603	2,772	1,694
1975	42.07	114.6	68.4	2,724	1,626	5,240	16,774	9,617	3,201	1,835
1976	43.46	133.2	73.6	3,065	1,694	5,373	19,351	10,153	3,602	1,890
1977	44.67	155.6	78.0	3,483	1,746	5,504	22,821	10,935	4,146	1,987
1978	45.89	179.3	82.6	3,907	1,800	5,782	26,823	11,795	4,639	2,040
1979	47.10	220.5	88.3	4,682	1,875	5,970	33,027	12,331	5,532	2,065
1980	48.32	266.0	92.7	5,505	1,918	6,119	39,652	12,951	6,429	2,117
1981	49.53	304.8	96.2	6,154	1,942	6,309	44,903	13,223	7,064	2,095
1982	50.70	332.5	99.1	6,671	1,951	6,504	49,815	13,599	7,640	2,091
1983	52.05		100.1		1,923	6,703	57,263	13,766	8,335	2,054
Estimated										
1984	53.35		95.6		1,792	6,895		13,077		1,897
1985	54.67		98.5		1,802	7,089		13,243		1,868
1986	56.00		101.4		1,811	7,287		13,745		1,886
1987	57.35		104.5		1,822	7,488		14,330		1,914
1988	58.72		107.6		1,832	7,661		14,776		1,929
1989	60.10		110.8		1,844	7,839		15,233		1,943
1990	61.48		114.2		1,857	8,021		15,706		1,958
2000	71.35		(I) 153.5		(I) 2,151	9,520		(I) 21,313		(I) 2,239
			(II) 181.6		(II) 2,545			(II) 25,583		(II) 2,687
			(III) 214.4		(III) 3,005			(III) 30,896		(III) 3,245

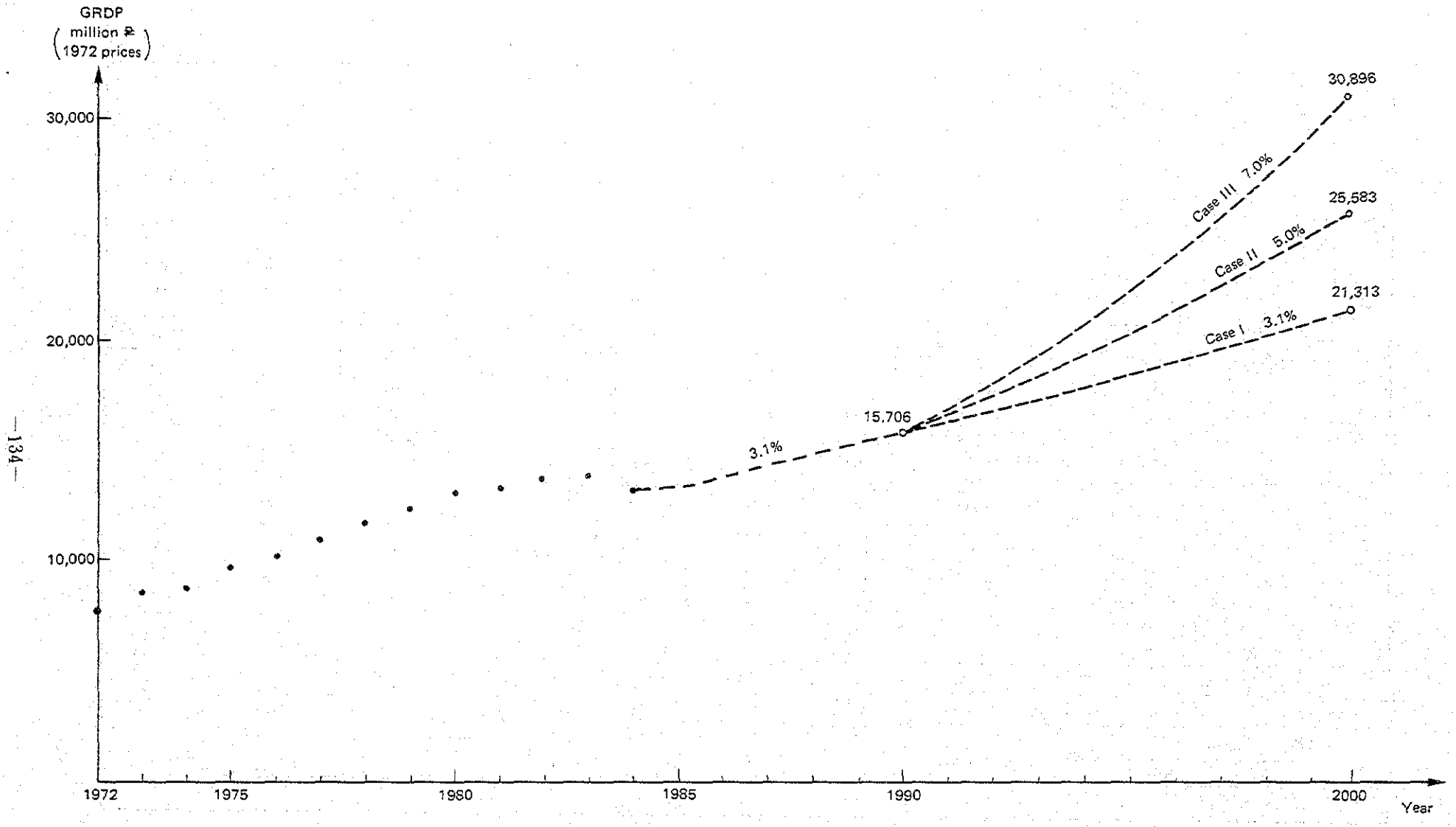


Fig. 6.1.1 Forecast of GRDP in Region IV

6.2. Traffic Forecast for Batangas Port

6.2.1 General

(1) Two Different Approaches

In forecasting cargo volume in 1990 and 2000, two different approaches are used and an accurate cargo forecast will be made by comparing the forecast results from the two methods.

The cargo handled at ports is closely linked with economic activities in their hinterlands. Following this, the first approach is a so-called macroscopic method, namely, regression analysis on the basis of commonly used economic indices such as GRDP.

The second approach is a microscopic method, meaning that selected major items are individually forecasted. In the microscopic approach, the following items are considered:

a) Demand and supply balances of commodities in the region;

b) Trends in producing and consuming districts outside of the region;

c) Cargo movement and cargo distribution among nearby ports.

Another microscopic approach is sometimes used for certain kinds of cargoes.

On the other hand, passenger traffic can be forecast in correlation with socio-economic activities, as passenger trips are undertaken for purposes of daily working business trips and sightseeing, which are strongly related to such regional economic variables as GRDP and income distribution. However, when a specific area is to be developed into a tourist resort, the number of sightseers is estimated separately, in a different way.

(2) Selection of Major Items

Major cargo items to be handled at the port consist of present and future items. Present cargo items are selected on the basis of current volume and growth rate while future cargo items are selected in consideration of the future social, industrial and traffic structure.

1) Present Major Items:
The selected cargo items are as follows:
- Palay/rice, copra, cement (minerals), logs/lumber and other cargoes for domestic trade;
- Cement (minerals) and other cargoes for foreign trade.

The cargo volume of the items listed above in parentheses can be forcast based on the volume of the items which immediately precede them; the volume of minerals can be estimated based on the forecast volume of cement.

2) Future Major Items:
The following are specified as new cargoes in the future, taking into consideration regional development trends and transportation development:
- Fertilizers for agricultural development;
- Steel products

6.2.2 Macroscopic Forecast

As mentioned above, regression analysis is generally applied in forecasting cargo volume.

The correlation between cargoes and GRDP is shown below, and cargoes are calculated as listed in Table 6.2.1.

a) Correlation between total cargo volume and GRDP:

$$Y = 91.86X - 830 \quad (R = 0.88)$$

where X : GRDP in Region IV (unit: billion pesos in 1972 constant prices)
Y : Total cargo volume (unit: thousand tons)
R : Correlation coefficient

b) Correlation between total cargo volume (exclusive of cement for export) and GRDP:

$$Y = 122.4X - 1,353 \quad (R = 0.95)$$

where X, R : Same as above (a)
Y : Total cargo volume exclusive of cement for export (unit: thousand tons)

c) Correleation between total domestic cargo volume and GRDP:

$$Y = 114.7X - 1,266 \quad (R = 0.89)$$

where X, R : Same as above (a)
Y : Total domestic cargo volume (unit: thousand tons)

Table 6.2.1 Forecast by Correlation Between Cargo Flow and GRDP (Macro Forecast)

	Year	GRDP (Region IV) (million ₱)	Total Cargo (tons)	Total Cargo Excluding Cement Export (tons)	Total Domestic Cargo (tons)
Series of Original Data	1979	12,265	290,923	168,822	168,822
	1980	12,951	361,093	204,052	187,100
	1981	13,223	385,697	253,556	223,294
	1982	13,599	461,593	302,386	279,248
	1983	13,766	395,748	360,548	357,331
Forecast	1990	15,706	613,000	569,000	535,000
	2000 (I)	21,313	1,128,000	1,256,000	1,178,000
	2000 (II)	25,583	1,520,000	1,778,000	1,668,000
	2000 (III)	30,896	2,000,000	2,429,000	2,277,000
Correlation coefficient			0.88	0.95	0.89

6.2.3 Microscopic Forecast

(1) General

The cargo volumes of the major items selected in 6.2.1 are forecast individually considering current cargo movement. For this purpose, an Origin and Destination Survey (hereafter called the O/D Survey) analyzing monthly documents was conducted by the Study Team in cooperation with PMU Batangas. The results of the Survey are shown in detail in Appendix 6.2.1.

In addition, the following two items were researched in order to grasp the pattern of cargo movement inside and outside of the region:

1) Present Cargo Flow

The domestic cargo movement by mode among regions in obtained from NCSO. However, the data of cargo on land has not been collected. The future cargo flows are estimated based on the NCSO data.

2) Road Completion:

The following assumptions are made in forecasting cargo volume:

a) The expressway between Batangas and Calamba will be partially operational by 1990 and completed by 2000.

b) The national road between Batangas and Quezon provinces will be operational by 2000.

c) The northern portion of the road around Mindoro Island will be operational in 1990, and the entire coastal road will be completed and fully opeational by 2000.

(2) Palay/Rice

1) General

In 1983, the demand-supply balances of Palay in the nation and the region are estimated as shown in Appendix 6.2.2. There are only three provinces in Region IV which produce surplus rice. This indicates that surplus rice in Mindoro Island will be shipped to Luzon Island.

Surplus rice will be handled at various ports in Luzon Island and Mindoro Island.

The steps of forecasting are as follows:

a) Estimate total cultivated area for rice, and area under irrigation.

b) Estimate the harvest per unit area for both irrigated and non-irrigated paddy.

c) Estimate the future production volume in the region.

d) Estimate the future demand, or consumption, based on future population and per capita consumption.

e) Estimate the future surplus which will be sent out of the region of the deficit which must be supplied into the region based on the difference of c) and d), above.

2) Estimate of Cultivated Area, Irrigated Area, and Harvest Per Unit Area

Over the past 5 years, the total cultivated area of rice has generally been decreasing. However, according to the Development Plan for Region IV, the irrigated area is increasing. The Plan recommends that areas which cannot be irrigated be switched to corn production. Accordingly, it is assumed that the total cultivated area of rice will not increase, but that the percentage of the area which is irrigated will continue to grow.

The area predicted to be irrigated in 1990 and 2000 has been projected considering the following documents:

i) Irrigated, Rainfed and Upland Areas of Ricefield by Province, Region IV 1984

ii) Irrigation Plan in Region IV (Appendix 6.2.3)

The estimated areas are listed in Table 6.2.2.

Table 6.2.2 Irrigated Area in 1990, 2000 (in Hectares)

	Potential Area (1984)	Irrigated Area (1984)	Increase in Irrigated Area (1985~1990)	Irrigated Area (1990)	Increase in Irrigated Area (1991~2000)	Irrigated Area (2000)	Percent of Potential Area Irrigated in the Year 2000 (%)
Total	287,582	123,163	40,460	163,623	14,000	177,623	60.2
Batangas	46,031	8,371	350	8,721	235	8,956	19.5
Cavite	27,519	17,000	620	17,620	900	18,520	67.3
Laguna	20,235	20,235	1,174	21,409	–	21,409	100
Quezon	30,988	11,893	1,271	13,164	1,853	15,017	48.5
Rizal	10,037	6,864	147	7,011	271	7,282	72.6
Growth Corridor	134,810	64,363	3,562	67,925	3,259	71,184	52.3
Aurora	22,136	9,138	1,890	11,028	2,880	13,908	62.8
Marinduque	7,167	1,205	296	1,501	25	1,526	21.3
Mindoro Occ.	41,243	7,307	9,407	16,714	1,180	17,894	43.4
Mindoro Ori.	52,340	21,648	15,079	36,727	3,328	40,055	76.5
Palawan	23,866	17,112	9,788	26,900	3,050	29,950	100
Romblon	6,020	2,390	438	2,828	278	3,106	51.6
Resource Subregion	152,772	58,800	36,898	95,698	10,741	106,439	69.7

Table 6.2.3 lists the present harvest of palay per hectare for Regions III and IV, and the national average, as well as the projected harvest per hectare for Region IV in 1990 and 2000. As we can see from the Table, the present harvest in Region IV is lower than the national average. We expect this figure to increase due to improved agricultural techniques and increased use of fertilizer. We expect that the harvest per hectare in Region IV will equal the current national average in 1990 and will reach the current level in Region III in the year 2000.

Table 6.2.3 Projected Yield per Hectare for Palay

(tons/ha)

	1982*1		1990		2000	
	Irrigated	Non-Irrigated	Irrigated	Non-Irrigated	Irrigated	Non-Irrigated
Philippines	2.95	1.78				
Region III	3.535	2.715				
Region IV	2.385	1.28	2.95	1.78	3.5	2.7

Note: *1 Data from BAECON (Palay: Yield per Hectare by Crop Type and Variety by Region, Philippines, Crop Year 1982)

3) Estimation of Per Capita Rice Consumption

The per capita rice consumption decreased from 112.4 kg/person in 1978 to 110.9 kg/person in 1982, according to a nation-wide nutrition survey by the Food and Nutrition Research Institute.

We expect that per capita rice consumption in the future will continue to decrease because of improved living conditions and a more diversified diet.

The equation of related 1978 and 1982 per capita rice consumption is:

$$Y = -0.375X + 854.15$$

where Y : Per capita consumption in the year X (kg/person)
X : Year

From the above equation, per capita consumption in 1990 and 2000 is estimated as follows;

1990 = 108 kg/person (rice) = 166 kg/person (palay)
2000 = 104 kg/person (rice) = 160 kg/person (palay)

4) Production and Consumption in Region IV

The D/S balances in Region IV are estimated according to the forecasting steps explained in (2)-1), above. The results are listed in Table 6.2.4.

Table 6.2.4 Production and Consumption of Palay in Region IV (1990, 2000)

	1990				2000			
	Population ('000 Persons)	Production ('000 MT)	Consumption ('000 MT)	Balance ('000 MT)	Population ('000 Persons)	Production ('000 MT)	Consumption ('000 MT)	Balance ('000 MT)
Batangas	1,515	118	251	▲133	1,724	163	276	▲113
Cavite	1,025	121	170	▲49	1,259	154	201	▲47
Laguna	1,267	126	210	▲84	1,472	150	236	▲86
Quezon	1,477	109	245	▲136	1,744	148	279	▲131
Rizal	740	47	123	▲76	911	58	146	▲88
Aurora	139	85	23	62	163	120	26	94
Marinduque	225	19	37	▲18	257	26	41	▲15
Mindoro Occ.	297	142	49	93	373	188	60	128
Mindoro Ori.	591	244	98	146	720	313	115	198
Palawan	493	159	82	▲77	605	209	97	112
Romblon	248	22	41	▲19	277	30	44	▲14
Total	8,021	1,192	1,329	▲137	9,520	1,559	1,521	38

5) Cargo Volume at the Port of Batangas

In accordance with the D/S balances in the region, surplus rice from Mindoro will be shipped to Batangas Port, NFA, Bauan and other ports from Mindoro Ports (Calapan, San Jose and others).

The ratio of irrigated fields to total cultivated area is growing. However, we do not expect that the change in this ratio will change the patterns of distribution of rice and palay between Mindoro and Batangas Bay.

We expect that the distribution patterns in the future will not change significantly from the present patterns. The distribution patterns by port are shown in Table 6.2.5. Table 6.2.6 shows the estimated cargo volume for palay and rice in Batangas Bay. Virtually all of the rice entering Batangas Bay comes from Mindoro Island.

Table 6.2.5 Distribution Ratio of Palay and Rice from Mindoro, and Ratio of Rice to Palay in Shipments from Mindoro to Batangas Bay

Origin Port		Destination Port	Rice/Palay in Shipments to Batangas Bay
Oriental Mindoro (100%)		Batangas Port (96%) Others (4%)	4/1
Occ. Mindoro (100%)	San Jose (60%)	Bauan (20%) NFA terminal (20%) Others (60%)	(NFA) 1/4
	Sublayan (25%) Mamburao (15%)	Bauan (50%) NFA terminal (35%) Batangas port (15%)	(Private) 4/1

Refer to Appendix 6.2.5

Table 6.2.6 Estimated Cargo Volume of Palay and Rice in Batangas Bay (1990, 2000)

(tons)

	1990	2000
Batangas Port	105,000	143,000
Bauan	28,000	38,000
NFA	22,000	31,000
Total	155,000	212,000

(3) Copra

Copra handled at Batangas Port is mainly transported from Oriental Mindoro to coconut oil mills and desiccated coconut plants, both of which are mainly located in Manila and Laguna.

To forecast copra cargo volume, the same approach is taken as for forecasting rice volume.

Foodnuts, which are privately consumed, and homemade oil represent 2 to 3.5% total coconut products; the remaining 96.5 to 98.0% are for processing materials.

In the Philippines, coconut production is decreasing because of the decreased nut bearing of old trees. (Appendix 6.2.6).

PCA is planning new planting and replanting of HYB coconut to respond to this situation.

The future crop area is estimated in accordance with the new planting, replanting and rehabilitation program of PCA, as shown in Table 6.2.7.

Table 6.2.7 New Planting, Replating, Rehabilitation Program – Oriental Mindoro

(ha)

Year	New Planting	Replating	Rehabilitation
1	–	–	106
2	200	50	212
3	300	75	425
4	375	125	637
5	325	175	637
Total	1,200	425	2,017

Source: PCA

Actual and estimated coconut area in Oriental Mindoro is shown in Table 6.2.8.

Table 6.2.8 Actual and Estimated Coconut Area in Oriental Mindoro

(ha)

	Actual (1984)	1990	1995	2000
Total	40,000	41,200	42,400	43,600
Local	38,900	38,475	38,050	37,625
HYB	1,100	2,725	4,350	5,975

According to PCA, the production volume per unit area of copra is 1 ton/ha for local varieties and 3 to 5 ton/ha for hybrids.

The future production of copra is estimated according to the following assumptions:

i) Local coconut varieties are already being harvested.

ii) Hybrid coconuts can be harvested 5 years after planting.

iii) Production volume per hectare is 0.9 tons for local varieties and 3 tons for hybrids.

Almost all of the copra produced in Oriental Mindoro is shipped through Batangas Port. The estimated production and cargo volume are shown in Table 6.2.9.

Table 6.2.9 Estimated Copra Production in Oriental Mindoro and Cargo Volume at Batangas Port

(tons)

	1990	2000
Production	38,000	47,000
Cargo Volume	37,000	45,000

(4) Cement

1) General

The locations of nationwide cement factories are shown in Appendix 6.2.7. In Region IV, four factories are located in Rizal and one (Fortune Cement) in Batangas. The four factories in Rizal, located just behind Metro Manila, supply cement for the domestic market of the Metro Manila area. On the other hand, according to information obtained from PCIA, about 50% of the total production at Fortune Cement from 1980 to 1982 was for the foreign market, all of which was handled at Batangas Port, and the remaining 50% was for domestic use. Of Fortune's production for domestic use, about one-half is now being consumed in the province of Batangas, 40% to 45% in the provinces of Laguna, Cavite, Quezon and Mindoro, and the rest in Metro Manila. Except for the cement supplied to Mindoro, it is all transported by truck. Thus, the cement handled at Batangas Port is specified as that which is shipped to Mindoro and that which is exported. All of the cement is provided by Fortune Cement. The pattern of the cement movement described will probably not change in the future.

So, the domestic consumption in Mindoro Island and export volume are forecast below.

2) Domestic Demand

The domestic demand is estimated using the following formula.

Cargo Volume of Cement	=	Future Consumption per Capita	x	Future Population of Mindoro Island

The per capita consumption of cement and per capita GNP of Southeast Asian countries for 1971 and 1980 are plotted in Appendix 6.2.8. This shows a strong relationship between per capita GNP and per capita consumption of cement.

In estimating the future consumption level, Malaysia is taken as an example since her per capita GNP is a little above the Philippines, and the population density, which influences the consumption of cement, is similar. In other words, it is assumed that the Malaysian per capita consumption of cement will be attained in the Philippines when the per capita GNP of the Philippines reaches the level of the present per capita GNP of Malaysia.

The following equation is made from the above assumption:

$$Y = 0.1193X - 14.6$$

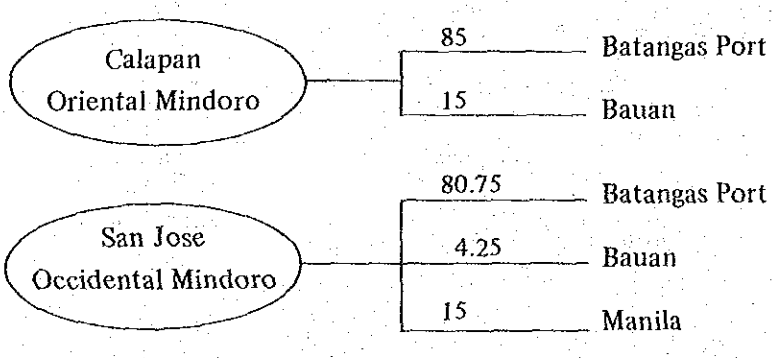
where Y : Per capita cement consumption (kg)
X : Per capita GNP ($, 1980 prices)

As the per capita GNPs for 1990 and 2000 are assumed to be $687 and $796 to $1,112 respectively, Table 6.2.10 gives the estimated domestic demand for Mindoro Island.

Table 6.2.10 Estimated Consumption of Cement in Mindoro Island (1990, 2000)

	Per Capita GNP ($/person)	Per Capita Cement Consumption (kg/person)	Oriental Mindoro		Occ. Mindoro	
			Population ('000)	Cement (tons)	Population ('000)	Cement (tons)
1990	687	67.3	591	40,000	297	20,000
2000 (I)	796	80.4		58,000		30,000
(II)	942	97.8	720	71,000	373	37,000
(III)	1,112	118		85,000		44,000

According to the O/D Survey, the transportation of cement which is consumed on Mindoro Island is as shown in Figure 6.2.1.



Note: The numbers represent the percentage of cargo handled at each of the ports.

Fig. 6.2.1 Present Transportation Pattern of Cement from Luzon to Mindoro Island

The transportation pattern in 1990 is considered to remain essentially the same as at present. However, in 2000 after the expansion of Batangas Port, it will be more economical to handle the cargo in one location. Thus, the pattern for the year 2000 is expected to be as follows:

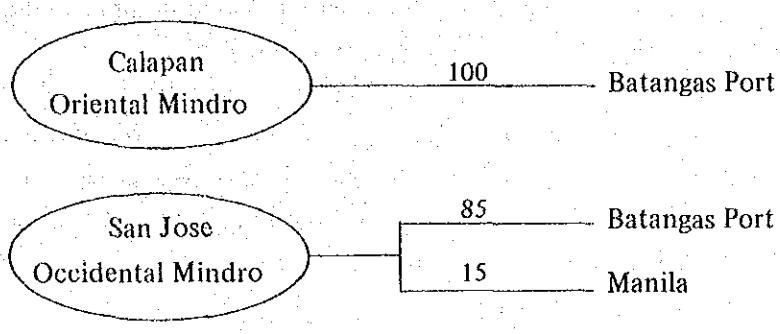


Fig. 6.2.2 Transportation Pattern of Cement from Luzon to Mindoro Island in the Year 2000

Considering the transportation patterns and the estimated consumption, the cargo volumes of cement to be handled in 1990 and 2000 at each port are estimated as shown in Table 6.2.11.

Table 6.2.11 Estimated Cargo Volume of Cement Transported from Luzon to Mindoro Island in 1990, 2000

(tons)

	1990			2000		
	Total	Ori. Mindoro	Occ. Mindoro	Total	Ori. Mindoro	Occ. Mindoro
Batangas	50,000	34,000	16,000	(I) 84,000 (II) 102,000 (III) 123,000	58,000 71,000 86,000	26,000 31,000 37,000
Bauan	7,000	6,000	1,000	–	–	–
Manila	3,000	–	3,000	(I) 4,000 (II) 6,000 (III) 7,000	– –	4,000 6,000 7,000

3) Cement Export

Appendix 6.2.9 shows annual domestic and export sales of cement from the Philippines. The total export figure is relatively stable at about 800,000 tons per year except for 1979 and 1983. Fortune Cement, Inc. on the average accounts for 18.7% of total exports.

We use two methods to estimate the export volume of cement.

i) Method 1

The world market for cement is quite competitive. Transportation costs are a major factor in determining prices. The quality of cement produced in the Philippines is not particularly high. As goods compete based on price and quality, the Filipino goods are only competitive in nearby countries.

As a matter of fact, more than 95% of the cement exports from the Philippines are sold in Asia (Appendix 6.2.10). The future cement imports of four major South and Southeast Asian purchasers (Hong Kong, Singapore, India, and Indonesia) are estimated using the Least Square Method based on the past import figures for 1972 ~ 1983 (Appendix 6.2.11).

The regression equation is as follows:

$$Y = 539.5X - 1{,}061{,}000 \quad (R = 0.95)$$

where Y : Total imports of the four major countries (unit: thousand tons)
X : Year
R : Correlation coefficient

The results are 12.6 and 18.0 million tons for 1990 and 2000 respectively.

These figures include clinker which is an intermediary manufactured cement product. Based on Japanese cement exports to Asian countries from 1980 to 1984, about 60% of total export volume is clinker. (Refer to Appendix 6.2.12). This means that Asian cement importing countries tend to have crush mills, which make cement from clinker. However, it will be not economical for the Philippines to export clinker, because it would be necessary to construct exclusive loading facilities for such exports.

Net cement imports of the Asian countries excluding clinker are estimated as 40% of the estimated total cement imports presented above. The average share of cement imports in these countries from the Philippines during the period of 1972 ~ 1982 was about 14.4%.

Assuming that this share does not change in the future, estimated cement exports from the Philippines would be 0.72 and 1.03 million tons for 1990 and 2000 respectively.

ii) Method 2

However, exports of cement from the Philippines were temporarily banned beginning in April, 1983. The Government of the Philippines made this decision because cement produced in the Philippines is not very competitive on the world market. However, the Philippines needs to sell cement abroad in order to gain foreign exchange which is necessary for the purchase of raw materials for the cement industry.

This method estimates the volume of cement exports based on the Philippine's

policy under which the industry should maintain a blance of foreign exchange. The domestic cement industry uses foreign currency to purchase coal for fuel, and must earn foreign currency from exports to finance these coal purchases. Thus, the future export volume is roughly calculated by the following equation:

$$\text{Export volume of cement} = \text{Imported coal volume used by the cement industry} \times \frac{\text{Import price of coal}}{\text{Export price of cement}}$$

The volume of imported coal that will be used by the cement industry is estimated as 482 and 402 thousand tons in 1990 and 2000, respectively. (Refer to Appendix 6.3.21).

The import price of coal and export price of cement are currently $70 (CIF) and $40 (FOB), respectively.

The estimates are prepared in ranges, taking into account both domestic production of cement and coal and the sensitivity of foreign trade, as follows:

① Lower side: 20% decrease of imported coal demand and price

② Upper side: 20% increase of imported coal demand and price

The results are from 0.56 to 1.2 million tons for 1990 and from 0.47 to 1.0 million tons for 2000.

iii) Comparison of Method 1 and Method 2

Method 1 can be considered an estimation of potential export volume, and method 2 as a more accurate estimation of future export volume. As the nations of Asia are pursuing policies leading towards self-sufficiency in cement production as a key industry for national development, it will be increasingly difficult for the Philippines to export large volumes of cement.

However, it will continue to be necessary for the Philippine cement industry to maintain minimal cement exports for the industry to remain sound in the future.

Meanwile, the competitiveness of Filipino cement on the world market will recover in the future along with the rationalization of the Philippine cement industry.

According to PCIA, future export volume will reach the prevailing level in the recent past, that is, about 800,000 tons per year. Based on the above considerations, method 2 is taken as the estimate for cement exports as method 2 is on the conservative side.

Thus, cement export volume for the nation is estimated as 560,000 tons in 1990 and from 470,000 tons to 1,000,000 tons in 2000, as shown in Table 6.2.12.

Based on the average from 1974 ~ 1983, Fortune's share of national cement

exports is about 18.7%. Assuming that in the future Fortune's share remains unchanged, future cement exports through Batangas Port are estimated as shown in Table 6.2.12.

Table 6.2.12 Estimated Cement Export Volume

(tons)

Year	National	Batangas Port
1990	560,000	105,000
2000 (I)	470,000	90,000
(II)	700,000	130,000
(III)	1,000,000	190,000

(5) Minerals

1) General

Minerals handled at Batangas port are mainly used for producing cement products. These minerals are raw materials such as gypsum, silica sand, etc. The minerals are not produced in the Batangas Area. Gypsum is not produced in the Philippines.
Accordingly, the volume of minerals handled in Batangas port is directly proportional to the production volume of cement in the hinterland of the port.

2) Production Volume of Cement in the Hinterland

Fortune's share of domestic sales is assumed to be 5.5% based on the 1974 ~ 1983 average. (Appendix 6.2.9). This share is assumed not to change in the future. Thus, production volume in the hinterland is estimated as shown in Table 6.2.13.

Table 6.2.13 Estimated Production Volume of Cement in the Hinterland of Batangas Port

(MT)

	Total Volume	Domestic Sales	Export
1990	333,000	228,000	105,000
2000 (I)	406,000	316,000	90,000
(II)	514,000	384,000	130,000
(III)	653,000	463,000	190,000

3) Estimated Volume of Minerals

The future cargo volume of minerals handled in Batangas Port is estimated using the Least Square Method based on the past figures for 1979 ~ 1983.

The regression equation is as follows:

$$Y = 0.0436X + 5,215$$

where Y : Mineral volume handled in the port (tons)

X : Production volume of cement in the hinterland (tons)

Since gypsum which equals 4% of production volume is not produced in the Philippines, this volume is assumed to be imported.

Based on these assumptions, the volume of minerals is estimated as shown in Table 6.2.14.

Table 6.2.14 Estimated Volume of Minerals Handled at Batangs Port

(tons)

	Production Volume of Cement	Minerals		
		Total	Domestic	Foreign
1990	340,000	20,000	7,000	13,000
2000 (I)	410,000	23,000	8,000	15,000
(II)	520,000	28,000	9,000	19,000
(III)	660,000	34,000	10,000	24,000

(6) Fertilizer

1) General

As shown in Appendix 6.2.13, 60 to 85% of the fertilizer products required in the nation were imported from 1979 to 1983. In 1984, a newly-established fertilizer factory (PHILPHOS) in Leyte Island started operation with a rated capacity of one million tons per year. It produces ammonium sulfate, complete/complex fertilizer and phosphoric acid.

The fertilizer consumed in southern Luzon is now being transported from distribution points in Manila by truck. According to "Fertilizer Marketing System in the Philippines" (issued by FPA in Dec. 1983), of the total fertilizer utilized for agricultural production, 44% is for palay, 37% for sugar, 6% for fruits, 5% for corn and the remaining 8% for coffee, tobacco, vegetables and other crops. This indicates that the major uses of fertilizer are for palay and sugar production.

Accordingly, the consumption volume of fertilizer was estimated individually for palay and sugar production, and collectively for other crops. However, the volume used

for coconut production will also be estimated separately due to the introduction of hybrid varieties.

Judging from the future role of Batangas Port as a route in the marketing system to supply the regional demand for fertilizer in Regions IV and V, the cargo volume of fertilizer through the port is estimated taking transportation systems into consideration.

2) Regional Demand for Fertilizer in Region IV

① Palay

The volume of fertilizer used for palay is calculated using the following formula:

Use of Fertilizer	=	Future Cultivated Area (ha)	×	Future Fertilizer Consumption Volume per Hectare

Future cultivated area for palay is estimated in part (2) as about 400 thousand hectares and 445 thousand hectares in 1990 and 2000, respectively.

Fertilizer consumption per hectare in 1983 is shown in Table 6.2.15.

6.2.15 Average Use of Fertilizer per Hectare for Rice (1983)

(kg/ha)

	All Farms	Irrigated	Rainfed	Upland
Philippines	129.5	164.0	106.5	38.0
Region III	180.0	217.5	150.0	118.5
Region IV	124.0	151.0	101.5	86.0
Region V	92.0	146.0	48.0	7.5

Source: BAECON

Per hectare fertilizer consumption is 124 kg/ha in 1983. This figure is expected to increase, due to changed agricultural techniques and increased irrigated area. In 1990, it is assumed that consumption will reach 180 kg/ha, the same level as in Region III where the rice production volume is presently the highest in the Philippines. During this period, the annual increase rate is 5.5%. In 2000, it is assumed that consumption will increase to 300 kg/ha in accordance with the policy of self-sufficiency for the Philippines.

② Sugar cane

The cultivated area and consumption volume of fertilizer per hectare for sugar cane in 1982 are shown in Table 6.2.16.

Table 6.2.16 Average Use of Fertilizer per Hectare for Sugar Cane (1982)

	Area (ha)	Fertilizer Consumption (tons)	Consumption per Hectare (kg/ha)
Philippines	383,234	194,096	506.5
Southern Luzon	56,162	28,541	458.2
Balayan*1	17,473	8,765	501.7
Don Pedro*1	16,206	5,931	366.0
Calamba*1	14,061	6,925	492.6
Bisudeco*2	8,421	4,100	488

Note: *1 Sugar mills in Region IV, Balayan and Don Pedro are located in Batangas Province, and Calamba is in Laguna Province
*2 Sugar mill in Region V
Source: PHILSUCOM (1982)

The production volume and export volume of sugar in the Philippines are decreasing as shown in Appendix 6.2.14.

The export volume of sugar will not increase in the future because sugar prices hang low on the world market due to weak demand. Then, it is assumed that the cultivated area of sugar cane in the hinterland is equal to the area at present, and per hectare fertilizer consumption is 500 kg/ha in 1990 and 2000.

③ Other crops

Judging from the total volume of fertilizer utilized for agricultural production, the volume consumed in producing crops other than palay and sugar is about 20% of total fertilizer consumption.

The comparison of the areas used to cultivate palay and sugar cane and the areas used to grow other crops are shown by province in Table 6.2.17. The Table also shows the relative use of fertilizer for palay and sugar cane versus other crops.

Table 6.2.17 Cultivated Area of Palay and Sugar Cane Compared with the Cultivated Area of Other Crops; and Relative Fertilizer Consumption for Palay and Sugar Cane and for Other Crops.

Cultivated Area of Palay and Sugar Cane vs. Other Crops	Provinces	Ratio of Fertilizer Consumption for Palay and Sugar Cane vs. for Other Crops
Similar to the national average	Laguna, Rizal, Romblon	80 : 20
Percent of other crops higher than the national average	Batangas, Cavite, Quezon	60 : 40
Percent of other crops lower than the national average	Other Region IV	100 : 0

Refer to Appendix 6.2.15

④ Coconut

As mentioned above, coconut production in the Philippines has been decreasing as trees grow older.

PCA is planning new planting and replanting of hybrid coconuts to improve this situation. Hybrid coconuts will require fertilizer to maintain high harvests.

It is assumed that the fertilizer for hybrid coconuts is a new demand.

According to PCA, the fertilizer volume required for hybrid coconuts is 1.5 kg/tree/year. Per hectare consumption volume of fertilizer for hybrid coconuts is estimated as 234 kg/ha at 156 trees/ha.

As for forecasting the cultivated area for hybrid coconuts, the same approach is taken as in part (3). The result is shown in Table 6.2.18.

Table 6.2.18 Estimated Crops Area for HYB Coconut in Region IV

(ha)

	Actual	Increase in 5 Years	1990	2000
Total	4,045	8,129	12,174	28,432
Batangas	179	900	1,079	2,879
Laguna	305	1,132	1,437	3,701
Marinduque	834	1,625	2,459	5,709
Occ. Mindoro	99	900	999	2,799
Ori. Mindoro	1,082	1,625	2,707	5,957
Quezon	1,546	1,947	3,493	7,387

Source: Basic data from PCA

3) Regional Demand for Fertilizer in Region V

Fertilizer consumption volume in Region V is calculated using Table 6.2.15, Table 6.2.16 and cultivated area at present, as shown in Table 6.2.19.

Table 6.2.19 Estimated Fertilizer Used in Region V

	Crop Area (ha)	Fertilizer Use per Hectre (kg/ha)	Estimated Fertilizer Use (tons)
Palay*1	275,060	92	25,300
Sugar Cane*2	8,421	488	4,100
Others	–	–	7,300
Total	–	–	36,700

Note: Estimated fertilizer use for other crops is assumed equal to 20% of total fertilizer consumption.

Source: *1 BAECON (1983)
*2 PHILSUCOM (1982)

The statistics in the Table concerning the use of fertilizer in palay production come from BAECON (1983). According to BAECON, the consumption of fertilizer for palay production is 92 kg/ha as shown in the Table. This figure is questionable. According to a survey conducted by PPI and AFC which are both fertilizer distribution companies, the per hectare fertilizer use for palay is about 44 kg/ha. When making estimates of future fertilizer use, we assume that the actual present use is somewhere between these two figures, at about 69 kg/ha.

Furthermore, we estimate the future use of fertilizer for production in Region V based on the following assumptions:

① Per hectare consumption for palay will increase due to changing agricultural techniques and increased irrigated area. It is assumed that consumption will be 84 kg/ha in 1990. Thus, as the present consumption and the consumption in the next few years is quite low, we estimate that the consumption will increase sharply between 1990 and 2000 as the transportation infrastructure is improved. We assume that the per hectare fertilizer consumption for palay will be 172 kg/ha in 2000.

② The fertilizer consumption per hectare for sugar cane will not change from present levels.

③ The fertilizer volume used for all other crops is about 20% of total fertilizer consumption.

4) Estimation of Demand in Region IV and V by Kind of Fertilizer

National consumption and consumption in Regions IV and V by kind of fertilizer are shown in Table 6.2.20.

Table 6.2.20 Average Use of Fertilizer per Hectare by Kind of Fertilizer, Region, and Land Type

(bags of 50kg)

	Total	Nitrogenous Fertilizer						Complete and Others	
		Sub-total	%	Urea	%	Ammosul	%		%
[Rice] *1									
Philippines	2.59	1.65	64	1.47	90	0.18	10	0.94	36
Region IV									
Irrigated	3.02	2.26	75	2.08	92	0.18	8	0.76	25
Rainfed	2.03	1.48	73	1.46	99	0.02	1	0.55	27
Upland	1.72	1.72	100	1.00	58	0.72	42	–	0
Region V									
Irrigated	2.92	2.16	74	2.05	95	0.11	5	0.76	26
Rainfed	0.96	0.77	80	0.76	99	0.01	1	0.19	20
Upland	0.15	0.14	93	0.14	100	–	0	0.01	7
[Sugar Cane] *2									
Philippines	10.12	4.89	48	3.42	70	1.47	30	5.23	52
Region IV	9.16	7.82	85	4.27	55	3.55	45	1.34	15

Note: Figures for rice are from 1983; sugar cane from 1982

Source: *1 Patterns and Levels of Fertilizer and Pesticide Use Philippine Rice and Corn Farms August 1984, BAECON

*2 PHILSUCOM

According this Table, it is assumed that nitrogenous fertilizer accounts for 75% of total fertilizer use. Complete fertilizers and others account for the remaining 25%. Urea represents 80% of total nitrogenous fertilizer and the rest is ammosul.

Based on the above assumptions, total fertilizer demand by kind of fertilizer is Region IV and V is estimated as shown in Table 6.2.21.

Table 6.2.21 Estimated Fertilizer Consumption by Type of Fertilizer in Regions IV and V

(tons)

	1990					2000				
	Consumption	Nitrogenous Fertilizers (75%)			Complete and Others (25%)	Consumption	Nitrogenous Fertilizers (75%)			Complete and Others (25%)
		Total	Urea (80%)	Ammosul (20%)			Total	Urea (80%)	Ammosul (20%)	
Region IV	127,700	95,800	76,600	19,200	31,900	203,800	152,900	122,300	30,600	50,900
Batangas	34,000	25,500	20,400	5,100	8,500	38,800	29,100	23,300	5,800	9,700
Cavite	14,000	10,500	8,400	2,100	3,500	24,400	18,300	14,600	3,700	6,100
Laguna	19,500	14,600	11,700	2,900	4,900	26,900	20,200	16,200	4,000	6,700
Quezon	11,200	8,400	6,700	1,700	2,800	20,000	15,000	12,000	3,000	5,000
Rizal	4,100	3,100	2,500	600	1,000	6,800	5,100	4,100	1,000	1,700
Aurora	4,300	3,200	2,600	600	1,100	8,200	6,200	5,000	1,200	2,000
Marinduque	1,500	1,100	900	200	400	3,100	2,300	1,800	500	800
Mindoro Occ.	16,100	12,100	9,700	2,400	4,000	31,900	23,900	19,100	4,800	8,000
Mindoro Ori.	17,100	12,800	10,200	2,600	4,300	32,800	24,600	19,700	4,900	8,200
Palawan	4,100	3,100	2,500	600	1,000	7,600	5,700	4,600	1,100	1,900
Romblon	1,800	1,400	1,100	300	400	3,300	2,500	2,000	500	800
Region V	34,000	25,500	20,400	5,100	8,500	64,400	48,300	38,600	9,700	16,100

5) Future Transportation Pattern and Cargo Volume Handled at Batangas Port

In 1990, it is assumed that the present distribution system will not be changed. That is, the fertilizer consumed in Region IV and V is transported from distribution points in Manila by truck. Then, cargo volume for fertilizer handled at Batangas Port is as follows:

i) 100% of consumption volume in Oriental Mindoro Province

ii) 30% of consumption volume in Occidental Mindoro Province

On the other hand, we assume that all of the import fertilizer required in Regions IV and V in 2000 will be imported via Batangas Port.

This assumption is based on the fact that there is no other port in Region IV and V where a large amount of fertilizer can be handled. The Port of Manila is also inadequate because of the lack of bulk handling facilities.

Then, cargo volume for fertilizer handled in Batangas Port is estimated considering the following:

i) Imported fertilizer (Urea) consumed in Region IV and V is imported directly, and imported fertilizer consumed in the island provinces of Region IV is transhipped from Batangas Port.

ii) Regarding domestic fertilizer (ammosul/complete fertilizer), it is assumed that complete fertilizer with phosphate (14-14-14) is produced at PHILPHOS and ammosul at PPI.

iii) The domestic fertilizer cargo handled at Batangas Port is the complete fertilizer from Batangas, Quezon, Cavite and Laguna Province, and the ammosul for Mindoro Island from PPI.

Based on the above assumptions, the cargo volume of fertilizer handled at Batangas Port is estimated as shown Table 6.2.22.

Table 6.2.22 Estimated Total Cargo Volume of Fertilizer at Batangas Port, 1990, 2000

(thousand tons)

1990			2000			
Total	Inward	Outward	Total	Import	Inward	Outward
22	–	22	244	160	27	56

(7) Logs and Wood Products

1) General

Nationwide log production is shown in Appendix 6.2.16, indicating that 45% of the national production comes from Regions X and XI, followed by Region II with 19%. Production is clearly declining.

The situation of sawmills in Region IV in 1982 is also shown in Appendix 6.2.17, showing that sawmills with timber concessions are located in the provinces of Palawan and Quezon, and that the forest industry in Region IV, except for these two provinces, is not so active.

2) Per Capita Consumption of Wood Products

Based on the data presented by BOFD, domestic consumption and per capita consumption of wood products (lumber, plywoods and veneer) are shown in Table 6.2.23.

Table 6.2.23 Per Capita Consumption of Wood Products (1971 ~ 1980)

	Population	Lumber*		Plywood*		Veneer*		Wood Products	
	('000)	Production ('000 m^3)	Export ('000 m^3)	Production ('000 m^3)	Export ('000 m^3)	Production ('000 m^3)	Export ('000 m^3)	Total Domestic Consumption ('000 m^3)	Per Capita Consumption (m^3)
1971	37,862	860	202	653	590	242	127	836	0.0221
1972	38,920	1,411	152	642	564	234	127	1,444	0.0371
1973	40,010	1,060	179	732	692	211	107	1,025	0.0256
1974	41,120	1,114	275	705	353	172	178	1,185	0.0288
1975	42,070	2,274	458	465	249	207	135	2,104	0.0500
1976	43,460	1,609	493	416	261	403	166	1,508	0.0347
1977	44,670	1,567	455	489	221	496	155	1,721	0.0385
1978	45,890	1,780	573	490	362	546	154	1,727	0.0376
1979	47,100	1,626	915	503	324	634	186	1,338	0.0284
1980	48,320	1,529	742	553	322	660	62	1,616	0.0334

Note: * Forestry Statistics, 1982, Bureau of Forestry Development

Per capita consumption has been increasing gradually since 1971. Wood products are mainly used for housing and construction materials.

The correlation equation between wood products and GDP from 1971 to 1980 (except 1975, 1979), is as follows:

$$Y = 19.03X + 48.55 \quad (R = 0.79)$$

where Y : Domestic consumption volume of wood products (unit: thousand m^3)

X : GDP (unit: ₱ billion, at 1972 prices)

R : Correlation coefficient

Per capita consumption of wood products is estimated as 0.0361 m^3 in 1990 and 0.042 ~ 0.057 m^3 in 2000 using the above equation, as shown in Table 6.2.24.

Table 6.2.24 Estimated Per Capita Consumption of Wood Products

	GDP (₱ billion, 1972 prices)	Population (Thousand persons)	Estimated Per Capita Consumption of Wood Products (Cubic meters)
1990	114.1	61,480	0.0361
2000 (I)	153.5		0.042
(II)	181.6	71,350	0.049
(III)	214.4		0.057

3) Consumption and Production of Wood Products

Total consumption of wood products such as lumber, other construction materials, plywood and veneer is estimated at 69 thousand cubic meters in 1990 and 92 ~ 125 thousand cubic meters in 2000, based on the per capita consumption of wood products estimated in the former section multiplied by the future population.

Based on forestry statistics in 1982, there was only one sawmill in Batangas Province with a production capacity of 10,500 m^3 per year. According to interviews conducted by the Study Team, there are currently three sawmills in Batangas Province, and they all have a similar production capacity. The total production capacity of the sawmills in Batangas Province is estimated as 30,000 m^3 per year.

Therefore, about 30 thousand cubic meters of lumber will be supplied from within the area, and the volume of wood products coming from outside the area is estimated as 39 and 62 ~ 95 thousand cubic meters in 1990 and 2000, respectively.

There results are shown in Table 6.2.25.

Table 6.2.25 Estimated Consumption of Wood Products in the Batangas Area and Cargo Volume into the Area

	Per Capita Consumption of Wood Products (m^3)	Population ('000 persons)	Consumption Volume in Region ('000 m^3)	Cargo Volume into the Area ('000 m^3)
1990	0.0361	1,922	69	39
2000 (I)	0.042		92	62
(II)	0.049	2,190	107	77
(III)	0.057		125	95

Note: Batangas Area includes a part of Languna Province (Araminos, Calamba, Los Bamos and San Pablo City)

4) Inward Cargo Volume

Both logs, which are raw materials for sawmills, and wood products will be shipped from the southern part of the Philippines through Batangas Port in the future.

The conversion ratios are estimated as follows:

① From logs to lumber = 0.6

② From volume (m^3) to weight (tons) (for logs) = 0.722

③ From volume to weight (for wood products) = 0.6

Inward cargo volume of logs and wood products to Batangas Port are estimated as 59 thousand metric tons in 1990 and 73 ~ 93 thousand metric tons in 2000 as shown in Table 6.2.26.

Table 6.2.26 Estimated Inward Cargo Volume of Logs and Wood Products through Batangas Port 1990, 2000

('000 tons)

	Total	Logs	Wood Products
1990	59	36	23
2000 (I)	73	36	37
(II)	82	36	46
(III)	93	36	57

5) Outward Cargo Volume

In Mindoro island, reforestation began in 1976 and logging has been prohibited since Nov. 1982, in order to preserve the watershed. If this policy is observed, the demand for wood products in Mindoro will have to be supplied from outside the island.

We estimate that about 25% of Oriental Mindoro's consumption of wood products will be supplied from Batangas Port.

Thus, future outward cargo volume is estimated as 3,000 tons in 1990 and 4,500 ~ 6,000 tons in 2000 as shown in Table 6.2.27.

Table 6.2.27 Estimated Outward Cargo Volume of Wood Products through Batangas Port 1990, 2000

	Population in Oriental Mindoro (persons)	Per Capita Consumption of Wood Products (m^3/person)	Consumption Volume in Ori. Mindoro (m^3)	Cargo Volume through Batangas Port (tons)
	ⓐ	ⓑ	ⓒ = ⓐ × ⓑ	ⓓ = ⓒ × 0.25 × 0.6
1990	591,000	0.0361	21,000	3,000
2000 (I)	720,000	0.042	30,000	4,500
2000 (II)		0.049	35,000	5,000
2000 (III)		0.057	41,000	6,000

(8) Steel

1) General

As mentioned in Chapter 5, steel material consumed in the Metro Manila area which is currently handled at Manila Port is expected to be handled at Batangas Port in the future. These cargoes are half-finished goods which are supplied to the area from NSC in Illigan. The materials such as billets (used for bars and wire rods), hot and cold rolled products, galvanized sheets, and plates are used by local processing industries. The steel cargo volume is forecast below.

2) Forecast of National Steel Demand

Table 6.2.28 shows the production, export and import volume of steel materials (including processed materials) in the Philippines from 1975 to 1980.

Table 6.2.28 Production, Import and Export of Iron and Steel Products in the Philippines

('000 MT)

	1975	1976	1977	1978	1979	1980
Total	1,285.5	1,398.8	1,581.8	1,787.0	1,815.3	1,895.3
Production	761.9	801.0	936.3	1,015.8	1,089.2	1,255.6
Import	533.8	647.3	647.9	816.6	781.9	642.1
Export	10.2	49.5	2.4	45.4	55.8	2.4
Flat Products						
Production	325.8	350.7	468.9	500.5	505.1	645.5
Import	430.3	562.6	558.6	722.9	674.5	550.3
Export	9.9	49.5	2.4	45.4	55.5	2.4
Non-Flat Products						
Production	436.1	450.3	467.4	515.3	584.1	610.1
Import	103.5	84.7	89.3	93.7	107.4	91.8
Export	0.3	–	–	–	0.3	–

Source: Primary Iron and Steel Industry of the Philippines, 1980 (Metals Industry Research and Development Center)

As steel materials are basic goods for industrialization, national steel consumption per capita is correlated with per capita GDP. The following is the correlation formula from 1975 to 1980:

$$Y = 0.03176X - 20.64 \quad (R = 0.937)$$

where Y : Steel consumption per capita (kg/person)
X : Per capita GDP (at 1972 prices, ₱)
R : Correlation coefficient

Nationwide steel consumption volume in 1990 and 2000 is calculated by the above formula as shown in Table 6.2.29.

Table 6.2.29 Estimated Steel Demand in the Philippines

	Per Capita GDP (₱)	Per Capita Consumption (kg)	Population ('000 persons)	Steel Demand ('000 MT)
1990	1,857	38.3	61,480	2,350
2000 (I)	2,151	47.7		3,400
(II)	2,545	60.2	71,350	4,300
(III)	3,005	74.8		5,300

3) Production Capacity of Crude Steel and Future Import Volume

In 1980, the annual production capacity of crude steel in the Philippines was 805,750 tons, of which 760,000 tons were produced around Metro Manila (Appendix 6.2.18). Philippine steel production currently fulfills 60% to 66% of local demand, and this ratio is generally increasing. Thus, the import ratio is decreasing, due to the operation of the NSC works in Iligan. Some types of steel products are difficult to produce domestically, and will continue to be imported for some time. We estimate that in the future, about 15% of the steel consumed in the Philippines will continue to be imported.

Table 6.2.30 Estimated Domestic Production and Import of Steel

	Domestic Production ('000 MT)	Imports ('000 MT)
1990	2,000	350
2000 (I)	2,900	500
(II)	3,650	650
(III)	4,500	800

4) Port Cargo Volume and Inflow Volume around Metro Manila

In the Philippines, the present distribution of rerolling mills (users of steel products) in terms of output is as follows:

i) 95% of bars and wirerods are produced on Luzon Island.

ii) 55% of galvanized sheets are also produced on Luzon Island.

iii) As for other steel products, 76 ~ 82% of them are produced around Metro Manila, on the basis of industry shipments. (Appendix 1.4.2. (5))

Thus, we calculate that overall, 80% of steel products, most of which are produced at Iligan, are consumed by processing industries in the Metro Manila Area. More specifically, 80% of total national demand is in the Metro Manila Area, and the difference between local production and local demand represents the volume which must be shipped into the Metro Manila Area.

5) Distribution of Enterprises which Consume Steel Products

Next, we examine the distribution of iron and steel enterprises which consume steel products. Under the regional development policy, the Metropolitan Manila Area (MMA) will maintain its present central industrial status, but industries will spread into the neighboring regions of Central Luzon and Southern Tagalog. This partial decentralization, or regional dispersal of industries, will help alleviate the increasing problems of pollution and overcrowding. (Refer to the Long-term Philippine Development Plan up to the Year 2000).

Decentralization will be an effective means to improve the overall environment of the city.

The future consumption volume of steel around the MMA is estimated based on this decentralization policy. We break down the projected steel demand into three areas, which are roughly defined as follows:

① Inner MMA: Within a 50 km radius from Manila

② Northern Outer MMA: The northern areas located between 50 km and 100 km from Manila

③ Southern Outer MMA: The southern areas located between 50 km and 100 km from Manila

This distribution of iron and steel enterprises which consume steel products, based on the NSC user list, is presented in Fig. 6.2.3. This Figure shows that there are currently 46 companies in the northern part of MMA, 39 companies in the southern part of MMA, 8 in the southern part of Rizal Province, 6 in Laguna Province and one in Bulacan Province. Outside of a 20 km radius from Manila, more users are located to the south than to the north.

i) New Establishments

It is assumed that the increase in demand between 1990 and 2000 will be fulfilled by new manufacturers, and that these new establishments will locate outside of the Inner MMA.

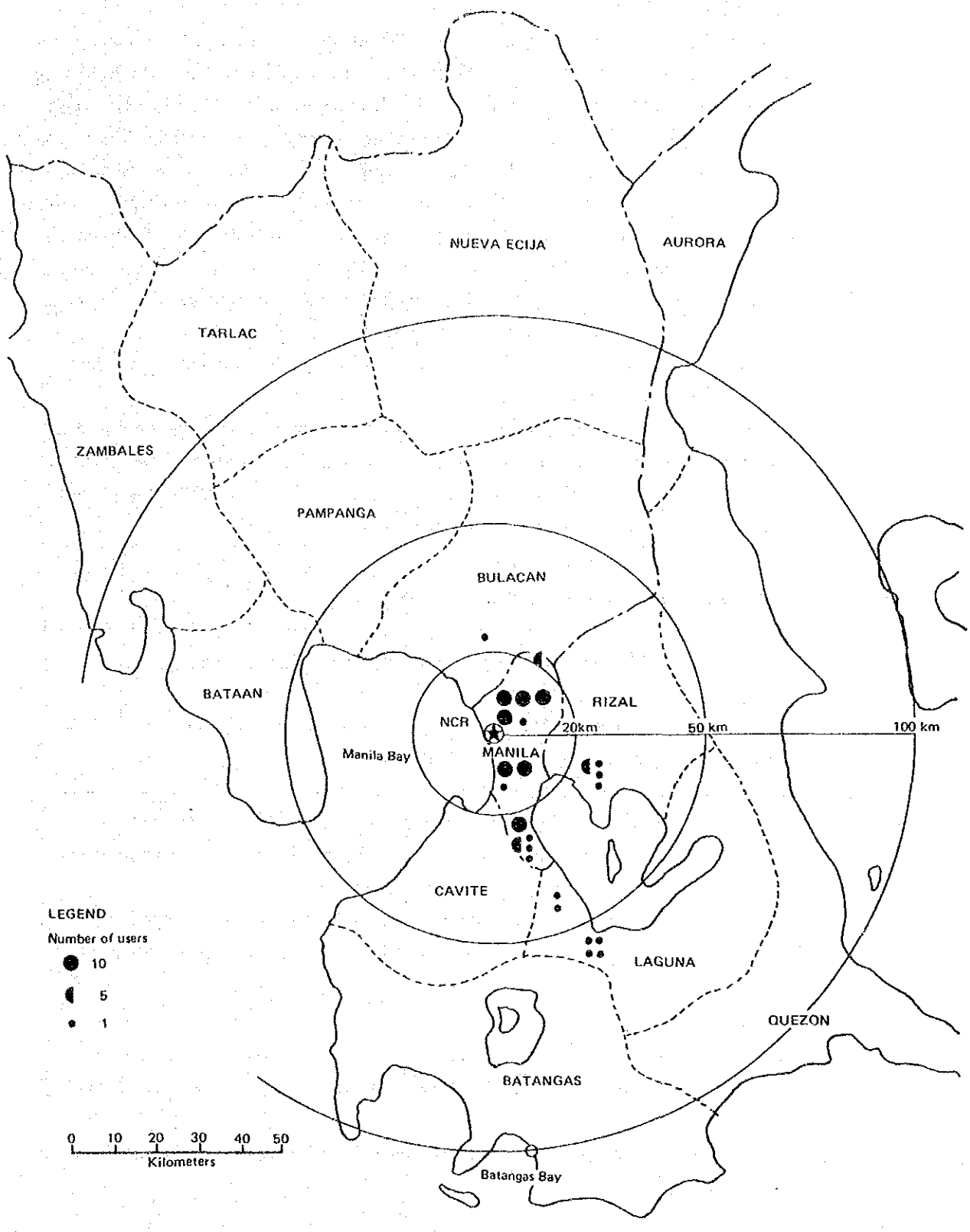


Fig. 6.2.3 Distribution of Iron and Steel Users around the Metropolitan Manila Area

ii) Relocation of Firms

In the future, some of the already established manufacturers will invest in new plants and equipment either to expand production capacity or to replace existing facilities as they become outdated. Other firms may make such investments as part of rationalization efforts in order to remain competitive. When the manufacturers invest in new plants and equipment, they may choose to relocate outside of the Inner MMA. It will become increasingly difficult to obtain suitable sites for expansion in the central urban area. Futhermore, as the inner city becomes increasingly congested, located in Outer MMA becomes more attractive. Potential savings from reduced transportation costs in less crowded areas and lower land prices provide economic incentives for relocation.

Based on user list of NSC, 5 of the 53 users located south of Manila are located more than 40 km from the center of the city.

It seems that when industries relocate they tend to move to the Outer MMA. However, 61 of the 100 companies in the MMA are still located within 20 km of Manila north harbour. Thus, we assume that the 30% of the companies will relocate to the Outer MMA by the year 2000.

6) Future Demand in Southern Outer MMA

Specifically, the Outer MMA is defined as follows:

- Norther Outer MMA: the provinces of Bataan, Bulacan and Panpanga (Region III)
- Southern Outer MMA: the provinces of Batangas, Cavite and Laguna (Region IV)

Northern and Southern Outer MMA are similar in population and land area, each with about 2.6 ~ 2.9 million people and about 6,200 sq.km.

In order to make the best possible use of the new development of infrastructures in Southern Outer MMA including the superhighway and the new development at Batangas Port, new establishments must be encouraged to locate in the Batangas area, and existing establishments must be encouraged to relocate there.

As a result of the policy encouraging location in the South, we expect that steel demand of Outer MMA as most of the demand in Outer MMA will concentrate in the southern region.

7) Port Cargoes

According to the results of the transportation cost analysis, we can assume that all of the steel demand in Southern Outer MMA will be fulfilled by cargoes passing through Batangas Port.

Thus, the cargo volume of steel products handled at Batangas Port is estimated as shown in Table 6.2.31.

Table 6.2.31 Steel Demand of Outer MMA and Steel Cargo Volume Handled at Batangas Port

('000 tons)

Year	Demand of the entier metropolitan area	Demand of Outer MMA			Demand of Southern Outer MMA	Cargo Volume at Batangas Port	
		New establish-ments	Relocated establish-ments	Sub-total		Domestic	Foreign
	(a)	(b) = (a) 2000 - (a) 1990	(c) = (a) 1990 × 0.3	(d)	(e) = (d) x 0.7		
1990	1,880	*	*	*	*	-	-
(I)	2,720	840		1,380	960	820	140
2000 (II)	3,440	1,560	540	2,100	1,400	1,200	200
(III)	4,240	2,360		2,900	2,030	1,730	300

(9) Other Items

According to the O/D survey, cargo on the Calapan route represents 80% of the total cargo volume handled at Batangas Port. The Ro-Ro service between Batangas and Calapan carries most of this cargo.

For statistical purposes, PPA classifies the vehicle weight on the Ro-Ro vessels as "other general cargo". The O/D survey shows that the ratio of other general cargo to total cargo volume is about 37% for inward cargo and 64% for outward cargo on the Calapan route.

On the other hand, our manifest research executed from Nov. 1 to 7 at Batangas, shows that the ratio of vehicle weight to total cargo is almost equal to the ratio of general cargo to total cargo mentioned above for both inward and outward cargo along the Calapan route. Thus in this study, "other general cargo" is considered equal to vehicle weight.

1) Inward Cargo

Inward cargo is comprised of agricultural products, like calamansi, bananas, fruits and vegetables.

Our method for forecasting, therefore, is that inward cargo is estimated in proportion to the future growth rate of agricultural products.

$$\boxed{\text{Future inward cargo volume for other items}} = \boxed{\text{Inward cargo volume (1983) of other items}} \times \left(\text{Annual average growth rate of agricultural products}^{*1} \text{ in the Philippines}\right)^{n}$$

*1: 4.8%, annual target growth rate of agricultural products, excluding rice, by the Updated Philippine Development Plan 1984 ~ 1987.

n : Number of years from 1983 to the target year.

Table 6.2.32 Estimated Other Cargoes (Inward) Handled at Batangas Port

(tons)

	1983	1990	2000
Other Cargoes (Inward)	65,000	90,000	148,000

2) Outward Cargo

Outward cargoes of other items are daily subsistance commodities, like bottled cargo, sugar and other consumer goods. The above commodities are delivered to the Province of Oriental Mindoro judging from the present cargo flow. These commodities are consumed in proportion to popultion and standard of living.

i) Forecasting Formula

Future outward cargo volume of other items at Batangas Port	=	Consumption volume per capita	x	Population of Oriental Mindoro

ii) Calculation

Future per capita consumption volume is calculated in correlation to past levels (1978 to 1982) and per capita GDP as shown in Table 6.2.33.

Table 6.2.33 Per Capita Consumption Volume and Per Capita GDP (1978 ~ 1982)

Year	Outward Other Cargoes (tons)	Population of Oriental Mindoro ('000 persons)	Per Capita Consumption Volume (kg/person)	Per Capita GDP (₱, 1972 prices)
1978	15,979	423	37.8	1,800
1979	17,087	435	39	1,875
1980	18,813	447	42	1,918
1981	23,431	456	51	1,942
1982	25,557	464	55	1,951

The correlation formula gained from the above Table is as follows:

$$Y = 0.1033X - 151 \quad (R = 0.84)$$

where Y : Per capita consumption volume (kg/person)
X : Per capita GDP (₱, at 1972 prices)
R : Correlation coefficient

Table 6.2.34 shows the forecast volume of outward cargo for other items.

Table 6.2.34 Estimated Other Cargoes (Outward) Handled at Batangas Port, 1990, 2000

	Per Capita GDP (estimated) (₱, 1972 prices)	Population of Oriental Mindoro (estimated) ('000 persons)	Other Cargoes (Outward) (tons)
1990	1,857	591	24,000
2000 (I)	2,170	720	53,000
(II)	2,567		82,000
(III)	3,030		117,000

3) Regional Distribution of Other Cargo in Domestic Trade

Other cargo volume, estimated in the foregoing section, is distributed to and from Oriental Mindoro and other areas. The cargo volume to and from Oriental Mindoro and other areas in 1983, by our O/D survey, is shown in Table 6.2.35.

Table 6.2.35 Percent of Other Cargoes at Batangas Port Shipped To/From Oriental Mindoro (1983)

(tons)

	Oriental Mindoro*1		Others		Total*2	
	Inward	Outward	Inward	Outward	Inward	Outward
Cargo Volume of Other Cargo	63,000	28,000	2,000	5,000	65,000	33,000
Ratio	97%	85%	3%	14%	100%	100%

Note: *1 Oriental Mindoro consists of Calapan, Pto. Galera and half of the unclassified "others", portion of Region IV.
*2 Excluding vehicle weight

Other cargo volume to and from Oriental Mindoro is estimated as shown in Table 6.2.36, assuming that the present ratio of distribution remains unchanged in the future, that in 95% for inward cargo and 85% for outward.

Table 6.2.36 Distribution of Other Cargoes To/From Oriental Mindoro and To/From Other Parts of Region IV

(tons)

	1990			2000		
	Total	Oriental Mindoro	Others	Total	Oriental Mindoro	Others
Total	114,000	105,000	9,000	(I) 201,000 (II) 230,000 (III) 265,000	185,000 210,000 240,000	16,000 20,000 25,000
Inward	90,000	85,000	5,000	148,000	140,000	8,000
Outward	24,000	20,000	4,000	(I) 53,000 (II) 82,000 (III) 117,000	45,000 70,000 100,000	8,000 12,000 17,000

4) Other General Cargo in Foreign Trade

If a wharf where public general cargoes in foreign trade are handled is constructed at the Port, other general cargo in foreign trade will grow at about the same pace as the increase in specified cargoes. The ratio of other general cargo to specified cargoes is 8.5% according to Table 6.2.37.

In the case of Batangas Port, it is reasonable to assume a ratio of 8%, and the ratio of exports to imports is assumed to be 2:1.

Table 6.2.38 shows that there are some cargoes such as chemicals and sugar which are not forecast in this study. These cargoes are usually handled at private ports. However, sometimes portions of these cargoes are also handled at the Port of Batangas. Portions of these cargoes may be temporarily handled at the Port of Batangas again some time in the future. It is reasonable to assume that they will be handled at the same levels as during the past 5 years.

In conclusion, the overall forecast for other cargoes are presented in Table 6.2.39.

Table 6.2.37 Specified Cargoes vs. Other Gen. Cargo at PMU'S*1 (1983)

('000 tons, %)

	Total		Cagayan De Oro		Cebu		Iloilo		Iligan		San Fernand		Davao	
	Cargo Volume	Other G.C./ S.C.	Cargo Volume	Other G.C./ S.C.	Cargo Volume	Other G.C./ S.C.	Cargo Volume	Other G.C./ S.C.	Cargo Volume	Other G.C./ S.C.	Cargo Volume	Other G.C./ S.C.	Cargo Volume	Other G.C./ S.C.
Total	920		175		108		131		118		244		144	
Specified Cargoes	848	8.5	170	2.9	69	56	130	0.8	113	4.4	224	8.9	142	1.4
Other Gen Cargo	72		5		39		1		5		20		2	
Import	454		24		80		124		80		105		41	
S.C.	406	12	19	26	46	74	123	0.8	75	6.7	103	1.9	40	2.5
G.C.	48		5		34		1		5		2		1	
Export	466		151		28		7		38		139		103	
S.C.	442	5.4	151	0	23	22	7	0	38	0	121	15	102	1.0
G.C.	24		0		5		0		0		18		1	

Note: *1 PMU's listed in this table include all PMU's with over 100,000 tons total cargo except PMU Manila
Source: PPA Statistical Report, 1983

Table 6.2.38 Statistics of Foreign Cargo at Batangas Port

(tons)

	1979	1980	1981	1982	1983
Total	53,165	168,326	162,403	182,345	38,417
Import	3,206	5,667	6,056	4,017	1,217
Minerals	–	5,644	–	4,000	–
Chemicals	–	–	5,250	–	–
G.C.	3,206	23	806	17	1,217
Export	49,959	158,326	156,347	178,328	37,200
Cement	49,958	147,041	132,141	160,707	37,200
Sugar	–	8,708	24,050	–	–
Chemicals	–	–	82	–	–
Bottled Cargo	–	16	40	–	–
G.C.	1	2,561	34	17,621	–

Table 6.2.39 Estimated Other Cargoes (Foreign) Handled at Batangas Port, 1990, 2000

(tons)

		Estimated Specific Cargo ①	Estimated Other General Cargo ② = ① x 0.08	Other Specific Cargo ③	Estimated Other Cargo ② + ③
1990	Total	154,000	12,000	29,000	41,000
	Import		8,000	5,000	13,000
	Export		4,000	24,000	28,000
2000	Total	481,000	40,000	29,000	69,000
	Import		26,000	5,000	31,000
	Export		14,000	24,000	38,000

(10) Ro-Ro Cargo and Vehicle Cargo Forecasts

1) Outline

Ro-Ro vessels are now being operated only on the route between the Port of Batangas and the Port of Calapan in Oriental Mindoro. This Ro-Ro route plays the most important role in the transportation of commodities between Oriental Mindoro and the Port of Batangas. Similarly, operation of Ro-Ro vessels is expected to start on the route between the Port of Batangas and Occidental Mindoro in the future.

Port cargo volume at the Port of Batangas transported to/from Mindoro Island by Ro-Ro vessels is forecast in this section.

Most of cargoes transported between the Port of Batangas and Mindoro Island are presently transported by Ro-Ro vessels. They will retain a major share of cargo

transportation in the future. On the other hand, many small crafts less than five hundred (500) DWT which presently call at the Port of Batangas will continue to play a minor role in cargo transportation between the Port of Batangas and the small ports located around Mindoro Island.

In the estimation of future cargo volume, the weight of vehicles transported by Ro-Ro vessels as the cargo volume of vehicles is forecast separately.

Said weight of vehicles is presently included in the cargo classification of other cargoes. However, the weight of vehicles can be estimated by using the ratio between the cargo volume transported by vehicles on Ro-Ro vessels and the weight of the vehicles themselves.

2) Estimation of Cargo Volume of Ro-Ro Vessels

Ro-Ro vessels are presently operated, as stated, only on the route between Batangas and Calapan. The cargo volume transported between the Port of Batangas and Mindoro Island can be broken down into that which is transported between the Port of Batangas and the Port of Calapan, and that which is transported between the Port of Batangas and other ports on Mindoro Island.

Almost all of the cargo transported between Batangas and Calapan is carried by the Ro-Ro service. We can calculate the ratio of the Ro-Ro cargo versus all the other cargo which is sent to and from other ports in Oriental Mindoro. This ratio is not likely to change in the future.

In this manner the future cargo volume transported by Ro-Ro vessels between the Port of Batangas and the Port of Calapan can be estimated by using the present ratio and the estimated future cargo volume between the Ports.

The results of the O/D survey concerning port cargoes handled at the Port of Batangas in 1983 are shown in Appendix 6.2.1. Most of the cargo volume to and from the "others" category in Region IV in these tables is trade with ports in Mindoro Island other than the ports specifically listed in these tables, according to the original data of monthly cumulative documents held by PMU Batangas. Fifty percent (50%) of this cargo volume to/from others in Region IV can safely be assumed to be cargo volume to/from Oriental Mindoro.

Total cargo volume to/from all ports in Oriental Mindoro can be calculated by adding up the said fifty percent of cargo volume to/from others in Region IV, cargo volume to/from Pto. Galera, and cargo volume to/from Calapan in Appendix 6.2.1 other than that of Other General Cargo, which is nearly equal to the weight of the vehicles. These values are summarized in Table 6.2.40 to calculate the ratio between cargo volume to/from the Port of Calapan and that to/from all ports in Oriental Mindoro. In this table, the present total cargo volume to/from Oriental Mindoro is calculated as 161,000 tons, about 117,000 tons of which is inward and the rest is outward at the Port of Batangas.

Table 6.2.40 Percent of Total Oriental Mindoro Cargo Handled on the Calapan Route

	Oriental Mindoro	Calapan*1		Pto. Galera	Other Oriental*2 Mindoro
	Cargo (tons)	Cargo (tons)	(%)	Cargo (tons)	Cargo (tons)
Total	161,966	150,461	93	5,250	6,255
Inward	117,026	110,600	95	3,246	3,180
Outward	44,940	39,861	89	2,004	3,075

Note: *1 Cargo volume to/from Calapan except Other Gen. Cargo
*2 50% of cargo volume to/from Other Region IV Ports except Sta. Cruz, Balanacan, San Jose, Pto. Galera, Pto. Princesa and Bauan.

According to Table 6.2.40, the ratio of cargo to Calapan is 93 percent of total cargoes, 95 percent of inward cargoes and 89 percent of outward cargoes in 1983. The values of these ratios will not change greatly in the future. Thus ratios for inward cargoes and outward cargoes by commodity can be assumed to be 95 percent and 90 percent respectively.

Therefore, future cargo volume by Ro-Ro vessels between the Port of Batangas and the Port of Calapan can be estimated by multiplying these ratios by the previosly estimated cargo volume to/from all the ports in Oriental Mindoro by commodity.

3) Estimation of Vehicle Weight

To estimate the weight of vehicles transported by Ro-Ro vessels, the ratio between cargo volume transported by vehicles and the weight of the vehicles themselves on Ro-Ro vessels should be calculated.

According to automobile producer statistics, the ratio in Japan is as follows:

$$\frac{\text{Weight of vehicles}}{\text{Cargo volume transported by vehicles}} = 0.75 \text{ (refer to Appendix 6.2.19)}$$

This value is also applicable in the Philippines. The number of vehicles which transport inward cargoes can be taken as the same as that which transport outward cargoes in total in a year. Thus we should adopt whichever is larger, the weight of inward or outward cargoes, when calculating the actual weight of the vehicles themselves.

Under this context, the weight of vehicles on Ro-Ro vessels was estimated by multiplying the inward cargo weight by the above ratio, 0.75. The result is shown in Table 6.2.41.

Table 6.2.41 Estimated Vehicle Weight

('000 MT)

	Potential Ro-Ro Cargo Volume *1	In/Out	Ratio of Ro/Ro	Projected Ro-Ro Cargo Volume *2	Vehicle Weight	Actual Vehicle Weight
1990	222	In	0.95	211	158	158
	77	Out	0.9	69	52	158
2000	320	In	0.95	303	227	227
	(I) 131	Out	0.9	117	87	227
	(II) 167			150	113	
	(III) 216			194	145	

*1 "Potential Ro-Ro Cargo Volume" is the total volume of all cargoes that can be carried by Ro-Ro vessels.

*2 "Projected Ro-Ro Cargo Volume" is the volume of cargo which we project will actually be carried by Ro-Ro Vessels.

(11) Additional Cargo To/From Occidental Mindoro from New Ro/Ro Service

The introduction of a new Ro-Ro ferry service will develop Occidental Mindoro and greatly increase the cargo volume. This forecast assumes that the new service will be established between Batangas and Abra de Ilog in the year 2,000. "Inter-model Route Network Analysis of the West Mindoro – Luzon Corridor (NTPP, Sep. 1983)" concludes the following by comparing cargo and passenger traffic costs of Occidental Mindoro – Manila directly by conventional ship with costs of Occidental Mindoro – Manila via Batangas by Ro-Ro truck.

① As far as transport cost between central and northern Occidental Mindoro and Manila, cost via Batangas (by Ro-Ro) is cheaper. In the case of transportation from the southern part of Occidental Mindoro to/from Manila, both costs are similar.

② As for passenger traffic, the cost via Batangas is cheapest for all of Occidental Mindoro.

③ The flow of rice, which is the biggest surplus cargo, is controlled by NFA.

Judging from the above conclusions, the new Ro-Ro service between Batangas and Abra de Ilog could convey all cargoes except for rice in the central and northern part and 50% of them in the southern part, and all travellers from Occidental Mindoro are assumed to make use of the Abra de Ilog route. The central and northern part, and the southern part of Occidental Mindoro are defined as follows:

① Central and Northern Part – Abra de Ilog, Paluan, Mamburao, Sta. Cruz, Sablayan

② Southern Part – Magsaysay, San Jose, Rizal, Calintaan

The land area and population of the central and northern, and southern parts in 1980 are shown in Table 6.2.42.

Table 6.2.42 Land Area and Population of Occidental Mindoro (1980)

	Land Area		Population	
	(Km^2)	(%)	(Persons)	(%)
Central and Northern Part	4,307.8	76	83,490	42
Southern Part	1,368.5	24	116,847	58
Total	5,676.3	100	200,337	100

Source: Province of Occidental Mindoro Accomplishment Report 1978 ~ 1983/1984; Office of the Prime Minister

Agricultural products and consumer goods are distributed in accordance with the population ratio of 40 to 60 of the central and norhtern part to the southern part.

Based on the above, cargo volume for the new Ro-Ro service is estimated by commodity considering the following assumptions:

① 30% of the palay/rice in the central-northern part and 20% of the palay/rice in the southern part will be purchased by private millers or other private buyers.

② 85% of the cement consumed in Occidetal Mindoro will be transported from Batangas.

③ 100% of the imported fertilizer consumed in Occidental Mindoro will be shipped from Batangas Port.

The percentages of the 3 cargoes listed above will be transpoted via the Ro-Ro service.
On the other hand, other cargoes are estimated by the following formula.

Inward Cargo: Mainly agricultural products

[Inward other cargoes for Ro-Ro] = [Inward oher cargoes of Oriental Mindoro] × [Ratio of agricultural products except palay and coconut between Oriental and Occidental Mindoro] × 0.7

Outward Cargo: Mainly consumer goods

[Outward other cargoes for Ro-Ro] = [Outward other cargoes of Oriental Mindoro] × [Ratio of population between Oriental and Occidental Mindoro] × 0.7

Futhermore, the ratio between cargo handled by the Ro-Ro service versus the cargo handled by other vessels in Oriental Mindoro calculated in (10), above, is assumed applicable to the new Ro-Ro service planned for Occidental Mindoro.

The forecast results for the new service are shown in Table 6.2.43.

Table 6.2.43 Estimated Cargo Volume Carried by Ro-Ro Vessels for Occidental Mindoro at Batangas Port, 2000

(tons)

Commodity		Production/ Consumption in Occ. Mindoro	Cargo Volume Available for Ro-Ro Vessels	Cargo Volume Carried by Ro-Ro Vessels
Palay/Rice	In	128,000	22,000	21,000
Cement	Out	(I) 30,000	26,000	23,000
		(II) 37,000	31,000	28,000
		(III) 44,000	37,000	33,000
Fertilizer	Out	33,000	22,000	20,000
Other Cargoes	In	34,000	24,000	22,000
	Out	(I) 10,000	7,000	6,000
		(II) 17,000	12,000	11,000
		(III) 24,000	17,000	15,000
Total	In	162,000	46,000	43,000
	Out	(I) 72,000	57,000	50,000
		(II) 87,000	65,000	59,000
		(III) 100,000	78,000	70,000

(12) Passengers

Generally passenger trips will be classified as follows;

① Islander's trips (including daily working business trips)
② Sightseer's trips

As mentioned in 6.2.1 (1), the number of passengers for islander's trips is estimated in correlation with socio-economic activities which are expressed by GRDP, and sightseers are estimated in consideration of future tourist resort development.

1) Number of Trips for Islanders

Batangas Port currently has three passenger routes which connect Batangas to Calapan, Puerto Galera and Abra de Ilog. In order to find out the correlation between the past actual number of trips per capita and GRDP, the hinterlands and their population for each port have been determined. As a first step of the calculation, the hinterlands are assumed as follows:

① Calapan route: Oriental Mindoro Provice except the Municipality of Puerto Galera
② Puerto Galera Route: Municipality of Puerto Galera
③ Abra de Ilog Route: Municipalities of Abra de Ilog, Paluan, Mambrao, and Santa Cruz in Occidental Mindoro

Since the combined hinterlands of Calapan and Puerto Galera Ports are considered to be the whole of Oriental Mindoro, the total number of passengers that pass through both the ports of Calapan and Puerto Galera can be assumed to be obtained in correlation with the population of Oriental Mindoro. As for the Abra de Ilog Port, its hinterland consists of the four municipalities of northern Occidental Mindoro province. Based on the statistics of NCSO in 1980, the population of these four municipalities in 1980 accounted for 20% of the total of Occidental Mindoro. (Appendix 6.2.20)
Since this composition of the population to the total is assumed to be constant by the year 1983, the number of trips per capita can be calculated by dividing the actual number of passengers by the total population of these hinterlands, as shown in Table 6.2.44.

Table 6.2.44 Number of Trips per Islander

	Number of Passengers (persons)	Population (persons)			Number of Trips Per Capita
		Mindoro Ori.	Mindoro Occ. (20%)	Total	
1979	739,775	435,000	43,000	478,000	1.55
1980	630,463	447,000	45,000	492,000	1.28
1981	592,665	456,000	46,000	502,000	1.18
1982	635,621	464,000	48,000	512,000	1.24
1983	735,593	474,000	50,000	524,000	1.40

To obtain the correlation between the number of trips per capita and GRDP from 1980 to 1983, the Least Square Method has been applied. As a result, the following equation has been obtained:

$$Y = 0.0001316\,X - 0.486 \quad (R = 0.521)$$

Where, Y : number of trips per capita[
X : GRDP in Region IV (₱ million, at 1972 prices)
R : correlation coefficient

The number of passengers in 1990 and 2000 can be estimated by using the population and the number of trips per capita obtained from the above equation, as shown in Table 6.2.45.
As for the population in 2000, as the hinterland of Abra de Ilog will expand, the estimation for the number of passengers has been carried out using the total population of Mindoro Island.

Table 6.2.45 Estimated Number of Passengers at Batangas Port in 1990, 2000

	GRDP (₱ million 1972 prices)	Trips per Capita	Population (persons)	Passengers (persons)
1990	15,706	1.58	650,000	1,027,000
2000 (I)	21,313	2.32		2,500,000
(II)	25,583	2.88	1,090,000	3,140,000
(III)	30,896	3.58		3,900,000

2) Tourists for the Newly Developed Resort

According to MIRDP, a large scale resort development project is now taking place at Puerto Galera.

In the future, the number of passengers will be increased by this project. The new sightseers will travel the Puerto Galera route.

According to the Puerto Galera Integrated Tourism Development Project, the future number of sightseers is assumed as follows:

1990 ..... 12,000 persons
2000 ..... 19,500 persons

Further, as this project will be completed in 2015, the number of sightseers will increase further.

3) Estimated Number of Passengers by Route

The number of passengers, estimated in 1) and 2), are distributed by the populations of each hinterland as follows:

① Calapan Route: Oriental Mindoro except Puerto Galera
② Puerto Galera Route: 3% of total Oriental Mindoro plus sightseers to Puerto Galera
③ Abra de Ilog Route: 20% of total Occidental Mindoro in 1990, 100% in 2000

In Occidental Mindoro, there are three airports, San Jose, Mambrao and Lubang. The total number of passengers at these three airports was about 90 thousand persons in 1979. (Appendix 6.2.21)

Then, for the Abra de Ilog route in 2000, the estimated number of passengers will be reduced 10% to account for air passengers.

The estimated number of passengers by route are shown in Table 6.2.46.

Table 6.2.46 Estimated Number of Passengers by Route at Batangas Port

(Persons)

	Total	Calapan	Puerto Galera	Abra de Ilog
1990	1,040,000	906,000	40,000	94,000
2000 (I)	2,470,000	1,620,000	70,000	780,000
(II)	3,050,000	2,010,000	80,000	960,000
(III)	3,800,000	2,500,000	100,000	1,200,000

6-2-4 Summary of Cargo and Passenger Forecasts

(1) Comparison between Macroscopic and Microscopic Estimates

According to the macroscopic approach, the total cargo volume at Batangas Port excluding cement export is estimated to be 570 thousand tons and 1,250 ~ 2,430 thousand tons in 1990 and 2000 respectively.

On the other hand, according to the microscopic estimate, major cargoes except for cement export total 766 thousand tons and 2,435 ~ 2,933 thousand tons for 1990 and 2000 respectively.

Adding 105 thousand tons and 90 ~ 190 thousand tons of estimated cement export volume for 1990 and 2000, the total cargo volume, including cement export by the macroscopic method, amounts to 675 thousand tons and 1,340 ~ 2,620 thousand tons in 1990 and 2000, respectively, as shown in Table 6.2.47, 6.2.48.

Table 6.2.47 Estimated Cargo Volume by Macroscopic Approach

('000 tons)

	Total Excluding Cement Export	Cement Export	Total
1990	570	105	675
2000 (I)	1,250	90	1,340
(II)	1,780	130	1,910
(III)	2,430	190	2,620

Table 6.2.48 Estimated Cargo Volume by Microscopic Approach

('000 tons)

	Total Excluding Cement Export	Cement Export	Total
1990	766	105	871
2000 (I)	2,435	90	2,525
(II)	2,933	130	3,063
(III)	3,641	190	3,831

The difference between macro and microscopic estimations is 196 thousand tons and 1,153 ~ 1,210 thousand tons for 1990 and 2000 respectively. The microscopic estimate is larger than the macroscopic estimate.

There are various reasons for this difference, as follows:

① As mentioned before, although Batangas Port is strongly related to the Metro Manila Zone, its hinterlands differ greatly by commodity.

② Through this Port, agricultural products from Mindoro Island are shipped to the Metro Manila Zone.

③ The macroscopic estimation, which is based on the actual trends of cargo traffic of the last few years, does not reflect the future changes in the functions of the Port.

Thus, the macroscopic estimate does not reflect the future functions of Batangas Port including increasing agricultural activities and promoting improved infrastructures on Mindoro Island.

Therefore, it is reasonable to adopt the microscopic estimate of future port traffic.

(2) Summary of Cargo and Passenger Forecast

The cargo and passenger forecast is carried out assuming three alternative economic growth rates between 1990 and 2000. This means that the estimated cargo and passenger volume reflect a range of possible economic fluctuations in the future. We have applied the middle estimate for planning the scale of the port facilities for 2000.

This forecast is shown in Table 6.2.49 and 6.2.50. Figure 6.2.4 is a graphic representation of the cargo forecast by trade mode.

Table 6.2.49 Projection of Cargo and Passenger Traffic through Batangas Port

('000 tons, '000 persons)

	Actual					Estimated									
	1983					1990					2000				
	Domestic		Foreign		Total	Domestic		Foreign		Total	Domestic		Foreign		Total
	UL	L	UL	L		UL	L	UL	L		UL	L	UL	L	
(Cargo)															
Palay/Rice	34	0	–	–	34	105	–	–	–	105	159	–	–	–	159
Copra	20	0	–	–	20	37	–	–	–	37	45	–	–	–	45
Cement	4	20	–	35	59	–	50	–	105	155	–	102	–	130	232
Minerals	21	–	–	2	23	7	–	13	–	20	9	–	19	–	28
Logs/Wood Products	17	3	–	–	20	59	–	–	–	62	82	5	–	–	87
Fertilizer	0	5	–	–	5	–	22	–	–	22	27	56	160	–	243
Steel	–	–	–	–	–	–	–	–	–		1,200	–	200	–	1,400
Others	131	102	1	–	234	90	24	12	28	154	166	92	31	38	327
Sub-total	227	130	1	37	395	298	99	25	133	555	1,688	255	410	168	2,521
Cargo Volume for Ro/Ro**	–	–	–	–	–	211	69	–	–	280	346	209	–	–	555
Vehicle Weight	*	*	–	–	*	158	158	–	–	316	271	271	–	–	542
Total	227	130	1	37	395	456	257	25	133	871	1,959	526	410	168	3,063
Passengers	736		–		736	1,040		–		1,040	3,050		–		3,050

Note: 1) * included in others
2) ** This figure is included in the sub-total
3) UL = unloaded cargo, L = loaded cargo

Table 6.2.50 Summary of Cargo Volume for Ro-Ro Vessels

('000 tons)

	1990									2000											
	Ro-Ro (1)			Others			Total			Ro-Ro(1)			Ro-Ro(2)			Others			Total		
	UL	L	Total	UL	L	Total	UL	L	Total	UL	L	Total	UL	L	Total	UL	L	Total	UL	L	Total
Palay/Rice	95	-	95	10	-	10	105	-	105	130	-	130	21	-	21	8	-	8	159	-	159
Copra	35	-	35	2	-	2	37	-	37	43	-	43	-	-	-	2	-	2	45	-	45
Cement	-	31	31	-	19	19	-	50	-	64	-	64	-	28	28	-	10	10	-	102	102
Minerals	-	-	-	7	-	7	7	-	7	-	-	-	-	-	-	9	-	9	9	-	9
Logs/Wood Products	-	2	2	59	1	60	59	3	62	-	3	3	-	-	-	82	2	84	82	5	87
Fertilizer	-	18	18	-	4	4	-	22	22	-	22	22	-	20	20	27	14	41	27	56	83
Steel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1200	-	1200	1200	-	1200
Others	81	18	99	9	6	15	90	24	114	130	61	191	22	11	33	14	20	34	166	92	258
Sub-total	211	69	280	87	30	117	298	99	397	303	150	453	43	59	102	1342	46	1388	1688	255	1943
Vehicle Weight	158	158	316	-	-	-	158	158	316	227	227	454	44	44	88	-	-	-	271	271	542
Total	369	227	596	87	30	117	456	257	713	530	377	907	87	103	190	1342	46	1388	1959	526	2485

Note: RO-RO (1): Calapan Route
Ro-Ro (2): Abra de Ilog Route

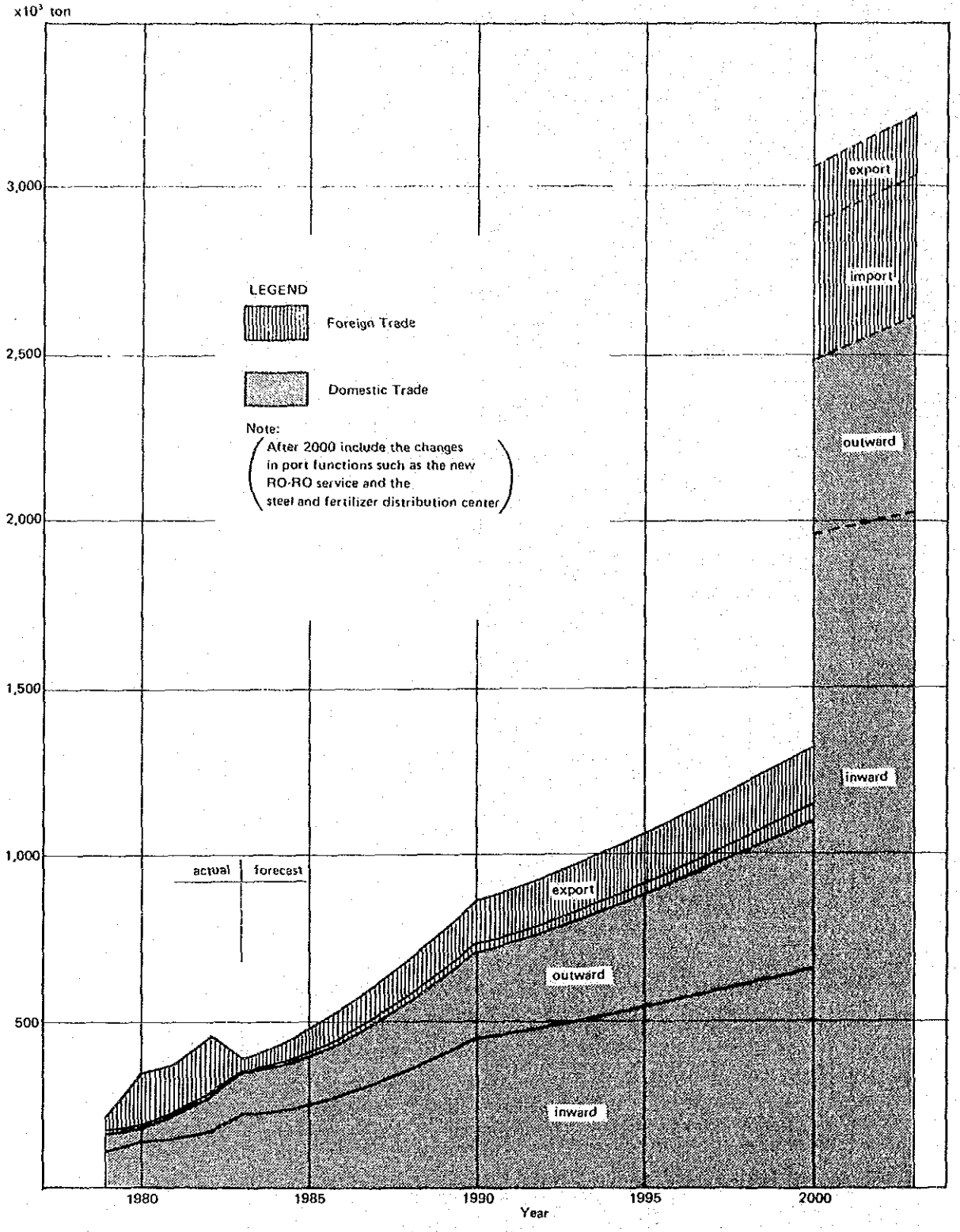


Fig. 6.2.4 Cargo Forecast by Trade Mode at Batangas Port