

FINAL REPORT

No. 77

**THE STUDY
ON
THE DEVELOPMENT PLAN
OF
THE PORT
OF**

SEMARANG

(PHASE-II)

JUNE, 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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PREFACE

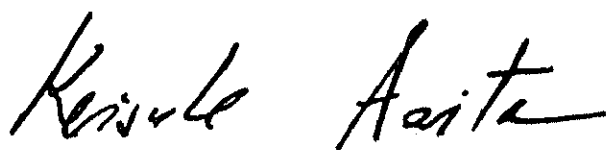
In response to the request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a feasibility study on the Development Plan of the Port of Semarang (Phase II) and entrusted the study to the Japan International Cooperation Agency (JICA). JICA organized a study team of 9 experts headed by Mr. Masao Ohno, Executive Director of the Overseas Coastal Area Development Institute of Japan (OCDI). From May 1985 to March 1986, the Study Team visited Indonesia several times, carried out on site surveys, updated the Master Plan, designed an urgent development plan and conducted a feasibility study.

The Team also exchanged views on the Plan with the officials concerned of the Indonesian Government, and studied the activities of the port, the social and economic conditions of the hinterland and natural conditions, etc. 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 development of the Port of Semarang as a nucleus of Central Java and contribute to the promotion of 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 Indonesia for the close cooperation they extended to the Team.

June, 1986



Keisuke Arita

President

Japan International Cooperation Agency

LITTER OF TRANSMITTAL

June 1986

Mr. Keisuke Arita
President
Japan International Cooperation Agency

Dear Mr. Arita,

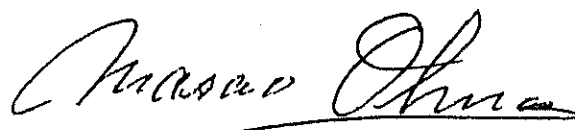
It is my great pleasure to submit herewith a report on the Development Plan of the Port of Semarang in the Republic of Indonesia.

The Japanese Study Team conducted a survey on the project in Indonesia from May 1985 at the request of the Japan International Cooperation Agency. The findings of this survey were discussed to update the Master Plan and to study the feasibility of the Urgent Development Plan of the Port of Semarang, and were then compiled into this report. The report shows that the project is extremely important, so I hope the project is executed promptly.

On behalf of the Japanese Study Team and myself, I would like to express my deepest appreciation to the Government of the Republic of Indonesia and to the various organizations concerned with the Plan for the unlimited cooperation and assistance and the warm hospitality they extended to the Team during our stay in Indonesia.

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

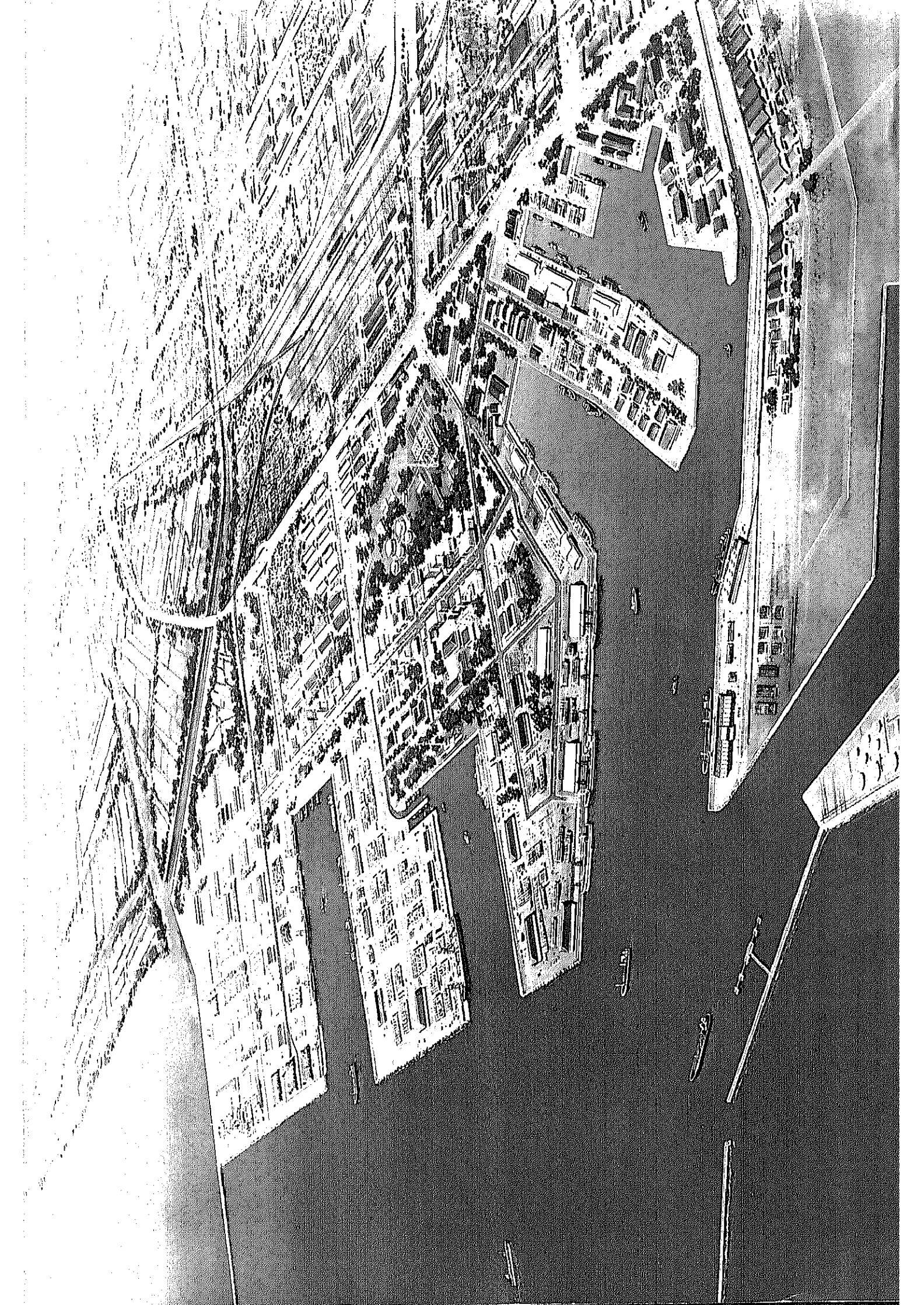
Sincerely yours,



Masao Ohno

Head

Japanese Study Team for the Development
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LIST OF ABBREVIATIONS AND INDONESIAN LANGUAGE

ADPEL	Administrator of Pelabuhan
Ag.	Agricultural
Angka	Statistics
Av.	Average
BAPPEDA	Badan Perencanaan Pembangunan Doerak (Provincial Development and Planning Board)
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Economic Development Board)
Biro	Bureau
Bogasari	Name of a Company Producing Wheat Flour
B.P.P.	Badan Pengusahaan Pelabuhan (Port Administration Agency)
C.	Cohesion
C. D. L.	Cardinal Datum Level
CIF	Cost, Insurance & Freight
dalam	inner
D.D	Detail Design
D.G.S.C.	Directorate General of Sea Communications
DKI	Daerah Khusus Ibukota (Special Region)
\$	Dollar
DOLOG	Depot Logistik (Logistic Depot)
D.W.T.	Dead Weight Ton
E.I.R.R.	Economic Internal Rate of Return
F.O.B.	free on board
F.R.R.	Financial Rate of Return
G/C	General Cargo
GDP	Gross Domestic Product
GI	Galvanized Iron
GNP	Gross National Product
GRP	Gross Regional Product
G/T, G.T	Gross Tonnage
$H_{1/3}$	Significant Wave Height
H max.	Maximum Wave Height
ha.	hectare
H.C.	Holocene Clay
H.W.	High Water Level
INPRES 4/1985	Instruction of the President No. 4 Year 1985
J. I. C. A.	Japan International Cooperation Agency
K_1	Luni Solar Diurnal Component
K_2	Luni Solar Semidiurnal Component
KANWIL	Kartor Wilayah Perbukangan Laut (District Office of Sea Communications)

Kayu Lapis	A big wood processing factory in Semarang City
K_H	Horizontal Seismic Coefficient
Khusus	Special Bulk Carrier
K. K.	Family
Km	Kilometer
ℓ.	liter
L.O.A., LOA	Length of Overall
M.	Moisture
M_2	Principal Lunar Semidiurnal Component
Max.	Maximum
M.O.F.	Ministry of Fishery
Mt.	Mountain
N	The number of blows by S.P.T.
N_2	Larger Lunar Elliptic Semidiurnal Component
NICs	New Industrial Countries
No.	Number
NRT	Net Registered Ton
Nusantara	Inter Island Vessels in Indonesia
O_1	Principal Lunar Diurnal Component
OCDI	Overseas Coastal Area Development Institute of Japan
OECD	Overseas Economic Cooperation Fund of Japan
Orang	Person
P_1	Principal Solar Diurnal Component
P. C.	Pleistocene Clay
Penduduk	Dweller
Perum Pelabuhan	Perusahaan Umum Pelabuhan (National Port Corporation)
Perum Pengerrukan	Perusahaan Umum Pengerukan (National Dredging Corporation)
Perum	Pengerrukan
P. L. T. U.	Pembangkit Listrik Tenaga Uap (Electric Power Corporation)
Proyeksi	Projection
P.T.	Perseroan Terbatas (Limited Company)
qu	Unconfined Compressive Strength
R	Correlation Ratio
Rakyat	Sail Boat
Repelita	Five Year National Development Plan
Rp. RP	Rupiah
S_2	Principal Lunar Diurnal Component
Samudra	Oceangoing Vessel
SCF	Standard Conversion Factor
Sec.	Second
SPJV	Simizu Penta-Ocean Joint Venture
S. P. T.	Standard Penetration Test
SWR	Shadow Wage Rate

T.	Temperature
tengah	central
TEU	Twenty foot equivalent unit
tg.	tandjung (Cape, peninsula)
US, U.S.	United States of America
USSR	Union of Soviet Socialist Republics
YUKA	Yayasan Usaha Karya (Stevedoring Labour Corporation)
Z	Depth (m)

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SUMMARY

SUMMARY

● BASIC POLICY FOR THE DEVELOPMENT OF SEMARANG PORT

Semarang Port should be considered not only as a profit making entity, but rather as a basic infrastructure which is essential for the development of the regional and national economy.

The development project at the port will be the biggest development project in the region, Central Java and Yogyakarta, in the latter part of this century.

Thus, the Government of Indonesia should utilize the port development to promote industrialization and overall economic development throughout the region. The port development should function as the nucleus of regional growth.

Towards this end, the JICA Study Team has prepared a comprehensive port development plan.

The Port of Semarang at Present



• SEMARANG PORT AT PRESENT

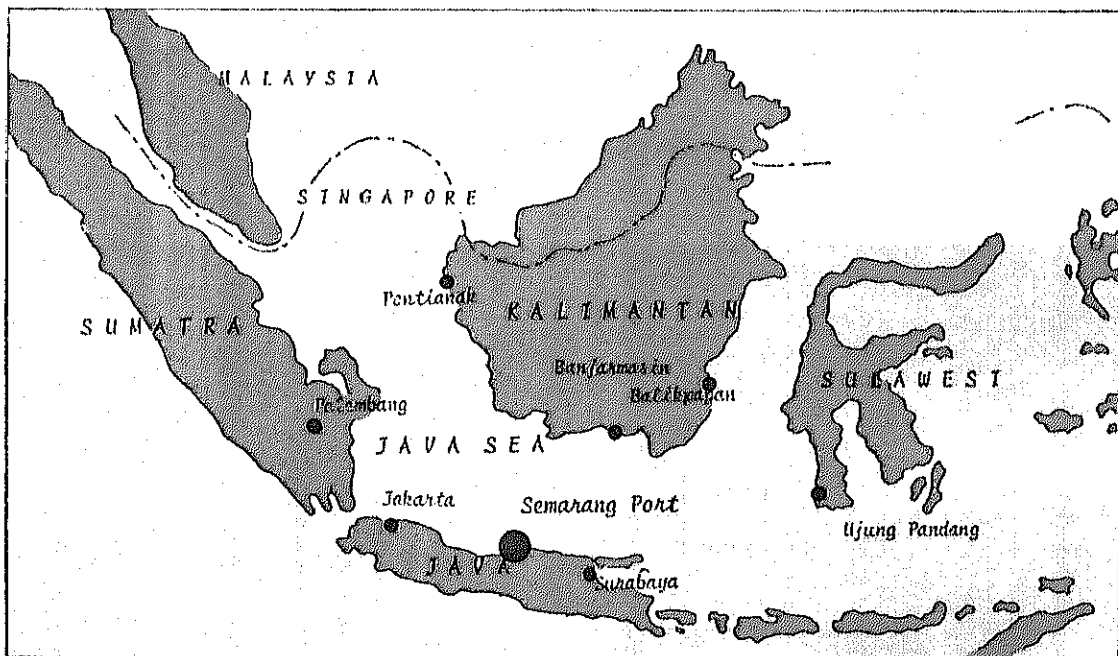
Location – The pivot of a fan covering major islands

Indonesia, the largest island nation in the world, has an area of 1.92 million square kilometers consisting of 13,000 islands stretching over a distance 6,000 kilometers.

Geographically, Semarang Port is favorably located at the center of the north shore of Java Island. Major ports located in Sumatra, Kalimantan and Sulawesi are all within one thousand kilometers of the port.

In a sense, Semarang Port is the pivot of a large fan which covers all of these major islands.

Location of Semarang Port



History – Semarang was a flourishing port 70 years ago

Until the 1860's, Semarang was a small town built around a Dutch fort facing the Java Sea. The Semarang River was the only artery to carry goods by proa (small boat) between the town and the oceangoing vessels which anchored offshore.

As the town continued to grow, lack of sufficient storage, godowns and warehouse sites became a serious problem.

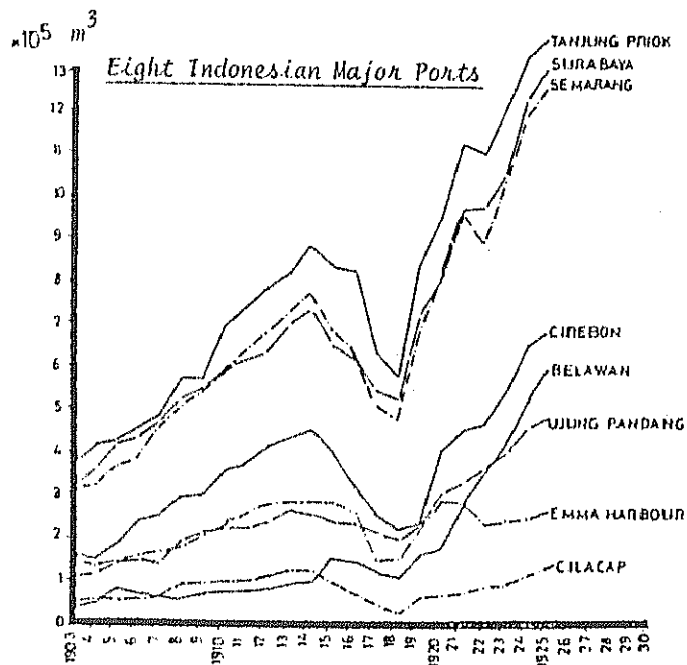
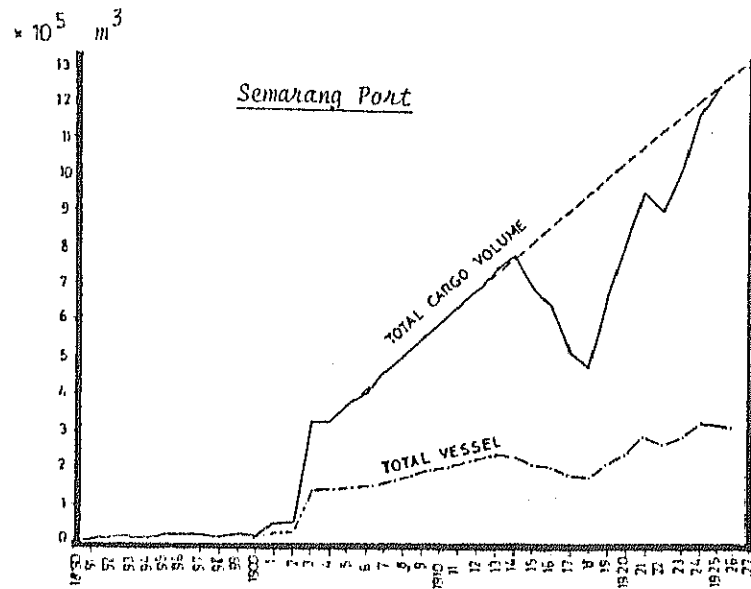
To cope with the demand, a port plan was prepared and construction work began at the end of 19th century.

After completion of the work, trade at Semarang Port grew enormously.

Before 1900, vessels rarely called at Semarang, but by 1903 trade at the port began to boom. The city flourished along with the new port.

In terms of cargo throughput, Semarang became the third largest port in Indonesia. It was also the first port in Indonesia to be connected with its hinterland via railway.

Subsequently, however, no major expansion or improvement works were executed, and Semarang Port gradually lost its position as one of the top Indonesian ports.



Activity of Semarang Port (1980 ~ 1925)

Hinterland — A large but poor area

Central Java including Yogyakarta comprises 19.1 percent of the national population, roughly equal to the entire population of Sumatra. The population density in the hinterland, Central Java and Yogyakarta, is the highest in Indonesia.

The area is one of the poorest in the nation.

The biggest sector is agriculture, and the per capita gross products of Central Java and Yogyakarta in 1980 are ranked 23rd and 24th, respectively, among the 27 provinces of Indonesia.

Roughly speaking, the per capita income level of these provinces is about 70 percent of the national average.

It is now high time to develop these provinces through port development. Development of Semarang Port should increase the per capita income through promoting industrial and economic activities.

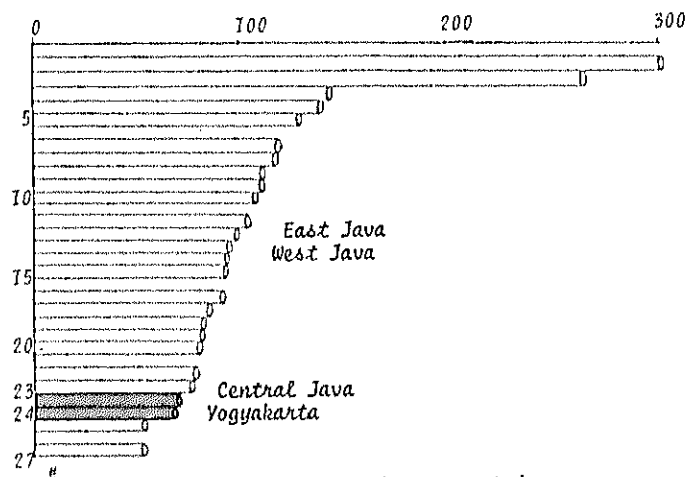
Port Activities at Present – Eighth largest port in Indonesia

In 1983, overall dry cargo throughput totaled 1.7 million tons. Import, export, domestic in and out cargoes totaled 0.58, 0.18, 0.74 and 0.18 million tons, respectively.

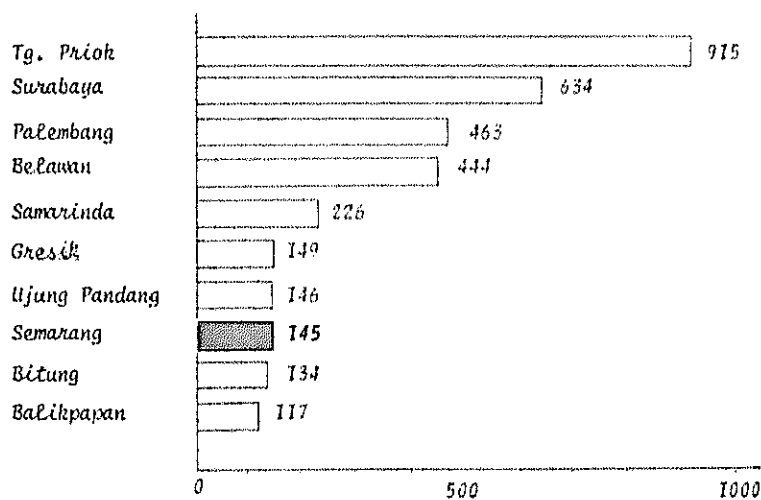
Although there had been no major expansion work until recently, the potential for development at Semarang Port is great.

Semarang serves as a gateway to various international ports in Japan, China, Europe, America, Singapore, Hong Kong and Australia.

Domestic trade is conducted between Semarang and a variety of ports including Pontianak, Sampit, Banjarmasin, Balikpapan and Palembang.



Comparison of Per Capita GRP by Province (1980)



Total Cargo Throughput of Ten Indonesian Major Ports (1982)

In terms of cargo throughput, Semarang Port is the eighth largest port in Indonesia. Major export commodities are plywood, rubber, lumber and agricultural products. Major imports are iron and steel, machinery, rice and general cargo.

Since the recent completion of the new deep sea wharves in 1985, the number of calling vessels and the cargo throughput have begun to increase rapidly. In the near future, Semarang Port will once again become one of the leading ports of Indonesia.

Natural Conditions – Northwest wind in the rainy season, recent abnormal high tide, bad soil conditions and siltation are problems

Wind

According to data compiled from 1978 through 1984, strong winds occur with high frequency in January and February during the rainy season.

Annually, the frequency of occurrence of wind velocity is as follows.

<i>Velocity</i>	<i>Frequency of Occurrence</i>
<i>Less than 5 m/sec</i>	<i>83%</i>
<i>5 ~ 10 m/sec</i>	<i>17%</i>
<i>Over 10 m/sec</i>	<i>0.5%</i>

Tide

Since June of 1984, the north coast of Java Island has been experiencing abnormally high tides. At Semarang Port, the high tide has been roughly 0.2 ~ 0.3 m above the normal level.

Although it is difficult to predict how long this phenomenon will continue, it is necessary to consider these high tides in the port development plan.

Soil Conditions

A 30 ~ 40 m thick layer of soft clay covers the entire port area. Thus, the foundations of structures must be precisely designed.

Siltation

Siltation is an important factor at the port, particularly in the access channel and harbour basin. As the new deep sea wharves have only recently been completed, it has not been possible to determine the current patterns of siltation at the port.

However, there is ample time to record sufficient data before the commencement of the Phase II construction works.

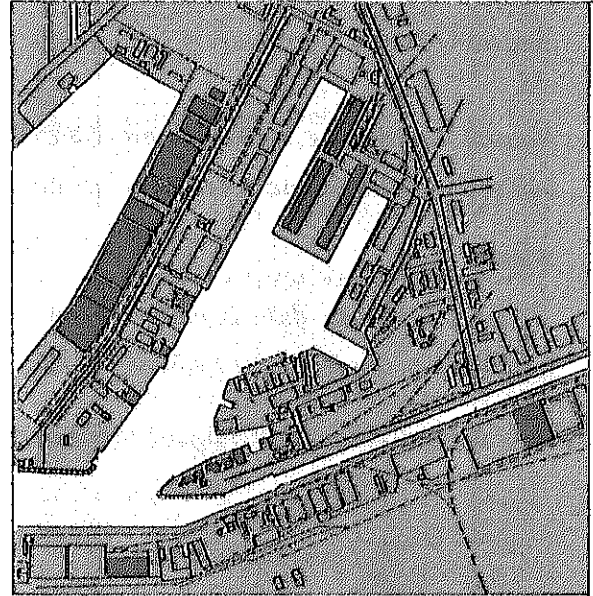
Existing Facilities – Many timeworn and obsolete facilities
Superannuated Facilities

Many transit sheds and warehouses are no longer used, and some of the wharves are too shallow and have become obsolete.



Most of the unused facilities are located on the south side of the Coastal Harbour and along Kali Baru.

It is necessary to demolish or to renovate these timeworn facilities.

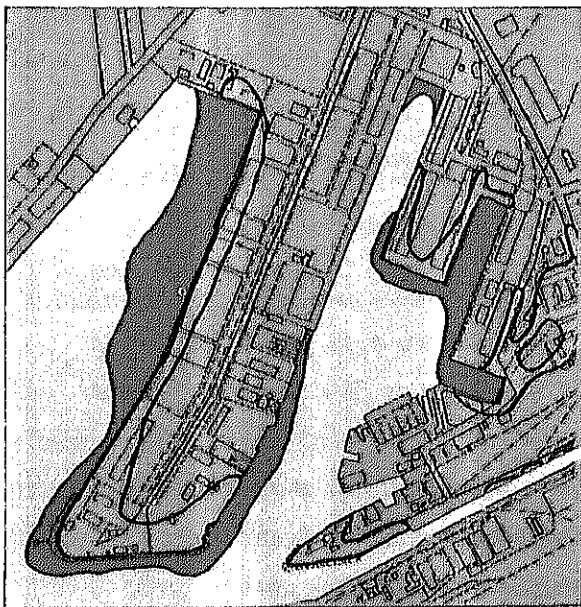


Flooded Areas

There are several areas which are regularly flooded by seawater during high tide.



Appropriate measures must be taken so that these facilities can be used at all times.



Shallow Water Depth

The partially submerged broken breakwater is not capable of protecting the channel and basins from siltation.

Further, some of the berths at the old port may have become too shallow for the safe passage or mooring of vessels. The quaywall in the southwest part of the Coastal Harbour and at the top of the finger of the Inner Harbour are too shallow.



Port Productivity at Present – Low productivity with obsolete cargo handling system is a serious problem

Although Semarang Port has a relatively long quaywall of over 4 kilometers, until recently there was no deep sea wharf, and most of the cargoes for ocean-going vessels had to rely on barges for transshipment. Basically, it was the same system used 70 years ago.

As for international trade, the demand has surpassed the handling capacity since the 1970's. Until 1985, the lack of a deep sea wharf severely limited cargo handling efficiency. The recently completed 600 m international deep sea wharf has greatly improved this situation.

However, the current facilities for large vessels are still insufficient. In fact, the current facilities cannot even handle the cargo demand as of 1983.

Thus, a lack of appropriate facilities will continue to hamper cargo handling efficiency unless the comprehensive port development project is implemented.

On the other hand, the facilities for small vessels are more than adequate as no barge transport will be required for the time being.

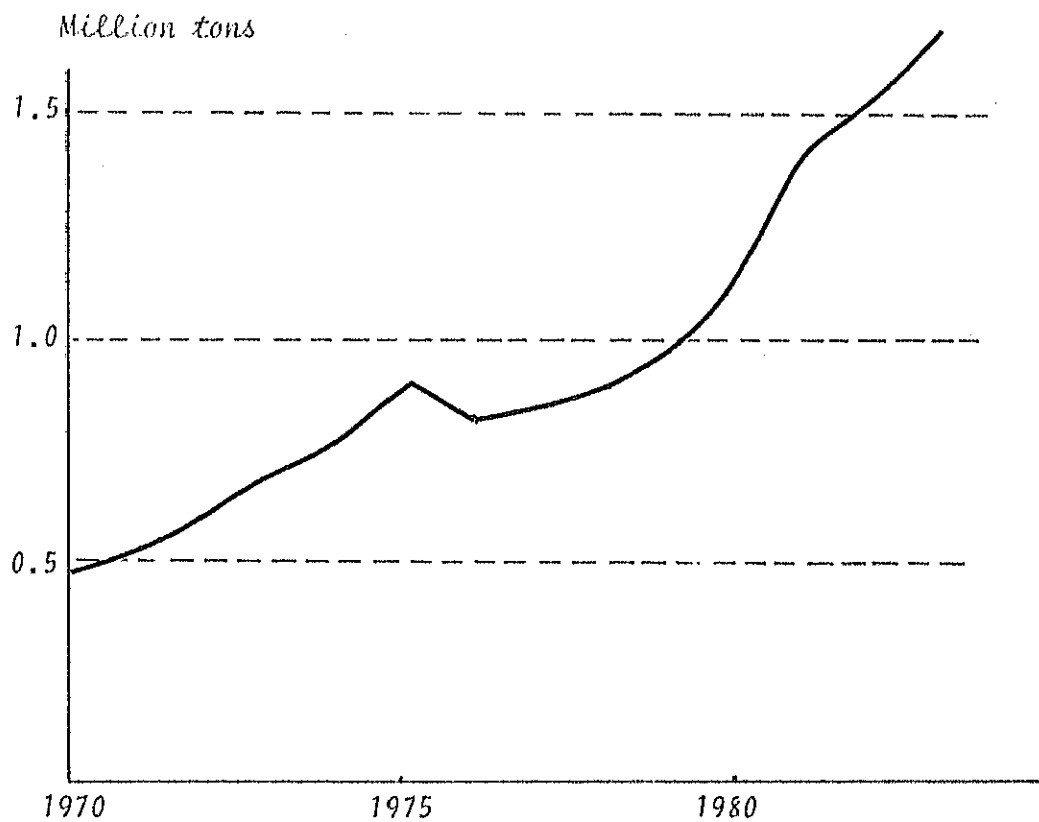
Overall Quay Length of the Port

(Meters)

	Inter-national	Coastal Harbour	Inner Harbour	Kali Baru	Others	Total
	-9 m	-5.5 m	-3 m	-3 m		
Whole Berth Line	605	650	1,480	1,100	455	4,330
Usable Berth Line	495	338	1,387	418	93	2,631

Overall Cargo Flow in the Port (1983)

<i>Trade</i>	<i>Cargo Throughput</i>	<i>Average Size of Calling Vessels</i>	<i>Average Cargo Handling Volume</i>	<i>No. of Calling Vessels</i>	<i>Days of Stay</i>
	<i>10,000 tons</i>	<i>DWT</i>	<i>tons</i>		
<i>Foreign</i>	79				<i>day</i>
<i>Barge Transshipment</i>	68	10,700	2,090	325	4.2
<i>Coastal Harbour (-5.5 m)</i>	11	1,500 (<i>For.</i>)	850	61	5.2
		1,900 (<i>Nus.</i>)	780	78	4.1
<i>Domestic</i>	90				
<i>Barge Transshipment</i>	56	3,970	2,630	27	8.7
<i>Coastal Harbour (-5.5 m)</i>	13	910	370	339	9.6
<i>Inner Harbour (-3.0 m)</i>	11	160	220	530	6.1
<i>Kali Baru (-3.0 m)</i>	10	210	127	790	8.3
<i>Total</i>	169				



Trend of Overall Cargo Throughput

● **FUTURE CARGO PROJECTION**

Future Economic Framework of the Hinterland – Two Scenarios Considered

The current economic situation of the hinterland, that is Central Java and Yogyakarta, is the worst among major Indonesian provinces due to undeveloped infrastructures and industries.

As for the future economic framework of the hinterland, there are many possibilities based on the Government policy. For the purpose of comparison, the Team considers two likely scenarios.

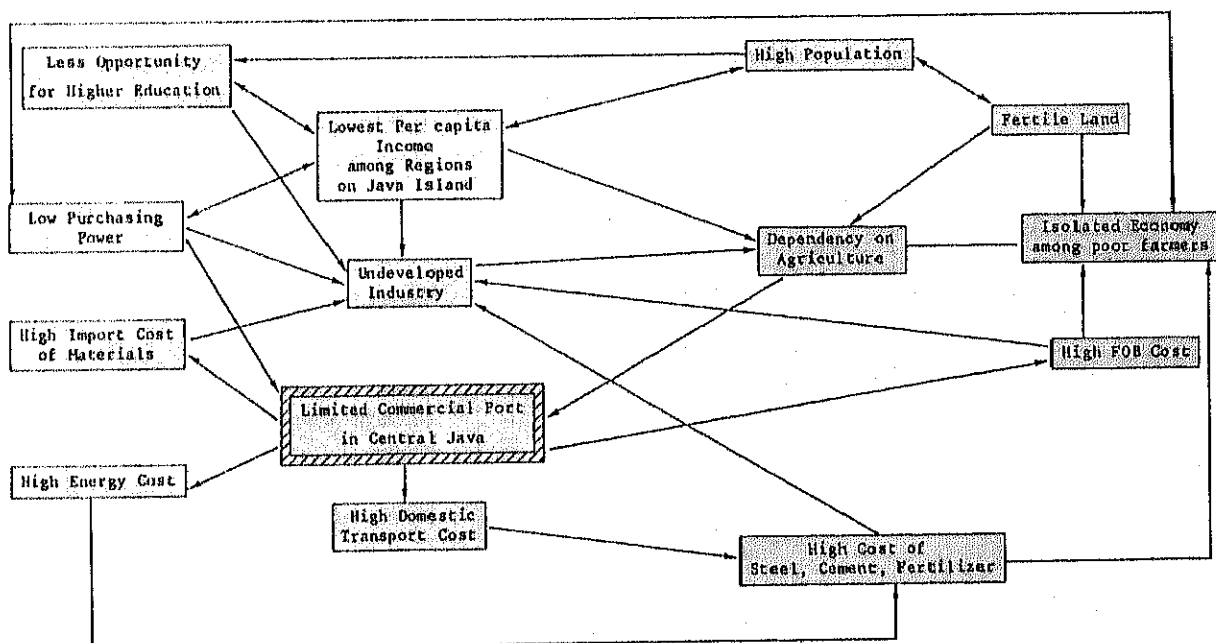
Under the first scenario, the Government will not take any positive action to improve the local economy of these provinces through the development of the port or other infrastructures. The economy will remain relatively stagnant. This is the "Without Development" case.

Under the second scenario, the Government will stress the economic development of the area and undertake major development projects.

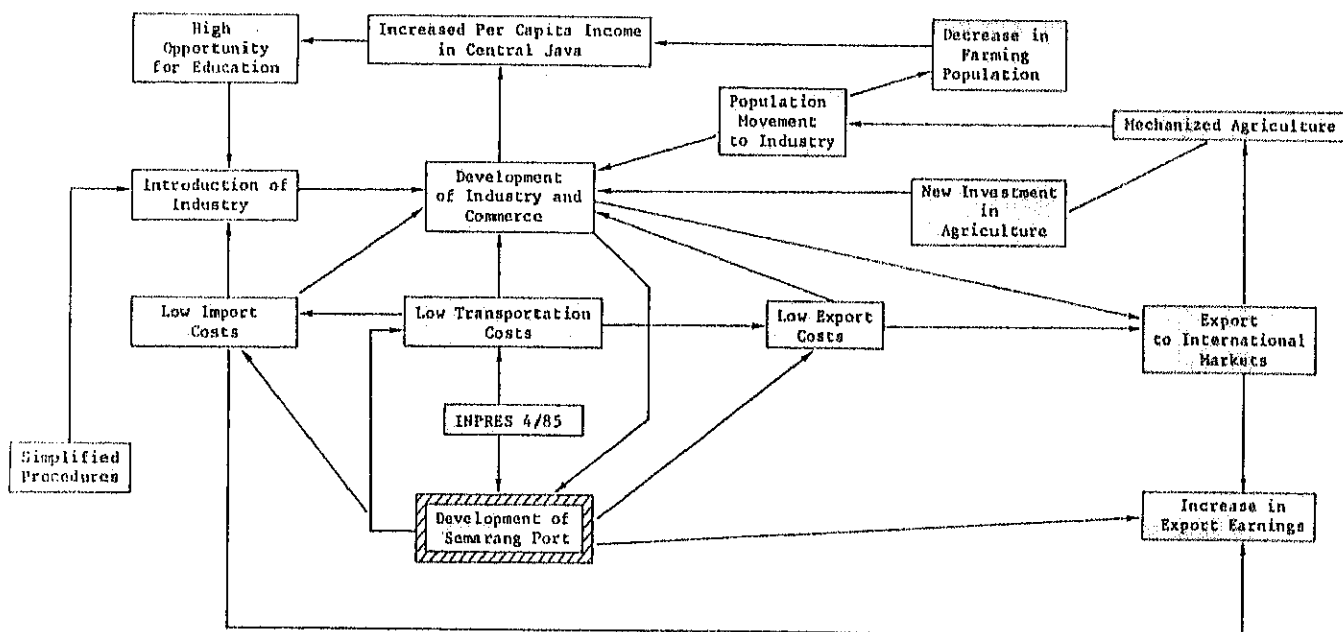
Industrialization will be accelerated, the economy will become active, and the per capita GRP and income of the local residents will catch up to the national average. This is the "With Development" case.

The future socioeconomic conditions under the scenarios are presented below.

Without Development Case



With Development Case



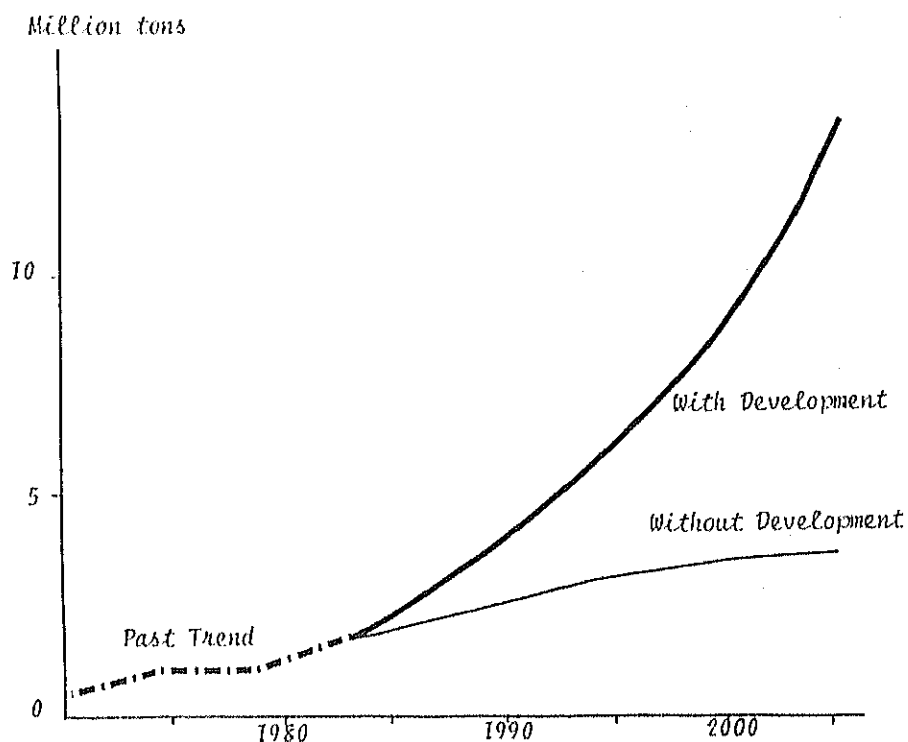
Premises of the Scenarios

	<i>Without Development</i>	<i>With Development</i>
<i>Infrastructures</i>	<i>Despite increased demand, no major infrastructures will be developed.</i>	<i>Facilities at Semarang Port will be greatly improved and expanded. Roads and railways will also be constructed to cope with increased demand.</i>
<i>Industry</i>	<i>As there will be no special incentives, no particular industries will locate behind the port and in the urban area.</i>	<i>In response to port development and other incentives, iron and steel, cement, food processing, wood processing and machinery industries will locate behind the port and in the urban area in the near future.</i>
<i>Growth Rate of GRP in the Hinterland</i>	1985 ~ 1990: 6.0% 1990 ~ 1995: 3.0 ~ 4.0% 1995 ~ 2005: 0.0 ~ 2.0%	1985 ~ 1990: 7.5% 1990 ~ 2005: 9.0%
<i>Transport</i>	<i>Most of the raw materials and consumer goods will be carried from neighbouring provinces and other ports.</i>	<i>Most of the raw materials and consumer goods will be shipped through Semarang Port. The relatively low shipping costs will reduce prices and benefit the local economy.</i>

Future Cargo Throughput at Semarang Port

Based on the scenarios, the overall future cargo throughput at Semarang Port is forecast as follows.

Future Cargo Projection by Scenario



Under the "Without Development" case, the flow of commodities will remain basically the same as at present. This scenario is unrealistic.

Under the "With Development" case, commodities showing remarkable increases in cargo volume are coal, fertilizer, grain, cement, iron and steel and logs.

Future Cargo Projection by Major Commodity

Unit: '000 tons

		1983	1990	1995	2000	2005
Export	Wood Products	115	265	342	400	465
Import	Iron/Steel	149	370	570	880	1,350
	Grain	-	188	316	515	824
Inward	Logs	495	773	1,000	1,160	1,340
	Steel	-	110	270	520	980
	Lumber	132	299	503	787	1,239
	Fertilizer	56	680	950	1,150	1,240
	Coal	-	150	300	600	1,050
	Cement	-	-	360	510	820

The throughput of wood products and agricultural products will also increase as a results of the development.

The forecast was carried out based on "With Development" case.

Updating the Master Plan of the Phase I Study

The total cargo throughput in 2000 estimated in this Study (Phase II) is about 2.5 million tons greater than the estimate in the Phase I study.

The difference in estimates results from different development policies.

The Phase I study emphasized only the development of the commercial port, whereas the current study considers the development of both the commercial and the industrial port, in accordance with the wishes of the Indonesian Government.

If cargoes such as coal, fertilizer, cement and logs which have become a priority under the new policy were not included, the estimated total cargo throughput of the Study would actually be 0.8 million tons less than the Phase I estimate.

Thus, the new projection is not overly optimistic.

● **MASTER PLAN AND SHORT-TERM DEVELOPMENT PLAN**

Target Year of the Plan

The target year of these plans are 1995 for the Short-term Plan and 2005 for the Master Plan.

Required Number of Berths and Quay Length in the Target Year

Taking into account the cargo throughput and other factors, the required number of berths is shown as follows.

Required Quay Length for Master Plan and Short-term Development Plan

	Existing	1995	2005	Required for Short-term Plan	Unit Berth Length
<i>Oceangoing Conventional</i>					
11,000 DWT	3.7	6	10	2.3	- 10 m 150 m
4,000 DWT	--	4	8	4	-7.5 m 100 m
<i>Container</i>	--	1*	1	1*	- 10 m 220 m - 11 m 280 m
<i>Iron/Scrap</i>	--	2	4	2	-7.5 m 100 m
<i>Grain</i>	--	1	1	1	- 11 m 220 m
<i>Domestic</i>					
1,500 DWT	4.6	4	10	--	-5.5 m 70 m
<i>Local/Rakyat</i>	53	30	60	--	-3 m 35 m
<i>Coal</i>	--	1	1	1	-7.5 m 150 m
<i>Fertilizer</i>	--	1	1	1	-7.5 m 150 m
<i>Cement</i>	--	1	1	1	-7.5 m 150 m
<i>Passenger</i>	--	1*	1	1*	-7.5 m 150 m -6.5 m 200 m

* Multipurpose Terminal

Required Area for the Land Use Plan

The proposed land use plan in the Master Plan includes the following facilities.

For Cargo Movement

<i>International Terminal</i>	<i>Conventional Oceangoing Vessel Wharf, Container Terminal, Iron (Scrap) Terminal and Grain Terminal</i>
<i>Domestic Public Wharf</i>	<i>Nusantara Wharf, Local and Rakyat Wharf and Passenger Terminal</i>
<i>Distribution Area</i>	<i>Warehouses and Open Storage Areas</i>

For Industrial Activities

<i>Littoral Industry Zone</i>	<i>Coal Distribution Terminal, Cement Distribution Terminal, Chemical Plant, Steel Mill and Fertilizer Distribution Terminal</i>
<i>Manufacturing Industry Zone</i>	<i>Wood Processing, Furniture Production, Electronics, Food Processing, Machinery, Automobiles, Shipbuilding</i>

For Business and Government Area

<i>Government Area</i>	<i>Port Administration Office, Police, Quarantine and Other Service Offices</i>
<i>Business Area</i>	<i>Shipping Agents, Trucking Companies,</i>

Total required area is as follows.

	Unit: ha	
	1995	2005
<i>International</i>	27.4	57.2
<i>Domestic</i>	64.8	64.8
<i>Distribution</i>	23.6	55.4
<i>Littoral Industry (East)</i>	53.0	73.2
<i>Manufacturing Industry (West)</i>	42.3	169.1
<i>Government Area</i>	15.8	26.6
<i>Business Area</i>	29.5	37.6
<i>Others</i>	13.6	13.6
<i>Total</i>	323.0	497.5

MASTER PLAN OF SEMARANG PORT (2005)

