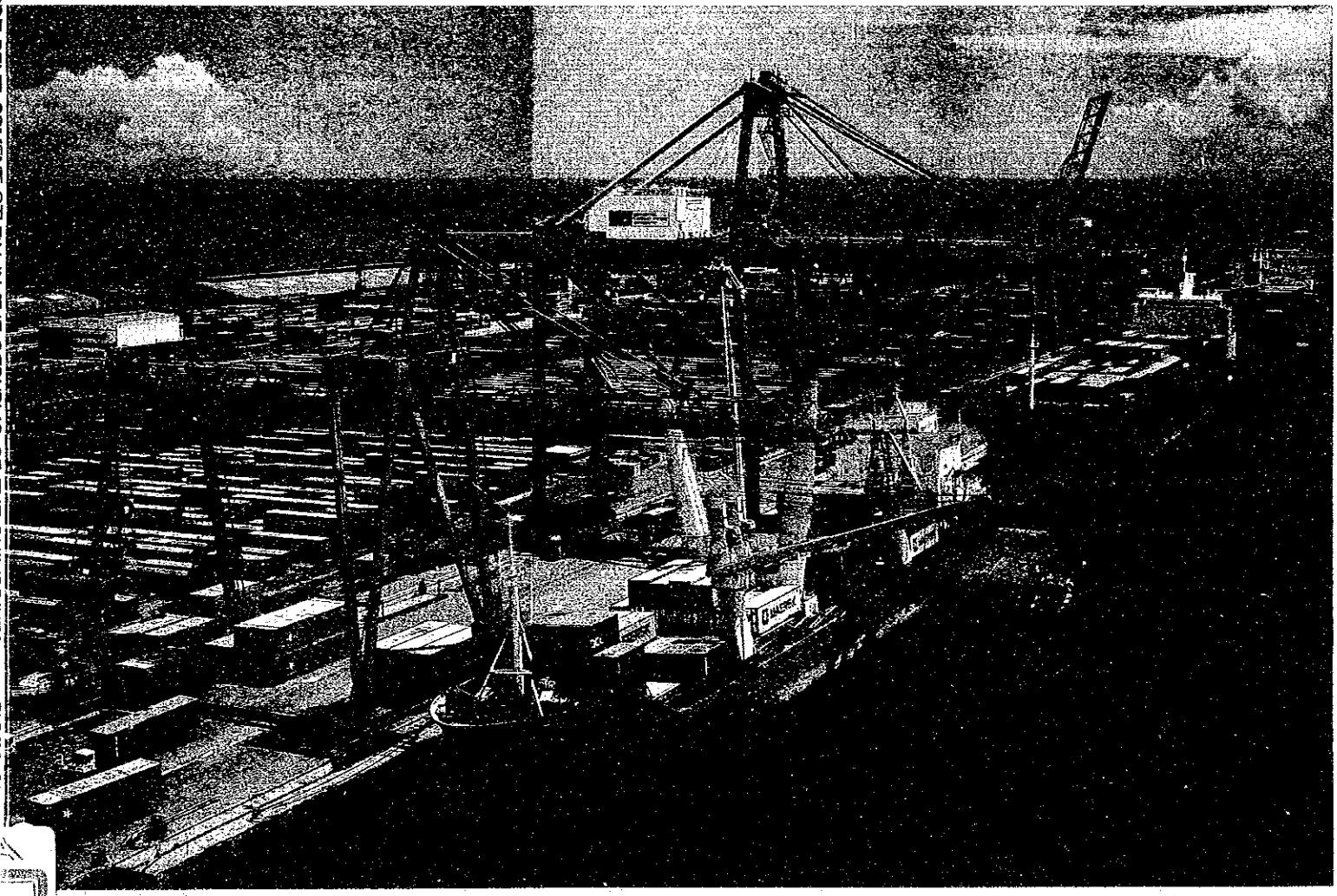
社会開発調査部報告書 OOPERATION AGENCY (JICA)
DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
IN THE PHILIPPINES

No. 52

FINAL REPORT

THE GREATER CAPITAL REGION INTEGRATED PORT DEVELOPMENT STUDY IN THE REPUBLIC OF THE PHILIPPINES

SUMMARY



OCTOBER 1994

THE OVERSEAS COASTAL AREA DEVELOPMENT INSTITUTE OF JAPAN (OCDI)
OCEAN CONSULTANT JAPAN CO.,LTD.(OCJ)

FINAL REPORT THE GREATER CAPITAL REGION INTEGRATED PORT DEVELOPMENT STUDY IN THE REPUBLIC OF THE PHILIPPINES SUMMARY

Exchange Rate

1 US Dollar = 28.0 Peso = 112 Yen

(As of December 1993)

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
IN THE PHILIPPINES

FINAL REPORT

THE GREATER CAPITAL REGION INTEGRATED PORT DEVELOPMENT STUDY IN THE REPUBLIC OF THE PHILIPPINES

SUMMARY

OCTOBER 1994

PREFACE

In response to a request from the Government of the Republic of Philippines, the Government of Japan decided to conduct a Master plan study on THE GREATER CAPITAL REGION INTEGRATED PORT DEVELOPMENT and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent a study team to the Philippines between April 1993 to August 1994. The study team was headed by My. Kano and composed of members of the Overseas Coastal Area Development Institute of Japan (OCDI) and Ocean Consultant Japan Co., LTD. (OCJ).

The team held discussions with the officials concerned of the Government of the Philippines and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Philippines for their close cooperation extended to team.

October 1994

Kimio FUJITA
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

October 1994

Mr. Kimio FUJITA
President
Japan International Cooperation Agency

Dear Mr. Fujita,

It is my great pleasure to submit herewith the Report on the Greater Capital Region Integrated Port Development Study in the Republic of the Philippines.

The Study Team which consists of the Overseas Coastal Area Development Institute of Japan (OCDI) and Ocean Consultant, Japan, Co., Ltd.(OCJ) conducted four series of surveys in the Philippines from April 1993 to August 1994 as per the contract with the Japan International Cooperation Agency.

Based on the findings of these surveys as well as the data and information collected and analyzed in Japan, the Study Team held discussions with the Philippine officials of the Department of Transportation and Communications and other authorities concerned, and has formulated development strategies of major ports in the Greater Capital Region, master plans for the Port of Manila, the Port of Batangas, Sangley Point, and the Naic/Cavite New Port, and also has conducted a preliminary evaluation of master plan components for the selected two ports.

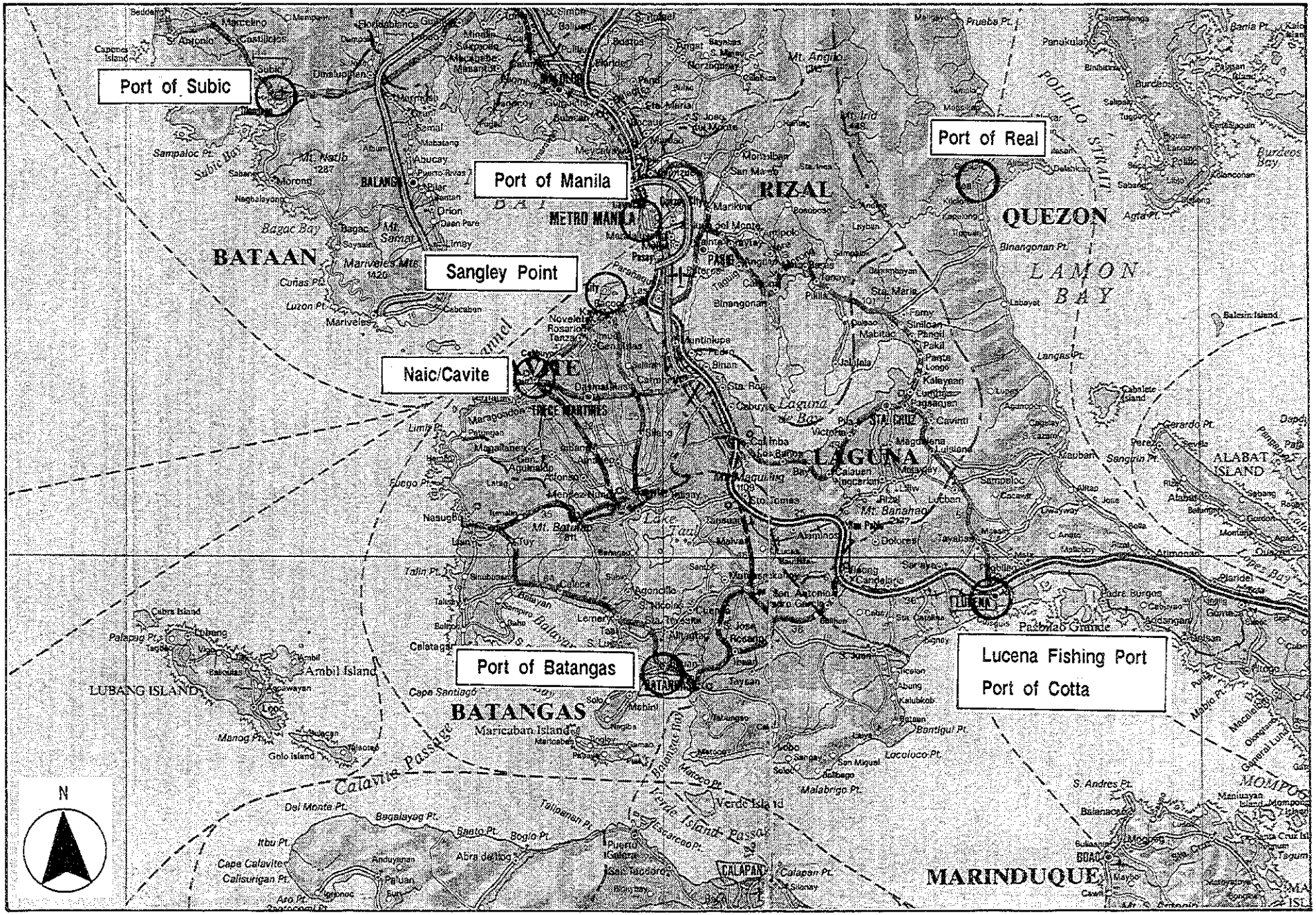
On behalf of the Study Team, I would like to express my deepest appreciation to the Department of Transportation and Communications and to other related agencies of the Philippine Government for their brilliant cooperation and assistance and for the heartfelt hospitality which was extended to the Study Team during our stay in the Philippines.

I am also greatly indebted to the Japan International Cooperation Agency, the Ministry of Foreign Affairs, the Ministry of Transport, and the Embassy of Japan in Manila for giving us valuable suggestions and assistance during the field surveys and the preparation of this report.

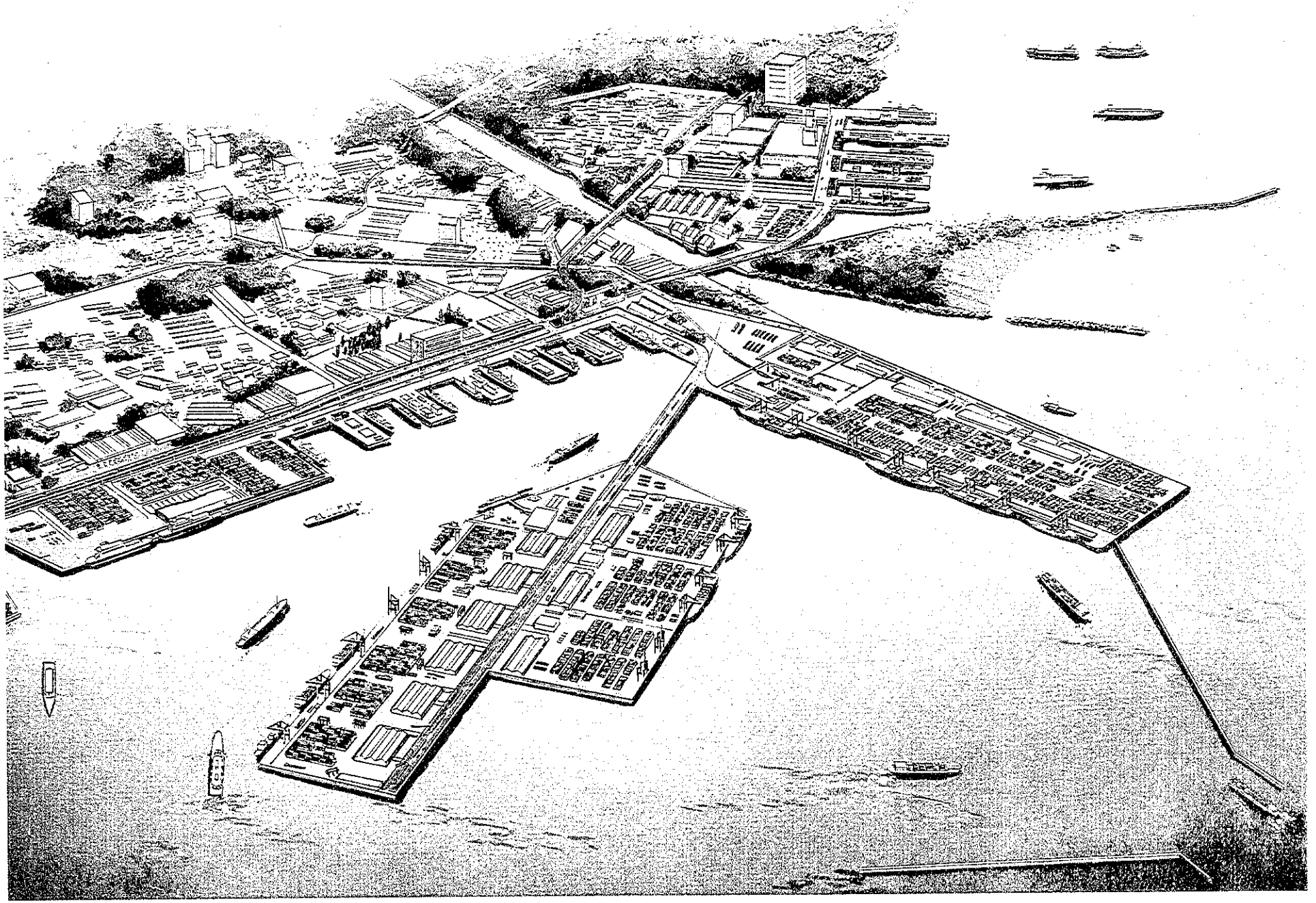
Yours faithfully,

Jiro KANO
Leader of the Study Team for the Greater Capital Region Integrated Port Development Study in the Philippines

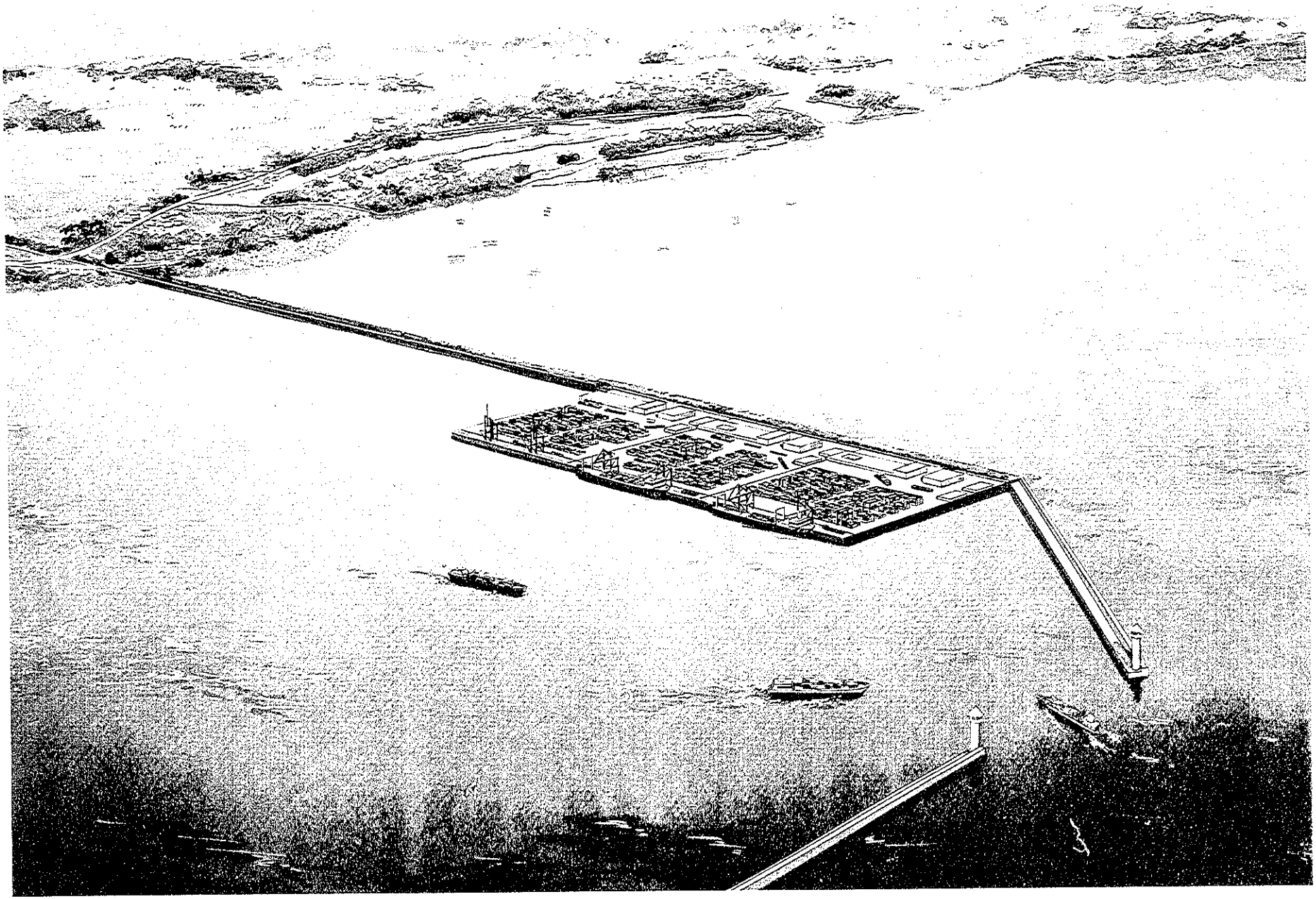

N
PHILIPPINE SEA
PHILIPPINES
LUZON
LA UNION
PANGASINAN
ZAMBALES
TARLAC
NUEVA ECIJA
AURORA
BATAAN
MANILA
CAVITE CITY
QUEZON
CAMARINES NORTE
CALAGUA ISLANDS
POLILLO ISLANDS
MARINDUQUE
MINDORO ORIENTAL
MINDORO OCCIDENTAL
BATANGAS
SIBUYAN ISLAND
MASBATE
ROMBLON
Port of Manila
Port of Batangas
Verde Island Passage
Tablas Strait
Mompog Passage
Apo Reef Nat. Park
LOCATION MAP



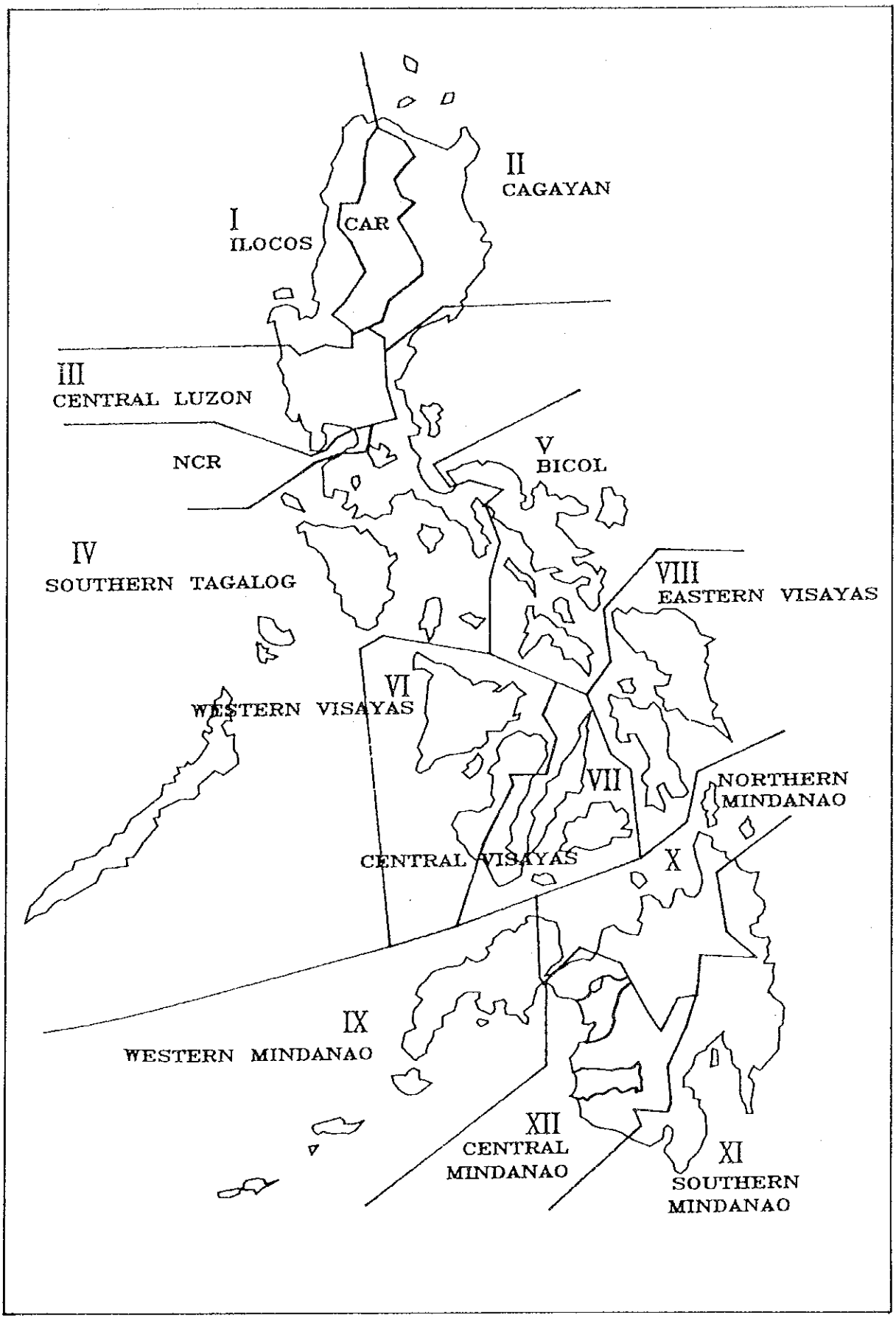
LOCATION MAP OF MAJOR PORTS IN GCR



PORT OF MANILA (MEDIUM ECONOMIC GROWTH CASE)



NAIC/CAVITE NEW PORT (HIGH ECONOMIC GROWTH CASE)



REGIONAL DELINEATION

ABBREVIATIONS

ADB	Asian Development Bank
AG&P	Atlantic Gulf and Pacific Corp. Manila
BAECON	Bureau of Agricultural Economics
BAEX	Bureau of Agricultural Extension
BBTI	Batangas Bay Terminal Incorporation
BCGS	Bureau of Coast Geodetic Survey
BEU	Bureau of Energy Utilization
BFAR	Bureau of Fishery Aquatic Resources
BFD	Bureau of Forest Development
BM	Bench Mark
BMG	Bureau of Mining Group
BOC	Bureau of Customs
BOD	Biochemical Oxygen Demand
CALABARZON	Cavite, Laguna, Batangas, Rizal and Quezon
CB	Central Bank
CFC	Conversion Factor for Consumption
CFS	Container Freight Station
CPA	Cebu Port Authority
DENR	Department of Environment and Natural Resources
DHS	Department of Human Settlements
DOA	Department of Agriculture
DOE	Department of Energy
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
DTI	Department of Trade and Industry
DWT	Dead Weight Tonnage
EDSA	Epifanio Delos Santos Ave Extension
EIRR	Economic Internal Rate of Return
EMB	Environmental Management Bureau
EPZ	Export Processing Zone
FPA	Fertilizer and Pesticide Authority
GCR	Greater Capital Region
GDP	Gross Domestic Product

GPS	Global Positioning System
GNP	Gross National Product
GRDP	Gross Regional Domestic Product
GRT	Gross Tonnage
GT	Gross ton(s)
GVA	Gross Value Added
ICD	Inland Container Depot
ICTSI	International Container Terminal Service, Inc.
JETRO	Japan External Trade Recovery Organization
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standard
LOA	Length of Over All
LO/LO ship	Lift on Lift off ship
MARINA	Maritime Industry Authority
MICT	Manila International Container Terminal
MIRDP	Mindoro Integrated Rural Development Plan
MT	Metric Ton(s)
NEDA	National Economic and Development Authority
NCA	National Coal Authority
NCR	National Capital Region
NCSO	National Census and Statistics Office
NEPC	National Environmental Protection Council
NFA	National Food Authority
NHA	National Housing Authority
NIEP	Nationwide Industrial Estate Planning
NSC	National Steel Corporation
NSCB	National Statistic Cordination Board
NTPP	National Transportation Planning Project
O/D	Origin and Destination
OECF	Overseas Economic Cooperation Fund
PAGASA	Philippine Atmospheric Geographical and Astronomical Service Administration
PASTORA	Planning Assistance Service to Rural Areas
PCA	Philippine Coconut Authority
PCIA	Philippine Cement Industry Authority

PCU	Passenger Car Unit
PFDA	Philippine Fishery Development Authority
PFM	Pacific Flour Mills
PHILSUCOM	Philippine Sugar Commission
PMU	Port Management Unit
PNCC	Philippine National Construction Company
PNOC	Philippine National Oil Company
PPA	Philippine Ports Authority
REGION III	Central Luzon Region
REGION VI	Southern Tagalog Region
RO/RO ship	Roll on Roll off ship
SCF	Standard Conversion Factor
SME	Small & Medium scale Enterprises
SMB	Sverdrup, Munk and Bretschneider
SPT	Standard Penetration Test
TEU	Twenty-foot Equivalent Unit
UNICHEM	United Coconut Chemicals, Inc.

CONTENTS

EXECUTIVE SUMMARY

Executive Summary

1. Background of the Study

Metro Manila and its surrounding eight (8) provinces (hereinafter referred to as "the Greater Capital Region" or "GCR" for short) is a promising area in terms of economic development, and is expected to become the economic center of the Philippines. In particular, the CALABARZON Region (Southern five (5) provinces) is designated as a large scale regional development area. Industrial development projects are already in progress in some areas of the region.

However, transport infrastructure such as roads, highways, railways and ports in those areas is still undeveloped except for that in Metro Manila. This has been an obstacle in achieving a balanced development of the whole region. Especially, the improvement and development of ports and harbors in the Greater Capital Region is one of the most urgent problems. In other words, port capacities have been unable to catch up with both actual seaborne cargo demand and enlargement of calling vessels for a long time. In addition, a greater amount of seaborne cargo has been concentrating at the Port of Manila. This causes an unfavorable and excessive impact on the land transportation within the hinterland.

On the other hand, the development of other ports in the Greater Capital Region has been retarded in spite of urgent needs for port rehabilitation and extension. In order to improve this situation, it is most essential to establish functional allocation and prioritization among ports in the Greater Capital Region, and to formulate both port development strategies and long-term port master plans from the viewpoint of regional economic development.

Based on this recognition described above, the Government of the Philippines requested the Government of Japan to conduct a study on integrated port development in the greater Capital Region (hereinafter referred to as "the Study"). In response to the request, the Government of Japan conducted the preliminary study in November 1992, which was entrusted to the Japan International Cooperation Agency (JICA). This Study was conducted from March 1993 to October 1994 and the results of the Study are incorporated in this report.

2. Objectives of the Study

The objectives of the Study are as follows:

1) To formulate development strategies of major ports in the Greater Capital Region for the period up to the year 2010 in terms of functional allocation and development requirements of each port.

2) To formulate a master plan for the Port of Manila, Batangas, Sangley Point and Naic/Cavite for the period up to the year 2010; and

3) To conduct pre-liminary evaluation of the master plan components.

3. Outline of the Study Result

3.1 Port Development Strategies

Port development strategies for the Port of Manila, Batangas, Sangley Point, Naic/Cavite and Subic in the target year 2010 are outlined as shown in Table 3-1-1.

3.2 Master Plan

The master plans (Long-term pot facility's plan and introduction of necessary cargo handling equipment) for the Port of Manila, Batangas, Sangley Point and Naic/Cavite are outlined as shown in Table 3-2-1.

4. Project Costs

The construction costs for the projects proposed in this study are outlined as shown in Table 4-1.

Table 3-1-1 Port Development Strategies in the Greater Capital Region

Port	Present Situation	Port Development Strategy
Subic	· Broad calm water area. Former US Naval Base. · American President Lines (APL) has already started international container service, but frequency is low, thus a small amount of container cargo is handled at port. · Industrialization at Subic has been realized by Taiwan group at first. · Free port project has been announced and port authority has begun duty-free sale on a small scale. · Possible project for marine recreation development. Beach is now open for public. · Distant location from Metro Manila, especially poor road link between San Fernando and Olongapo. · Cargo handling system is not modernized, in addition further improvement of port facilities is still needed for efficient cargo handling operation.	· Base port whose hinterland covers the North-west Luzon Island. · In order to develop the Port, road investment connecting with major commercial or industrial centers should have the first priority. · From the very long-term point of view, international container transshipment port is possible. · Industrial port in accordance with industrial development in backward area is also possible. · The Port should play a role as free trade zone, shelter port during storm and other urgent use until the port and road links are fully developed.
Manila	· The busiest port in the Philippines. · Super-hub port connecting with all major islands. · Increasing seaborne cargo recently, in particular container and roll on/roll off cargo. · Obvious trend of vessel-size enlargement · Successful privatization at the Manila International Container Terminal (MICT) · Rail-served Inland Container Depot Project by MICT · Definite limitation of land space for port extension. · Possible impact of port traffic upon urban highway system in Metro Manila without any countermeasure in future.	· The Port of Manila remains unshakable as super-hub port of the Philippines · In accordance with de-centralization of Metro Manila's urban function together with highway improvement extension in surrounding areas, diversion of the port role and function at Manila will be promoted. · The provision of further port facilities for rapidly increasing domestic container and roll on/roll off cargo is very urgent. Countermeasure for vessel-size enlargement is also needed. · Regarding international container cargo, Mict'S NO.5 container terminal and Rail-served Inland Container Depot (both are now projected), can catch up with increasing container demand up to the year 2000. After that, offshore port extension for new container terminals is required. · Further port improvement (port facilities and cargo handling system) for coping with growing international container cargo, especially in high economic case scenario, at the South Harbor should be accelerated. · In order to decrease the impact of port traffic on urban highway system, a port bridge across the Pasig River is needed. In addition, R-10 elevated highway project should be implemented.
Sangley Point	· Broad calm water area. Close to the South Channel in the Manila Bay. · Located in the neighborhood of Cavite Export Processing Zone (EPZ) and Metro Manila as well. · Relocation of the Naval Base is difficult. · Capacity of the access road to the proposed port site is not enough, in addition, widening of the road is infeasible due to fully developed urban district.	· Conversion plan of the Naval Base into an international commercial port is possible if relocation of the Base is achieved. · Wide discussion about the Naval Vase relocation is recommendable, from the national economic point of view. · From the long-term point of view, a construction plan of an international container port surrounding Sangley Point will mature, in spite of unsuccessful relocation of the Naval Base. · Further development of Cavite's EPZ and highway extension to Rosario will accelerate a new port construction.
Naic/ Cavite	· Natural sand beach, very shallow water area. · Small scale fishing activity, and seasonal beach recreation. · Sandy solid foundation at sea bottom. (Good natural condition for port construction) · Poor access road link to the port to cope with heavy container cargo transport. · Distance from commercial or industrial centers in GCR is also in question (Super highway construction is needed)	· High potential to construct a large scale commercial port along the Naic coast according to natural and social conditions. · The port construction plan of a few number of container berths is not recommendable for economic reasons. · Countermeasure for strong wave attack from the north direction should be carefully taken into account, during project implementation. · Countermeasure for drift sand into a port should be also taken into account.
Batangas	· Base port for trade with the Mindoro Island. · Roll on/roll off vessel's cargo and passenger are rapidly increasing. · A deep-sea port is possible without breakwaters. · Super-highway between the Port and the South Super Expressway is necessary. · Increasing demand of port cargo related to progress of the CALABARZON Regional Development Project.	· Base port for trade with the Mindoro Island is strengthened. · Provision of further port facilities for growing container cargo is accelerated after the completion of Phase-I project. Further port extension is not urgent until the target year 2010. · Improvement of cargo handling system to cope with modern container and roll on/roll off vessel arrival at the port. · The most promising port to assist the CALABARZON Regional Development Project.

Table 3-2-1 GCR Port Master Plan in the Target Year 2010 (1)

Port	Project	Low Economic Growth Case (GDP 4%)		Medium Economic Growth Case (GDP 5.5 %)		High Economic Growth (I) Case (GDP 7~7.5%)		High Economic Growth (II) Case (GDP 7~7.5%)		High Economic Growth (III) Case (GDP 7~7.5%)		Assumptions of Scenario
		Cargo Through put	Requirement	Cargo Though put	Requirement	Cargo Through put	Requirement	Cargo Through put	Requirement	Cargo Through put	Requirement	
MANILA	South Harbor Int'l Container Terminal	4,210 (Thousand Tons)	<Facility> Int'l container yard: 7.5 ha	4,440 (Thousand Tons)	<Facility> Int'l container yard: 7.5 ha	10,430 (Thousand Tons)	<Facility> Int'l container terminal: 3 berths (Depth -13 m; Length 300 m) and container yard: 35.4 ha Int'l container yard: 7.5 ha Dredging for access channel and turning basin: 5.3 Mil m^3 Port access road: 1,850 m <Equipment> Container Crane: 6 Nos. Transfer Crane: 15 Nos.	4,200 (Thousand Tons)	<Facility> Int'l container yard: 7.5 ha	4,200 (Thousand Tons)	<Facility> Int'l container yard: 7.5 ha	· All Surface and elevated highway projects are timely implemented according to DPWH's Highway Development Program.
	Manila Int'l Container Terminal (MICT)	12,090 (Thousand Tons)	<Facility> Int'l container Terminal: 1 berth (Depth -13 m; Length 300 m) Int'l container yard: 10 ha Dredging for access channel and turning basin: 1.98 Mil m^3 <Equipment> Container Crane: 2 Nos. Transfer Crane: 5 Nos.	17,800 (Thousand Tons)	<Facility> Int'l container Terminal: 3 berths (Depth -13 m; Length: 300 m) Int'l Container yard: 30.2 ha Dredging for access channel and turning basin: 3.48 Mil m^3 <Equipment> Container Crane: 6 Nos. Transfer Crane: 15 Nos.	20,570 (Thousand Tons)	<Facility> Int'l container Terminal: 4 berths (Depth -13 m; Length 300 m) Int'l container yard: 39.5 ha Breakwater extension: 400 m Dredging for access channel and turning basin: 5.02 Mil m^3 <Equipment> Container Crane: 8 Nos. Transfer Crane: 20 Nos.	20,570 (Thousand Tons)	<Facility> Int'l container Terminal: 4 berth (Depth -13 m; Length 300 m) Int'l container yard: 39.5 ha Breakwater extension: 400 m Dredging for access channel and turning basin: 5.02 Mil m^3 <Equipment> Container Crane: 8 Nos. Transfer Crane: 20 Nos.	20,570 (Thousand Tons)	<Facility> Int'l container Terminal: 4 berths (Depth -13 m; Length 300 m) Int'l container yard: 39.5 ha Breakwater extension : 400 m Dredging for access channel and turning basin: 5.02 Mil m^3 <Equipment> Container Crane: 8 Nos. Transfer Crane: 20 Nos.	· MICT's NO.5 int'l container terminal project will have been completed by the year 2000. · MICT's rail-served inland container depot project will have been compled without delay.
	North Harbor Dom'c Container Terminal	10,140 (Thousand Tons)	<Facility> Dom'c container terminal: 5 berths (Depth -10 m; Length 180 m) Dom'c container yard: 21 ha Dredging for access channel and turning basin: 3.7 Mil m^3 Port access road: 1,340 m Port bridge: 6 lanes <Equipment> Container crane: 5 Nos. Straddle carrier: 15 Nos.	13,750 (Thousand Tons)	<Facility> Dom'c container terminal: 6 berths (Depth -10 m; Length 180 m) Dom'c container yard: 26 ha Dredging for access channel and turning basin: 3.96 Mil m^3 Port access road: 1,520 m Port bridge: 6 lanes <Equipment> Container crane: 6 Nos. Straddle carrier: 18 Nos.	13,000 (Thousand Tons)	<Facility> Dom'c container terminal: 6 berth (Depth -10 m; Length 180 m) Dom'c container yard: 26 ha Dredging for access channel and turning basin: 3.96 Mil ^{3} Port access road: 1,520 m Port bridge: 6 lanes <Equipment> Container crane: 6 Nos. Straddle carrier: 18 Nos.	13,000 (Thousand Tons)	<Facility> Dom'c container terminal: 6 berths (Depth -10 m ; Length 180 m) Dom'c container yard: 26 ha Dredging for access channel and turning basin: 3.96 Mil m^3 Port access road: 1,520 m Port bridge: 6 lanes <Equipment> Container crane: 6 Nos. Straddle carrier: 18 Nos.	13,000 (Thousand Tons)	<Facility> Dom'c container terminal: 6 berths (Depth -10 m; Length 180 m) Dom'c container yard: 26 ha Dredging for access channel and turning basin; 3.96 Mil m^3 Port access road: 1,520 m Port bridge: 6 lanes <Equipment> Container crane: 6 Nos. Straddle carrier: 18 Nos.	· NHA's reclamation project is for mixed use, not for port facility only.
	Smokey Mount'n Dom'c Container Terminal					8,440 (Thousand Tons)	<Facility> Dom'c container terminal: 4 berths (Depth -10; Length -180 m) Dom'c container yard: 17 ha Dredging for access channel and turning basin: 4.2 Mil m^3 Port access road: 3,500 m <Equipment> Container crane: 4 Nos. Straddle carrier: 12 Nos.	8,440 (Thousand Tons)	<Facility> Dom'c container terminal: 4 berths (Depth -10 m; Length -180 m) Dom'c container yard: 17 ha Dredging for access channel and turning basin: 4.2 Mil m^3 Port access road: 3,500 m <Equipment> Container crane: 4 Nos. Straddle carrier: 12 Nos.	8,440 (Thousand Tons)	<Facility> Dom'c container terminal: 4 berths (Depth -10 m; Length -180 m) Dom'c container yard: 17 ha Dredging for access channel and turning basin: 4.2 Mil m^3 Port access road: 3,500 m <Equipment> Container crane: 4 Nos. Straddle carrier: 12 Nos.	· Smokey Mount'n Development and Reclamation Project will have been completed by the year 2010.
	North Harbor Dom'c RO/RO Terminal	9,160 (Thousand Tons)	<Facility> Dom'c RO/RO terminal: 1 berth (Depth -9 m ; Length 220 m) Dom'c RO/RO yard: 14.6 ha Dredging for access channel and turning basin: 0.04 Mil m^3	12,400 (Thousand Tons)	<Facility> Dom'c RO/RO terminal: 2 berths (Depth -9 m; Length 220 m) Dom'c RO/RO yard: 14.6 ha Dredging for access channel and turning basin: 0.24 Mil m^3	15,040 (Thousand Tons)	<Facility> Dom'c RO/RO terminal: 3 berths (Depth -9 m; Length 220 m) Dom'c RO/RO yard; 14.6 ha Dredging for access channel and turning basin: 0.47 Mil m^3	15,040 (Thousand Tons)	<Facility> Dom'c RO/RO terminal: 3 berths (Depth -9 m ; Length 220 m) Dom'c RO/RO yard: 14.6 ha Dredging for access channel and turning basin: 0.47 Mil m^3	15,040 (Thousand Tons)	<Facility> Dom'c RO/RO terminal: 3 berths (Depth -9 m; Length 220 m) Dom'c RO/RO yard: 14.6 ha Dredging for access channel and turning basin: 0.47 Mil m^3	· NO.1 and NO.2 dom'c RO/RO terminals (both are on-going projects) will have been constructed by the year 1995. · NO.3 dom'c RO/RO terminal project will have been completed by the year 1997.

Table 3-2-1 GCR Port Master Plan in the Target Year 2010 (2)

Port	Project	Low Economic Growth Case (GDP 4%)		Medium Economic Growth Case (GDP 5.5 %)		High Economic Growth (I) Case (GDP 7~7.5%)		High Economic Growth (II) Case (GDP 7~7.5%)		High Economic Growth (III) Case (GDP 7~7.5%)		Assumptions of Scenario
		Cargo Through put	Requirement	Cargo Though put	Requirement	Cargo Through put	Requirement	Cargo Through put	Requirement	Cargo Through put	Requirement	
SANGLEY POINT	Int'l Container Terminal									6,230 (Thousand Tons)	<Facility> Int'l container terminal: 3 berths (Depth -13 m; Length 300 m) Int'l container yard: 27.9 ha Dredging (or access channel and turning basin: 8.5 Mil m^3 Port access road: 4,300 m <Equipment> Container crane: 6 Nos. Transfer crane: 15 Nos.	· Cost for the Naval Base relocation is not borne by the port sector. · Manila-Cavite highway project will have been completed by the year 2010
NAIC/ CAVITE	Int'l Container Terminal							6,230 (Thousand Tons)	<Facility> Int'l container terminal: 3 berths (Depth -13 m; Length 300 m) Int'l container yard: 27.9 ha Breakwater : 2,020 m Dredging for access channel and turning basin: 5.65 Mil m^3 Port access road: 3,800 m <Equipment> Container crane: 6 Nos. Transfer crane: 15 Nos.			· Both DPWH's urban highway development projects and MICT's rail-served inland container depot project will not have been completed by the year 2010. · Relocation of the Naval Base at Sangley Point will not have been achieved.
BATANGAS	Int'l Terminal					1,200 (Thousand Tons)	<Facility> Int'l container terminal: 1 berth (Depth -10 m; Length 180 m) Int'l container yard: 2 ha Dredging for access channel and turning basin: 0.35 Mil m^3 Port access road 490m <Equipment> Container crane: 1 No. Straddle carrier: 3 Nos.	1,200 (Thousand Tons)	<Facility> Int'l container terminal: 1 berth (Depth -10 m; Length 180) Int'l container yard: 2 ha Dredging for access channel and turning basin: 0.35 Mil m^3 Port access read 490 m <Equipment> Container crane: 1 No. Straddle carrier: 3 Nos.	1,200 (Thousand Tons)	<Facility> Int'l container terminal: 1 berth (Depth -10 m; Length 180 m) Int'l container yard: 2 ha Dredging for access channel and turning basin: 0.35 Mil m^3 Port access road: 490 m <Equipment> Container crane: 1 No. Straddle carrier: 3 Nos.	· Phase-I project will have been completed without delay. · South Super Expressway's extension to Batangas will have been implemented by the year 2000.
						400 (Thousand Tons)	<Facility> Int'l conventional terminal: 1 berth (Depth -10 m; Length 170 m)	400 (Thousand Tons)	<Facility> Int'l conventional terminal: 1 berth (Depth -10 m; Length 170 m)	400 (Thousand Tons)	<Facility> Int'l conventional terminal: 1 berth (Depth -10 m; Length 170 m)	
	Dom'c Terminal	1,300 (Thousand Tons)	<Facility> Dom'c container terminal: 1 berth (Depth -10 m; Length 150 m) Dom'c container yard: 2.6 ha Dredging for access channel and turning basin: 0.4 Mil m^3 <Equipment> Container Crane: 1 No. Straddle Carrier: 3 Nos.	2,170 (Thousand Tons)	<Facility> Dom'c container terminal: 1 berth (Depth -10 m; Length 150 m) Dom'c container yard: 2.6 ha Dredging for access channel and turning basin: 0.4 Mil m^3 <Equipment> Container crane: 1 No. Straddle carrier: 3 Nos.	3,300 (Thousand Tons)	<Facility> Dom'c container terminal: 1 berth (Depth -10 m; Length 150 m) Dom'c container yard: 2.6 ha Dredging for access channel and turning basin: 0.4 Mil m^3 <Equipment> Container crane: 1 No. Straddle carrier: 3 Nos.	3,300 (Thousand Tons)	<Facility> Dom'c container terminal: 1 berth (Depth -10 m; Length 150 m) Dom'c container yard: 2.6 ha Dredging for access channel and turning basin: 0.4 Mil m^3 <Equipment> Container crane: 1 No. Straddle carrier: 3 Nos.	· Phase-I project will have been completed without delay. · South Super Expressway's extension to Batangas will have will have been implemented by the year 2000.
						2,400 (Thousand Tons)	Dom's RO/RO terminal: 1 berth (Depth -5.5 m; Length 120 m) Dredging for access channel and turning basin: 0.05 Mil m^3	2,400 (Thousand Tons)	Dom'c RO/RO terminal: 1 berth (Depth -5.5 m; Length 120 m) Dredging for access channel and turning basin: 0.05 Mil m^3	2,400 (Thousand Tons)	Dom'c RO/RO terminal: 1 berth (Depth -5.5 m; Length 120 m) Dredging for access channel and turning basin: 0.05 Mil m^3	

Table 4-1 Project Cost

(Unit: Million Peso)

Port	Project	Medium Economic Growth Case [GDP 5.5%]	High Economic Growth (I) Case [GDP 7~7.5%]	High Economic Growth (II) Case [GDP 7~7.5%]	High Economic Growth (III) Case [GDP 7~7.5%]
Manila	South Harbor Int'l Container Terminal	1,424 (353)	11,545 (5,120)	1,424 (353)	1,424 (353)
	Manila Int'l Container Terminal (MICT)	9,748 (4,783)	12,931 (6,458)	12,931 (6,458)	12,931 (6,458)
	North Harbor Dom'c Container Terminal	7,786 (3,998)	7,749 (3,969)	7,749 (3,969)	7,749 (3,969)
	Smokey Mount's Dom'c Container Terminal	- (-)	7,609 (2,561)	7,609 (2,561)	7,609 (2,561)
	North Harbor Dom'c RO/RO Terminal	875 (689)	1,141 (899)	1,141 (899)	1,141 (899)
	Sub-total	19,833 (9,823)	40,975 (19,007)	30,854 (14,240)	30,854 (14,240)
Sangley Point	-	-	-	-	15,825 (4,753)
Naic/ Cavite	-	-	-	11,351 (4,747)	-
Batangas	Int'l Terminal	-	1,203 (417)	1,203 (417)	1,203 (417)
	Dom'c Terminal	1,037 (461)	1,133 (537)	1,133 (537)	1,133 (537)
	Sub-total	1,037 (461)	2,336 (954)	2,336 (954)	2,336 (954)
Total		20,870 (10,284)	43,311 (19,961)	44,541 (19,941)	49,015 (19,947)

Remark: Figures within parenthesis indicate cost for port facility construction only

5. Preliminary Evaluation

5.1 Preliminary Economic Analysis

5.1.1 Preliminary Economic Analysis for the Port of Manila in the Medium Economic Growth Case

The following three port development projects at the Port of Manila for the period up to the year 2010 are evaluated from the national economic point of view.

(1) Additional three (3) international container berths at Manila International Container Terminal (MICT).

(2) Initial three (3) domestic container berths at the North Harbor, which should be constructed urgently by the year 1999.

(3) Three (3) more domestic container berths and additional two (2) roll on/roll off (RO/RO) berths at the North Harbor.

As for benefits from the projects, four kinds of economic benefits are estimated through the so-called "With" and "Without" comparison.

(1) Savings in vessel waiting cost.

(2) Savings in ocean transport costs by means of improvements of ship operation schedule.

(3) Savings in time cost of cargoes.

(4) Savings in additional cargo handling equipment costs

The economic internal rate of return (EIRR) of each project is calculated as 17 to 20%. This exceeds the required minimum level of 15%, which is generally adopted to assess the economic justifiability of a project in the Philippines. Accordingly, the above three projects at the Port of Manila are considered economically feasible.

Table 5-1-1 Economic Internal Rate of Return (EIRR) of Master Plan Components at the Port of Manila
(Medium Economic Growth Case; GDP 5.5%)

Project	Costs Billion Peso	Benefits Billion Peso	EIRR (%)
International Container Terminal at MICT (3 Berths)	15.7	76.6	20
Domestic Container Terminal at North Harbor (First 3 Berths)	6.1	28.2	18
Domestic Container Terminal (3 Berths) and RO/RO Terminal (2 Berths)	7.0	34.5	17

5.1.2 Preliminary Economic Analysis for the Port of Batangas in the Medium Economic Growth Case

The following port development project at the Port of Batangas for the period up to the year 2010 is evaluated from the national economic point of view.

(1) Domestic container berth (Depth -10m; Length 150m; 1 Container Crane and straddle Carriers)

As for benefits from the project, two kinds of economic benefits are estimated through the so-called "With" and "Without" comparison.

(1) Savings in vessel waiting cost.

(2) Savings in time cost of cargoes.

The economic internal rate of return (EIRR of the project is calculated as 28%. This

exceeds the criterion of 15%, which is generally adopted to assess the economic justifiability of a project in the Philippines. Accordingly, the above project at the Port of Batangas is considered economically feasible.

Table 5-1-2 Economic Internal Rate of Return (EIRR) of Master Plan Components at the Port of Batangas
(Medium Economic Growth Case; GDP 5.5%)

Project	Costs Billion Peso	Benefits Billion Peso	EIRR (%)
Domestic Container Terminal (1 Berth)	1.8	17.2	28

5.2 Environmental Consideration

Project sites are located in water areas surrounded by existing breakwaters, where the extension of breakwaters, and dredging for channel deepening and maintenance are carried out throughout the year; the environment is duly considered and necessary countermeasures are taken concerning the above activities. Accordingly, construction of additional port facilities within the port will hardly make an impact on the environment surrounding the port.

However, the possible increase of economic activities as a result of port development may cause a general increase in the basic load on the environment system. PPA should establish an environmental conservation policy in respect to port development and take necessary measures such as careful selection of port construction machines and constant monitoring of port environment.

6. Outline of Recommendations

It is recommended that all projects at major ports in the Greater Capital Region which have been formulated by the Study on the basis of the master plan for the period up to the year 2010, be implemented in accordance with a staged construction schedule in order to achieve economical, efficient, safe and reliable management and operations of the ports. When implementing projects, it is proposed to take the following measures:

(1) It is concluded that PPA's privatization policy is sound and successful at present from the viewpoint of port management and operation. Accordingly, privatization can be extended to newly-constructed terminals at major ports in GCR.
At the same time, PPA should recognize the importance of public port's role in terms of efficient port management and operation. In this respect, PPA should fully enhance its port administrative function when promoting further privatization.

(2) Land and water area as well as basic port facilities necessary to PPA's port administration should be managed by PPA.

(3) PPA should take the initiative in utilizing some foreign soft loans with low interest rates in order to secure better financial soundness as the official executing agency of port development projects.

(4) In view of further port development in the Greater Capital Region beyond the target year 2010, it is recommended that Sangley Point and the Naic/Cavite New Port be considered the most promising project sites for a newly-constructed international container port instead of the further port extension at Manila.
In this connection, further port development study at Sangley Point and Naic/Cavite should be conducted when the extent of the rapidly growing economic activities and seaborne cargo and passenger demand is clearly grasped.

OGRANIZATION OF THE STUDY TEAM

ORGANIZATION OF THE STUDY TEAM

The study team is comprised of 10 specialists. Their names and responsibilities are listed below.

[Name]	[Responsibility]
Jiro KANO	Overall Management/ Port Highway Planning (OCDI)
Koichiro HAYASHI	Port Facilities Allocation Planning / Port Planning (I) (OCDI)
Kazuki YAMAGUCHI	Port Planning (II)/ Environmental Consideration (OCDI)
Takeshi SOEJIMA	Regional Development Planning / Demand Forecast (I) (OCDI)
Toshihiko KAMEMURA	Demand Forecast (II)/ Economic Analysis (OCDI)
Tetsuro ICHISE	Management and Operation (OCDI)
Takeaki HOSHINO	Facility Design (OCJ)
Nobuya FURUHASHI	Natural Conditions (I) (OCJ)
Toshinori OHSHITA	Natural Conditions (II) (OCJ)
Masahiro YOKOGAWA	Construction Method/ Cost Estimation (OCJ)
Chitose KAWAKAMI	Coordinator (OCDI)

SUMMARY

CHAPTER 1

PRESENT SITUATION OF PORTS IN GCR AND PORT DEVELOPMENT STRATEGIES

CHAPTER 1 PRESENT SITUATION OF PORTS IN GCR AND PORT DEVELOPMENT STRATEGIES

1.1 Outline of the Greater Capital Region(GCR)

1.1.1 Social Condition

The Philippines is an island country composed of over 7,100 islands and the total land area is approximately 300,000 square kilometers. Metro-Manila is the core area of GCR which is composed of several provinces, belonging to adjoining regions(Region III and IV).

The Philippines is a stricken country, and GCR itself has suffered damage from a recent eruption of Mt. Pinatubo.

Population of the Philippines in 1990 was over 60,000,000 and the average growth rate of population for the period of 1980-1990 was 2.35%. The population of Region IV in 1990 was 8,270,000 which is larger than that of NCR and accounts for 13.6% of the Philippine population.

Table 1-1-1 Population of the Philippines

YEAR	PHILIPPINES	N C R	REGION III	REGION IV
1970	36,684,000	3,967,000	3,615,000	4,456,000
1980	48,098,000	5,926,000	4,803,000	6,119,000
1990	60,685,000	7,929,000	6,199,000	8,266,000

(Note) Provinces belonging to Region III are Bataan, Bulacan, Nueva Ecija, Pampanga, Tarlac and Zambales. Aurora, Batangas, Cavite, Laguna, Marindoque, Mindoro, Occ.Mindoro, Ori.Mindoro, Palawan, Quezon, Rizal and Romblon belong to Region IV.
Underlined provinces in this paragraph belong to GCR.

1.1.2 Economic Trend

The GDP of the Philippines recorded an annual average growth rate of 3.6% from 1971-1991. There was a negative annual growth rate three times during this period. The economic growth rate of Philippines is lower than that of other ASEAN countries, and unlike those countries, the Philippine economy can not be said to be riding the crest of

a boom. GRDP of NCR has remained at 30% of GDP and total GRDP of GCR accounted for over 50%. It is the nature of the Philippine economic structure that the entire country depends on the economic development of Central and Southern Luzon.

The share of GDP by sector(agriculture, industry and service) changed to 22:36:42 in 1990 from 23:41:36 in 1980. It can be observed that the Philippine economy is now at the stage of transferring its economic weight from the industry to service sector, while agriculture is a fundamental sector that employs a large number of people. In GCR also, service sector has increased its share. In the industrial sector, food and beverage sector holds a large portion while technology intensive industry has not increased its share. According to this trend, Philippine Government is encouraging the establishment of an export processing zone to promote industrial development.

Export processing zones or industrial zones are being created in several areas in response to the government's policy of aggressive industrialization. In GCR there are almost 30 such projects, mainly located in provinces of CAVITE and LAGUNA under the CALABARZON Development Plan, that have been or will be implemented.

Per capita GDP peaked in 1982: 12,868 pesos at 1985 constant price. Since the economic crisis(1984-1985), per capita GDP has not yet recovered its 1982 level.

Table 1-1-2 G(R)DP of the Philippines

(Unit:Million Pesos, constant 1985 price)

YEAR	PHILIPPINES	N C R	REGION III	REGION IV
1980	609,769	183,444	52,831	86,998
1982	653,469	196,603	60,542	93,448
1990	718,070	221,577	69,482	107,019

Table 1-1-3 Per Capita G(R)DP of the Philippines

(Unit:Pesos, constant 1985 price)

YEAR	PHILIPPINES	N C R	REGION III	REGION IV
1980	12,620	30,728	10,945	14,134
1982	12,868	30,985	11,941	14,341
1990	11,680	27,787	11,313	13,204

Table 1-1-4 G(R)DP by Sector

(Unit:Million Pesos, constant 1985 price)

SECTOR	PHILIPPINES	N C R	REGION III	REGION IV
Agro	160,734 (22%)	0 (0%)	15,849 (23%)	30,193 (28%)
Ind.	255,548 (36%)	96,427 (44%)	29,855 (43%)	44,736 (41%)
Serv.	301,787 (42%)	125,150 (56%)	23,778 (34%)	32,090 (30%)

1.1.3 Trend of Foreign Trade

Values of foreign trade of the Philippines are 2.3(1970), 13.5(1980), 20.4(1990) billion US dollars respectively, and average annual growth rates are 19%(1970-1980) and 4%(1980-1990). The volume of imports was 1.5 times greater than that of exports, reflecting the unfavorable balance of trade that has recently taken hold. The first and second biggest trading partners are the USA and Japan, followed by NIES and the 2EC. Evidence that foreign trade is centralized and marine-oriented is found in the fact that 49% of foreign trade passes through the port of Manila.

Table 1-1-5 Foreign Trade of the Philippines

(Unit:Million US$)

YEAR	TOTAL	EXPORT	IMPORT
1970	2,301	1,142	1,159
1980	13,515	5,788	7,728
1990	20,392	8,186	12,206

Table 1-1-6 Major Trade Partners and Trade Values

(Unit:Million US$)

YEAR	U S A	JAPAN	TAIWAN	E C
1985	2,936 (30%)	1,609 (17%)	264 (3%)	1,082 (11%)
1990	5,460 (27%)	3,881 (19%)	1,015 (5%)	2,814 (14%)

Table 1-1-7 Port and Trade Values

(Unit:Million US$)

YEAR	PHILIPPINES	MANILA AIR PORT	PORT OF MANILA	BATANGAS PORT
1989	18,240	3,231	8,932(49%)	1,171
1990	20,392	3,768	9,984(49%)	1,273

1.1.4 The Medium-Term Philippines Development Plan(1993-1998)

Targeted socio-economic development goal is to reach the same level of NIES by Year 2000. The Medium-Term Philippines Development Plan has the following targets;

(1) The proportion of families living in poverty is expected to decline to 30% by 1998.
(2) GNP in real terms shall grow at an average of 7.5% over the planning period.
(3) Real per capita income in constant dollars should reach US$ 1,270 by 1998.
(4) GDP is to increase from a rate of 4% in 1993 to 10% in 1998, while production inside the NCR should decrease from 31.3% of GDP in 1993 to 28.7% in 1998.
(5) Inflation shall not average more than 6.2% annually.
(6) Investment shall rise from 22.0% of GNP in 1993 to 33.3% by 1998.

1.2 Growing Container Traffic

International Container cargo handled at ports in the Philippines in 1990 amounts to 1.38 million TEU, the sixth largest volume from among the (10) east Asian countries. The average annual growth rate of international container cargo in the Philippines during the last ten (10) years was 12%, higher than the world average annual growth rate. At the same time, the tendency in enlargement of calling vessels is clearly identified. For example, 10,000DWT container vessels often call at the Port of Manila. In addition to international container cargo, domestic container cargo has been also increasing at a fast pace. In order to cope with the remarkable containerization in the Philippines, future port development at major ports in the Greater Capital Region must be accelerated without delay.

Table 1-2-1 Growth of Container Cargo throughout the World

(Unit: TEU)

No.	Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	Growth Rate 1990/1980
A	East Asia												
1	Japan	3,417,118	3,740,864	3,753,667	4,113,749	5,033,897	5,517,009	5,614,703	6,210,011	6,909,050	7,539,316	7,851,608	8.7 %
2	Taiwan	1,644,322	1,787,753	1,902,260	2,429,304	3,026,839	3,075,151	4,104,953	4,772,339	4,889,091	5,278,227	5,430,039	12.7 %
3	Singapore	916,989	1,064,504	1,116,288	1,340,009	1,552,184	1,698,800	2,203,100	2,634,500	3,275,100	4,364,400	5,223,500	19.0 %
4	Hong Kong	1,464,961	1,559,819	1,659,943	1,837,047	2,108,583	2,288,753	2,779,025	3,457,182	4,033,427	4,463,709	5,100,569	13.3 %
5	South Korea			861,971	977,661	1,177,866	1,245,538	1,532,911	1,949,143	2,065,462	2,158,828	2,348,475	13.3 %
6	Philippines	427,220	552,473	684,575	736,109	657,792	638,471	756,163	913,909	1,096,742	1,295,208	1,383,252	12.2 %
7	China	54,038	90,528	142,877	191,651	273,154	446,473	487,416	406,906	793,706	968,860	1,143,898	35.7 %
8	Thailand	189,430	241,500	259,424	304,524	341,021	400,419	511,264	643,530	795,301	939,040	1,079,290	19.0 %
9	Indonesia	87,110	140,157	158,352	233,379	219,093	228,619	364,008	393,131	588,267	762,256	922,547	26.6 %
10	Malaysia	171,693	204,644	223,534	293,403	362,399	389,279	401,908	489,077	589,128	723,933	881,741	17.8 %
	Sub Total	8,382,881	9,382,242	10,762,891	12,455,886	14,752,828	15,928,512	18,753,456	21,869,728	25,135,275	28,484,777	31,364,192	14.1 %
B	North America												
1	USA	8,566,838	8,430,582	8,729,691	9,559,451	10,902,002	11,532,678	12,393,288	13,258,276	13,968,282	14,632,763	15,278,162	
2	Canada	757,267	785,752	767,495	838,377	1,001,490	1,068,395	1,155,307	1,288,233	1,402,673	1,432,062	1,524,771	
	Sub Total	9,324,105	9,216,334	9,497,186	10,397,828	11,903,492	12,601,073	13,548,595	14,546,509	15,370,955	16,064,825	16,082,933	6.1 %
C-1	North Europe												
1	Uk	2,263,546	2,194,227	2,574,710	2,724,272	2,918,756	2,886,196	3,011,273	3,337,037	3,670,196	3,786,704	4,016,59	
2	Netherlands	2,055,968	2,215,141	2,301,786	2,409,645	2,665,935	2,769,281	2,972,697	2,948,609	3,382,676	3,725,702	3,761,184	
3	Germany	1,493,097	1,725,193	1,689,686	1,759,002	2,055,782	2,151,646	2,254,128	2,561,689	2,816,650	3,092,829	3,265,747	
4	Belgiumm	915,207	1,033,627	1,027,939	1,239,558	1,456,538	1,470,478	1,534,504	1,670,983	1,724,267	1,768,157	1,901,172	
5	Spain	704,818	844,753	959,916	1,075,385	1,400,979	1,508,281	1,477,300	1,685,994	1,761,884	1,768,157	1,859,057	
6	France	1,071,025	1,280,797	1,214,990	1,164,726	1,290,246	1,484,786	1,350,370	1,341,232	1,435,045	1,605,792	1,567,511	
7	Sweden	314,331	346,418	422,315	393,872	453,121	471,372	467,051	500,667	499,202	453,789	471,929	
8	Portugal	176,178	181,510	194,105	208,375	238,707	265,531	291,652	344,895	376,500	377,054	411,184	
9	Eirc	236,474	276,452	285,683	250,896	258,556	254,582	288,348	306,768	338,666	379,332	380,208	
10	Denmark	317,543	332,426	353,391	346,441	422,613	420,166	397,280	425,489	479,788	378,680	358,949	
11	Finland	105,069	108,949	126,156	142,212	157,430	164,629	180,905	217,956	261,798	305,868	306,125	
14	Poland	81,946	76,932	30,662	92,262	102,518	99,715	98,642	125,310	149,637	147,351	146,196	
12	Iceland					72,025	92,964	114,534	140,170	142,646	151,740	159,831	
13	Norway	66,288	71,206	65,937		70,034	76,885	114,647	119,982	135,908	141,883	157,390	
	Sub Total	9,801,590	10,687,631	11,297,276	11,806,646	13,563,240	14,116,512	14,553,331	15,726,781	17,174,863	18,083,038	18,763,053	6.7 %
C-2	Mediterranean												
1	Italy	1,228,713	1,230,827	1,240,608	1,368,899	1,614,201	1,524,894	1,476,320	1,557,534	1,632,196	1,670,541	1,807,183	
2	Greece	171,203	194,483	211,377	201,086	186,219	208,075	253,282	288,648	371,351	433,948	479,854	
3	Israel	274,145	299,858	304,442	336,244	331,006	307,725	344,741	376,139	392,198	514,060	462,000	
4	Cyprus	87,646	252,117	180,652	181,703	267,440	197,256	206,902	245,623	291,529	369,291	384,279	
5	Egypt	69,111	70,001	142,856	178,593	185,758	176,386	170,282	179,108	186,364	195,447	316,214	
6	Turkey					84,837	184,667	159,835	171,193	202,512	265,378	219,223	
7	Yugoslavia	55,591	71,741	72,075	79,548	84,184	81,196	87,568	119,084	145,044	144,685	150,181	
	Sub Total	1,886,409	2,119,027	2,152,010	2,346,073	2,753,645	2,680,199	2,698,930	2,937,329	3,221,194	3,593,350	3,819,034	7.3 %

Source: OCDI

1.3 Present Situation of Ports in GCR

(1) Outline of Port facilities

There are several ports in GCR, but the Port of Manila and Batangas are the two major ports. The Port of Manila which is the biggest port in the Philippines consists of three harbors, namely South Harbor, MICT and North Harbor.

Foreign cargo is mainly handled at South Harbor. MICT is used as an international container terminal while North Harbor is a base of the domestic terminal catering to coast-wide cargo and passenger ship.

Port of Batangas plays an important role as a base port in the Calabarzon development area and as a gate-way to Mindoro island.

The dimensions of the port facilities in the Port of Manila and Batangas are shown in Table 1-3-1.

Table 1-3-1 Dimensions of Major Port Facilities

Name of Port		Classification	Number of Berth	Length of Berth (m)	Depth of Berth (m)
Port of Manila					
	South Harbor	International Container Berth	4	747	-10
		International Conventional Berth	14	2,638	-10
	MICT	International Container Berth	4	900	-12
	North Harbor	Domestic Container Berth	41	4,657	-6
		Domestic Conventional Berth			
		RO/RO Berth	2	375	-9
Port of Batangas		Domestic Conventional Berth	13	618	-3.5~-6.0
		RO/RO Berth			
		Ferry Berth			

1.4 Natural and Environmental Conditions

1.4.1 Natural Condition of Manila Bay

(1) Meteorology

1) Rainfall

Annual precipitation ranges from 1,900 to 2,500 mm with an annual average of 2,100 mm.

Viewed seasonally, rainfall is concentrated from June-November (the rainy season).

2) Winds

The frequency of tropical cyclones crossing the Philippines from 1948 to 1992 is four to sixteen annually.

The wind condition is relatively calm through the year except typhoon crossing time and the wind hindcasting of velocity less than 5m/sec is 77%. The prevailing wind direction is West.

(2) Oceanographic Condition

1) Tides

The design manual for port and harbour facilities in the Philippine Ports Authority (1994) shows following design tide levels.

Tide Level	South Harbor	North Harbor	MICT	Batangas	Subic
HWL	+1.26	+1.26	+1.26	+1.41	+1.20
MHHW	+1.01	+1.01	+1.01	+1.10	+0.91
MTL	+0.49	+0.49	+0.49	+0.52	+0.46
MLLW	±0.00	±0.00	±0.00	±0.00	±0.00
LWL	-0.23	-0.23	-0.23	-0.32	-0.20

Results of tide observation at Naic/Cavite New Port were very close to the design tide levels of Manila Port by PPA.

2) Waves

As for ports of Manila and Batangas, wind wave generated in the bay for planning and design of port development was already estimated in the previous study.

The wave heights for design of Naic/Cavite New port and Sangley Point are calculated by SMB method based on the wind duration and fetch length.

The design wave at ports of Manila, Batangas and probable waves at Naic/Cavite, Sangley Point are as follows.

Site / Wave	Manila	Batangas	Naic/Cavite	Sangley Point
Height (1/3) 50 Years	2.69m	3.24m	3.18m	2.75m
Direction	W	SW	NNE	NNE

3) Littoral Transport

The objective sites of port development at Manila, Sangley point and Batangas are located at the most inner sides of the bays where no serious problems in littoral transport can be found. Along the Cavite coast where the construction of Naic/Cavite New Port is proposed, however, considerable littoral transport is recognized.

Some problems in littoral transport would be expected to arise along the coast due to interruption of the littoral drift by the proposed port facilities. It is recommended to undertake further detailed investigation of littoral drift along the Cavite coastal area in a future stage.

(3) Site Investigation Works

During the second site survey period from November 1993 to January 1994, natural condition survey was performed at Port of Manila and Naic/Cavite.

Six (6) offshore borings, soundings and spot current observation were performed at Port of Manila and five (5) offshore borings, soundings, bottom sediment samplings, tide and current observation were performed at Naic/Cavite New Port simultaneously.

1) Tide Observation

Thirty days continuous tide observation was performed at Naic/Cavite New Port and the result of harmonic analysis is as follows.

Tide Level	Naic/Cavite New Port	Manila Port
MHHW	+0.954	+1.01
MLHW	+0.935	—
MTL	+0.566	+0.49
MHLW	+0.196	—
MLLW	−0.084	±0.00

Small differences in tide levels between Manila Port and Naic/Cavite New Port are encountered.

2) Currents

Current observation was conducted at a total of ten (10) points in this study, namely, two (2) points at South Harbor, two (2) points at MICT and six (6) points at Naic/Cavite New Port.

The maximum current velocity of each port is as follows.

Manila South Harbor	0.11 m/s
MICT	0.15 m/s
Naic/Cavite Harbor	0.33 m/s

As for Batangas Bay, maximum current velocity in the vicinity of Batangas Port, 0.49 m/s, was recorded in 1983 by BCGS.

3) Geological Condition

Eleven (11) offshore borings were performed at Manila and Naic, namely, four (4) borings along existing breakwater of Manila North Harbor, two (2) borings along existing breakwater of Manila South Harkbor and five (5) borings in Naic/Cavite.

Soil characteristic for each site are as follows.

① Manila North Harbor

The uppermost horizon is dark grey high plastic silty clay with sand and

shell fragments.

The thickness varies from 8 to 15 meters and the N-value is less than 2.

The second horizon is greyish brown medium to high plastic clayey sand/sandy clay. The thickness varies from 6 to 15 meters and the N-values is from 5 to 50.

The third horizon is brown very dense gravelly sand.

This horizon undulates between MLLW -12m to MLLW -29m.

② Manila South Harbor

Three horizons similar to Manila North Harbor are found.

The thickness varies from 17 to 23 meters for the uppermost horizon and from 6 to 22 meters for the second horizon.

The third horizon undulates between MLLW -25m to MLLW -45m.

③ Naic/Cavite New Port

The upper horizon is dark grey dense to very dense silty sand.

The thickness varies from 6 to 12 meters.

The N-values are between 14 and 50.

The second horizon is brownish grey stiff to very hard sandy silty clay.

4) Sonic Prospecting

Within the survey area in Naic/Cavite New Port, the sediment classification as identified by borehole logs was generally homogeneous and there were no distinct layers observed in the records up to -50m.

5) Bathymetric Survey

The bathymetric survey was conducted to find out the exact and precise data of seabed elevation for the Manila South Harbor, the Manila North Harbor and the Naic/Cavite New Port.

1.4.2 Environmental Conditions

(1) Seawater Quality in Manila Bay

The Study Team conducted tests on PH and DO (dissolved oxygen) at the Port of Manila (7 points in South Harbor, MICT and North Harbor) and offshore of Maragondon Point (1 point in Naic/Cavite New Port) in December 1993.

Water samples were taken from the surface layer, middle layer and lower layer at each point except Maragondon Point where only the surface layer was sampled.

DO levels at all points ranged between 6.6~30.5 mg/l, thereby satisfying the Water Quality Criteria in which minimum DO is 5.0 mg/l. In addition, PH level at all points ranged between 7.8~8.2, falling within the standard range which is from 6.0 to 8.5.

However, sea water turbidity, especially suspended solids (SS), seems to be quite bad near the mouth of the Pasig River based on field observation. This river flows into the Port of Manila with the sewage from houses, offices and factories which contributes to water pollution.

(2) Examination and Procedure of Environmental Impact Assessment

Importance of the environmental consideration for the development and environmental preservation is widely recognized in the Philippines. The Environmental Management Bureau (EMB) which is responsible for making the environmental policy, and for the examination and procedure of environmental impact assessment, is organized in the Department of Environment and Natural Resources (DENR).

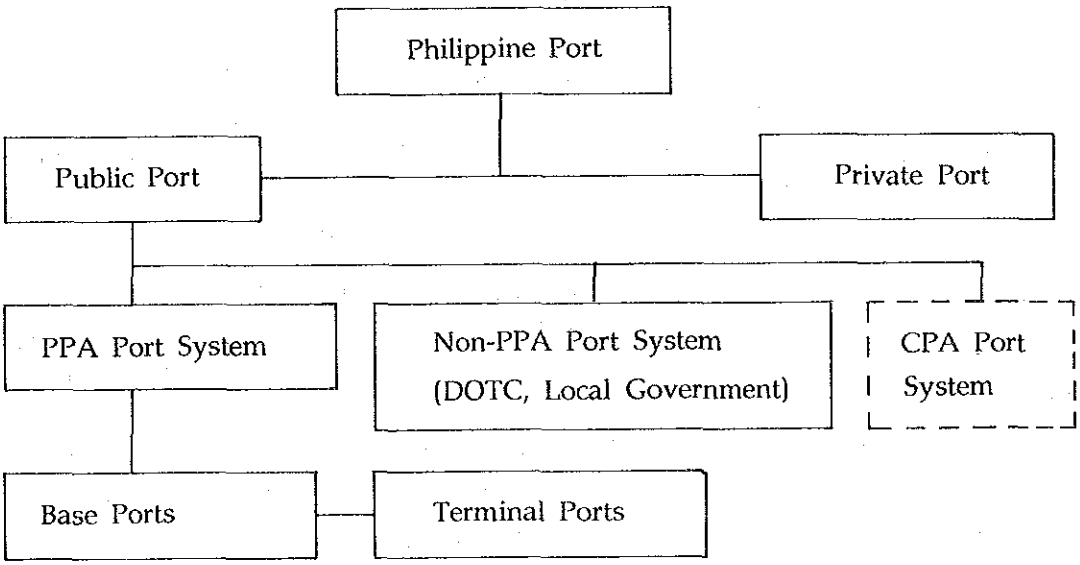
EMB also conducts observation of the air quality in Metro Manila and the water quality in Manila Bay on a regular basis.

1.5 Outline of Port Management and Operations in the Philippines

1.5.1 Outline of Philippine Ports

Ports in the Philippines are classified into public ports built and managed by public sectors and private ports. Public ports are classified into two categories; those under the jurisdiction of PPA port system and others.

[Philippine Port System]



As for public ports except those under control of PPA (and CPA) port system, actual construction and rehabilitation of these ports is carried out by DOTC at national government's expense, while maintenance and operation is carried out by local governments.

There are 109 ports at present which are designated as part of the PPA port system by the Management-Executive Committee of the PPA. The Management-Executive Committee is now considering a reduction in the number of the ports under the jurisdiction of PPA port system from the viewpoint of enhancing competitiveness with neighboring foreign countries' ports and its financial autonomy. Cebu Authority was established this year, but its jurisdiction has not yet been declared.

There are 366 private ports registered in the PPA. There are also a lot of ports that are not registered in the PPA. These private ports handle their own cargo. They have to get permission of BOI, DENR, and PPA. Normally the permitted operation period is 25 years, and it can be renewed.

Some of the private ports still handle non-licensed public cargoes. This must be rectified in terms of not only PPA's revenue, but also in terms of the legal system.

1.5.2 Current Port Projects for Modernization in GCR

Second Manila Port Project financed by the Asian Development Bank is now under way to improve port efficiency because port facilities (wharves, sheds and so on) in the Port of Manila have become too old for use and North and South Harbors are in need of immediate rehabilitation.

A development project financed by OECF is also under way in the Port of Batangas, though it is now suspended due to the relocation problem.

In addition, the Port of Manila lacks a grain terminal. Almost all imported grain (including fertilizer) is unloaded off shore at the basin of South Harbor and conveyed by lighters. Therefore, the handling efficiency is less than good.

In order to solve this problem, Feasibility Study of Manila Grain Terminal by USAID has already been completed and it is now being considered to construct the above terminal by the way of BOT (Build-Operate-and-Transfer) Scheme.

1.6 Macroscopic Demand Forecast

Three cases of annual average growth rates are set for the future Philippine economy(Refer to Table 1-6-1). Economic indexes are based on the Philippine Medium-Term Development Plan(1993-1998) and economic development trends.

Table 1-6-1 Annual Growth Rate of GDP

CASE	ANNUAL GROWTH RATE OF GDP	REMARKS
HIGH	7.5% (7.0% AFTER YEAR 2001)	NATIONAL DEV. PLAN
MEDIUM	5.5%	WORLD BANK REPORT
LOW	4.0%	HISTRICAL TREND

Two methods shall be applied for macroscopic cargo demand forecast: one is based on correlation between port cargo and GRDP, and the other derives from extrapolation of historical trend of cargo. As the results of above two methods, three types of future cargo volumes in GCR are projected(Refer to Tables 1-6-2 and 1-6-3)

Table 1-6-2 Future Cargo Volume (Unit:Million Tons)

CASE	HIGH		MEDIUM		LOW	
TARGET YEAR	2000	2010	2000	2010	2000	2010
PORT OF MANILA						
TOTAL	34.1	76.3	28.6	54.0	25.0	39.9
DOMESTIC	20.9	46.6	17.5	33.0	15.3	24.4
FOREIGN	13.2	29.7	11.1	21.0	9.7	15.5
PORT OF BATANGAS						
TOTAL	2.3	6.0	1.8	3.9	1.5	2.3
DOMESTIC	2.2	5.7	1.7	3.7	1.4	2.2
FOREIGN	0.1	0.3	0.1	0.2	0.1	0.1

Table 1-6-3 Future Passenger Volume (Unit:Million Persons)

CASE	HIGH		MEDIUM		LOW	
TARGET YEAR	2000	2010	2000	2010	2000	2010
PORT OF MANILA	6.85	16.9	5.5	10.7	4.7	7.3
PORT OF BATANGAS	3.0	9.2	2.3	5.1	1.8	2.8

1.7 Port Development Strategies

The major ports in the Greater Capital Region which should have port development strategies, are the Port of Manila (South Harbor, Manila International Container Terminal and North Harbor), Batangas, Subic, Sangley Point, and Naci/Cavite which has been selected as an alternative port to Sangley Point. In addition to the above five (5) major GCR ports, the following two (2) ports, the Port of Lucena/Pagbilao and Infanta/Real, have been chosen as a possible base ports whose development strategies should be established from the viewpoint of regional development in the long term.

On the basis of future economic and maritime business trends in the Philippines, it is considered that basic needs for further development and improvement of major GCR ports should be stressed. These general observations can be supported by various background factors and its future prospects as described here below.

(1) Steadily increasing trend of economic growth in the Philippines can be expected for at least another five or ten years, in accordance with the Government's Medium Term Economic Development Program.

(2) Maritime container traffic to/from the Philippines will constantly increase due to export drive and expansion of the consumer market.

(3) Substantial growth of the container cargo flow in and out of the CALABARZON area is predicted according to the on-going expansion scheme of the Export Processing Zone.

(4) The Government policy for commercialization of public sector's activities will substantially contribute to improvement of port operation and management in the Philippines.

(5) Land transport systems including the South Super Expressway and the rail-served inland container depot project are now in the process of extension and rehabilitation, and full-scale improvement of the systems can be expected, though it will take some

more time.

All the above issues being taken into account, and also based on the macro demand forecast for the target year 2010 and the result of O/D survey, especially the port hinterland identified by the survey, port development strategies have been formulated. The result of the port development strategy study is summarized in Table 1-7-1.

As shown in Table 1-7-1, port development strategies depend on (1) Economic growth up to the target year 2010, (2) Progress of urban highway network development and (3) Acquisition of space for port development on a large scale. For example, in case of low or medium economic growth up to the year 2010, port development strategies stress the need for port improvement and extension at the Port of Manila, and then Batangas.

In case of high economic growth up to the year 2010, at least three (3) port development strategies will be possible. If the urban highway network development proceeds exactly as scheduled, the concentration of port development at the Port of Manila and Batangas is again advantageous to the national economy of the Philippines. If not, the need for port development at Sangley Point or Naic/Cavite is enhanced, rather than the full-scale development at the Port of Manila.

With respect to Subic, the port is now distant from Metro Manila or commercial centers of the Luzon Island. But, the former U.S. Naval Base still has great potential for future development. In order to take advantage of the port, road investment connecting with major commercial or industrial centers should have the first priority for the time being. In the long term, Subic is expected to become an international container transshipment port.

Table 1-7-1 Port Development Strategies in the Greater Capital Region

Port	Present Situation	Medium and Low Economic Growth Case GDP: 4 ~ 5.5% Urban Highway Network in Metro Manila: Progressed	High Economic Growth (I) Case GDP: 7 ~ 7.5% Urban Highway Network in Metro Manila: Full Implemented	High Economic Growth (II)/(III) Case GDP: 7 ~ 7.5% Urban Highway Network in Metro Manila: Delayed
Subic	· Broad calm water area. Former US Naval Base. · American President Lines (APL) has already started international container service but frequency is low, thus a small amount of container cargo is handled at the port. · Industrialization at Subic has been realized by Taiwan group at first. · Free port project has been announced and port authority has begun duty-free sale on a small scale. · Possible project for marine recreation development. Beach is now open for public. · Distant location from Metro Manila, especially poor road link between San Fernando and Olongapo. · Cargo handling system is not modernized, in addition further improvement of port facilities is still needed for efficient cargo handling operation.	· Base port whose hinterland covers the North-west Luzon Island. · In order to develop the Port, road investment connecting with major commercial or industrial centers should have the first priority. · Industrial port in accordance with industrial development in backward area is also possible. · The Port should play a role as free trade zone, shelter port during storm and other urgent use until the port and road links are fully developed.	· Base port whose hinterland covers the North-west Luzon Island. · In order to develop the Port, road investment connecting with major commercial or industrial centers should have the first priority. · Industrialization at Subic has been realized by Taiwan group at first. · From the very long-term point of view, an international container transshipment port is possible. · Industrial port in accordance with industrial development in backward area is also possible. · The Port should play a role as free trade zone, shelter port during storm and other urgent use until the port and road links are fully developed.	· Base port whose hinterland covers the North-west Luzon Island. · In order to develop the Port, road investment connecting with major commercial or industrial centers should have the first priority. · From the very long-term point of view, an international container transshipment port is possible. · Increase of an alternative port function to the Port of Manila, in accordance with gradually improved trunk road to Metro Manila. · Industrial port in accordance with industrial development in backward area is also possible. · The Port should play a role as free trade zone, shelter port during storm and other urgent use until the port and road links are fully developed.
Manila	· The busiest port in the Philippines. · Super-hub port connecting with all major islands. · Increasing seaborne cargo recently, in particular container and roll on/roll off cargo. · Obvious trend of vessel-size enlargement · Successful privatization at the Manila International Container Terminal (MICT) · Rail-served Inland Container Depot Project by MICT is being realized. · Definite limitation of land space for port extension. · Possible impact of port traffic upon urban highway system in Metro Manila without any countermeasure in future.	· The provision of further port facilities for rapidly increasing domestic container and roll on/roll off cargo is very urgent. Countermeasure for vessel-size enlargement is also needed. · Regarding international container cargo, MICT's NO.5 container terminal and Rail-served Inland Container Depot (both are now projected), can catch up with increasing container demand up to the year 2000. After that offshore port extension for MICT's new container terminals is required. · Promotion of measures for further containerization at the South Harbor, especially in terms of cargo handling operation, is required. · In order to decrease the impact of port traffic on urban highway system, a port bridge across the Pasig River is needed. In addition, R-10 elevated highway project should be implemented.	· The Port of Manila remains unshakable as super-hub port of the Philippines. · In accordance with de-centralization of Metro Manila's urban function together with highway improvement extension in surrounding areas, diversion of the port role and function at Manila will be promoted. · The provision of further port facilities for rapidly increasing domestic container and roll on/roll off cargo is very urgent. Countermeasure for vessel-size enlargement is also needed. · Regarding international container cargo, MICT's NO.5 container terminal and Rail-served Inland Container Depot (both are now projected), can catch up with increasing container demand up to the year 2000. After that, offshore port extension for MICT's new container terminals is required. · Offshore port extension for the South Harbor new container terminals is required. · In order to decrease the impact of port traffic on urban highway system, a port bridge across the Pasig River is needed. In addition, R-10 elevated highway project should be urgently implemented.	· The Port of Manila remains unshakable as super-hub port of the Philippines. · In accordance with de-centralization of Metro Manila's urban function together with highway improvement extension in surrounding areas, diversion of the port role and function at Manila should be strongly promoted. · The provision of further port facilities for rapidly increasing domestic container and roll on/roll off cargo is very urgent. Countermeasure for vessel-size enlargement is also needed. · Regarding international container cargo, MICT's NO.5 container terminal and Rail-served Inland Container Depto (both are now projected), can catch up with increasing container demand up to the year 2000. After that, offshore port extension for MICT's new container terminals is required. · Promotion of comprehensive measures for further containerization at the South Harbor, especially in terms of cargo handling operation, should be carried out. · In order to decrease the impact of port traffic on urban highway system, a port bridge across the Pasig River is needed. In addition, R-10 elevated highway project should be implemented.
Sangley Point	· Broad calm water area. Close to the South Channel in the Manila Bay. · Located in the neighborhood of Cavite Export Processing Zone (EPZ) and Metro Manila as well. · Relocation of the Naval Base is difficult. · Capacity of the access road to the proposed port site is not enough, in addition, widening of the road is infeasible due to fully developed urban district.	· Conversion plan of the Naval Base into an international commercial port is possible if relocation of the Base is achieved. · Wide discussion about the Naval Vase relocation is recommendable, from the national economic point of view. · Further development of Cavite's EPZ and highway extension to Rosario would accelerate a new port construction.	· Conversion plan of the Naval Base into an international commercial port is possible if relocation of the Base is achieved. · Wide discussion about the Naval Vase relocation is recommendable, from the national economic point of view. · A construction plan of an international container port surrounding Sangley Point will mature, in spite of unsuccessful relocation of the Naval Base. · Further development of Cavite's EPZ and highway extension to Rosario will accelerate a new port construction.	· Conversion plan of the Naval Base into an international commercial port is possible if relocation of the Base is achieved. · Wide discussion about the Naval Vase relocation is recommendable, from the national economic point of view. · Further development of Cavite's EPZ and highway extension to Rosario would accelerate a new port construction.
Naic/ Cavite	· Natural sand beach, very shallow water area. · Small scale fishing activity, and seasonal beach recreation. · Sandy solid foundation at sea bottom. (Good natural condition for port construction) · Poor access road link to the port to cope with heavy container cargo transport. · Distance from commercial or industrial centers in GCR is also in question. (Super highway construction is needed)	· High potential to construct a large scale commercial port along the Naic coast according to natural and social conditions.	· High potential to construct a large scale commercial port along the Naic coast according to natural and social conditions. · Potential for an international container port will increase when highway extension from Rosario/Cavite to Naic is implemented.	· High potential to construct a large scale commercial port along the Naic coast according to natural and social conditions. · The port construction plan of a small number of container berths is not recommendable for economic reason. · Countermeasure for strong wave attack from the north direction should be carefully taken into account, during project implementation. · Countermeasure for drift sand into a port should be also taken into account. · Highway extension from Rosario/Cavite to Naic is urgently required.
Batangas	· Base port for trade with the Mindoro Island. · Roll on/roll off vessel's cargo and passenger are rapidly increasing. · A deep-sea port is possible without breakwaters. · Super-highway between the Port and the South Super Expressway is necessary. · Increasing demand of port cargo related to agricultural and industrial production due to progress of the CALABARZON Regional Development Project.	· Base port for trade with the Mindoro Island is strengthened. · Provision of further port facilities for growing container cargo is accelerated after the completion of Phase-I project. Further port extension is not urgent until the target year 2010. · Improvement of cargo handling system to cope with modern container and roll on/roll off vessel arrival at the port. · The most promising port to assist the CALABARZON Regional Development Project.	· Base port for trade with the Mindoro Island is strengthened. · Provision of further port facilities for growing container cargo is accelerated after the completion of Phase-I project. Further port extension is not urgent until the target year 2010. · Improvement of cargo handling system to cope with modern container and roll on/roll off vessel arrival at the port. · The most promising port to assist the CALABARZON Regional Development Project.	· Base port for trade with the Mindoro Island is strengthened. · Provision of further port facilities for growing container cargo is accelerated after the completion of Phase-I project. Further port extension is not urgent until the target year 2010. · Improvement of cargo handling system to cope with modern container and roll on/roll off vessel arrival at the port. · The most promising port to assist the CALABARZON Regional Development Project.
Lucena/ Pagbilao	· Location is 13~15 km away from the city of Lucena. · 2 x 350 MW power plant project is on-going in the Pagbilao Grande Island. · There is a development plan of a large scale commercial port by using loading/unloading facilities at the power plant. · Trunk road from Metro Manila has been implemented, accordingly a short road to Pagbilao remains undeveloped. · Broad undeveloped areas in terms of water and land.	· High potential to construct a large scale commercial port at Pagbilao from the viewpoint of land acquisition and provision of broad calm water area. · Sea water is shallow, -5 m more or less. Dredging volume for access channel and turning basin will be on a large scale. · A large scale port bridge must be constructed toward the Pagbilao Grande Island. · Development Plan of a large scale commercial port will not mature for the time being, as contrasted to Phase-I project implementation at Batangas in near future. · Conservation of water resources must be carefully taken into account.	· High potential to construct a large scale commercial port at Pagbilao from the viewpoint of land acquisition and provision of broad calm water area. · Sea water is shallow, -5m more or less. Dredging volume for access channel and turning basin will be on a large scale. · A large scale port bridge must be constructed toward the Pagbilao Grande Island. · Development plan of a large scale commercial port will not mature for the time being, as contrasted to Phase-I project implementation at Batangas in near future. · Conservation of water resources must be carefully taken into account.	· High potential to construct a large scale commercial port at Pagbilao from the viewpoint of land acquisition and provision of broad calm water area. · Sea water is shallow, -5 m more or less. Dredging volume for access channel and turning basin will be on a large scale. · A large scale port bridge must be constructed toward the Pagbilao Grande Island. · Development Plan of a large scale commercial port will not mature for the time being, as contrasted to Phase-I project implementation at Batangas in near future. · Conservation of water resources must be carefully taken into account.
Infanta/ Real	· Small local port for trade with the Polillo Island. · Greater function as a fishing port. · Promising location near to Japan and other regions in the Pacific Ocean. · Sand beach coast and shallow sea water. · Roads to Metro Manila and Lucena have not been developed yet. Accordingly, totally isolated.	· A huge amount of road investment is needed, but priority of road development is still low at present, consequently the construction of a commercial port at Infanta/Real will not be possible from the short or medium term point of view. · Small local port for the time being.	· A huge amount of road investment is needed, but priority of road development is still low at present, consequently the construction of a commercial port at Infanta/Real will not be possible from the short or medium term point of view. · Base port along the Eastern Luzon coast will mature from the long-term point of view.	· A huge amount of road investment is needed, but priority of road development is still low at present, consequently the construction of a commercial port at Infanta/Real will not be possible from the short or medium term point of view. · Base port along the Eastern Luzon coast will mature from the long-term point of view.

CHAPTER 2

MASTER PLAN (2010)

CHAPTER 2 MASTER PLAN (2010)

2.1 Basic Policy for Port Master Planning

Port master planning is generally conducted on the understanding that public ports should be considered as economic infrastructure, or social capital, or as a national asset which is vital in promoting the national economy and upgrading total welfare of the citizen. As described in the previous chapter, port development strategies have laid the foundation of port master planning. In addition to those, master plans for the Port of Manila, Batangas, Sangley Point and Naic/Cavite have been formulated on the basis of the following nine (9) basic policies.

(1) Port development should back up high industrialization in the Greater Capital Region (GCR). With respect to the CALABARZON region in particular, port development should facilitate the smooth implementation of the CALABARZON Regional Development Project.

(2) Existing port facilities including on-going projects such as No.5 International Container Terminal at the Manila International Container Terminal (MICT) and No.1 to No.3 Roll on/Roll off Terminal at the North Harbor, must be utilized up to the maximum capacity in order to meet growing cargo and passenger demand in future.

(3) The result of O/D survey, especially the port hinterland identified by the survey, must be taken into account when the role and function of each GCR port is determined.

(4) Port master planning must be based on the principle of minimization of total cost which consists of capital investment for port facilities and cargo handling equipment, land acquisition cost, environment preservation cost, transportation cost within the hinterland and so on.

(5) Port master plans should give rise to no further impact on the urban transport system, especially in Metro Manila.

(6) Port master planning is also premised on the following assumptions.

- Metro Manila's urban highway networks will be fully established to the extent that the JICA's "Feasibility Study on Metro Manila Urban Expressway System" proposed in 1993.
- The MICT's rail-served inland container depot project will be implemented without delay by the year 2000.
- The Phase-I project at the Port of Batangas will be completed in accordance with

the original implementation schedule.

(7) The hinterland of the Port of Subic is considered at present as the mid-west part of the Luzon Island.

(8) Environmental impact must be carefully examined and assessed.

(9) The advantage and disadvantage of a port development plan for Sangley Point should be clarified and compared with those for other alternative ports, although the conversion plan of Sangley Point into an international commercial port may become one of the most expensive projects due to cost for the Naval Base relocation.

2.2 Origin and Destination Survey

For the purpose of grasping the situation of the hinterland, two origin/destination surveys were conducted. The first survey was conducted at the port of Manila in June 1993, and the second one was conducted at the cordon lines of Metro Manila in November 1993. As the results of surveys, the majority of foreign cargoes handled at the port of Manila come to/from GCR with a few transshipment. Objective locations of O/D of domestic cargoes were almost all in Metro Manila; this city obviously functions as a distribution center. The share of cargo related to Region III or Region IV is just over 10% of all cargoes handled at the port of Manila.

Table 2-2-1 Characteristics of Cargo and Passenger

AREA	DOMESTIC CARGO (Ton)	FOREIGN CARGO (Ton)	TOTAL CARGO (Ton)	TOTAL PASSENGER (Person)
REGION III	3,100 7 %	10,700 13 %	13,800 11 %	500 4 %
N C R	39,700 85 %	62,500 73 %	102,200 77 %	9,700 85 %
REGION IV	3,900 8 %	11,900 14 %	15,800 12 %	1,200 11 %
TOTAL	46,700 100 %	85,100 100 %	131,800 100 %	11,400 100 %

There are two future trends to be pointed out. One is that foreign cargo will increase corresponding to the CALABARZON Development Plan. The other is that domestic cargo will be transferred from Manila to Batangas in order to decrease transit cost from/to the southern Philippines corresponding to the development of the port of Batangas.

Port user's preference survey was conducted regarding availability of using ports of Subic and Batangas when they were to have the same function as the port of Manila. Two of forty-four intended to use them totally, and twenty of forty-four would use them partially. From these results, it is too early to determine whether operation at these two ports will be feasible;further study is required.

The share of passengers coming from/to Region IV exceeds 10 % in Table 2-2-1. This suggests that long distance RO/RO vessels will probably call at Batangas in the future.

2.3 Microscopic Demand Forecast

2.3.1 Conditions of Demand Forecast

After due consideration of socio-economic conditions and the hinterland, microscopic demand forecast by cargo in target year was planned. Foreign container cargo handled at the port of Manila accounts for 95% of whole volume handled at 20 Base Ports. It reflects foreign trade of the Philippines. As domestic cargo, there are two types of transportation: one is the secondary transportation of foreign cargo according to the GRDP of each island and the other is the commercial transportation between islands and Manila,which represents the largest consumption and production area. A commercial port does not define a special commodity as a main cargo, so grouping cargo by sector was projected by annual growth rate.

There are several factors to be considered in the step of demand forecast in the year 2010. De-urbanization of factories related to CALABARZON Development Plan, reduction in transshipment time from Visayan islands, reduction of volume per value, importation restriction resulting from the trade imbalance and progress of containerization are factors that will be taken into account.

Medium case shall be projected as a microscopic demand forecast.

2.3.2 Cargo Volume Transported from Manila to Batangas

Cargo volume is expected to be transported from Manila to Batangas for the following two reasons.

(1) De-urbanization of factories related to the CALABARZON Regional Development Project

The CALABARZON Regional Development Project accelerates the establishment of factories in the suburbs. For some factories, an access route to the port of Batangas is more profitable than a route to the port of Manila. So some vessels will call at the port of Batangas instead of the Port of Manila when the Port of Batangas is equipped with the same level of facilities as the Port of Manila. The cargo volume to be shifted is estimated at 5% of the industrial cargo handled at the Port of Manila with reference to the CALABARZON Regional Development Plan.

(2) Reduction in transshipment time from Visayan islands

Based on the O/D survey, 8% of current domestic cargoes at the Port of Manila come from/to Region IV. In the year 2010, 600,000 tons of domestic cargoes will be expected to be shifted from Manila to Batangas.

Table 2-3-1 Cargo Volume in 2010 by Microscopic Demand Forecast

(Unit:Thousand Tons)

TYPE OF CARGO	G C R	PORT OF MANILA	PORT OF BATANGAS
TOTAL	56,715	52,015	4,700
DOMESTIC	30,707	27,019	3,688
FOREIGN	26,008	24,996	1,012

2.3.3 Estimated Container Cargo by Region

Container cargo volumes of the Port of Manila generated in NCR, Region III and Regions IV respectively are estimated based on the O/D survey. Computed cargo volumes in 1991 and 2010 are 8.8 and 31.7 million tons respectively in NCR, 1.3 and 6.4 million tons in Region III and 2.0 and 7.1 million tons in Region IV. Of the total

container volume in 2010, domestic cargoes account for 3.1 million tons while foreign cargoes account for 4.0 million tons.

Table 2-3-2 Container Cargo in GCR

(Unit:Thousand Tons)

PORT AND GENERATED AREA	YEAR 1991	YEAR 2010		
	TOTAL	TOTAL	DOMESTIC	FOREIGN
PORT OF MANILA	12,100	45,200	23,000	22,200
REGION III	1,300	6,400	3,400	3,000
N C R	8,800	31,700	16,500	15,200
REGION IV	2,000	7,100	3,100	4,000
PORT OF BATANGAS	0	2,900	2,100	800

2.4 Future Vessel Forecast

It is assumed that the largest vessel presently calling the Port of Manila will basically become the standard size in future. Results of forecasted vessel size at the Port of Manila and Batangas are shown in Table 2-4-1 and 2-4-2 respectively.

Table 2-4-1 Vessel Size at Port of Manila in Target Year

		1991	2010	Remarks
Foreign Container Vessel	Large Vessel	Av. 14,700 DWT	Av. 30,000 DWT	Second Generation Ship
		LOA 154.0 m	LOA 237.0 m	
		Draft 8.5 m	Draft 11.6 m	
		Beam 24.0 m	Beam 30.7 m	
	Small Vessel	Av. 8,500 DWT	Av. 13,000 DWT	Largest Calling Vessel
		LOA 120.0 m	LOA 153.0 m	
		Draft 7.0 m	Draft 8.4 m	
		Beam 20.0 m	Beam 23.0 m	
Domestic Container Vessel	Large Vessel	Av. 5,300 DWT	Av. 12,500 DWT	Largest Calling Vessel
		LOA 97.0 m	LOA 145.0 m	
		Draft 6.0 m	Draft 8.3 m	
		Beam 17.0 m	Beam 21.6 m	
Domestic RO/RO Vessel	Large Vessel	Av. 5,590 GRT	Av. 13,700 GRT	Largest Calling Vessel
		LOA 121.0 m	LOA 195.0 m	
		Draft 7.0 m	Draft 7.5 m	
		Beam 19.0 m	Beam 24.0 m	
	Small Vessel	Av. 3,000 GRT	Av. 3,000 GRT	Suitable for berth depth
		LOA 113.0 m	LOA 113.0 m	
		Draft 4.9 m	Draft 4.9 m	
		Beam 18.9 m	Beam 18.9 m	
Conventional Vessel	Foreign	Av. 8,400 DWT	Av. 10,000 DWT	Largest Calling Vessel
		LOA 108.0 m	LOA 137.0 m	
		Draft 8.1 m	Draft 8.5 m	
		Beam 19.0 m	Beam 19.9 m	
	Domestic	Av. 3,400 DWT	Av. 4,100 DWT	Largest Calling Vessel
		LOA 82.0 m	LOA 88.3 m	
		Draft 5.0 m	Draft 5.1 m	
		Beam 13.0 m	Beam 14.2 m	

Table 2-4-2 Vessel Size at Port of Batangas in Target Year

		1991	2010	Remarks
Foreign Container Vessel	Small Vessel	—	Av. 13,000 DWT	Same as South Harbor, Manila
		—	LOA 153.0 m	
		—	Draft 8.4 m	
		—	Beam 23.0 m	
Domestic Container Vessel	Large Vessel	—	Av. 8,500 DWT	Same as North Harbor, Manila
		—	LOA 113.0 m	
		—	Draft 9.0 m	
		—	Beam 19.0 m	
Domestic RO/RO Vessel	Small Vessel	Av. 500 GRT	Av. 2,000 GRT	Same as Phase I Project
		LOA 56.1 m	LOA 96.0 m	
		Draft 3.0 m	Draft 4.4 m	
		Beam 12.3 m	Beam 17.1 m	
Conventional Vessel	Foreign	—	Av. 10,000 DWT	Same as South Harbor, Manila
		—	LOA 137.0 m	
		—	Draft 8.5 m	
		—	Beam 19.9 m	

2.5 Traffic Impact Survey and Port Road Planning

2.5.1 Traffic Impact Survey

Computer simulation study was conducted to check the influence of port related cargo vehicles and passenger vehicles on NCR urban road traffic system in 2010. Following results are defined by evaluating decrease of speed and ratio of port related vehicles.

(1) Port related vehicles account for 2-3% of NCR urban road traffic.

(2) Direct access from port area to planned elevated highway or trunk roads like EDSA will mitigate traffic congestion in the port area.

Table 2-5-1 Traffic Impact on Urban Road by Port Related Vehicle

CASE	AREA	TRAFFIC VOLUME (PCU·KM)	PORT RELATED VEHICLE	
			(PCU·KM)	SHARE(%)
BASIC	INSIDE EDSA	10,746,000	-	-
	OUTSIDE EDSA	20,600,000	-	-
	PLANNED ELEV.H/W	4,701,000	-	-
	TOTAL	36,047,000	-	-
MEDIUM CASE INCREASE SHARE OUTSIDE EDSA	INSIDE EDSA	10,869,000	123,000	1.1
	OUTSIDE EDSA	20,764,000	164,000	0.8
	PLANNED ELEV.H/W	5,392,000	691,000	14.7
	TOTAL	37,025,000	979,000	2.7
MEDIUM CASE PRESENT SHARE	INSIDE EDSA	10,863,000	117,000	1.1
	OUTSIDE EDSA	20,714,000	114,000	0.6
	PLANNED ELEV.H/W	5,269,000	568,000	12.1
	TOTAL	36,845,000	799,000	2.2
HIGH CASE INCREASE SHARE OUTSIDE EDSA	INSIDE EDSA	10,914,000	168,000	1.6
	OUTSIDE EDSA	20,889,000	290,000	1.4
	PLANNED ELEV.H/W	5,855,000	1,154,000	24.5
	TOTAL	37,658,000	1,612,000	4.5

Note: PCU means Passenger Car Unit.

2.5.2 Port Road Planning

(1) Preconditions of Port Road Planning

Impacts on the urban traffic in Metro Manila from the port-related vehicles are already described in the previous section.
In this section, based on cargo volume projected in the Master Plan (target year 2010), necessary number of vehicle lanes along the existing breakwater at the North Harbor and the port bridge between MICT and the South Harbor (see Figure 2-5-1) are examined.

The preconditions for calculating the necessary number of vehicle lanes is as follows:

<table>
<tr><td colspan="3">① Cargo volume transported by one truck (W)
Container cargo : One box per truck
General cargo : Domestic cargo 5.67 metric tons per truck
Foreign cargo 9.03 metric tons per truck</td></tr>
<tr><td>② Annual working days (D)
300 days</td><td>④ Daily Variation (γ)
1.4</td><td>⑥ Related vehicle rate (δ)</td></tr>
<tr><td>③ Monthly variation (β)
1.2</td><td>⑤ Real load rate (ϵ)
0.75</td><td>⑦ Hourly variation (σ)
Domestic cargo 0.09
Foreign cargo 0.11</td></tr>
</table>

(2) Port Road Planning

Based on the forecasted cargo volume handled at port in the target year 2010, and using each factor above, design traffic volume (vehicles/hour) is obtained by using the following formula.

Design Traffic Volume (vehicles/hour)

$$= \frac{\textit{Annual handled cargo volume}}{W} \times \frac{\beta \times \gamma}{D} \times \frac{(1+\delta)}{\epsilon} \times \sigma$$

After the calculation, in case of the medium and high economic growth scenario, the necessary number of vehicle lanes of the port road which is planned along the existing breakwater at the North Harbor and the port bridge between MICT and the South Harbor is shown in Table 2-5-2. Further, the design standard traffic volume is adopted as 600 vehicles hour/lane which is based on technical standards in Japan.

The design traffic volume at the port bridge between MICT and the South Harbor is set by using the ratio used in a simulation for the urban traffic impact in Metro Manila described in the previous section. All of the port-related vehicles allocated to the port bridge are assumed to use this port bridge.

Table 2-5-2 Design Traffic Volume and Necessary Vehicle Lanes

Item / Project	Design Traffic Volume (vehicles/hour)		Number of Lanes	
	Medium Economic Growth Case	High Economic Growth Case	Medium Economic Growth Case	High Economic Growth Case
Existing Breakwater (Foreign/Domestic Container Terminal)	1,670	2,360	4 (6)	4 (6)
Port Bridge (Connected between MICT and South Harbor)	2,050	2,960	4 (6)	6 (6)

Remarks: Design traffic volume includes passenger related vehicles.
: The planned vehicle lanes are given in parentheses.

The width of the port bridge should be determined, taking future expansion of

road lanes into account.

In addition, the width of the port road which is planned along the existing breakwater should be also determined, taking into account the parking/waiting space of trucks and other port-related vehicles. This is because there is no room for expansion on both sides of the port road.

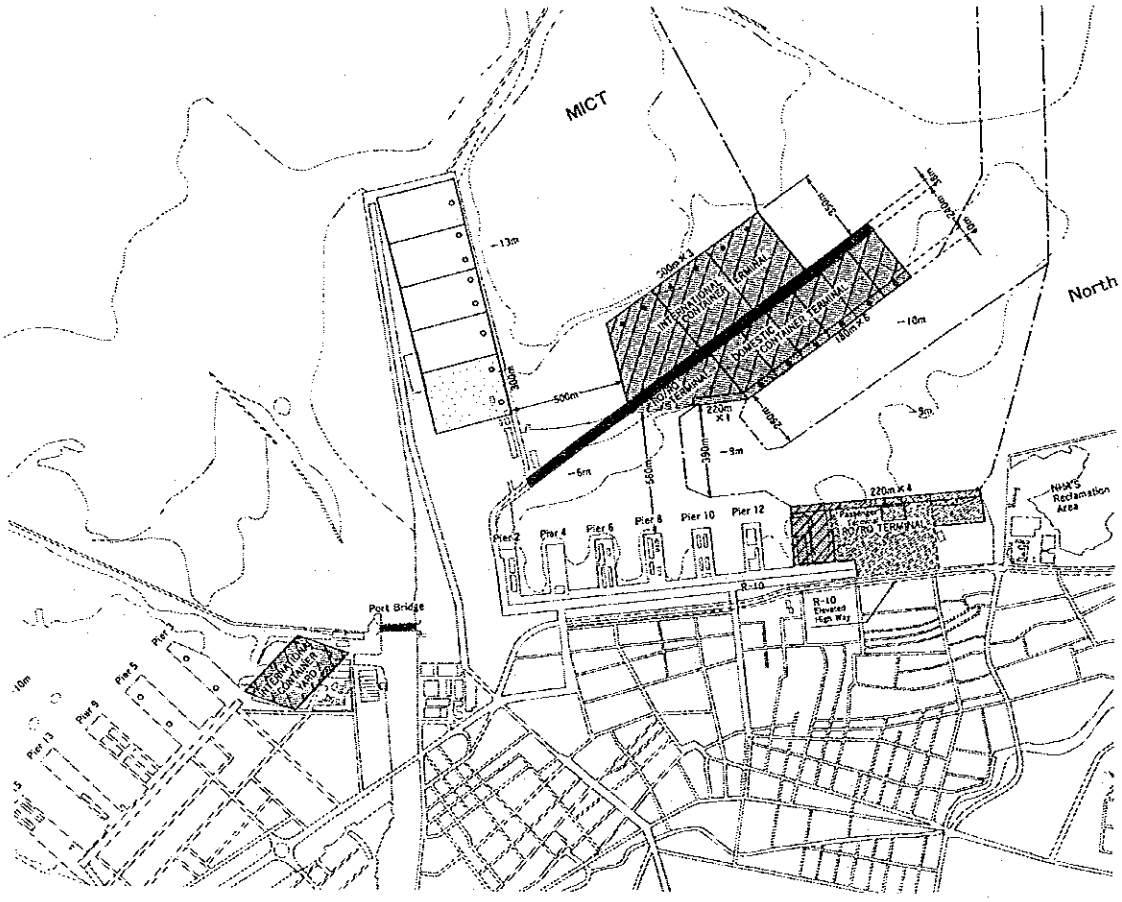


Figure 2-5-1 Location of Port Road

2.6 Port Master Plan

2.6.1 Berth Requirement

In determining the required number of berths, the Study Team assumed that the increasing domestic container cargo shall be basically handled at newly-built berths considering the large vessel in the future and on the other hand, the general cargo (non-containerized cargo) shall be handled at the existing berths because the future vessel size is forecasted to be almost the same as the present vessel size.

(1) Premise Conditions of Port Plan

The cargo and passenger demand forecast, and the forecasted calling vessel size in the target year 2010 are described in Chapter 2.3 and 2.4 respectively. Furthermore, the premise conditions of the major items related to the port plan are as follows:

1) Berth occupancy rate:50%
2) Critical wave height and degree of wave calmness in front of a berth
   :Under 0.5m, more than 95%
3) Width of waterway and area of turning basin
   :More than LOA, more than two times of LOA
4) Kind of cargo handling equipment
   (Foreign container)
   :Transfer crane
   (Domestic container)
   :Straddle carrier
5) Productivity
   (Container Cargo)
   :25 boxes per 1 gantry crane
   :10 boxes per ship gear or other crane
   (General Cargo)
   :20 metric tons per gang (Domestic)
   :25 metric tons per gang (Foreign)
6) Operation time and days
   (Container terminal)
   :24 hrs. per day, 365 days per year

(Other existing wharf)

:13 hrs. per day, 360 days per year

Remarks: The operation days per year at the Port of Batangas are assumed to be reduced to 320 considering the natural conditions and the fact that there is no breakwater.

(2) Berth Requirement

The formula for calculating the necessary number of berths is shown below (formula 2.6.1).

$$BOR = \frac{V \times M}{n \times m \times (H \times D - 2V)} \quad \text{.....(formula 2.6.1)}$$

BOR : Berth Occupancy Rate (50%)
V : Number of Vessels per year
M : Average Handling Cargo Volume per vessel
n : Number of Gantry Crane or Gang
m : Productivity
H : Operation times per day
D : Operation days per year
2V : Idle Time (2 hours per vessel)

The number of additional berths required in the target year of the medium case scenario at the Port of Manila and Port of Batangas is shown in Table 2-6-1 and Table 2-6-2, respectively. Table 2-6-3 and Table 2-6-4 also show the number of additional berths required in the target year under the high case scenario.

Table 2-6-1 Berth Requirement of Port of Manila (Medium Economic Growth Case)

Cargo Category			Cargo Volume 1991 (*1,000MT)	Cargo Volume 2010 (*1,000MT)	Existing Capacity (*1,000MT)	Cargo Assignment to New Berth(A) (*1,000MT)	New Berth Capacity Per Berth(B) (*1,000MT)	Required Additional Berth(A)/(B) (Nos. of Berth)	Remarks
Container Cargo			11,952	45,150	21,420	23,730	-	11	
	Foreign		5,002	22,240	14,500	7,740	2,570	3	-13m quaywall
	Domestic		6,950	22,910	6,920	15,990	-	8	
		Container Vessel	-	-	6,920	13,750	2,170	6	-10m quaywall
		RO/RO Vessel	-	-		2,240	1,420	2	-9m quaywall
General Cargo			5,156	6,870	9,570	0	0	-	
	Foreign		1,646	2,820	3,890	0	-	-	
	Domestic		3,510	4,050	5,680	0	-	-	
Total			17,108	52,020	30,990	-	-	11	

Note: Existing Capacity includes On-going Project's facilities.

Table 2-6-2 Berth Requirement of Port of Batangas (Medium Economic Growth Case)

Cargo Category			Cargo Volume 1991 (*1,000MT)	Cargo Volume 2010 (*1,000MT)	Existing Capacity (*1,000MT)	Cargo Assignment to New Berth(A) (*1,000MT)	New Berth Capacity Per Berth(B) (*1,000MT)	Required Additional Berth(A)/(B) (Nos. of Berth)	Remarks
Container Cargo			0	2,940	2,010	1,210	-	1	
	Foreign		0	770	1,050	0	-	-	
	Domestic		0	2,170	960	1,210	-	1	
		Container Vessel	-	-	960	1,210	2,100	1	-10m quaywall
		RO/RO Vessel	-	-		0	-	0	
General Cargo			998	1,760	2,200	0	-	-	
	Foreign		54	240	280	0	-	-	
	Domestic		944	1,520	1,920	0	-	-	
Total			998	4,700	4,210	-	-	1	

Note: Existing Capacity includes Phase I Projects's facilities.