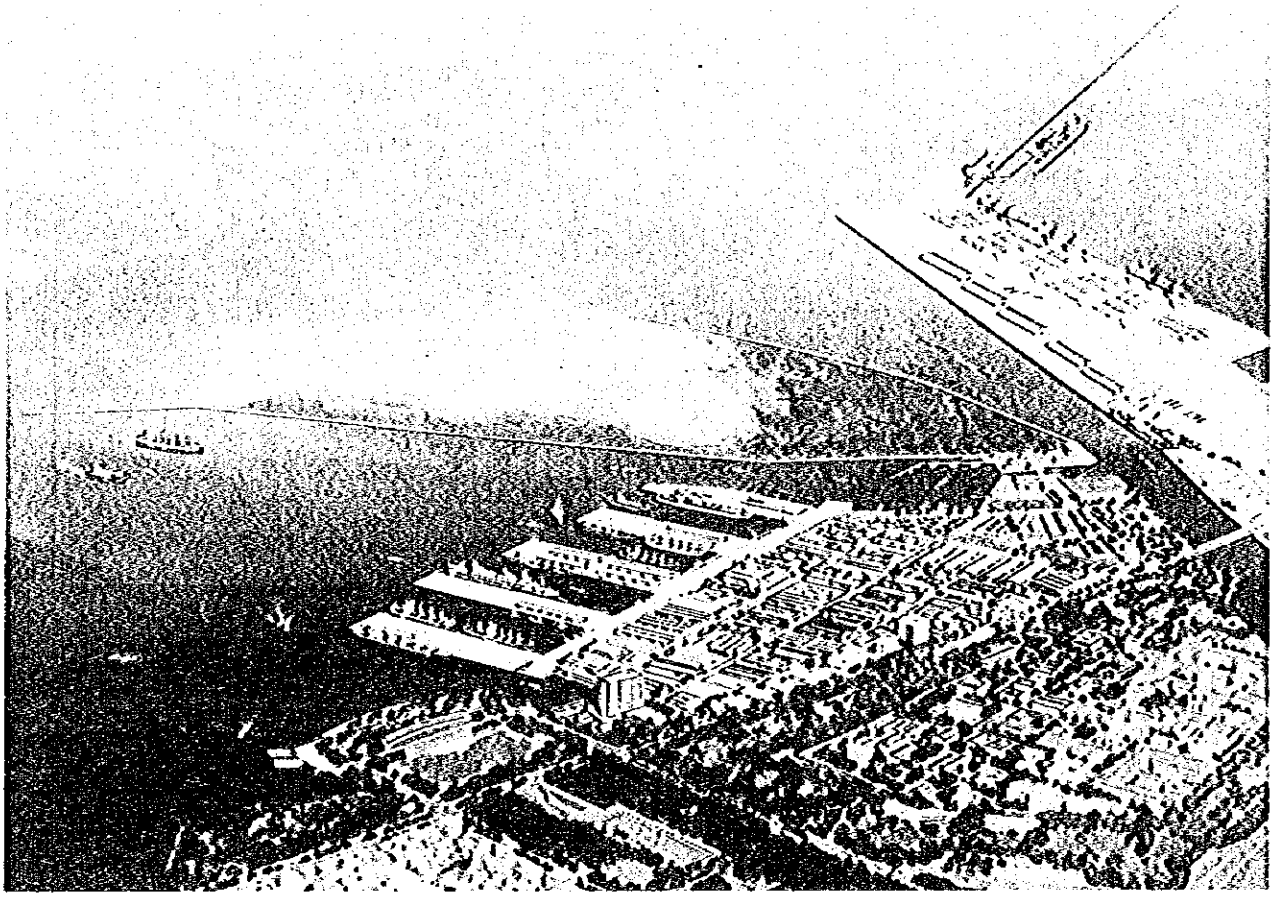
社会開発協力部報告書

VOLUME 1 SUMMARY

MANILA SOUTH PORT REHABILITATION PROJECT

REPUBLIC OF THE PHILIPPINES



FEASIBILITY STUDY

FINAL REPORT

JUNE 1987

JAPAN INTERNATIONAL COOPERATION AGENCY

VOLUME 1 SUMMARY

MANILA SOUTH PORT REHABILITATION PROJECT

REPUBLIC OF THE PHILIPPINES

FEASIBILITY STUDY

FINAL REPORT

JUNE 1987

PREFACE

In response to a request of the Government of the Republic of the Philippines, the Government of Japan has decided to conduct a feasibility study on the Manila South Port Rehabilitation Project, and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the Philippines a study team headed by Mr. Terumi Iijima, Executive Director, the Overseas Coastal Area Development Institute (OCDI), several times from April 1986 to March 1987.

The team exchanged views with the officials concerned of the Government of the Republic of the Philippines on the project, conducted field surveys and collected reference materials. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the promotion of the Manila South Port Rehabilitation Project and contribute to the friendly relations between our two countries.

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

June 1987

Keisuke Arita

President

Japan International Cooperation Agency

LETTER OF TRANSMITTAL

June 1987

Mr. Keisuke Arita
President
Japan International Cooperation Agency

Dear Mr. Arita:

It is my great pleasure to submit herewith the Report for the Feasibility Study on the Manila South Port Rehabilitation Project in the Republic of the Philippines.

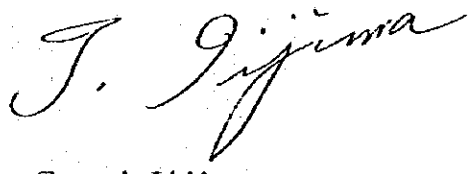
This report is the result of studies carried out by the Overseas Coastal Area Development Institute of Japan and Nikken Sekkei Ltd. at the request of the Japan International Cooperation Agency. Regarding this project, our study team conducted four series of field surveys, one of which took place for 75 days from June 16, 1986, to collect a variety of data including data concerning natural conditions.

The findings of these surveys were discussed to review the Master Plan and to study the feasibility of the Manila South Port Rehabilitation Project, and were then compiled into this report. The study shows that the Project is extremely important, so I hope the Project is executed promptly.

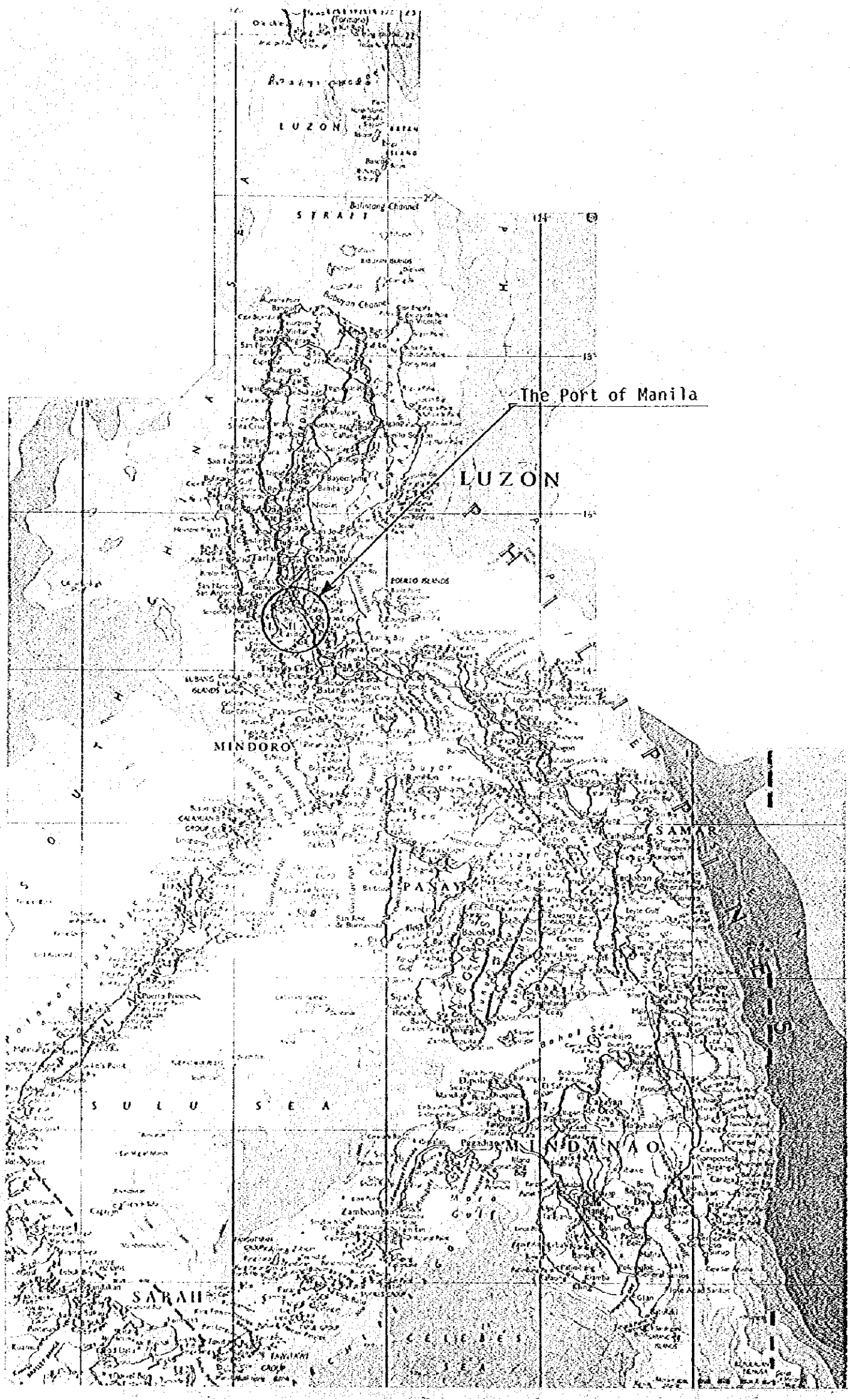
On behalf of the study team, let me express my heartfelt thanks to the Philippine Port Authority and to the other related agencies of the Philippine Government for the generous cooperation, assistance and warm hospitality which were extended to the study team during their stay in the Philippines.

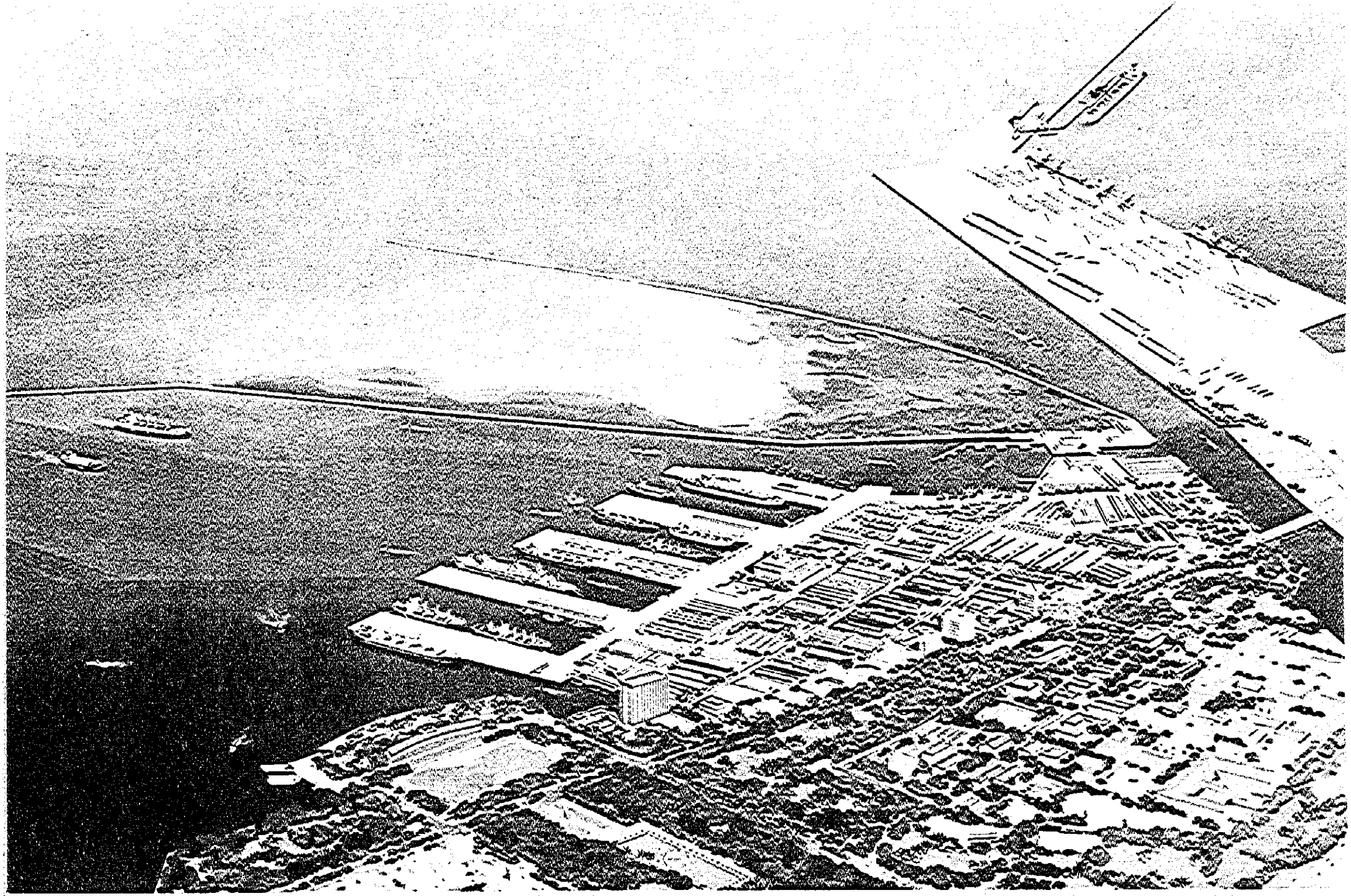
Our thanks are also due to the Japan International Cooperation Agency, the Ministry of Transport, the Ministry of Foreign Affairs and the Japanese Embassy in Manila for their valuable advice and support during the field surveys and the preparation of this report.

Yours faithfully,



Terumi Iijima
Head
Japanese Study Team for the Manila
South Port Rehabilitation Project
(Executive Director, the Overseas
Coastal Area Development Institute
of Japan)


The Port of Manila
LUZON
LUZON
MINDORO
SAMAR
PANAY
MINDANAO
SULU SEA
SARAH
CELEBES SEA
Bohol Sea
Moro Gulf
Balintang Channel
Babuyan Channel
PORBIO ISLANDS
CALAMIAN GROUP
CUYO ISLANDS
SULU ARCHIPELAGO



EXCHANGE RATE

$ 1 = ₱ 20.5

$ 1 = ¥ 154

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 Incorporated
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
BOI	Board of Investments
BOM	Bureau of Mining
CB	Central Bank
DWT	Dead Weight Tonnage
EPZA	Export Processing Zone Authority
EIRR	Economic Internal Rate of Return
FPA	Fertilizer and Pesticide Authority
FAO	Food and Agricultural Organization of the United Nations
GDP	Gross Domestic Product
FRR	Financial Internal Rate of Return
GNDP	Gross National Domestic Product
GNP	Gross National Product
GRDP	Gross Regional Domestic Product
Gs	Specific Gravity of Soil Particles
GRT	Gross Registered Tonnage
GT	Gross ton(s)
IBRD	International Bank for Reconstruction and Development
JETRO	Japan Trade Center
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standards
MARINA	Maritime Industry Authority
MHS	Ministry of Human Settlement
MICT	Manila International Container Terminal
MIRDP	Mindoro Intergrated Rural Development Plan

MLLWL	Mean Lowest Low Water Level
MOA	Ministry of Agriculture
MOE	Ministry of Energy
MMA	Metropolitan Manila Area
MTI	Ministry of Trade and Industry
MOTC	Ministry of Transportation and Communications
MPWH	Ministry of Public Works and Highways
MT	Metric Ton(s)
NEDA	National Economic Development Authority
NCA	National Coal Authoriy
NCC	Northern Cemment Corporation
NCR	National Capital Region
NCSO	National Census and Statistics Office
NEPC	National Environmental Protection Council
NFA	National Food Authority
NIEP	Nationwide Industrial Estate Program
NSC	National Steel Corporation
NTPP	National Transportation Planning Project
OCDI	Overseas Coastal Area Development Institute of Japan
OECF	Overseas Economc Cooperation Fund
PAGASA	Philippine Atomospheric Geographical and Astronomical Service Administration
PASTORA	Planning Assistance Service to Rural Areas
PCA	Philippine Coconut Authority
PCIA	Philippine Cement Industry Authority
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
PNR	Philippine National Railways
P	Peso(s)
PPA	Philippine Ports Authority
qu	Unconfined compressive strength
RT	Revenue Ton(s)
SPT	Standard Penetration Test
TEU	Twenty-foot Equivalent Units
UDS	Undisturbed Sample

UNICHEM	United Coconut Chemicals, Inc.
W	Water Content
$	United States Dollar(s)
¥	Japanese Yen
PMU Manila	Port Management Unit (Manila)

CONTENTS

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

1. Necessity of the Rehabilitation of South Harbor

The Port of Manila is the most important port in the Philippines, and plays an essential role in the national economic development.

The Port of Manila consists of North Harbor for domestic trade and South Harbor for foreign trade in addition to the Manila International Container Terminal (MICT), of which MICT handles mainly containers of non-self-sustaining container ships.

South Harbor is thus the main gateway of the country for international trade, and the hinterland of the Port is not limited to the Metro Manila Area, but covers the entire nation.

All the harbor facilities except MICT were constructed shortly after World War II. The facilities have become superannuated, and some parts of the facilities have reached a very dangerous condition. The cargo handling activities at South Harbor are being hindered by the outdated facilities.

The Government of the Philipines is now promoting the recovery of the national economy from the 1983 economic recession in accordance with the revised national development plan, the Medium-Term Philippine Development Plan 1987-1992.

To achieve further national development, improvement of the transportation infrastructure is essential.

Overall, a comprehensive rehabilitation plan for South Harbor is required, and adequate and timely action should be taken by the government.

2. Master Plan

The Master Plan is formulated with a target year of 2005. In order to secure efficient port operations, South Harbor will continue to be used for the exclusive handling of foreign trade cargo except for some containerized cargoes which will be handled at MICT.

The estimated cargo volume at South Harbor in the target year is about 5.2 million tons considering the historical trend, the forecast growth of the socio-economic activities, and the proper allotment of container cargo handling with MICT.

Based on the required scale of proper facilities as estimated from the projected traffic, the Master Plan proposes rehabilitation/renovation of the dilapidated facilities and restriction of the use of Pier 13.

Judging from the technical evaluation, this pier should not be used for handling heavy cargoes. Thus, Pier 13 will be used for passenger ships, small craft and other non-cargo handling ships.

In order to achieve effective cargo handling, the Master Plan also proposes (1) to introduce an exclusive grain terminal at the west end of MICT, (2) to widen quaywall aprons and level up the central passageway of piers, (3) to modify the physical facilities at the port, (4) to emphasize preferential berthing for specialized cargo ships such as container, iron & steel and timber ships, and (5) to transfer part of loose cargo handling at anchorage to piers.

The construction cost is roughly estimated at about 1.4 billion pesos (in August 1986 prices).

3. Short-term Rehabilitation Plan

The Short-term Rehabilitation Plan is aimed at the year 1995, and covers the urgent rehabilitation of dilapidated facilities and improvement of operations. The estimated cargo volume in 1995, on the basis of which the Short-term Plan is formulated, is about 3.6 million tons.

The Short-term Plan proposes (1) repair works for the damaged portions of existing facilities, (2) improvement of wharf facilities including the widening of aprons and the enlargement of open storage areas at the piers, and (3) introduction of floating pneumatic unloaders to improve the grain handling productivity at anchorage.

The construction cost is estimated at about 490 million pesos excluding the cost of the two floating unloaders. About 280 million pesos of the cost, approximately 57 %, will come from foreign loans. The construction period is around five years. The cost of the two floating unloaders is estimated at about 220 million pesos.

4. Economic and Financial Analysis of the Short-term Rehabilitation Plan

1) Economic Analysis

The Short-term Rehabilitation Plan is evaluated using the Economic Internal Rate of Return (EIRR) which is calculated based on cost-benefit analysis from the viewpoint of the national economy. Benefits considered are the savings in ships' staying costs, cargo handling costs and time costs, while costs are the construction and maintenance costs. The internal rate of return, using 30 years as the period of economic

calculation, is 18.46%.

This shows that the Short-term Rehabilitation Plan is feasible from the viewpoint of the national economy.

2) Financial Analysis

PPA maintains its financial viability throughout the entire project life including the construction period. It will be able to pay all expenditures and have some surplus even after appropriating funds for the repayment of foreign loans including interest.

As for the profitability of the project itself, the FIRR is estimated to be 7.69 for the base case, which exceeds the weighted average cost of capital (3.1%).

Judging from the above, we conclude that the Short-term Rehabilitation Plan with the target year of 1995 is feasible both economically and financially.

RECOMMENDATIONS

Most of the facilities at Manila port were constructed a long time ago and have become outdated. Thus, in order to respond to the changes of ship type and packing type, it has become necessary to improve the port facilities and the port operation systems. Planning, fund raising, detailed design and construction for this rehabilitation project will hereafter be conducted in accordance with the plans presented in this report.

The planning and implementation of this project should be harmonized with the ongoing development project of M.I.C.T. and with other plans concerned.

The recommendations below concern various matters we noticed while conducting this survey and drafting the plans.

1) Manila Port is currently managed and operated in three separate sections: South Harbor for foreign trade cargo, M.I.C.T. mainly for foreign trade container cargo of non-self-sustaining container ships, and North Harbor for domestic cargo. In order to secure systematic port management and efficient port operations, this policy should be continued in the future.

2) The cargo handling volume at Manila Port is greatly influenced by the economic activities of the Philippines. The economy of the Philippines is now beginning to recover from the 1983 economic recession. However, for various reasons, it is difficult to forecast the future of the Philippine economy at the present time. Thus, economic trends should be carefully monitored in the future, and the Master Plan should be periodically reviewed and modified if necessary.

3) M.I.C.T. will be developed along with the increase of containerized cargo volume. PPA should make an effort to transfer the handling of cargo of non-self-sustaining container ships from South Harbor to M.I.C.T. in the future.

4) The area adjoining the South Harbor Port Zone is now used for miscellaneous purposes. From the viewpoint of long-term and overall planning, the expansion of the Port Zone is desirable in order to

secure smooth port operations.

5) The rehabilitation works at South Harbor should be executed without interfering with regular port activities, that is to say the regular handling of cargo at the port, whenever possible.
Before repair/renovation work of any pier starts, the following measures should be taken:

ⓐ Coordination among the administration and operation sections and port users in order to maintain smooth port operations

ⓑ Planning and selection of a practical construction method which will make the duration of repair/renovation works as short as possible

ⓒ Provision of sufficient space for normal port operations which might otherwise be hampered during the repair/renovation works

6) Considering the existing physical conditions of South Harbor, the following counter-measures should be implemented as quickly as possible, and thorough maintenance should be given to all facilities.

ⓐ Pier 13
This is severely damaged and therefore, cargo handling operations with heavy duty vehicles should be banned.

ⓑ Pier 15
The vicinity of the entrance and the central lowered passageway are severely damaged, so urgent improvement/renovation is required in these areas.

Without proper maintenance/repair works, there is a risk of serious accidents occurring at these Piers, such as casualty or even loss of life due to pier collapse, as a result of the operation of cargo handling vehicles in structurally unreliable areas.

7) In order to improve the handling productivity of grain cargo at Anchorage, floating unloaders should be introduced at the earliest possible time. For this purpose, sources of revenue, management and operation systems should be investigated.

8) In connection with piers at North Harbor, the following items should be fully taken into consideration.

ⓐ With regard to the structural condition of Pier 16, no settlement of the Pier was observed, but it is still a controversial subject among the people concerned. It is considered preferable to periodically

carry out a systematic and rational observation of the backfill condition, by means of a level survey and underwater inspection of the Pier, in order to determine whether any structural change is going on.

ⓑ It is desirable to close the comparatively wider gaps of Pier 16 in order to prevent the backfill material from escaping through the gaps when the structure is affected by unpredictably strong forces such as earthquakes.

ⓒ Berths of North Harbor piers shouldn't be deepened until sufficient geological and bathymetrical survey/investigation work is carried out.

9) To complete the project effectively, it will be necessary to take care of the following matters.

ⓐ Improvement of navigation aids.

ⓑ Improvement and maintenance of main access roads to the port area as recommended in this report.

ⓒ Although the breakwaters are just functionally adequate at present, it is desirable to repair both the South and West Breakwaters in order to ensure calm conditions and safe navigation in the South Harbor basin.

10) Despite the fact that PPA has clearly realized good financial management, producing about 110 million pesos of average annual net income from 1980 to 1985, PPA cannot use its funds freely because of legal restrictions. Therefore, PPA should be given sufficient autonomy to enable it to respond immediately to benefit port users and the country in general.

SUMMARY

CHAPTER 1 INTRODUCTION

1.1 Background

The Republic of the Philippines has established a long-term economic development plan (1978-1987). The main thrust of the economic policy has been shifted to promoting export-oriented industry.

The Government is now implementing a modified national development plan (1984-1987) in accordance with the basic policy. Although the Government is trying to promote exports, along with the increase of domestic demand imports have been increasing resulting in a worsening international balance of payments.

The Republic of the Philippines is an island nation with 870 ports. Thus, the development and operation of these ports and of maritime transportation as a whole comprise the most important facet of the national transportation infrastructure.

The port of Manila is the most important port in the nation, and plays a major role in the national economic development.

At present, the Government is steadily developing the Manila International Container Terminal in accordance with the master plan drawn up in 1978. At Manila, cargoes are also handled at the piers located at South Harbor and North Harbor.

These piers were constructed after World War II. The facilities have become superannuated, and cargo handling activities at South Harbor are being hindered by the outdated facilities.

Moreover, there are many related problems such as the lack of public areas and warehouses.

So, the Government of the Philippines has requested the Government of Japan to provide technical and economic cooperation in planning the rehabilitation of the South Harbor piers.

1.2 Objectives of the Study

The objectives of the study are to formulate a Master Plan for the development of the South Harbor of Manila Port for the period up to the year 2005 and to prepare a Short-term Rehabilitation Plan for this harbor including a feasibility study within the framework of the Master Plan.

The target year for the Short-term Rehabilitation Plan is the year 1995.

CHAPTER 2 SOCIO-ECONOMIC BACKGROUND

2.1 Population

2.1.1 Population At Present

The 1980 Philippine population census placed the total population of the country at 48,098,460 as of May 1, 1980. Among the thirteen regions, the bulk of the population was concentrated in MMA and the Southern Tagalog (Region IV) located south of MMA. MMA and Region IV are the most urbanized and most economically developed regions in the Philippines.

The tendency towards further concentration of population in MMA and Region IV can also be seen in the preliminary 1985 statistics.

2.1.2 Future Population

According to the Philippine population projections, the Philippine population will increase to 68,424 thousand people in 1995 and 81,591 thousand people in 2005 (middle estimate), and the annual growth rate will continue to decrease gradually. The forecast annual growth rate of MMA is higher than that of the nation. This shows that the concentration of population into MMA will continue during the projection period.

(Unit: 1,000 persons)

	1985		1995		2005		Annual Growth Rate (%)	
							95/85	05/95
Population Philippines	54,688	100	68,424	100	81,591	100	2.3	1.8
(MMA)	(6,942)	(12.7)	(8,971)	(13.1)	(10,737)	(13.2)	2.6	1.8

2.2 National Economy

2.2.1 Overall Development

In the 1970's the Philippine economy (GDP) maintained steady growth averaging just over 6 percent per annum. But in 1980 this growth rate started to decline and by 1984 it had become negative because of (a) the world-wide economic recession of 1980, following the second round of oil

price increases, (b) the collapse of the world markets for copra and sugar, which are among the main export products of the Philippines, and (c) the crisis of confidence and the flight of capital following the assassination of Senator Aquino in 1983.

2.2.2 Sectional Distribution of Activities

The GDP in 1985 was 90,469 million pesos of which 39.3% was in the service sector 31.9% in the industrial sector and 28.8% in the agricultural sector.

In the Philippines, agriculture still plays the pivotal role in socio-economic development. Agriculture provides the main source of livelihood to 70 percent of the population. Agriculture employs about 50 percent of the labor force and produces about half of the total export revenues. The industrial sector consitutes a major part of the Philippine's total economic activities. Major manufacturing industries are light manufacturing industries such as food, veberages, tobacco, textiles and apparel. The heavy industries, on the other hand, are paper and paper products, industrial chemicals, other chemical products, petroleum refineries and so on.

The main activities of the service sector are trade and service such as education, medicine and recreation.

Table 2.1 Gross Domestic Product at Constant 1972 Prices

(Unit: Million Pesos, %)

	1970		1975		1980		1985		Annual Growth Rate		
									'75/'70	'80/'75	'85/'80
Philippines	51,014	100.0	68,361	100.0	92,706	100.0	90,469	100.0	6.0	6.3	0.5
Agriculture Sector	14,734	28.9	18,218	26.6	23,732	25.6	26,010	28.8	4.3	5.4	1.9
Industry Sector	15,048	29.5	22,690	33.2	33,471	36.1	28,880	31.9	8.6	8.1	2.9
Service Sector	21,232	41.6	27,453	40.2	35,503	38.3	35,579	39.3	5.3	5.3	0.0

CHAPTER 3 PRESENT SITUATION OF THE PORT

3.1 Geographic Features and Natural Conditions

The Port of Manila is situated at the east end of the Bay of Manila and the mouth of the Pasig River. The Bay of Manila is almost round and the mouth of the Bay is located to the southwestern. The Bay of Manila is surrounded by low mountain ranges, which protect the Port of Manila from strong winds.

The prevailing wind directions are SE (from February to May), SW (from June to September) and NE (from October to January). The occurrence of wind speeds of more than 11 m/sec (40 km/h) is mainly observed from June to October.

On account of the above-mentioned geographical advantages, wave heights are usually not so high within the Harbor area and the Harbor is very quiet except when it is hit by typhoons during the monsoon season. According to the wave hindcasting derived from the mathematical simulation, the significant wave height ($H_{1/3}$) is only about one (1) m near the piers within South Harbor even during typhoons (the equivalent deepwater wave height is about 2.0m).

With regard to fog, people concerned say that there are no foggy days in Manila Port.

Judging from the above, it can be said that the geographically Port of Manila is generally good with nice natural conditions.

The Port is situated at the estuary of the Pasig River and therefore, siltation is unavoidable.

The subsoil condition of Manila Port shows different characteristics at South and North Harbors. Generally speaking, the thickness of the soft stratum (average 20-40 m) in South Harbor changes greatly from place to place.

The Philippines has been hit by many earthquakes. In the vicinity of Manila, many earthquakes have been experienced. According to PAGASA's data during 23 years from 1960 to 1983, there were 17 earthquakes with a magnitude of more than 5 on the Richter scale inside a 200 KM radius centering on Manila. Therefore, the seismic load factor must be taken into consideration for structural design.

3.2 Structural Survey

South Harbor

The field survey and laboratory tests shown in the following Table 3.1 were carried out mainly on the piers in South Harbor.

Table 3.1 Survey Items

Facilities	Survey method	Description	Remarks
Piers	Visual inspection	Direct visual inspection by boat and underwater inspection by diver	P-3,5,9, 13 and 15
	In-situ test	Chipping test, Schmidt Hammer, Potential difference measurement, Pile depth probing	- do -
	Laboratory tests	Compressive strength, Salt content, Estimated mix proportion Cavity ratio, Carbonization	- do -
Transit sheds and warehouses	Visual inspection	Exterior and interior equipment	Port area
Container yard and road	Visual inspection	Width, length and condition of pavement	- do -
Drainage system	Visual inspection	Drainage condition	- do -

The existing structural conditions of the piers were determined mainly by the visual inspection because the laboratory tests were made for test pieces/specimens sampled from comparatively sound parts.

Fig. 3.1 is a chart colored differently in accordance with the degree of damage estimated from the results of the visual inspection.

Table 3.2 is the overall assessment of the structural soundness/reliability of the individual piers based on the various investigations and inspections.

Table 3.2 Overall Evaluation of the Piers

Pier	Evaluation
3	Aged but still usable with some partial minor repair works to slabs/beams and fenders.
5	The most sound pier, but full repair of fenders and minimum repair works to slabs/beams required.
9	Aged but still usable with some partial minor repair works to slabs/beams and fenders.
13	Most deteriorated pier, very dangerous and in almost critical condition for normal cargo handling operation without overall repair works to superstructure including fenders.
15	Second most deteriorated pier, but still usable with some repair works to slabs/beams and fenders.

The following are the results of the survey/inspection of the existing buildings (refer to Fig. 3.2).

1. The two transit sheds of Pier 5 are structurally damaged, but others are good and still usable.

2. With regard to warehouses and buildings, the following are structurally damaged.

   Warehouses..... Block 141 (WH-2)
   Block 166
   Buildings..... Block 155 (MPWH's Equipment Service)
   Machine Shop (in Container Yard-01)

3. Most of the warehouses and buildings near the engineering island basin are considerably damaged.

Most of the roads in the port zone are paved and no major rehabilitation/renovation work will be required for the time being, though some parts of the pavement are partially uneven with cracks.

The drainage system does not necessarily work effectively and shallow rainwater pools are observed here and there after rainfall.

PIER 15

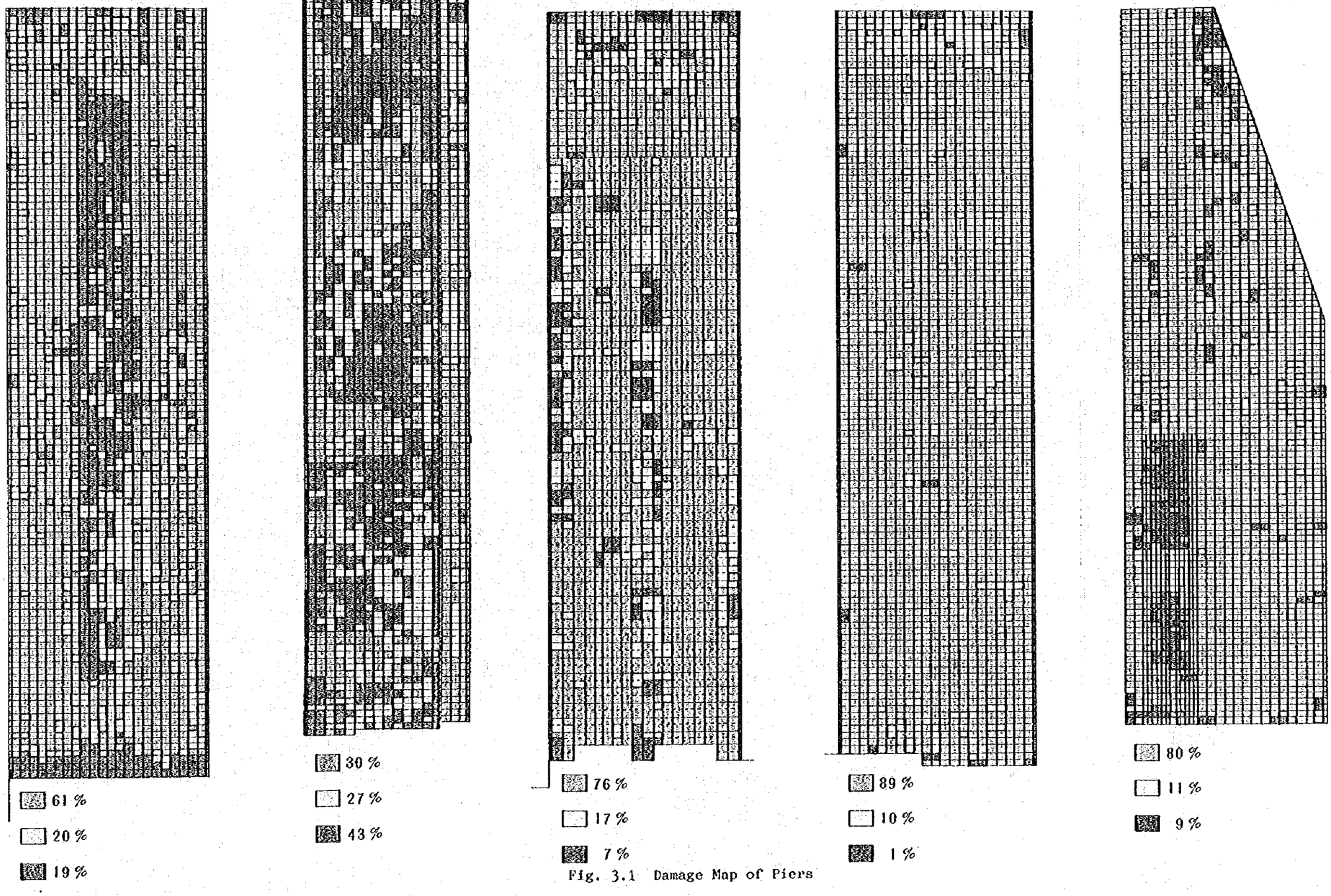
PIER 13

PIER 9

PIER 5

PIER 3

Legend
Sound
Slightly Damaged
Seriously Damaged



61 %
20 %
19 %

30 %
27 %
43 %

76 %
17 %
7 %

89 %
10 %
1 %

80 %
11 %
9 %

Fig. 3.1 Damage Map of Piers

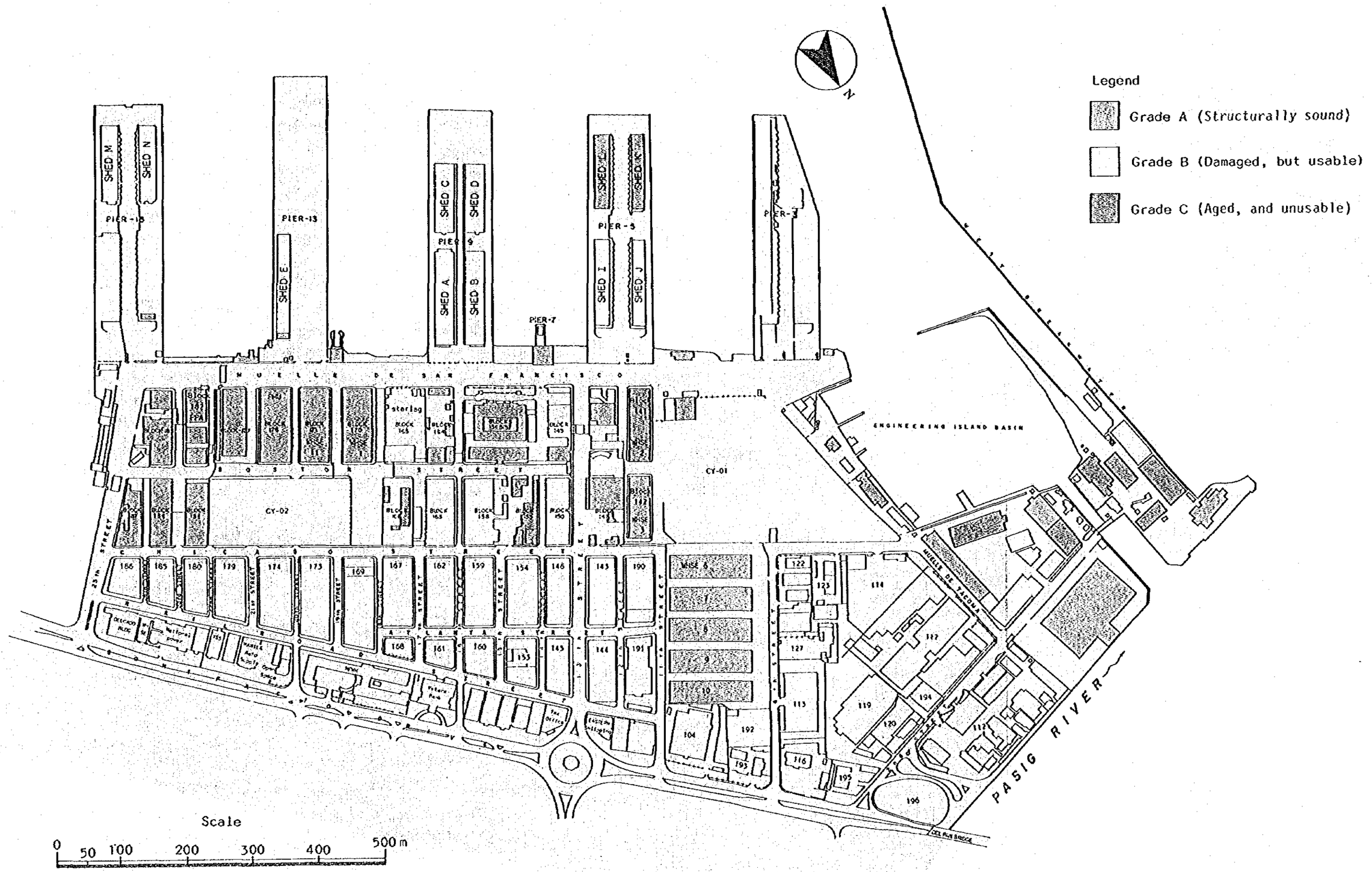


Fig. 3.2 Existing Condition of Transit Sheds, Warehouses and Buildings

North Harbor

The underwater survey for sheet piles was conducted by divers to confirm the degree of damage and the leakage of the backfilling material of Piers 8 through 16. A trial excavation was also carried out to grasp the existing condition of the sheet pile anchorages of Piers 8 and 16. Especially Pier 16, according to the people concerned, was supposed to have had its backfilling material spilled out through the gaps between the sheet piles. The Study Team payed much concern to leakage during inspection survey.

Fig. 3.3 shows the result of the underwater survey which tells that very few sheet piles are damaged and they have no structural defects.

Some gaps between the sheet piles were observed but the total number of the gaps is very small while the total length of each of the Piers is quite long along their perimeters.

The backfilling behind the sheet piles is filled with firm and dense soil material and no leakage of the backfilling is expected through the gaps.

Figs. 3.4 and 3.5 show the result of the trial excavation inspection. The tie-rods at Pier 8 are partially corroded and the tie-beams at Pier 16 are broken and have no structural reliability.

The Team studied the stability of the Piers based on the results of the trial excavation inspection and the geological investigation.

The conclusions of the structural study are as follows.

(1) No heavy load should be placed within 5 m from the ends of the piers.
(2) No deepening of water depth should be allowed without additional structural reinforcement works.

- 6 m below MLLW for Piers 8 through 14
- 5 m below MLLW for Pier 16

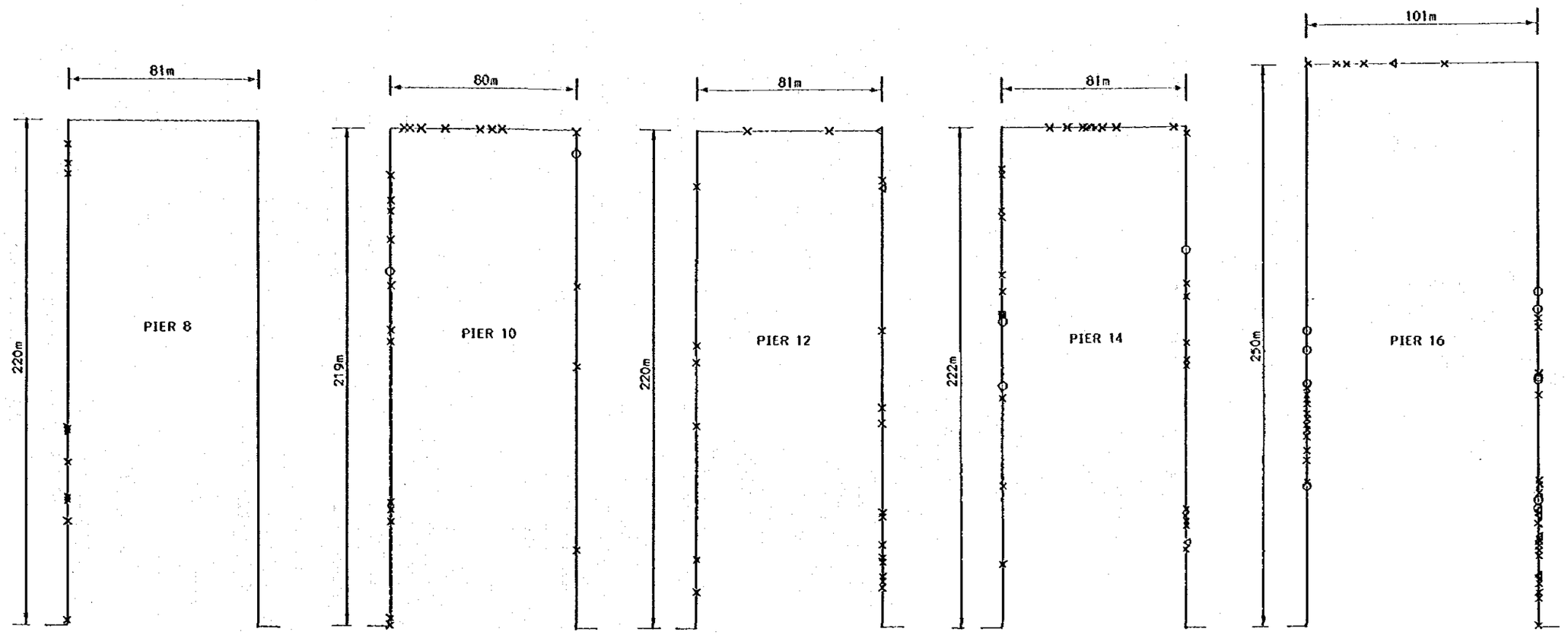
Pier 16 needs to be repaved. Because Pier 16 has a bad surface condition which is supposed to have been brought about by local settlement caused by heavy wheel loads, there is rutting and constant flow of backfilling material by rain water.

No further settlement of the backfilling of P16 is expected. The following are the reasons for this:

(a) no leakage of the backfilling was observed during the underwator survey

(b) no partial settlement was perceived in the backfilling around the end of the relieving platform (if the backfilling went out through the gaps between the sheet piles, partial settlement would be induced in the backfilling.....)

(c) the settlement due to consolidation is finished.



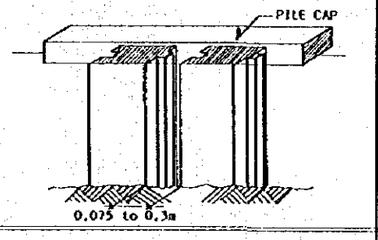
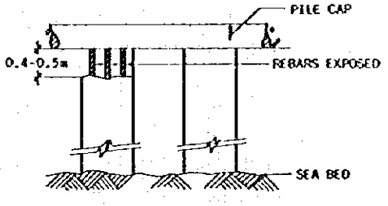
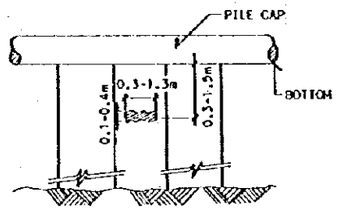
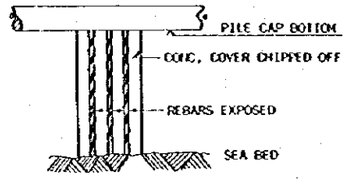
Pier No.	Sampling Number	TYPES OF CONCRETE SHEET PILE DAMAGE			
		TYPE-1 (Symbol-X)	TYPE-2 (Symbol-Δ)	TYPE-3 (Symbol-O)	TYPE-4 (Symbol-■)
		0.075 to 0.3m wide opening between piles from piles cap to sea bed. 	Rebars exposed at specified distance from bottom of pile cap. Concrete removed. 	Rectangular/horizontal/vertical crack with specified dimensions and distance from pile cap botton. 	Cracked entirely (whole pile) or concrete covering dropped out and rebars already exposed from pile cap bottom to sea bed. 
P-8	520 Nos.(@1.0m)	10 Nos. (1.9%, Max=0.15m)	0	0	0
P-10	520 Nos.(@1.0m)	24 Nos. (4.6%, Max=0.25m)	0	2 Nos.(0.4%)	0
P-12	520 Nos.(@1.0m)	20 Nos. (3.8%, Max=0.2 m)	3 Nos.(0.6%)	0	0
P-14	520 Nos.(@1.0m)	29 Nos. (5.6%, Max=0.3 m)	2 Nos.(0.4%)	3 Nos.(0.6%)	1 No. (0.2%)
P-16	602 Nos.(@2.0m)	36 Nos. (6.0%, Max=0.3 m)	6 Nos.(1.0%)	10 Nos.(1.7%)	0

Fig. 3.3 Underwater Survey of Concreate Sheet Piles in North Harbor

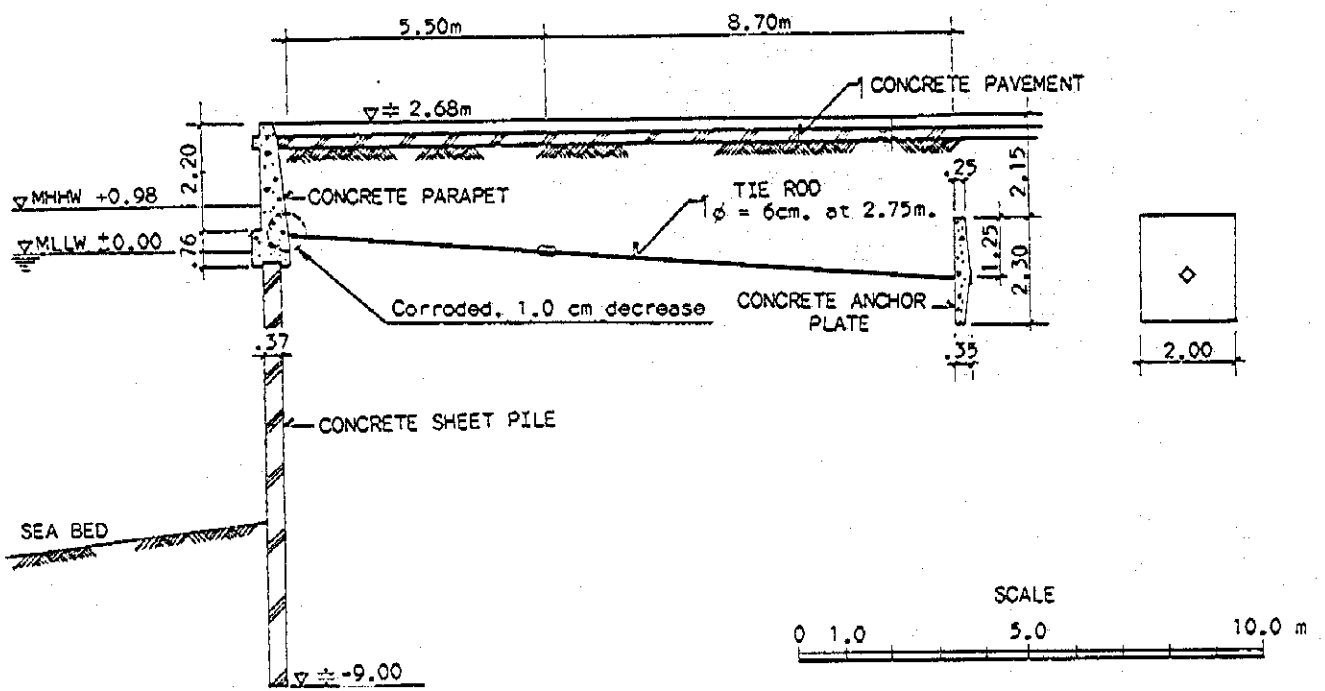


Fig. 3.4 Surveyed Section of Pier 8

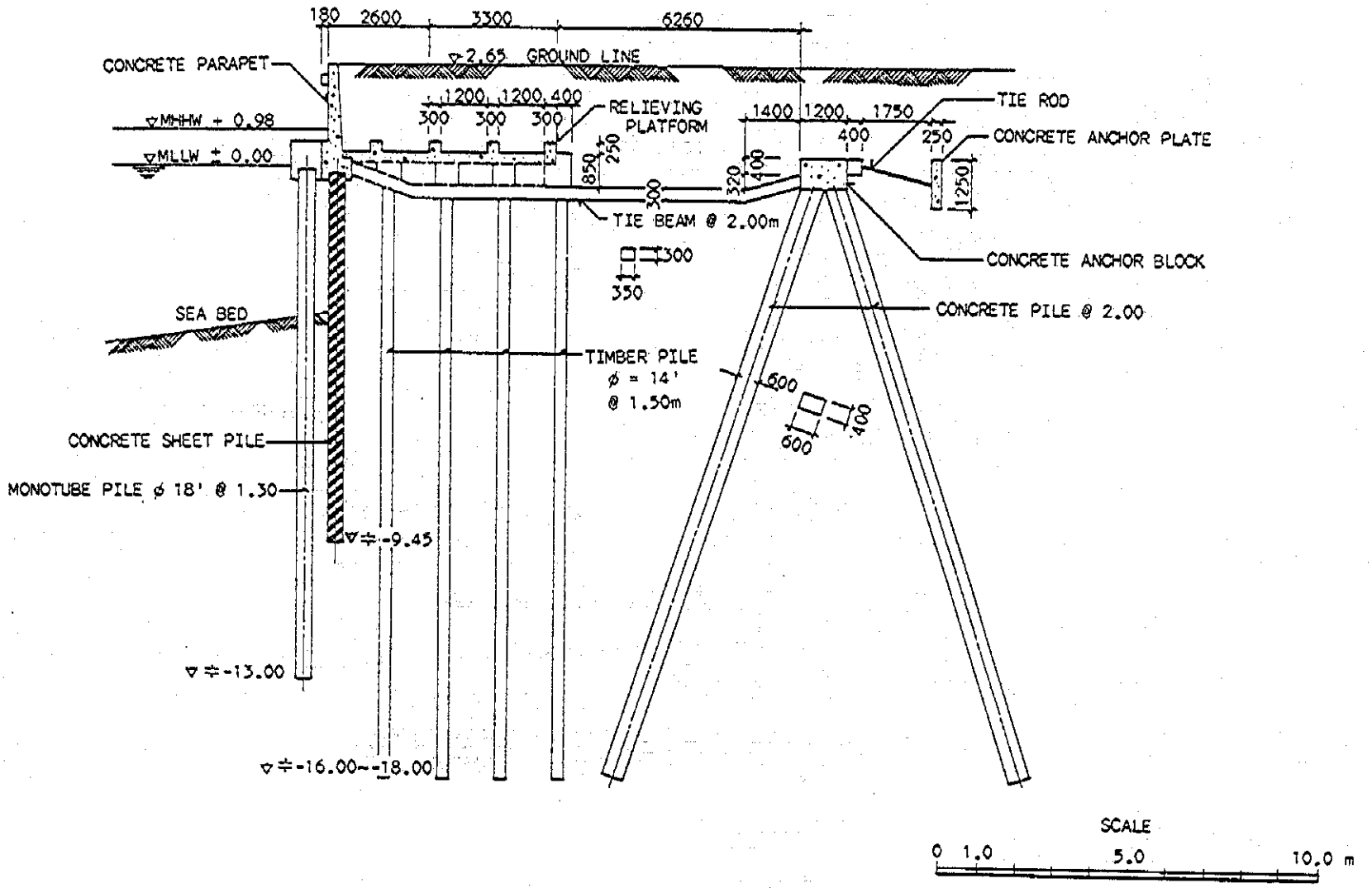


Fig. 3.5 Surveyed Section of Pier 16

CHAPTER 4 PRESENT SHIPPING AND CARGO THROUGHPUT

4.1 Present Shipping

4.1.1 Number of Calling Ships

In 1985, 2053 oceangoing vessels and 5,278 vessels for domestic trade called at the Port of Manila.

The total number of calling ships has been decreasing at an average annual rate of 4.8% over the last six years. However, the average G.R.T. per ship has been increasing for both foreign and domestic trade ships.

Almost all oceangoing ships moor at the South Harbor and M.I.C.T. berthing facilities and in the anchorage area.

About 1,000 oceangoing ships, 47% of the total calling ships, moored at the berths of South Harbor in 1985. However, both the number of berthing ships and the percentage of the total calling ships have been decreasing as shown as Fig. 4.1.

The number of mooring ships at M.I.C.T. was around 360, 18% of the total, in 1985, basically unchanged from 1982.

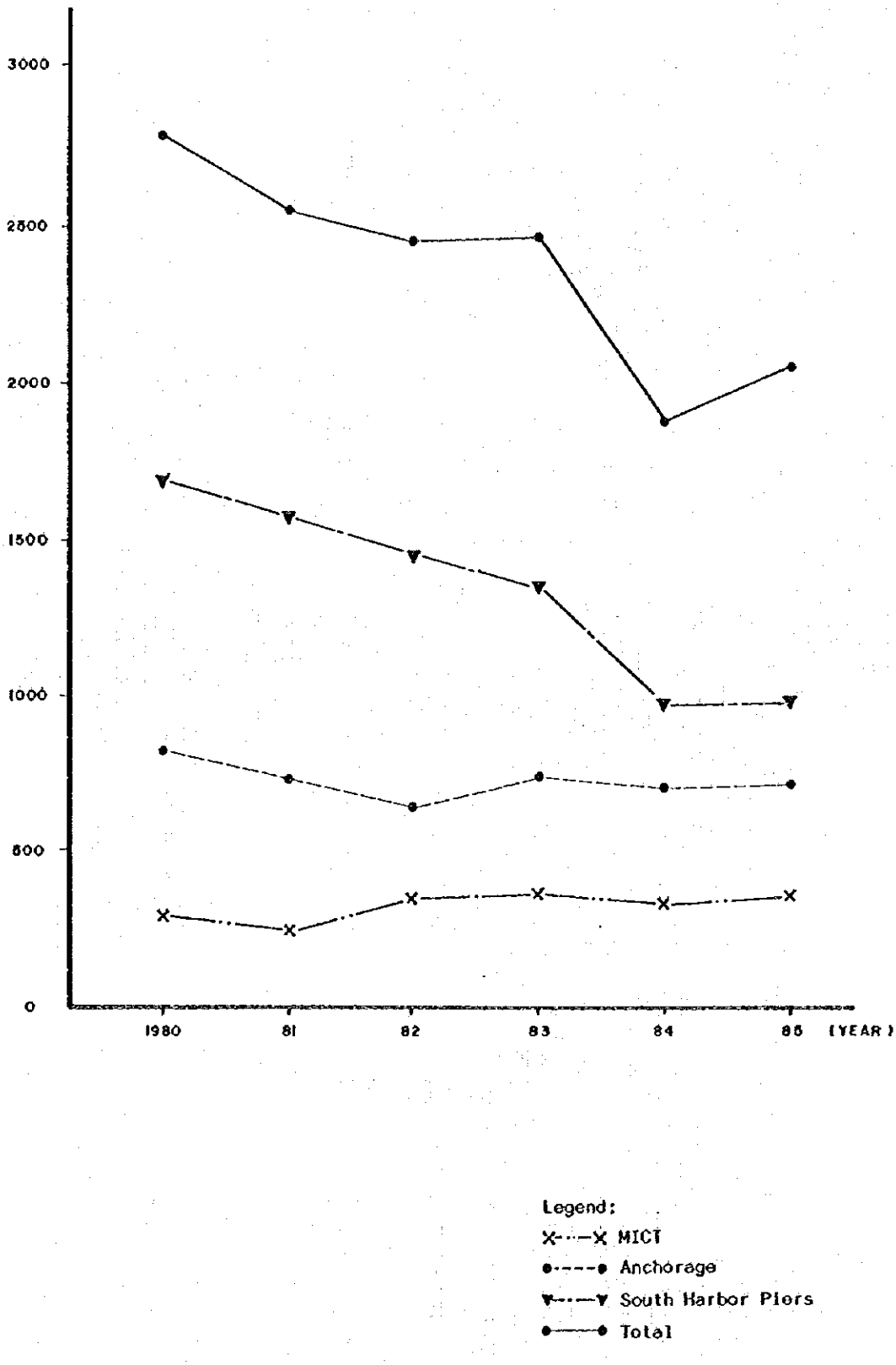


Fig. 4.1 Number of Oceangoing Ships Arriving at the Port of Manila

4.1.2 Ship Types and Characteristics

The number of oceangoing ships which called at the Port of Manila in 1985 is estimated by type of ship as follows:

	No. of Ships Calling	Percentage
Container Ships	882	43.0
Conventional Gen. Cargo Ships	459	22.4
Tankers	220	10.7
Bulk Carriers	202	9.8
Semi Container Ships	85	4.1
Passenger Ships	49	2.4
Ro-Ro Ships	19	0.9
Others	137	6.7

According to the above figures, container ships accounted for the largest share of all the calling ships. About 60% of the container ships are berthed at South Harbor and the rest are moored at MICT.

On the other hand, tankers, other ships and bulk carriers are generally moored at Anchorage. The percentage of vessels which are moored at Anchorage by ship type is as follows:

Tankers	98%
Others	79.6%
Bulk Carriers	62.9%
Conventional General Cargo Ships	43.8%

The average ship size and the average loading/unloading volume per ship by type of ship are shown in Table 4.1.

The predominant size of conventional general cargo ships calling at South Harbor is in the range of 5,000 - 10,000 DWT. As for container vessels, about 60% of them are below the 10,000 DWT class; however, 17,500 - 20,000 DWT class ships account for 20% of the container ships. Most of the container ships that call at the Port of Manila are feeder vessels connecting with line haul vessels at Hong Kong and Taiwan.

Table 4.1 Characteristics of Oceangoing Ships which called at Manila in 1985 by Ship Type

Ship Type	Average DWT	Avg. Loading/ Unloading Volume per ship (tons)
Conventional Ships	9,951	3,145
Semi-container Ships	10,678	1,761
Container Ships	12,022	1,905
Bulk Carriers	17,575	6,298
Tankers	9,554	1,210

4.2 Cargo Movement

4.2.1 General

The Port of Manila, the major commercial port in the Philippines, handled about 11.4 million tons of cargo including 4,406 million tons of foreign trade in 1985.

During the five year period from 1978 to 1983 the total throughput at the port increased at an average annual growth rate of 4.3%, but the throughput dropped sharply in 1984, a 23% decrease from the previous year, due to the drop in the national economy.

However, in 1985 the cargo volume recovered with a roughly 12% increase from 1984. The historical trend of the volume of cargo handled at the Port of Manila is presented in Table 4.2 and illustrated in Fig. 4.2.

With regards to foreign trade, the Port of Manila handles about eighty percent (80%) of all the import cargo and fifty percent (50%) of all the export cargo passing through Philippine government commercial ports. Thus, the hinterland of the Port of Manila is not limited to Metro Manila and its vicinity, but actually covers the entire nation.

Table 4.2 Volume of Cargo Handled at the Port of Manila

Unit: 1,000 tons

Year	Grand Total	Foreign Trade			Domestic Trade		
		Export	Import	Total	Out	In	Total
1978	10735	1086	4194	5280	2895	2560	5455
1979	11543	1005	4840	5849	2939	2755	5694
1980	11180	1153	4139	5292	2876	3012	5888
1981	11003	1028	4244	5272	2874	2857	5731
1982	11836	913	4632	5545	3037	3254	6291
1983	13253	1147	4900	6047	3286	3920	7206
1984	10183	1044	3337	4381	2129	3673	5802
1985	11394	1056	3350	4406	2872	4116	6988

Source: PPA

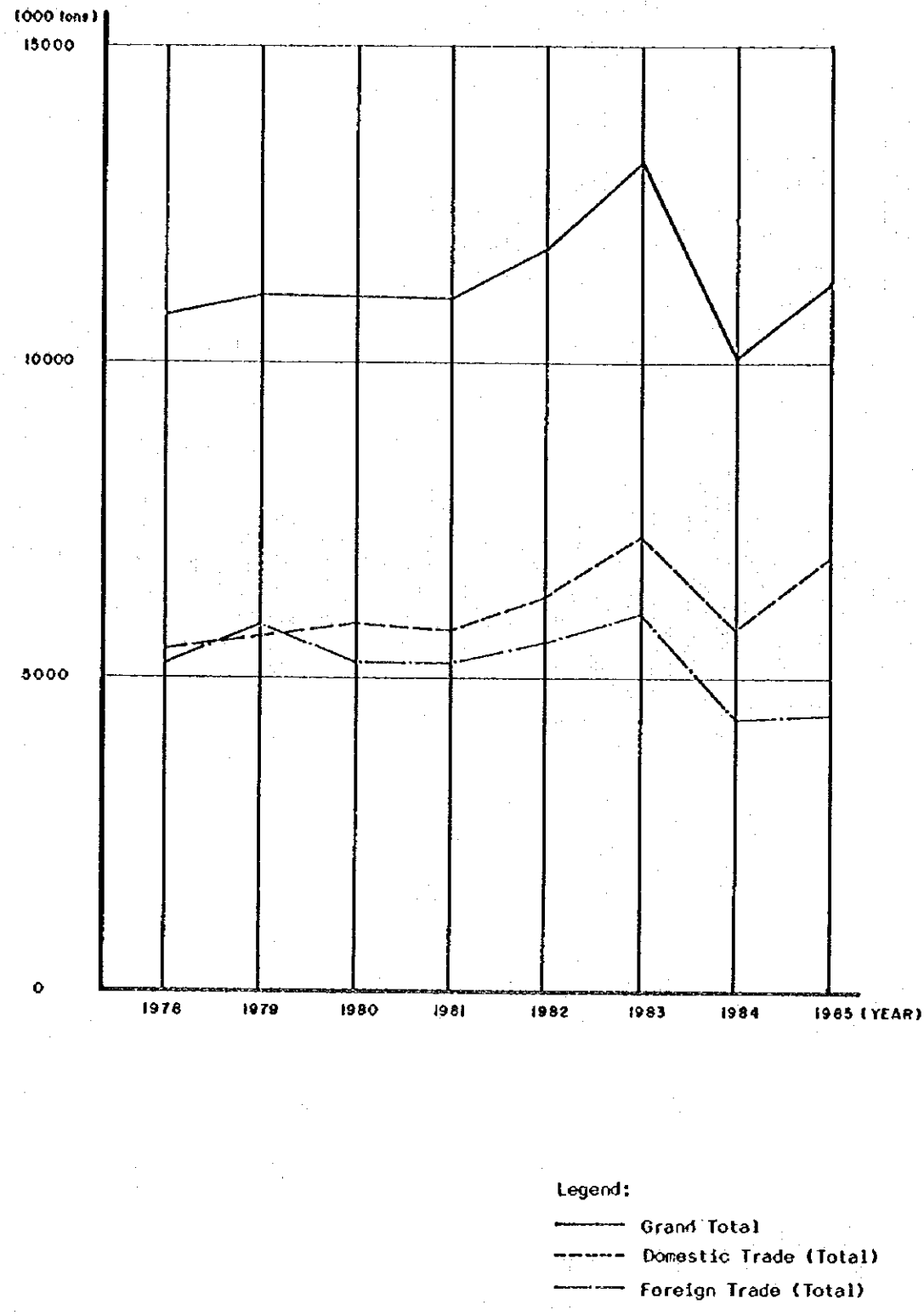


Fig. 4.2 Volume of Cargo Handled at the Port of Manila

The percentage of foreign trade cargo handled at the berths of South Harbor has been decreasing along with the increase at M.I.C.T. due to the advance of containerization. On the other hand, the percentage of foreign cargo handled at Anchorage has remained constant at over 30%. The major cargoes handled at Anchorage are bulk and homogeneous cargoes.

The percentage of the total foreign trade cargo handled in each zone is as follows:

Table 4.3 Volume of Foreign Cargo handled in each Zone

(Thousand tons)

	S.H.		Anchorage		M.I.C.T.	
	Volume of Cargo	Share	Volume of Cargo	Share	Volume of Cargo	Share
1980	3,154	60%	1,674	31%	464	9%
1981	3,086	59	1,737	33	449	8
1982	3,094	56	1,698	31	753	13
1983	2,813	47	2,238	37	996	16
1984	1,762	40	1,707	39	912	21
1985	2,032	46	1,522	35	852	19

Source: PPA

4.2.2 Foreign Trade Cargo by Commodity by Packing Type

The estimated volume of foreign trade cargo by major commodity handled at Manila in 1985 is presented in Table 4.4. As for imports, grains and chemicals including fertilizer are the most important commodities, while food products, timber and coconut products are the leading exports.

Table 4.4 Estimated Volume of Foreign Trade Cargo by Major Commodity at Manila in 1985

(Thousand tons)

Commodity	Cargo Volume
(Imports)	
Dairy Products	88
Wheat	361
Other Cereals	591
Feed	188
Paper and Pulp	150
Fertilizer	334
Chemicals	611
Iron & Steel	109
Machinery & Transport Equipment	139
Others	779
Sub-total	3,350
(Exports)	
Fish & Fish Products	27
Feed	48
Other Food	210
Forest Products	144
Coconut Oil	82
Other Coconut Prod.	67
Others	478
Sub-total	1,056
Grand Total	4,406

Estimated by the study team

The volume of cargo handled at the Port of Manila by packing type in 1985 is presented in Table 4.5. The share of loose cargo was 25%. Loose cargo was mainly handled at Anchorage, Pier 9 and Pier 5 Other cereals (mainly rice) and bagged fertilizer were the main "loose" cargoes handled. About 33% of the imports were bulk cargo. However, the export volume of bulk cargo was small. About 85% of all bulk cargo was handled at Anchorage.

Table 4.5 Estimated Volume of Cargo Handled at the Port of Manila by Packing Type 1985

(Unit: 1,000 M/T)

	Import		Export		Total	
	Volume	%	Volume	%	Volume	%
Loose (Break Bulk) Cargo	941 (3)	28.3	141 (2)	13.4	1,082 (5)	25
Containerized Cargo	1,196 (526)	35.7	771 (321)	73.0	1,967 (847)	44
Bulk (Dry) Cargo	1,105	32.7	52	4.8	1,157	26
Liquid	108	3.3	92	8.8	200	5
Total	3,350	100.0	1,056	100.0	4,406	100.0

Estimated volume based on study team analysis

Note: Figures in parentheses show the volume at MICT.

4.2.3 Containerized Cargo

The volume of imported containerized cargo had been increasing until 1983, with an average annual growth rate of 10%. However, the volume dropped sharply in 1984 along with the total import volume, and did not recover completely in 1985. On the other hand, the volume of exported containerized cargo increased favorably and recorded 771 thousand tons in 1985, with an annual average growth rate of 9.0% since 1978.

The percentage of containerized cargo in total foreign trade cargo is 35.7% for imports and 73.0% for exports in 1985. Around 43% of the total containerized cargoes are handled at MICT in 1985. 57% of the containerized cargo is handled at South Harbor, mainly at Pier 3 and Pier 13.

The historical trend of the containerized cargo volume is presented in Table 4.6.

Table 4.6 Historical Trend of Containerised Cargo Volume of Foreign Trade Handled at the Port of Manila

(Unit: 1,000 tons,%)

Year	Grand Total			South Harbor			M.I.C.T.		
	Export	Import	Total	Export	Import	Total	Export	Import	Total
1978	421	1,062	1,483	420 (99.8)	1,060 (99.8)	1,480 (99.8)	1 (0.2)	2 (0.2)	3 (0.2)
1979	483	1,384	1,867	445 (92.1)	1,282 (92.6)	1,727 (92.5)	38 (7.9)	102 (7.4)	140 (7.5)
1980	523	1,266	1,789	421 (80.5)	990 (78.2)	1,411 (78.9)	102 (19.5)	276 (21.8)	378 (21.1)
1981	555	1,373	1,928	470 (84.7)	1,075 (78.3)	1,545 (80.1)	85 (15.3)	298 (21.7)	383 (19.9)
1982	561	1,570	2,131	400 (71.3)	1,026 (65.4)	1,426 (67.0)	161 (28.7)	544 (34.6)	705 (33.1)
1983	574	1,707	2,281	356 (62.0)	954 (55.9)	1,310 (57.4)	218 (38.0)	753 (44.1)	971 (42.6)
1984	646	1,229	1,875	345 (53.4)	626 (50.9)	971 (51.8)	301 (46.6)	603 (49.1)	904 (48.2)
1985	771	1,196	1,967	450 (58.4)	670 (56.0)	1,120 (56.9)	321 (41.6)	526 (44.0)	847 (43.1)

Source: PPA
Note : Figures in parentheses show percentage of each harbor district.

4.3 Utilization of Port Facilities

The piers in South Harbor accommodate different types of vessels depending on the physical condition of each pier. For example, Pier 3 and Pier 13 are used mainly for containerized cargo, Pier 5 and Pier 9 for loose cargo and Pier 15 for specialized ships (combo, timber, etc.) and non-cargo vessels.

The average berth occupancy rate of all South Harbor was 22% in 1985, and the average tonnage handled per meter run per year was estimated at 504 t/m. These values are relatively low compared with the figures for North Harbor.

The berth occupancy ratios of each berth fluctuate over time.

The quay lengths of the piers except Pier 13 at South Harbor are too short compared with the length of calling ships. When vessels over 10,000 D.W.T. moor at a quaywall, it is impossible to use the neighboring berth.

Berths No. 3-3, 9-1, 13-1 and 15-2 are relatively well-used. However, the highest berth occupancy ratio is only 45.6%.

The berth occupancy of berths No.5-4, 5-5, 13-6 and 13-7 are lower due to poor physical conditions such as the narrow apron width and the poor fender system, and also due to the operational conditions of the transit sheds behind the quaywall.

There are some sorting and storage facilities with a low utilization rate in the South Harbor area. Sheds C, K and L were not used at all in 1985 due to a lack of cargo to be stored and to their dilapidated condition.

Fig. 4.3 shows the actual utilization of the existing facilities in South Harbor.

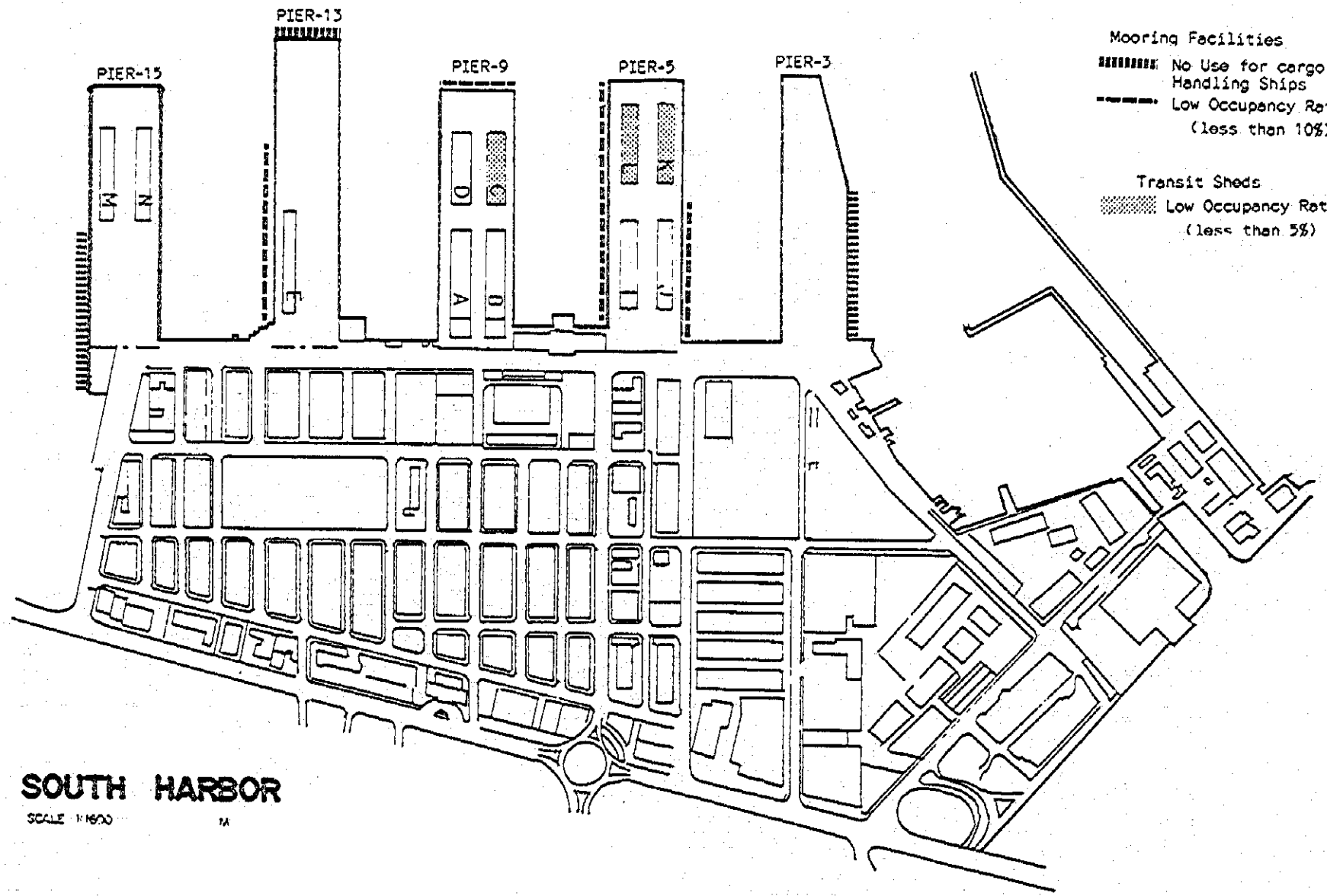


Fig. 4.3 Actual Utilization of Existing Facilities

CHAPTER 5 PORT MANAGEMENT AND FINANCE

5.1 Port Organization and Management

5.1.1 General Port Administration

The general objective of PPA is to implement state port policy: an integrated program for the planning, development, financing, operation, and maintenance of ports and port districts throughout the country.

Operationally, the Port Management Units (PMUs) which are semi-autonomous regional offices report to the General Manager concerning the activities of the various ports.

There are also many port services such as arrastre, stevedoring, pilotage, tug assistance and so on. Such services are generally conducted by the private sector under the supervision of PPA. PPA encourages private parties to undertake such port-related services in accordance with established measures and standards.

5.1.2 Existing Port Operations

The Port of Manila is operated under "common-use" policy. Therefore, there are no public port facilities for the exclusive use of any port user, but rather all the port facilities are assigned on a first-come first-served basis. However, berthing priority is granted to certain vessels having special arrangements with PPA. The following guideline is used at present for berthing allotment at South Harbor:

① Container handling ships are berthed at Piers 3 and 13.
② Break bulk handling ships are berthed at Piers 5 and 9.
③ Passenger ships and foreign government vessels on official business are berthed at Pier 15.

The official working holidays of the Port are only two days a year, Good Friday and Christmas.

Cargo handling in South Harbor is carried out in two shifts: the day shift (from 7 a.m. to 7 p.m.) and the night shift (from 7 p.m. to 7 a.m.).

The stevedoring work is ordinarily conducted using ship gear in South Harbor except for container handling at Pier 3 where a "tango" crane is used for loading and unloading.

5.1.3 Cargo Handling Productivity

Based on the review of PPA worksheets for the three months from October to December 1985, the standard productivity rate of arrastre and stevedoring companies, and the on site survey, the average actual cargo handling productivity in South Harbor by cargo type is presented below.

Table 5.1 Actual Cargo Handling Productivity

(Unit: tons/gang/hour)

	Quayside	Anchorage
Containerized Cargo		
Non-self-sustaining	14-16 Units	
self-sustaining	7- 8 Units	
Loose (break bulk) Cargo	15	*
Timber	15	*
Iron & Steel	18	
Bags	*	20
Bulk	26	22

Note: * Data not available.

The cargo handling work except container handling is executed by two different types of companies at South Harbor, stevedoring firms on board and arrastre firms at quay side. Sometimes the working speed of the two are different, so the overall productivity declines. Moreover, insufficient coordination among the firms related to the handling and transport of cargoes causes a lot of lost time.

Table 5.2 shows the actual average rate of standby/lost time at the Port of Manila, based on the working sheet per vessel activity prepared by PPA.

The percentage of standby/lost time to the total working time for bulk handling at Anchorage is estimated at 40% . One of the major causes is the delays caused by barges.

Table 5.2 Actual Average Rate of Standby/Lost Time

Cargo	Average Rate
Loose (break bulk)	0.19
Bags	0.25 at Anchorage
Container	0.27
Timber	0.13
Iron & Steel	0.23
Bulk	0.40 at Anchorage
Total average at piers	0.22

5.2 Past Financial Performance of PPA

Under an agreement between PPA and IBRD, PPA must achieve a rate of return on net fixed assets in operation of at least 7% and a debt service ratio of at least 1.75 times.

From the table below, it can be said that the past financial perfomance of PPA has been favorable.

Table 5.3 Past Financial Performance of PPA

	1981	1982	1983	1984	1985
Operating Ratio (%)	78	68	58	64	47
Rate of Return on Net Fixed Assets(%)	6.6	7.1	8.9	8.8	18.2
Debt Service Ratio (Times)	4.4	3.8	2.6	1.8	2.2

CHAPTER 6 DEMAND FORECAST

6.1 General Port Development Policy and Basic Assumptions

Considering the basic direction of national and regional development policy, basic assumptions concerning the roles and functions of the Port of Manila are set as follows:

① To reduce the burden of excessive concentration of traffic in MMA and to achieve more effective and economic transportation, certain cargoes such as iron and steel products and fertilizer will be imported via the Port of Batangas considering the spatial distribution of related industries.

② The basic functions and roles of the Port of Manila are the same as those specified in the Master Plan Study conducted by the Salzgittar Consult GMBH except for the above-mentioned relationship with the Port of Batangas.

③ Reflecting the status of MMA as the center of the Philippine economy, the Port of Manila will continue to play a central role as the main gateway for imported goods.

④ The export commodities handled at the Port of Manila will not change remarkably during the planning period.

6.2 Future Socio-Economic Framework

Since the collapse of the Marcos Government, the new Government of the Philippines has been in the process of formulating and adopting major new policies. Under this situation three alternatives, that is high, medium and low projections, are prepared based upon different assumptions.

Table 6.1 shows the projected GDP from 1990 to 2005.

Low assumption:

"World Development Report - 1985" (World Bank) estimates a 4% annual growth rate from 1985 to 1990 for medium income oil importing countries like the Philippines. It is assumed that the 4% annual growth rate will continue through 2005. The sectoral shares are assumed to remain the same as in 1985.

High assumption:

NEDA established the "Medium-Term Philippine Development Plan, 1987-1992" in December, 1986. NEDA estimates a 5.5% annual growth rate from 1985 to 1990. This growth rate is also used for 1990. It is also assumed that the 6% annual growth rate from 1990 to 1992 forecast by NEDA will continue through 2005. The sectoral shares are assumed equal to those forecast for 1990 by NEDA.

Medium assumption:

Annual growth rates are assumed based on NEDA's projections, interviews with experts at international agencies and the annual growth rates of the ASEAN countries which have similar sectoral GDP shares. The sectoral shares in 1990 are assumed equal to those in NEDA's preliminary estimate (as of 27 June, 1986). The sectoral shares from 1995 to 2005 are estimated based on the elasticity of each sector to GDP.

Table 6.1 Future Socio-Economic Framework

	In Million Pesos at Constant 1972 Prices					Annual Growth Rate(%)				Share (%)				
	1985	1990	1995	2000	2005	85/90	90/95	95/00	00/05	'85	'90	'95	'00	'05
Medium Case														
GDP	90,469	110,643	141,212	180,226	230,019	4.1	5.0	5.0	5.0	100.0	100.0	100.0	100.0	100.0
(Indicator)	(161.3)	(197.3)	(251.8)	(321.4)	(410.2)									
Agriculture	26,010	31,754	39,524	49,336	61,568	4.1	4.5	4.5	4.5	28.8	28.7	27.9	27.3	26.8
(Indicator)	(162.2)	(198.0)	(246.6)	(307.6)	(383.8)									
Industry	28,880	36,623	47,808	62,012	80,418	4.9	5.5	5.3	5.3	31.9	33.1	33.9	34.4	35.0
(Indicator)	(165.6)	(210.0)	(274.1)	(355.5)	(461.1)									
Services	35,579	42,266	53,880	68,878	88,032	3.5	5.0	5.0	5.0	39.3	38.2	38.2	38.2	38.2
(Indicator)	(157.5)	(187.1)	(238.5)	(304.9)	(389.6)									
High Case														
GDP	90,469	118,700	158,820	212,500	284,325	5.5	6.0	6.0	6.0	100.0	100.0	100.0	100.0	100.0
(Indicator)	(161.3)	(211.7)	(283.2)	(379.0)	(507.0)									
Agriculture	26,010	32,246	43,199	57,800	77,337	4.4	6.0	6.0	6.0	28.9	27.2	27.2	27.2	27.2
(Indicator)	(162.2)	(201.0)	(269.3)	(360.3)	(482.2)									
Industry	28,880	36,547	52,887	70,763	94,680	6.5	6.0	6.0	6.0	31.9	33.3	33.3	33.3	33.3
(Indicator)	(165.6)	(226.7)	(303.2)	(405.7)	(542.8)									
Services	35,579	46,907	62,734	83,937	112,308	5.7	6.0	6.0	6.0	39.3	39.5	39.5	39.5	39.5
(Indicator)	(157.5)	(207.6)	(277.7)	(371.5)	(497.1)									
Low Case														
GDP	90,469	110,101	133,933	163,069	198,455	4.0	4.0	4.0	4.0	100.0	100.0	100.0	100.0	100.0
(Indicator)	(161.3)	(196.3)	(239.0)	(290.8)	(353.9)									
Agriculture	26,010	31,929	38,858	47,290	57,552	4.2	4.0	4.0	4.0	28.9	29.0	29.0	29.0	29.0
(Indicator)	(162.2)	(199.1)	(242.3)	(294.8)	(358.8)									
Industry	28,880	35,232	42,878	52,182	63,506	4.1	4.0	4.0	4.0	31.9	32.0	32.0	32.0	32.0
(Indicator)	(165.6)	(202.0)	(245.8)	(299.2)	(364.1)									
Services	35,579	42,940	52,257	63,597	77,397	3.8	4.0	4.0	4.0	39.3	39.0	39.0	39.0	39.0
(Indicator)	(157.5)	(190.1)	(231.3)	(281.5)	(342.6)									

Indicator : 1972 = 100

6.3 Cargo Traffic Forecasts

6.3.1 Cargo Volume by Commodity

Two methods are used to forecast the cargo volume to be handled at the Port of Manila. One is a macro forecast which is a method to estimate the total cargo volume as a whole including many commodities based on the elasticity of cargo volume to GDP, assuming the cargo volume in 1988 will be equal to the 1983 volume, because the level of GDP may recover to the 1983 level by 1988. The other is a micro forecast, which is a method to estimate the cargo volume of each commodity group individually.

Based on an analysis of the historical trend of cargo movement at the port, the cargo volume for foreign trade should be estimated by major commodity groups individually. The cargo forecast by commodity group is conducted based on correlations with related indices, and is also forecast based on the forecast supply and demand.

As a conclusion, Table 6.2 shows a summary of the cargo forecast. Table 6.3 is a comparison of the total cargo volumes obtained by the macro and micro forecast methods.

Herein, the future cargo volumes to be handled at the Port of Manila for the target years are assumed equal to those forecast in the medium case of the forecast by commodity group, that is the micro forecast.

Table 6.2 Summary of Foreign Trade Cargo Forecast

(thousand tons)

	(year) Commodity	1985	1995	2005
Imports	Dairy Products	88	156	264
	Wheat	361	647	1,040
	Other Cereals	591	151	267
	Feed	188	514	956
	Paper and Pulp	150	253	353
	Fertilizer	334	410	460
	Chemicals	611	958	1,561
	Iron & Steel	109	290	320
	Machinery & Transport Equip.	139	437	764
	Others	779	1,192	1,914
Sub total		3,350	5,008	7,899
Exports	Fish & Fish Products	27	61	131
	Feed	48	66	85
	Other Food	210	317	483
	Forest Products	144	106	78
	Coconut Oil	82	80	80
	Other Coconut Products	67	85	85
	Others	478	885	1,600
Sub total		1,056	1,600	2,542
Grand total		4,406	6,608	10,441

Table 6.3 Comparison of Cargo Forecasts

(thousand tons)

	Import		Export		Total	
	1995	2005	1995	2005	1995	2005
Macro Forecast						
Medium case					7,656	10,905
High case					7,918	12,063
Low case					7,387	9,831
Forecast by Major Commodity						
Medium case	5,008	7,889	1,600	2,542	6,608	10,441
High case	5,291	9,150	1,681	2,935	6,972	12,085
Low case	4,694	6,713	1,537	2,253	6,231	8,966

6.3.2 Forecast by Cargo Mode

Based on the analysis of port statistics in 1985 by packing type, the forecast volume by cargo mode is determined considering the prevailing packaging methods. Especially, the volume of containerized cargo is forecast considering the future containerizable rate by commodity.

Using the estimated percentages of each packing type by major commodity and the containerizable ratios as shown in Table 6.4, the containerizable percentage of the total general cargo in the target year 2005 is estimated as follows:

Import	83%
Export	85%

Table 6.4 Estimated Percentage by Packing Type and Containerizable Ratio by Major Commodity

	General Cargo	Bulk	Liquid	Containerizable ratio
Imports	(%)	(%)	(%)	(%)
Dairy products	100			100
Wheat and Wheat Products	20	80		100
Other cereals	50	50		100
Feed	20	80		100
Paper and pulp	100			100
Fertilizer	50	50		0
Chemicals	65	20	15	90
Iron & Steel	100			25
Machinery and transport equipment	100			75
Others	65	25	10	100
Exports				
Fish & Fish products	100			100
Feed	100			100
Other food	100			100
Forest products	100			50
Coconut oil			100	
Other Coconut prod.	60	40		100
Others	100			80

Note: Containerizable ratio means the percentage of containerizable volume to the general cargo volume.

Table 6.5 shows the progress rate of containerization, that is the percentage of containerized cargo to total general cargo at the Port of Manila for the last six years.

Table 6.5 Containerization rate at the Port of Manila

Year	Import			Export		
	General C. ('000t)	Container C. ('000t)	Percentage (%)	General C. ('000t)	Container C. ('000t)	Percentage (%)
1980	2,728	1,266	46.4	1,027	523	50.9
1981	2,734	1,373	50.2	940	555	59.0
1982	2,966	1,570	52.9	820	561	68.4
1983	3,200	1,707	53.3	962	574	59.7
1984	1,868	1,229	65.8	924	646	69.9
1985	2,137	1,196	56.0	912	771	84.5

Note:Container cargo volume is based on PPA statistics.
General cargo volume is estimated using the percentage by packing type in 1985 based on port statistics.

Considering the growth of containerization, the containerization rates in the target years are forecast as follows:

(Year)	1990	1995	2000	2005
Import (%)	70	75	80	83
Export (%)	85	85	85	85

As a result, the estimated cargo volume by packing type is shown in Table 6.6.

Table 6.6 Estimated Cargo Volume by Packing Type

(thousand tons)

Year	Loose Cargo		Containerized		Bulk		Liquid		Total	
	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.	Imp.	Exp.
1990	705	176	1644	997	1278	34	209	80	3836	1287
1995	761	223	2285	1263	1700	34	262	80	5008	1600
2000	734	285	2936	1614	2140	34	333	80	6143	2013
2005	803	364	3920	2064	2751	34	425	80	7899	2542