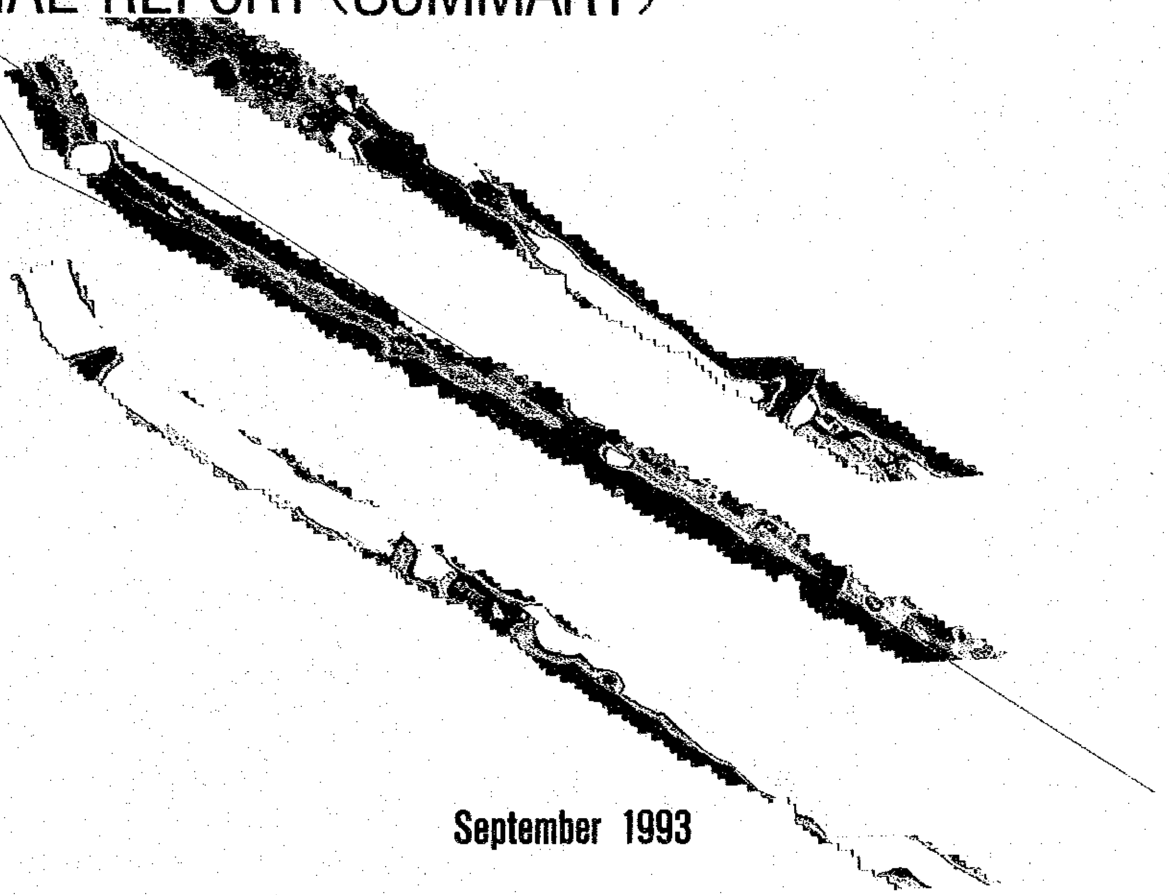
JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF TRANSPORT AND COMMUNICATION
THE SOCIALIST REPUBLIC OF VIET NAM

THE URGENT REHABILITATION PLAN OF HAI PHONG PORT THE MASTER PLAN STUDY ON THE TRANSPORT DEVELOPMENT IN THE NORTHERN PART OF THE SOCIALIST REPUBLIC OF VIET NAM

FINAL REPORT (SUMMARY)



September 1993

THE OVERSEAS COASTAL AREA DEVELOPMENT INSTITUTE OF JAPAN (OCDI)
NIPPON KOEI CO., LTD. (NK)

THE URGENT REHABILITATION PLAN OF HAI PHONG PORT
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PREFACE

In response to a request from the Government of the Socialist Republic of Viet Nam, the Government of Japan decided to conduct a feasibility study on the Urgent Rehabilitation Plan of Hai Phong Port and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Viet Nam a study team headed by Mr.Takahisa Sogabe,Senior Adviser of the Overseas Coastal Area Development Institute of Japan,from June 23 to August 21 in 1993.

The team conducted field survey at the study area and held discussions with officials concerned of the Government of Viet Nam. 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 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 Viet Nam for their close cooperation extended to the team.

September 1993

Kensuke Yanagiya
President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

September, 1993

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Mr. Yanagiya,

We are very pleased to submit herewith the Report on the Transport Development in the Northern Part(the urgent Rehabilitation Plan of Hai Phong Port) in the Socialist Republic of Viet Nam.

The Study Team, which consists of the Overseas Coastal Area Development Institute of Japan and Nippon Koei Co., Ltd conducted a survey in Viet Nam from June to August 1993 at the contract of the Japan International Cooperation Agency. The findings of this survey were fully discussed with Vietnamese counterparts to formulate and examine the feasibility of the Urgent Rehabilitation Plan on Navigation Channel, Main Port and Chua Ve Container Terminal for the period up to 1998.

In view of the urgency of rehabilitation of Hai Phong Port and of the need for transport development in northern part in Viet Nam, we earnestly wish that the Plan herein proposed will be implemented at the earliest possible time by the Government of Viet Nam.

We, the Study Team members, would like to express out deep appreciation to the central Government of Viet Nam, Viet Nam National maritime Bureau, Hai Phong Port Authority and other organizations concerned for the their kind cooperation and assistance and heartfelt hospitality which they extended to the Team during our stay in Viet Nam. We are also much obliged to the Japan International Cooperation Agency, the Ministry of Transport and the Japanese Embassy in Viet Nam, for giving us valuable suggestions and assistance during the study period.

Respectfuly,

T. Sogabe

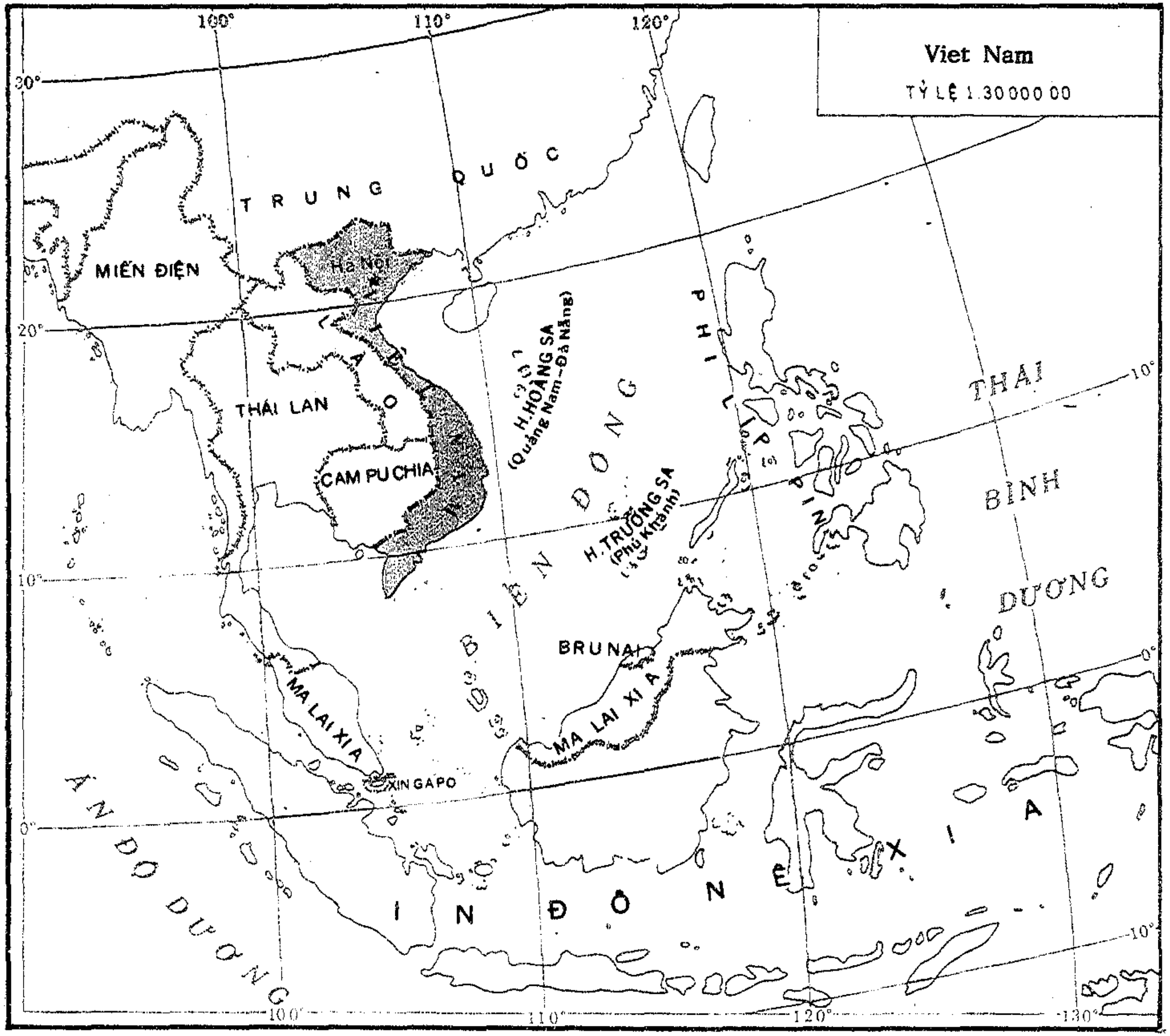
Takahisa Sogabe
Team Leader
Study on the Urgent
Rehabilitation Plan
of Hai Phong Port
(Senior Adviser, the
Overseas Coastal Area
Development Institute
of Japan)

ABBREVIATIONS

ADB	Asia Development Bank
AV.	Average
BT	Berth Section
CFC	Conversion Factor for Consumption Goods
CFS	Container Freight Station
CIF	Cost Insurance and Freight
DWT	Dead Weight Tonnage
EPZ	Export Processing Zone
EIRR	Economic Iternal Rate of Return
F/L	Folk-lift-truck
FIRR	Financial Internal Rate of Return
FOB	Freight on board
GDP	Gross Domestic Product
GRT	Gross Registered Tonnage
HP	Horse Power
LOA	Length of Over All
HWL	High Water Level
MOTAC	Ministory of Transport and Communication
OCC	Opportunity Cost of Capital
S/C	Straddle Carrier
S DIST.	Section Distance
SFC	Standard Conversion Factor
SPC	State Planning Committee
ST	Section
T/C	Transfer Crane
TEDI	Transport Engineering Design Institute
TESI	Transport Economic Science Institute
TEU	Twenty Equivalent Unit
UNDP	United Nation Development Program
VINAMARINE	Viet Nam National Maritime Buearou
VND	Viet Nam Don
VOSA	Viet Nam Ocean Shpping Agency
VOSCO	Viet Nam Ocean Shipping Company

CURRENCY EXCHANGE RATE

1 US Doller = 10,680 Viet Nam Don = 108 Japanese Yen
(July, 1993)


Viet Nam
TỶ LỆ 1.30000000
TRUNG QUỐC
MIẾN ĐIỆN
Hà Nội
LÀO
THÁI LAN
CAM PU CHIA
H.HOÀNG SA
(Quảng Nam–Đà Nẵng)
H.TRƯỜNG SA
(Phú Khánh)
BIỂN ĐÔNG
PHI LIP PIN
THÁI BÌNH DƯƠNG
BRUNAI
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XINGAPO
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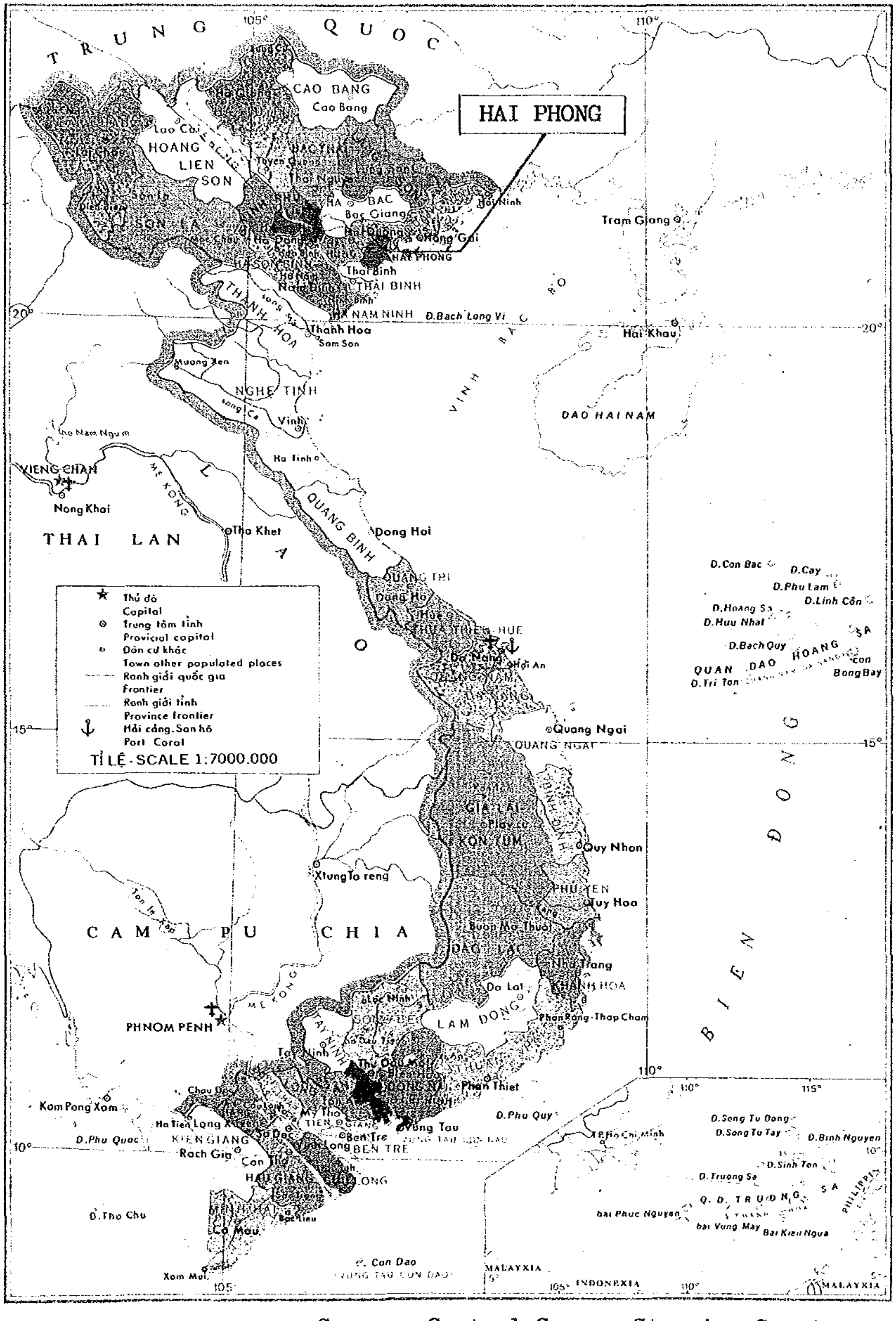
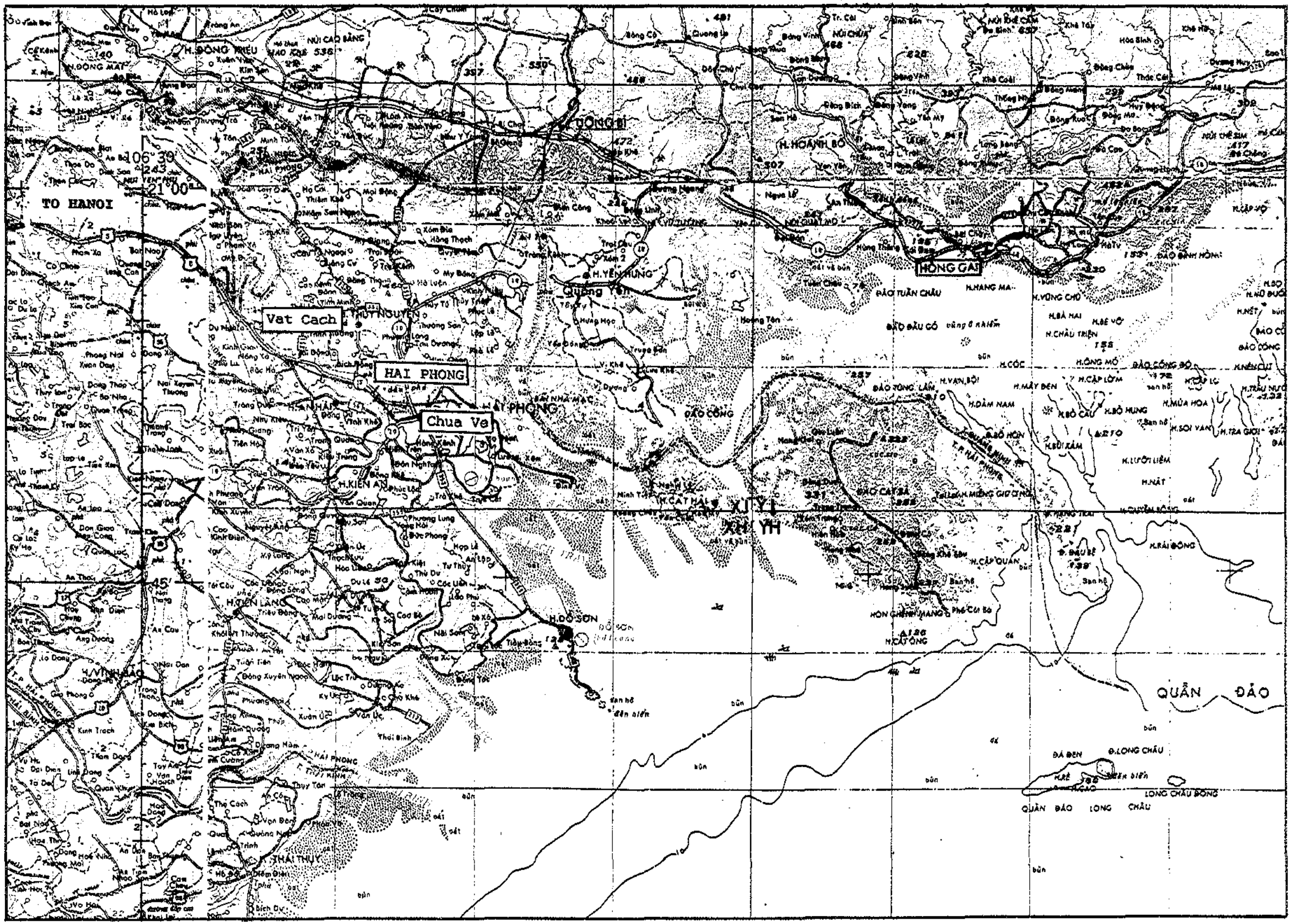
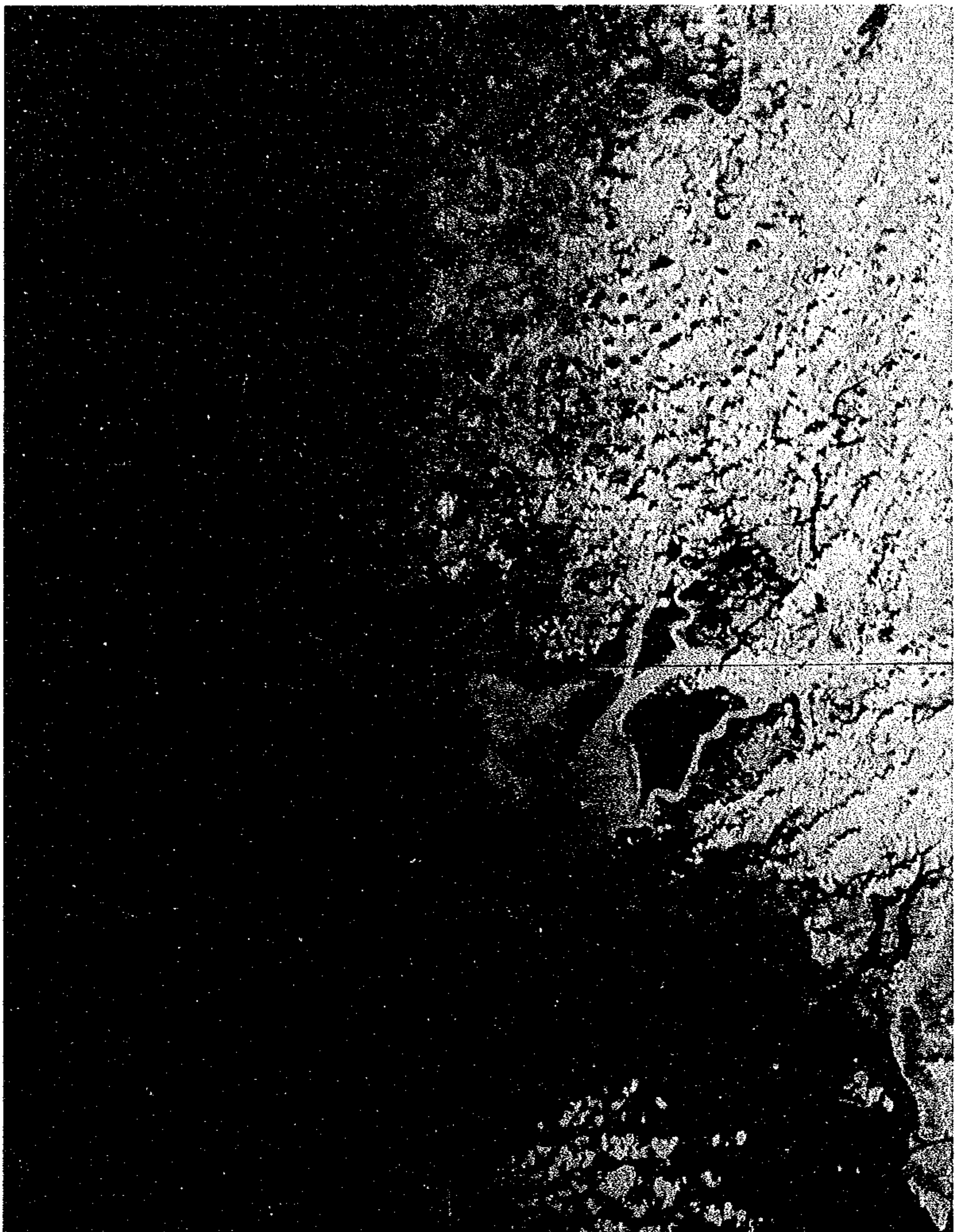
LOCATION OF STUDY



Source: Central Census Steering Committee

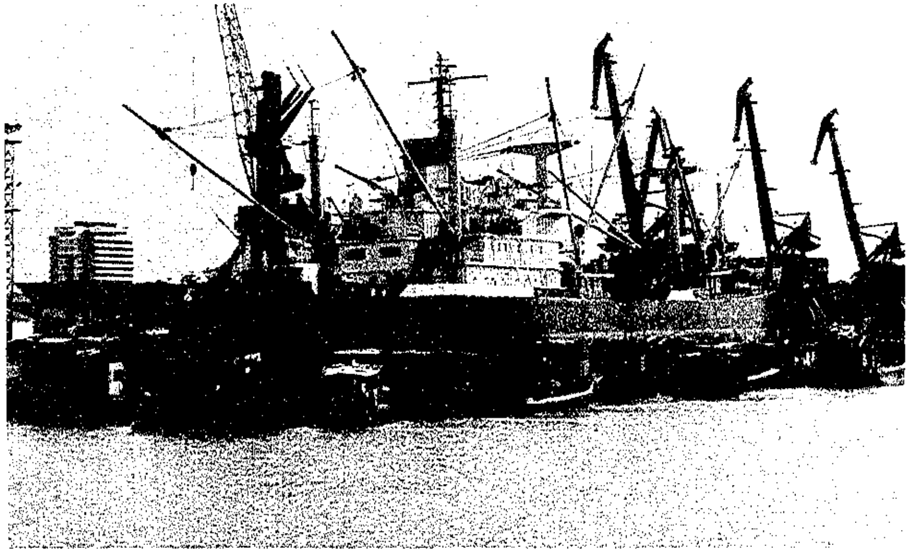


HAI PHONG AREA

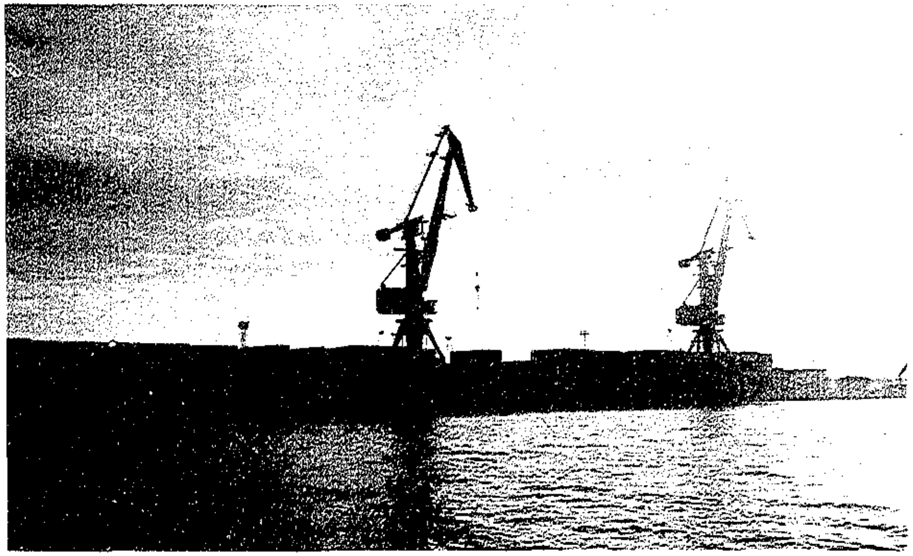


Taking photo from Landsat

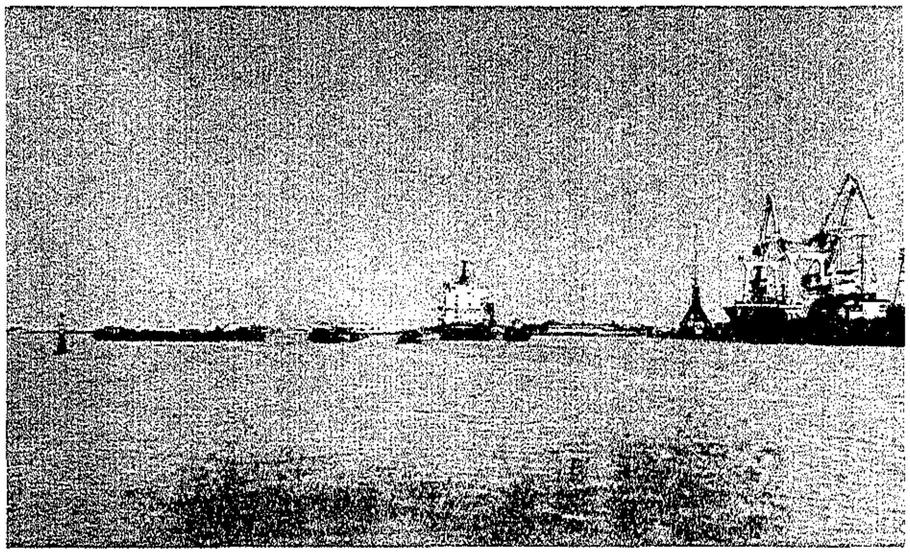
Taking photo from Landsat



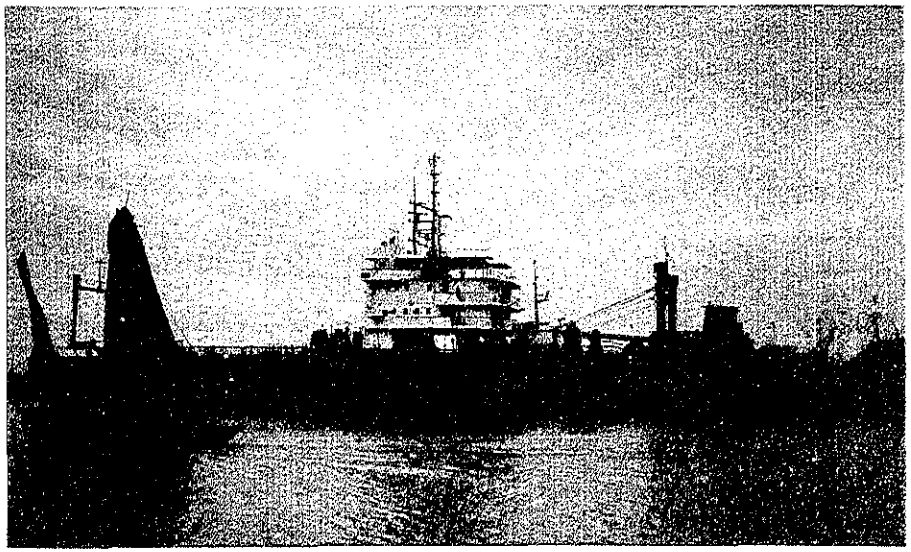
Hai phong Port



Chua Ve Port



Access Channel



Dredger

C O N T E N T S

SUMMARY

Background and Objective

The port of Hai Phong, for which urgent rehabilitation is required, is located at the mouth of the Red River in the northern region bordering China. It has been the most important port and a gate for international exchange in the northern part of Viet Nam for more than 200 years.

Hai Phong port is located on the right bank of the city of Hai Phong, about 36km upstream of an effluent of the Red River. The port faces a serious problem in its maintenance and management: channel sedimentation.

Particularly because the present channel is maintained at a water depth of -4m, the port capacity has fallen sharply. The amount of cargo handling volume there is also decreasing. Nevertheless, Hai Phong port's importance in Viet Nam remains unchanged due to its locational advantage, large background zone and significant role in economic development. The primary object of the study is to make a plan for the prompt and valid execution of a project covering improvement works to the channel and the basin, renovation of the container terminal and conservation of the main port area, so as to start work as soon as possible on the rehabilitation of Hai Phong port.

The Urgent Rehabilitation Plan

Project Term; 1994 to 1998

Traffic Demand Forecast

Target Year 1998
Cargo throughput 4.7 mil. tons, Containers 1.2 mil. tons, 150,000TEU, Additional Chinese Cargo 1.0 mil. tons

Year 2000
Cargo throughput 5.7 mil. tons, Additional Chinese Cargo 1.0 mil. tons

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Target of Channel Planning

Water depth; -6m
Bottom width; 80-100m
Overall length; 38km
Ship size;
10,000DWT class vessels under tidal operation

The access channel depth was decided -6.0m in consideration with the existing tidal operation, sedimentation volume and construction cost. This depth allows full-loaded 7,000 DWT vessels at +2.0m sea water level (MWL) with 93% frequency and 10,000 DWT at +3.0m 32% frequency. Implementation plan shall be met to accommodate above vessel types.

Implementation Plan

Channel dredging

Dredging volume;
10.94 Mil. m3

Dredger; Hopper type
(3000m3) 1 No.

Chua Ve area

Expansion of yard. Installation of well mechanized yard equipment.

Main port area

Renovation of container berth.

Reinforcement of cargo handling equipment

The total cost estimated for the whole Rehabilitation Plan is 170,432 thousand USD. After carefully prioritizing to each item, the Urgent Implementation Plan has been formulated at a cost of 138,960 thousand USD.

Economic Analysis

The internal rate of return, using a calculation period (project life) of 34 years, is 13.3 %. This shows that the Rehabilitation Plan is feasible from the viewpoint of the national economy.

Financial Analysis

The analysis shows that, throughout the entire period of the project life, the Hai Phong port Authority will show a good financial performance by the appropriate subsidies and the tariff.

The project can be regarded as feasible since FIRR(2.6%) is above the interest rate of the required founds.

Recommendations

Although the rehabilitation of the Hai Phong Port is judged very significant, it is not an easy project from economic and financial points of view. Through preparation and consideration of the following matters are necessary for implementation of the project.

(1) The urgent Rehabilitation Project of Hai Phong Port consists of many kinds of works and quick decisions for implementation are required. The executive agency should have strong function for carrying out the project smoothly.

(2) Cargo handling equipment should be replaced quite urgently.

(3) Considering ship size trend, it can be said that, in the case of cargo transportation, 10,000DWT class vessels convey a large amount of cargo, and that therefore it is imperative to provide sufficient facilities for accommodating that type of vessels.

(4) The cost of initial and maintenance dredging of channel and basin is tremendous, the amount of the dredging cost paid by the Hai Phong Port Authority might debilitate the port management. As the access channel are used by many vessels for each purpose , the major portion of the cost above should be paid by Government.

(5) It is imperative to make various efforts to collect a large volume of cargo.

CHAPTER 1 PREFACE

1-1 Background and Objective of The Study

At the 7th Assembly of the Vietnamese Communist Party held in June 1991, the 'Strategy for Economic and Social development up to 2000' which confirmed an adherence to the Doi Moi(reform) policy and established the economic and social goals for the next 10 years was adopted. The goals included a two-fold increase in GNP, and the raising of average annual growth rates of agriculture and industry to 4-5% and 10-12% respectively.

It is imperative to upgrade the infrastructures for social and economic development.

Under such circumstances, in December 1992 The Socialist Republic of Viet Nam requested the Japanese government to make a master plan for the improvement of transport systems in the northern part including Hanoi, Haip Pong and Cai Lan, where future development is expected.

In response to the request, the Japanese government sent a mission in January of this year to form a project and the preliminary study team decided to conduct a master plan study. After discussing of the Scope of Work for "The master plan study on the transport development in the northern part", the preparatory study team signed the S/W.

On 17th, June 1993, the study on transport development in the northern part of the Socialist Republic of Viet Nam commenced.

As part of this study, the importance of an urgent rehabilitation plan of Hai Phong port, about 100km away from the capital Hanoi, was recognized by both governments.

A study was thus carried out from June 23 to August 22 to work out an urgent rehabilitation plan.

(1) Present State of The Socialist Republic of Viet Nam

Viet Nam is situated on the eastern end of the Indo-China Peninsula. It has an elongated S-shape, 3,316,000 km2 in area, with a population of 68.9 million (source: World Countries' Economic Information File, 1993, JETRO). The country has two fertile deltas along the Red River and the Mekong River. Its coastline extends over 3,260 km, and the country has rich natural and human resources.

The port of Hai Phong, for which urgent rehabilitation is required, is located at the mouth of the Red River in the northern region bordering China. It has been the most important port and a gate for international exchange in the northern part of Vietnam for more than 200 years.

(2) Present State of Major Ports in Viet Nam

The port administration in Viet Nam was shifted from the hands of the Ministry of Transport and Communication (MOTAC) to the Vietnam National Maritime Bureau (VINAMARINE) on the basis of Regulation "239" on September 30, 1992 of the State Planning Committee (SPC).

A control system is taking shape in compliance with Administrative Regulation "31" of February 2, 1993.

There are about 70 ports in Viet Nam, of which 24, including seven major ones, function as international ports. The northern region has the following three major ports, out of the seven mentioned about, including one presently under construction, i.e., Cai Lan, which will be a large depth port in the future:

. Hai Phong port
. Quan Nin port (Hon Gay port)
. Cai Lan port

(3) Objective of The Study

Hai Phong port is located on the right bank of the city of Hai Phong, about 36km upstream of an effluent of the Songkoi River. The port faces a serious problem in its maintenance and management: channel sedimentation, which is an almost fatal problem for all river side ports. Particularly because the present channel is maintained at a water depth of -4m, the port capacity has fallen sharply. The amount of cargo handling volume there is also decreasing, partly due to a steep fall in trade with the former Soviet Union.

Originally, the port had a depth of -8.4m and accommodated large ships exceeding 10,000 DWT making use of tidal operations.

In the past, France and the former U.S.S.R., as well as the Vietnamese government, searched for effective ways to prevent sedimentation and took countermeasures, but to little avail.

Nevertheless, Hai Phong port's importance in Viet Nam remains unchanged due to its locational advantage, large background zone and significant role in economic development.

Such circumstances prompted the Vietnamese government to start building Cai Lang in 1987 as a port with sufficient space and depth. It will be a long time, however before its facilities can be made full use of, and thus it has become urgent to improve Hai Phong port.

The primary object of the study is to make a plan for the prompt and valid execution of a project covering improvement works to the channel and the basin, renovation of the container terminal and conservation of the main port area, so as to start work as soon as possible on the rehabilitation of Hai Phong port.

Clarification of the causes of channel sedimentation and estimation of future sedimentation in particular, is a highly technical problem requiring a full-scale approach rather than a survey on a short-term basis. Nevertheless, channel sedimentation was given priority in the survey in view of its urgency, and an attempt was made to roughly estimate the sedimentation through analysis of existing data and to recommend an appropriate water depth of the channel.

Chapter 2 PRESENT STATUS OF HAI PHONG PORT

2-1 GENERAL

Hai Phong Port, before the civil war, was the largest international port of Vietnam, but its shipping trade has recently been stagnant and the annual cargo throughput in 1992 shrank to 2.4 million tons. The North Vietnam's major trade partners, CIS and other eastern European countries has experienced a drastic change in economic structure. Another major issue in Hai Phong Port is the siltation problem.

2-2 PORT HINTERLANDS

In terms of inland traffic linkage, Hai Phong Port is situated in a very strategic place. Hanoi city is linked by national road "Route No. 5" to Hai Phong Port. Most of the road and railway networks in the north Vietnam converge to Hanoi City, so that Hai Phong Port is closely connected through Hanoi City to most of the provinces of northern Vietnam. In addition to the above inland road/railway linkage, river transportation is also widely linked to Hai Phong Port.

Under this circumstance, Hai Phong Port has a large hinterland that penetrates into the most of the provinces lying in the Red River Delta and it should also include part of neighboring country particularly, the Unnang province of China.

2-3 PORT FACILITIES

2-3-1 General

The major facilities of Hai Phong Port complex are summarized in the table 2-1 below. (cf. Fig.2-1)

Table 2-1 Major Facilities in Hai Phong Port

	Main Port	Vat Cach Port	Chua Ve Port	Old Chua Ve Port
1. Berth Facilities				
- Number of berth	11	3	2	1
- Berth length	1,722 m	314 m	330 m	200 m
- Water depth (Design)	-8.4 m	-3.0 m	-8.4 m	
2. Cargo Handling Facilities				
- Quayside crane	25 set (5-14 ton)	Floating crane	Container crane 2 set	
- Folk-lift truck	39 sets	3 sets	3 sets	
- Mobile crane	6 sets	5 sets	5 sets	
3. Transit Shed and Warehouse	30 buildings ($74,300 m^2$)	-	-	
4. Open storage yard	($53,000 m^2$)	-	($24,000 m^2$)	

2-3-2 Main Port

(1) Berth Facilities

Main Port of Hai Phong consists of 11 berths and 1,722 m long along the quayside. Among them, Berth No. 1 and No. 7 handle container cargo shipment, and the annual container throughput in 1992 was recorded at 13, 815 TEU in total. The remaining nine (9) berths cater for conventional general cargo and break-bulk cargo with an annual throughput of about 2.1 million tons. (cf. Fig.7-2)

(2) Cargo Handling Equipment

There are many port equipment in the main port of Hai Phong Port, including mobile cranes, folk-lift trucks, bull dogers, bus, etc. as shown in tables 2-2 and 2-3.

Table 2-2 Crane List

No.	Crane ID	Capa.	Year of Install.	Country Manuf.d	Consumption Power	Location
I.	Enterprise No.1					
1	Crane No.11	10T	1972	USSR	320kW	Berth No.5
2	Crane No.12	10T	1972	USSR	320kW	Berth No.1
3	Crane No.17	10T	1974	USSR	320kW	Berth No.3
4	Crane No.23	10T	1977	USSR	320kW	Berth No.2
5	Crane No.24	10T	1977	USSR	320kW	Berth No.1
6	Crane No.26	5T	1978	USSR	155kW	Berth No.5
7	Crane No.27	5T	1978	USSR	155kW	Berth No.4
8	Crane No.28	5T	1979	USSR	155kW	Berth No.4
9	Crane No.30	10T	1979	USSR	320kW	Berth No.3
10	Crane No.31	10T	1979	USSR	320kW	Berth No.3
11	Crane No.32	5T	1979	USSR	155kW	Pavement of Berth No.3
12	Crane No.29	5T	1979	USSR	155kW	Pavement of Berth No.3
13	Crane No.34	5T	1980	USSR	155kW	Berth No.12
14	Crane No.36	12.5T	1990	USSR	320kW	Pavement of Berth No.4
II.	Enterprise No.2					
1	Crane No.02	10T	1968	USSR	320kW	Berth No.8
2	Crane No.03	10T	1968	USSR	320kW	Berth No.9
3	Crane No.04	10T	1968	USSR	320kW	Berth No.11
4	Crane No.09	5T	1969	USSR	155kW	Berth No.11
5	Crane No.10	16T	1972	USSR	360kW	Berth No.7
6	Crane No.13	10T	1972	USSR	320kW	Berth No.8
7	Crane No.16	16T	1974	USSR	360kW	Berth No.7
8	Crane No.18	10T	1974	USSR	320kW	Berth No.6
9	Crane No.25	10T	1977	USSR	320kW	Berth No.6
10	Crane No.35	16T	1985	USSR	360kW	Pavement of Berth No.7
11	Crane No.37	10T	1990	USSR	320kW	Pavement of Berth No.7

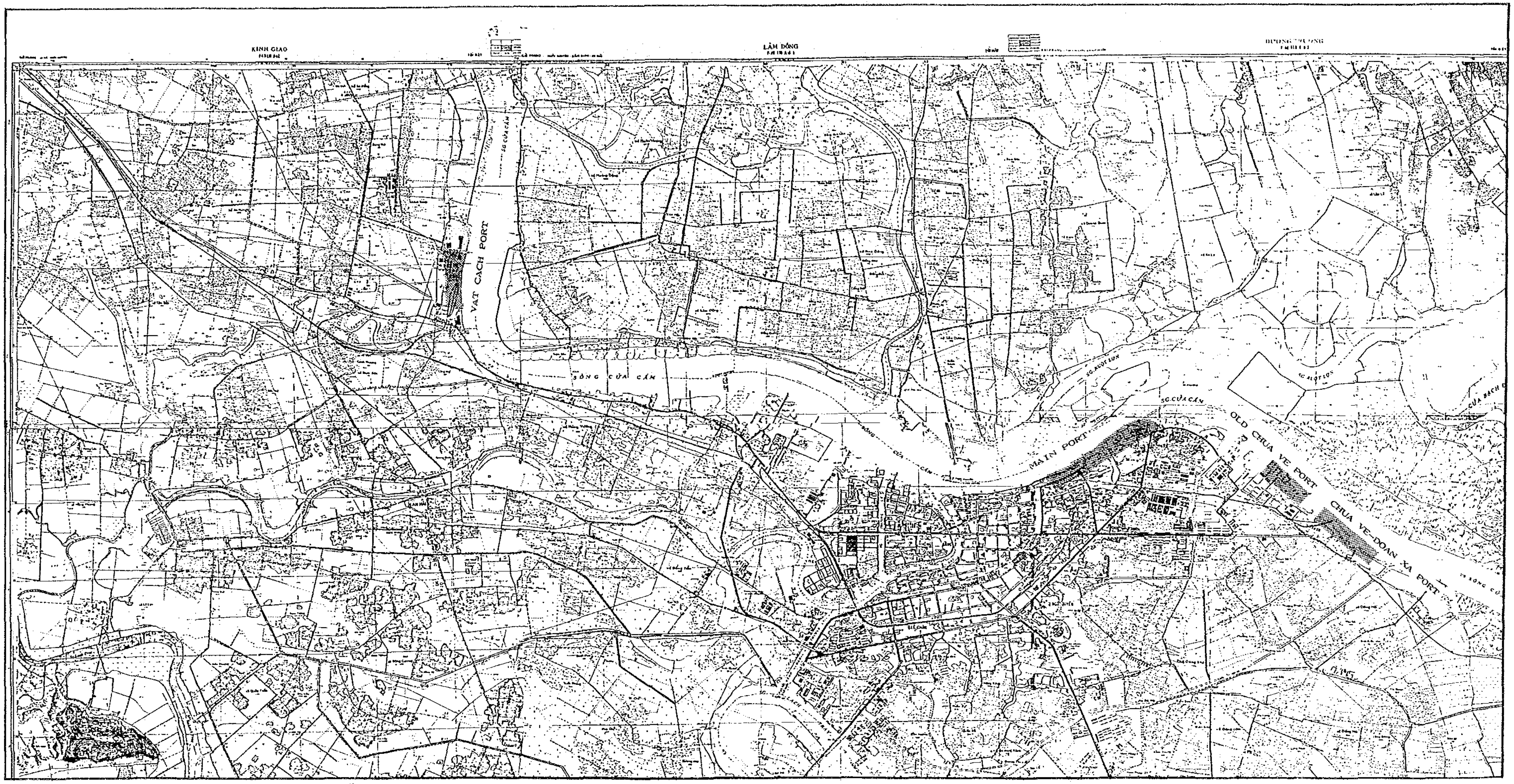


Fig. 2-1 Hai Phong Port Map

Table 2-3 Cargo Handling Equipment in Main Port & Chua Ve Port

No.	Equipment	Main Port Area		Chua Ve Port Area	Note
		Enterprise I	Enterprise II		
	TRUCK				
1	IFA-W50	10	13		Load 5 ton
2	Zul-130	1	2	4	Load 5 ton
3	Kamaz ben	3	2	2	Load 8 ton
4	Uwat	1	1	1	
5	TA369				
6	Bo MAZ		1	3	Load 5 ton
7	KAMAZ short				Load 8 ton
8	Bo MAZ short		34	9	Load 8 ton
9	Bo MAZ long				Load 12 ton
10	China				Load 5 ton
11	KPAZ			1	LOad 6 ton
	TRUCK				
1	Tractor 6711	1	1		
2	Tractor 6911		9		
3	Tractor 7011	11	1	6	
4	Tractor IRQ	5	34	3	
5	Tractor ZETC 25K	1			
6	Remorque Tractor	3	2	1	
7	Tractor MTZ				
	FOLKLIFT				
1	Forklift 4045	8	3		Lift 5 ton
2	Forklift 4014M	4		2	Lift 5 ton
3	Forklift Oil	4	3	1	Lift 3 ton
4	Forklift Power		11		Lift <1 ton
5	Forklift USSR-CT	1			Lift 10 ton
6	Forklift HYSTER-50	2			forklift 2.5T
7	Forklift HYSTER-250	1			
8	Forklift KAIMAR	1			forklift 5T
9	Forklift HYSTER-620	1			forklift 32T
	MOBILECRANE RUBBER				
1	-KC 5363	1	2	1	crane 25T
2	-KPA3			2	
3	_RDK			1	crane 28T
4	Hoist	2			
5	Bulldozer	1		1	
6	Sream roller				
7	Bus	6		5	
	CLEVIS				
1	20'	6			
2	40'	3			
3	Rumani 4T	9			
4	Russan 60T	1			
5	Russan 20T	1			

2-3-3 Chua Ve Port

Chua Vė Port, located about 4 km downstream of Main Port has a total of 329 m long quaywall. Container handling is carried out by two 40 ton cranes, while the remaining two 5 ton cranes care for shipment of construction materials like sand. The marshaling yard is a total of 25,500 m^2.

2-3-4 Navigation

The existing navigation channel is 80-100 m wide and -4.0 m deep at the shallowest section, allowing one way traffic except in the two -10 m deep and 300 m ~ 500 m wide sections. Most of large vessels navigate through the channel, using high tides (+250 cm) that occur once a day, averaging 4 hours in a row. The present navigational rule at Hai Phong Port limits the maximum ship length (L.O.A.) to be less than 155 m. (cf. Fig.2-2-(1) to Fig.2-2-(3))

2-4 ENVIRONMENTAL AND SITE CONDITIONS

2-4-1 Climate

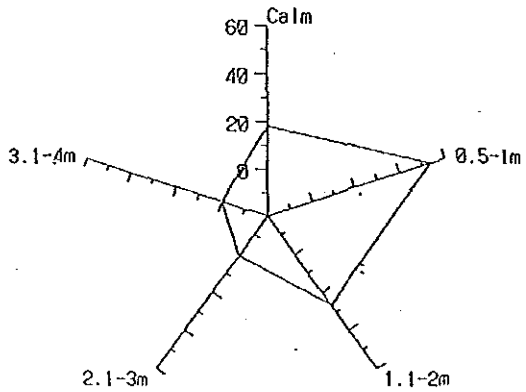
The meteorological and oceanographic conditions in Hai Phong are classified into a dry season from November to May and a rainy season from June to October. In the rainy season, the winds blow predominantly from SE to SSE and in the dry season from NE. According to the meteorological data at Hon Dau Weather Station, the most rainy month is June with 325 mm of rainfall and the dry month is December with only 16 mm. According to the Num Trieu Weather Station, the winds stronger than 10 m/sec occur only in winter season, but very rare in frequency. The past typhoon records shows that the large-scale typhoon occurred 12 times between 1940 and 1959 and 16 times between 1960 and 1970.

2-4-2 Oceanography

The wave records, observed off the Hon Dau, indicated that the predominant wave directions are SE, SSE and ESE, accounting for about 65% of all waves. Figure 2-1 of wave height distribution shows that the waves more than 0.5 m occur 82% and the waves more than 1.1 m only 28%.

Frequency in % of Wave Height

Hon Dau (1961-1982)



THE FREQUENCY IN % OF WAVE HEIGHT BY DIRECTION AT HON DAU :OBSERVATION PERIOD(1961-1982)

DIRECTION	CALM	N	NE	E	SE	S	SW	W	NW	TOTAL %
Calm	18.17									16.17
0.5-1m		5.14	5.44	15.84	18.62	6.02	1.65	0.34	0.87	53.99
1.1-2m		1.51	1.81	7.8	6.6	6.52	2.14	0.08	0.65	26.55
2.1-3m		0.064	0.055	0.242	0.279	0.374	0.106	0.008	0.008	1.15
3.1-4m				0.038	0.036	0.034	0.025	0.004	0.004	0.14
										100

Figure 2-3 Wave Frequency

2-4-3 Geology and Soil Condition

Hai Phong Port is located in the alluvial plain of the Cua Cam river. The river bed is covered by muddy silt, under which clayey sand, clay and sandy clay alternate down to -30 m. The soil test reveals that C value of silty soil ranges from 0.4 t/m^2 to 3.0 t/m^2. The silty and clayey soil contain some sandy materials of $\phi 3° - 12°$. At the level of -30 - -40 m, sandy soil with ϕ value of 30° can be noticed place by place.

Chapter 3 Evaluation Analysis of Present Deteriorating Condition

3-1 Channel and Basin

From the analysis on the vessel size distribution of the Hai Phong Port directly entering into the Hai Phong Channel, the vessels whose cargo was taken by barge unloading operation (lighter) at the Ha Long Bay and the relation between vessel size and drafts in the years 1989 and 1992, the following facts are founded out.

(1) In these three years, the number of larger vessels (10,000 DWT or more) entering into the channel has significantly decreased while the number of smaller vessels (6,000 weight ton or less) has increased.

(2) It can be said that the number and the size of vessels unloaded by the lighter outside the Hai Phong Bay have become larger. On the other hand the number of large vessels coming into the channel has decreased and the number of vessels which cannot directly enter into the channel has increased.

(3) It can be read that the vessels of 6,000 - 7,000 DWT could not enter the channel with full draft and, consequently, reduced their drafts down to approx. 7m when entering the channel.

From the above analysis, it is obvious that the main cause of these declining figures is the deteriorating condition of the Channel and Basin such as the draft limitation due to the shallower channel depth. In consideration of the present condition, we list below causes of such deterioration at the Channel and Basin.

CAUSE 1: Shallowing of Channels

- (1) Siltation Increase
  - 1) Influence of the Dinh Vu Dam (Intergradation of flow route)
  - 2) Change in Silt Density of Inflow
  - 3) Change in the Shore Lines of the Nam Trieu Channel
  - 4) Effect of Littoral Drift
  - 5) Location of Disposal Areas
- (2) Maintenance Dredging
  - 1) Problems with the Execution Method
    - a) Dredging Method, b) Type of Material
  - 2) Administration Aspects
    - a) Contract Signing, b) Dredge Volume Measurement
    - c) Budget
- (3) Problems in the Natural Conditions
  - 1) Seasons for Dredging, 2) Typhoon

CAUSE 2: Tides

the fact that the port has only one tide makes the shallow channel depth even more critical.

CAUSE 3: Channel Navigation

- (1) Depth Control
- (2) Channel Width
- (3) Nighttime Navigation

3-2 QUAYWALL STRUCTURE

(1)Main Port

The quaywall at Main Port was constructed with about 20 years ago with steel-sheet pile wharves under financial assistance from U.S.S.R. Accoding to a very rough structural analysis made by the Team, it has been preliminarily concluded that the existing berths have no surplus in terms of structural capacity. However, it can be said now that the current berth usage which does not entail such critical load condition as envisaged in the original design, would not pose any imminent risk to the existing berth stability.

(2)Chua Ve Port

The design of Chua Ve Port was originally made in 1975, and the Berth No. 1 and 2 were constructed between 1975 and 1982. During this construction stage, some design condition was modified. In order to confirm the stability of the struture, the following survey has been conducted on site.

- Structural analysis on stability of the existing pier
- Eye observation on the existing open deck pier.

As a result, it has been concluded that current berth operation will not pose any critical problem in structural stability of berth itself.

3-3 CARGO HANDLING SYSTEM

3-3-1 Main Port

(1) Container Cargo Handling

The container cargoes are handled on the berth No. 1 and berth No. 7 in Main port.

On the berth No. 1, more yard equipment, management of containers by computer and communication devices like VHF are necessary.

Berth No. 7 is not proper to handle container because the jib cranes used for handling both cargoes on ship side and yard side have not enough capacity and the stacking area is very narrow. Therefore, container handled at berth No. 7 should be transferred to berth No. 2, and then containers will be handled and controlled together with those at berth No. 1.

(2) General Cargo and Bulk Cargo Handling

General cargoes are handled by quayside jib cranes and ship gears, and bulk cargoes are handled by quayside jib cranes only. The jib cranes on yard are used for handling general cargoes and bulk cargoes.

Most of jib cranes made by USSR are old and more than half of them are over 16 years old. The capacity is 5 to 10 tons and the productivity is not high. The old jib cranes with low productivity should be discarded because those cranes need a large amount of cost for maintaining. Fork-lift trucks play an important role for improving the productivity of cargo handling, and the cost is comparatively cheap. Necessary number of fork-lift trucks should be prepared.

(3) Maintenance

The corrective and preventive maintenance is now conducted by Hai Phong Port Authority. The preventive maintenance is carried out by each three months and annual according to the manuals. Hai Phong Port Authority has the necessary engineers and technicians for repairing present cargo handling equipment in the port. They also have enough machines for repairing in the workshop.

3-3-2 Chua Ve Area

Container cargoes are mainly handled in Chua Ve area. Two jib cranes are used on the ship side and mobile cranes are used on the yard. The stacking height is maximum 2 tiers. Chua Ve area is planned to make the main container terminal in the future, and the mobile crane system is not preferable method, specialized yard equipment such as transfer crane or straddle carrier would be introduced for this port.

3-4 TRANSIT SHED

(1)Main Port

In Main Port, there are 14 transit sheds that store general cargo and other seaborne cargo. The storage area of transit sheds range from 1,110 m^2 (No. 9) to 6,120 m^2 (No. 10). The cargo movement, at present, seems rather stagnant except in the container yard, the transit sheds most of the time are almost empty. The transit shed No. 12A is now under renovation to CFS and transit shed No. 10 and No. 13 have a blueprint of redeveloping into bonded warehouses.

(2)Chua Ve Port

Chua Ve Port has three transit sheds, all of them very small (280 m^2 each) and aging, serving as temporary CFS. With the opening of large scale container terminal, more efficient and modernized facilities need to be established.

3-5 PORT TRAFFIC HANDLING

(1)Main Port

The railway line enters the port through Gate No. 3. The railway marshalling yard is located at the rear of Berth No. 1 and No. 2. The major railway lines from the marshaling yard travel through the eastern boundary of the port, reaching the Berth No. 1. This railway line runs over the entire stretch of the berth line (from No. 1 to No. 11). Another main line is running inside the yard area and connected to the transit sheds. At present, about 40-60 wagons travel daily in and out the maximum 100 wagons a day and utilazation efficiency is not high. In the planning of port rehabilitation, railway realignment should be carefully executed, giving due consideration to the continuing value of railway in Vietnam. There is no clearly termed port road, except for the asphalt paved port road running in front of the transit sheds. For achieving more efficient and traffic handling in the port, some marking system would be necessary in and around the container marshalling and open storage yard.

(2)Chua Ve Port

On the quaywall of Chua Ve Port, two (2) railway lines are installed, connecting to the Main Port area. One more railway line running in the marshalling yard connects to this main line to the Main Port. At present, these railways are quite in no use. There are two port access to Chua Ve Port from Main Port, one is passing through along the shoreside of the small port complex consisting of old Chua Ve Port, City Port, local fishing ports, and another is passing through the main city road. The entrance position at Berth No. 1 forces sharp hair-pin curves to all the incoming traffic, causing inconvenience. In future, more safety and efficient traffic handling system should be established. (cf. Fig.3-1)

Chapter 4 Preliminary Demand Forecast

4-1 Method of Forecast

To estimate cargo volumes of Hai Phong Port of the target year 1998, both a macro forecast (total cargo volume forecast) and a commodity basis forecast have preliminarily been carried out.

As for a basis of the macro forecast, target growth rates or socio-economic indicators stated in "Strategy for Socioeconomic Stabilization and development Up To The Year 2000" by SPC have been applied.

The hinterland of Hai Phong Port used for the estimation of future socio-economic indicators is determined as follows;

(1) North Mountains and Midlands (13 Provinces),
(2) Red River Delta (7 Provinces), and
(3) Thanh Hoa Province , total 21 provinces. (cf. Fig.4-1)

In the estimation of the socio-economic indicators, the growth of the industrial sector will be accelerated after the annual target growth rate of 11% is achieved; namely 15% from 1996 to 2000. The population growth rate will decline 0.15% annually. The Gross Production of Industry in the hinterland has been estimated by using a correlation to the Gross Production of Industry in all provinces.

The commodity basis forecast has been obtained from a analysis of the characteristics of past cargo volume of Hai Phong Port and tendency of each commodities. Applied commodities include international container, cement, fertilizer, metal products, ore, and general cargo.

A convenient method using a correlation or growth rates has been applied to this forecast, (except for cement of which forecast is based on a balance of production and consumption).

4-2 The results of the forecast

Table 4-1 and Fig.4-2 show the results of the forecast. Forecast-1 and -2 yield almost the same figures in the target year of 1998, although there are some differences prior to the target year. It can be understood that forecast-1 represents socio-economic demand ,in other words, potentiality, and forecast-2 represents a projection under the present situation. If so, the difference may shrink after constant expand of the total throughput owing to an implementation of necessary rehabilitation.

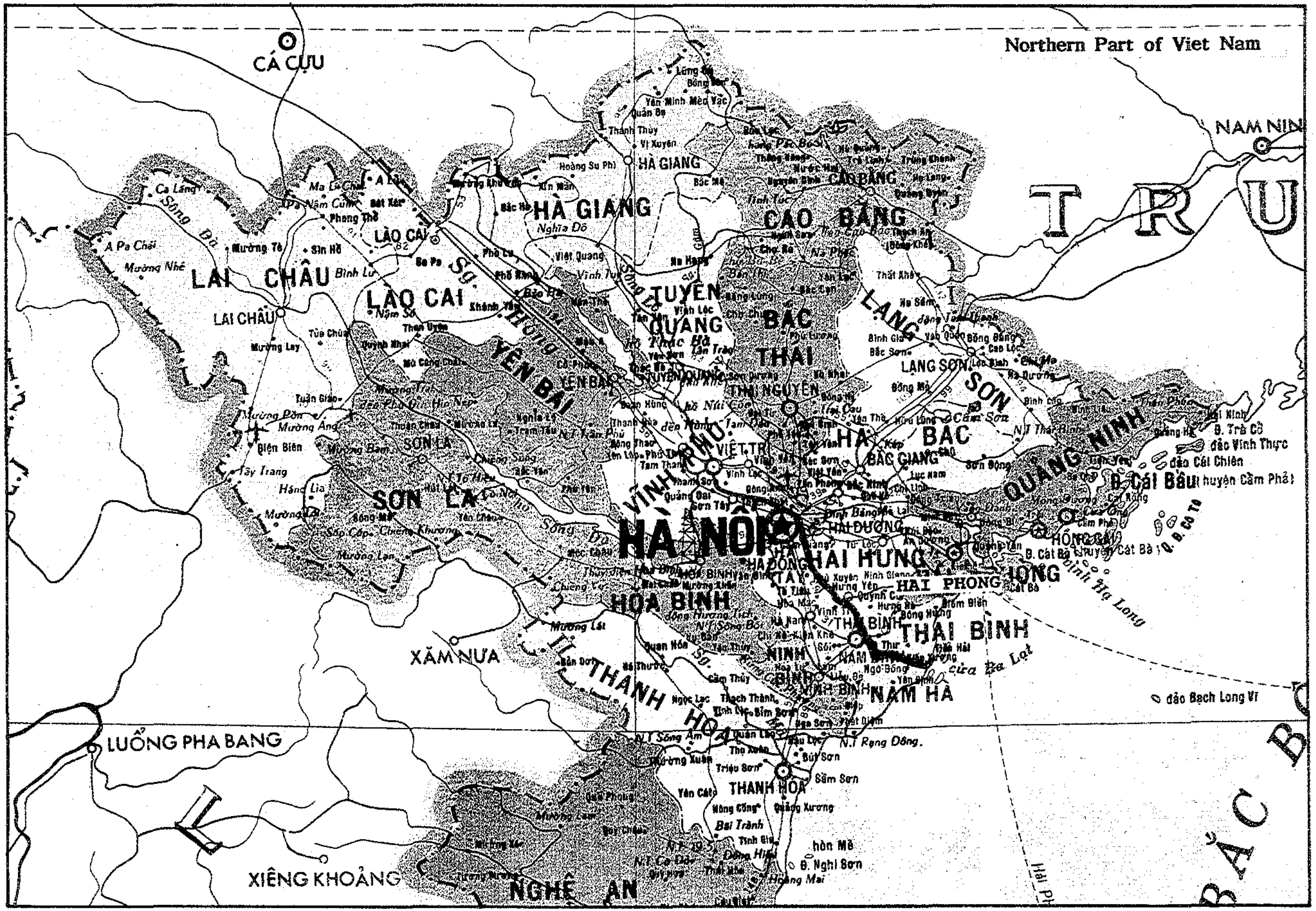


Fig. 4-1 Hinterland of Hai Phong Port

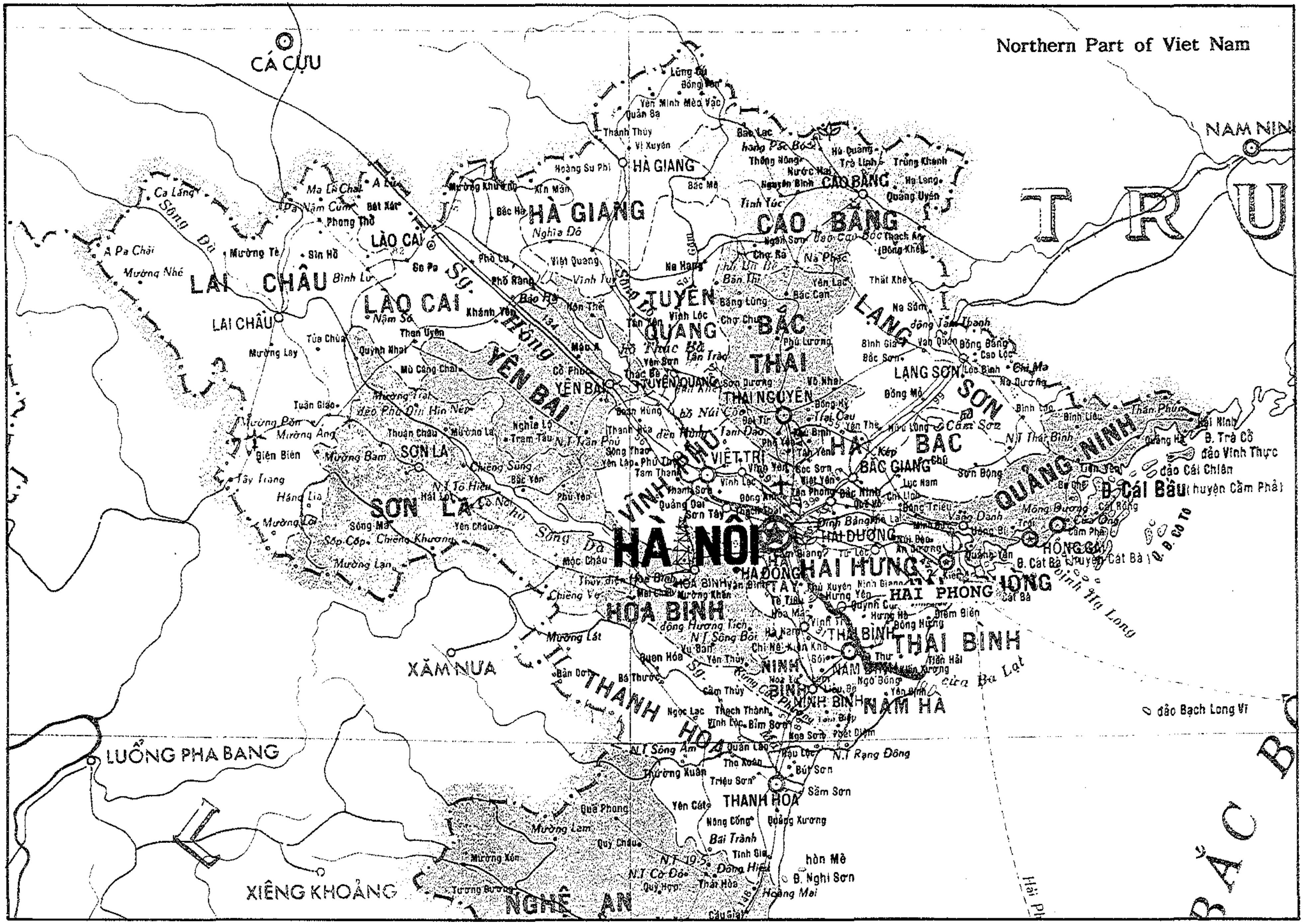


Fig. 4-1 Hinterland of Hai Phong Port

Table 4-1 Demand Forecast of Total Throughput by Commodities

UNIT:1000TON

Year		1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
ACTUAL TOTAL CARGO VOLUME		2,982	2,725	2,517	2,433	2,378								
FORECAST-1 MACRO				2,711	2,842	3,113	3,282	3,461	3,650	3,988	4,356	4,759	5,200	5,681
FORECAST-2 BY COMMODITY							2,812	3,088	3,312	3,611	4,305	4,687	5,154	5,772
EXPORT CARGO		234	751	524	409	382	585	630	680	751	872	1,050	1,296	1,653
GENERAL CARGO	1	193	212	213	111	143	308	342	380	437	502	578	664	764
LOGS, TIMBER	1	2	7	59	158	98	101	104	107	110	113	117	120	124
METAL	2	35	497	227	119	75	50	58	66	76	87	101	116	133
ORE	2	3	2	3	18	41	50	50	50	50	50	75	105	150
RICE	1	0	33	15	2	25	26	27	27	28	29	30	31	32
APATITE	2			7			50	50	50	50	90	150	260	450
IMPORT CARGO		1,499	1,068	976	621	849	1,057	1,144	1,237	1,361	1,410	1,485	1,585	1,712
GENERAL CARGO	1	433	353	382	229	283	475	516	562	633	713	804	906	1,021
FERTILIZER	1	309	271	281	313	374	367	390	412	434	369	314	267	227
METAL	2	407	283	202	28	99	114	131	151	173	199	229	264	303
ORE	2	138	75	82	39	59	60	60	60	60	60	60	60	60
ASPHALT	2	13	28	28	12	32	36	42	48	55	63	73	84	96
CEMENT	1	11	1	1	0	3	5	5	5	5	5	5	5	5
COAL	2	20					0	0	0	0	0	0	0	0
RICE	1	167	57				0	0	0	0	0	0	0	0
DOMESTIC CARGO		1,249	905	1,015	1,403	1,148	1,170	1,314	1,394	1,499	2,023	2,152	2,273	2,407
GENERAL CARGO	1	465	264	212	571	358	313	330	348	380	415	454	496	541
CEMENT	1	164	93	185	328	493	488	554	549	549	976	996	996	996
CONSTRUCTION MATERIALS	2	95	135	218	225	99	165	208	255	306	361	420	484	554
FERTILIZER	1	140	31	65	61	64	68	72	76	81	69	58	50	42
CLINKER	2	204	269	258	169	32	42	53	65	79	93	110	127	147
ORE	2		1		4	31	30	30	30	30	30	30	30	30
METAL	2	71	58	32	16	26	27	30	33	36	40	44	50	56
GYPSUM	2	26	11	24	13	22	25	25	25	25	25	25	25	25
COAL	2	68	32	20	13	20	10	10	10	10	10	10	10	10
APATITE	2	16	13		4	3	3	3	3	4	4	5	5	6
Break Bulk Cargo	1	1,885	1,321	1,414	1,773	1,841	2,150	2,339	2,465	2,657	3,192	3,355	3,535	3,752
Export	1	196	252	287	271	266	435	472	514	575	645	724	815	920
Import	1	920	681	665	542	660	847	911	978	1,072	1,087	1,123	1,178	1,253
Domestic	1	769	388	463	960	915	868	955	973	1,010	1,460	1,508	1,542	1,580
Bulk Cargo	2	1,097	1,404	1,101	660	537	662	749	846	954	1,114	1,332	1,620	2,019
Export	2	38	499	238	138	116	150	158	166	176	227	326	481	733
Import	2	579	387	311	79	189	210	233	259	289	323	362	408	460
Domestic	2	480	518	552	443	233	301	359	422	490	563	644	731	827

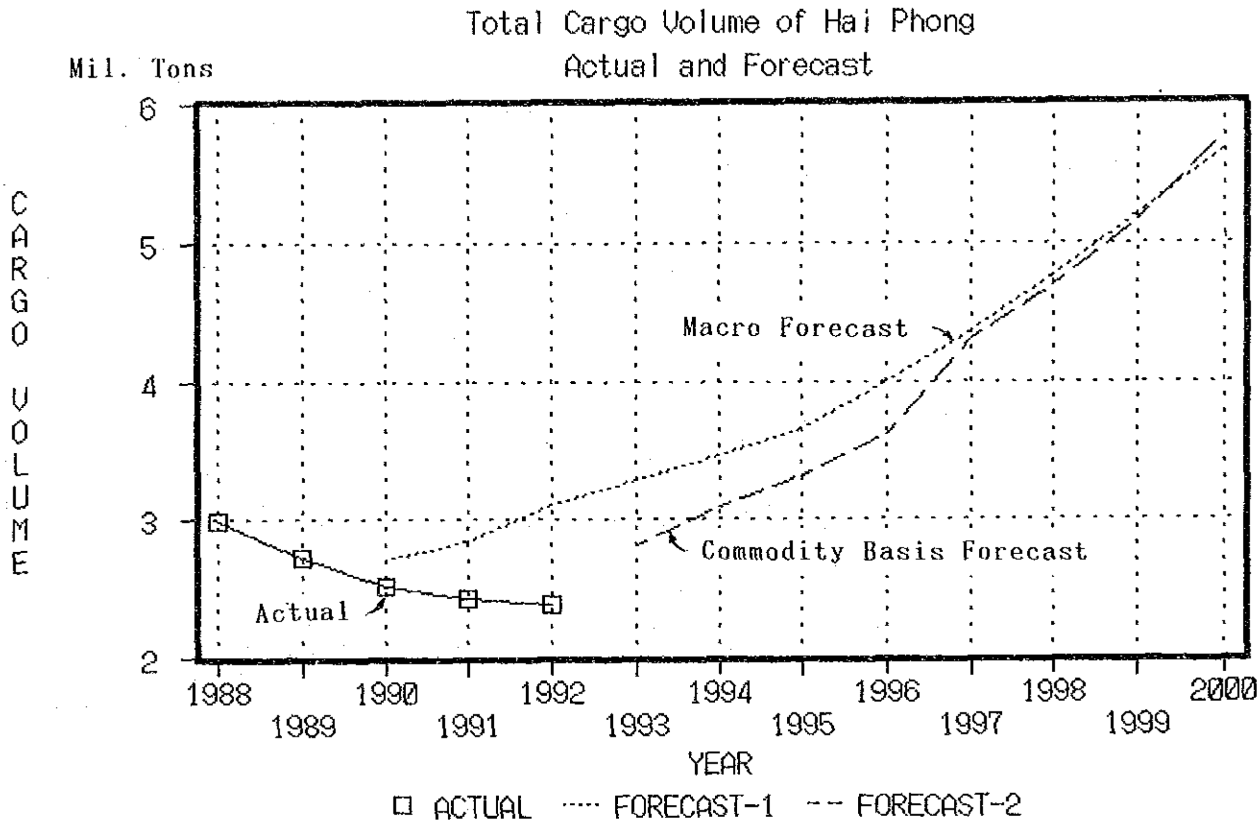


Figure 4-2 Forecast of Total Cargo Volume
(Macro and Commodity Basis)

4-3 Containerization

The forecast of container cargo has been obtained from the multiplication of containerizable cargo volume and container ratio in each years. The domestic break bulk cargo has been excluded from the containerizable cargo. The container ratio has been determined by using theoretical logistic curve on the basis of the past throughput. The upper limit of the container ratio has also been determined as 80% with reference to the past records or planned values in other Asian Ports.

The summary of the forecast is shown in Table 4-2, and Fig.4-3 gives the comparison of the estimated and the actual container ratio of Hai Phong Port. The container ratio of Saigon Port obtained from the original calculation is also indicated in the same figure. It can be said that both ports have the same background in terms of the international containerization, thus the increase of container ratio may be the similar in both ports as shown in Fig.4-3. This comparison can emphasis the propriety of the estimated container volume in Table 4-2.

Table 4-2 Forecast of Container Cargo Volume and TEU

	Units	Actual			1993	Forecast							
		1990	1991	1992	Jan-Jun	1993	1994	1995	1996	1997	1998	1999	2000
Total	Stuffed TEU	17191	14389	25467	18213	40500	52840	66160	83420	95780	110120	124460	140780
	Empty TEU	1365	4738	8644	6705	16500	21160	25840	31580	37220	43880	50540	58220
	Empty Ratio	7.4%	24.8%	25.3%	26.9%	28.9%	28.6%	28.1%	27.5%	28.0%	28.5%	28.9%	29.3%
	Total TEU	18,556	19,127	34,111	24,918	57,000	74,000	92,000	115,000	133,000	154,000	175,000	199,000
	Tons/TEU	9	8	8	8	8	8	8	8	8	8	8	8
	Tons	167,808	159,007	273,603	204,186	460,000	598,000	750,000	934,000	1,082,000	1,239,000	1,408,000	1,593,000
Export	Stuffed TEU	8283	5437	8959	5261	16000	20500	25000	30500	36000	42500	49000	56500
	Empty TEU	1181	4483	8318	5848	16000	20500	25000	30500	36000	42500	49000	56500
	Empty Ratio	12.5%	45.2%	48.1%	52.6%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
	Total TEU	9,464	9,920	17,277	11,109	32,000	41,000	50,000	61,000	72,000	85,000	98,000	113,000
	Tons/TEU	8	6	6	7	6	6	6	6	6	6	6	6
	Tons	71,116	63,634	109,230	76,702	201,000	256,000	313,000	382,000	455,000	533,000	617,000	709,000
Import	Stuffed TEU	8908	8952	16508	12952	24500	32340	41160	52920	59780	67620	75460	84280
	Empty TEU	184	255	326	857	500	660	840	1080	1220	1380	1540	1720
	Empty Ratio	2.0%	2.8%	1.9%	6.2%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
	Total TEU	9,092	9,207	16,834	13,809	25,000	33,000	42,000	54,000	61,000	69,000	77,000	86,000
	Tons/TEU	11	10	10	9	10	10	10	10	10	10	10	10
	Tons	96,692	95,373	164,373	127,484	259,000	342,000	437,000	552,000	627,000	706,000	791,000	884,000

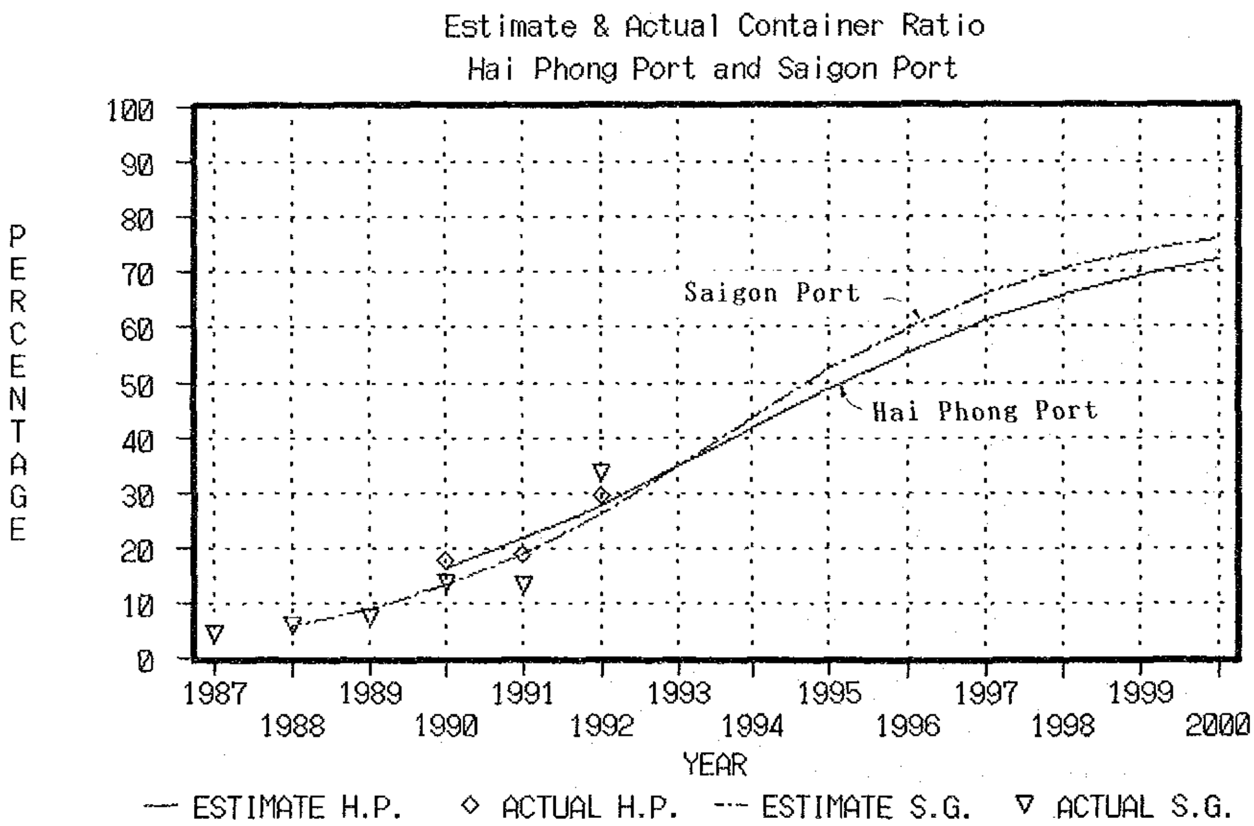


Figure 4-3 Container Ratio / Actual and Forecast

4-4 Cargo Distribution to Cai Lan Port

Only a small amount of export cargoes such as apatite and ore (approx. 0.6 mil. tons) out of the forecasted throughput of Hai Phong in 2000 (5.7 mil. tons) has been considered as a share with Cai Lan around the year 2000.

4-5 Cargo from/to China

The expected cargo volume of 2 to 5 million tons from/to Ynnan province of China is separately considered as an additional volume of one million tons in the target year and the year 2000.

This is because a long history lie on the border of these two countries, and there still remains such a political tactics as suspending containers to China at Hai Phong Port for a long time. Moreover, there are many sorts of Chinese general goods and materials that can already be found in Hai Phong city. Accordingly, it should be noted that the present cargo volumes already include a certain amount of Chinese cargoes.

4-6 Summary

Table 4-3 summarizes each elements of the preliminary demand forecast:

Table 4-3 Summary on Preliminary Demand Forecast

Year		1998	2000	Remarks
Cargo Volume (in 10,000tons)		470	570	600,000tons to Cai Lan Port in the year 2000
		570	670	Incl:China Trade
Container	Volume	120	160	(in 10,000tons)
	T E U	15	20	(in 10,000TEU)

It should be noted that the forecast has been made upon the following conditions;

(1) The estimation is basically according to the growth of Gross Product of Industry (GPI).

(2) The GPI has been assumed to reach the high targets set in the national economic plan. Thus, the figures in the forecast accordingly reflect the optimistic values.

(3) The Chinese cargo volumes may not be firm, but, the volume will steadily increased if diplomatic relations between Vietnam and China proceed under favorable condition.

4-7 Forecast of Vessel Type and Size

The average vessel size for each type of cargo vessels and container ships calling Hai Phong Port in 1992 resulted in 5,250DWT for bulk cargo vessel, 4,834DWT for general cargo vessel, 9,139DWT for bagged cargo vessel, and 4,414DWT for container cargo vessel.

On the other hand, Fig.4-4 and Fig.4-5 show the frequency at which those vessels entered the Access Channel in 1989 and 1992 respectively . The number of vessels over 10,000DWT had been declining during those three years, while the number of vessel, less than 6,000DWT, had increased.

(1) Forecast of Vessel Size

It is predicted that future distribution of vessel size will be similar to that in 1992. Accordingly, if the maximum average size of vessels can be used for the planned vessel size, then 9,000DWT in 1992 may be applied to the planning.

It is also predicted that the past entering frequency will be recovered after the implementation of the Urgent Rehabilitation Plan, and the condition of calling vessel in the target year will be the similar to that in 1989. The average size of vessels over 6,000DWT, which are required for lighter, is 10,900DWT with reference to Fig.4-4.

After consideration of both vessel size and entering frequency, it is determined that **10,000DWT** is to be applied to the Rehabilitation Plan.

(2) Draft of Planned Vessel Size

The full draft of each vessel size used for the design of the Access Channel is shown in Fig.4-6, and Fig.4-7 proofs a propriety of the design draft (shown as □) by indicating the actual entering draft of calling vessels in 1989 (shown as △) and 1992 (shown as ◇).

The draft of the planned vessel size 10,000DWT, therefore, is **8.3m** using Fig.4-6.

(3) Overall Length (LOA) of Planned Vessel

The LOA of each converted DWT class vessel in 1992 is plotted on Fig.4-8. The LOA of the planned vessel size 10,000DWT, is determined as **140m** from the figure.

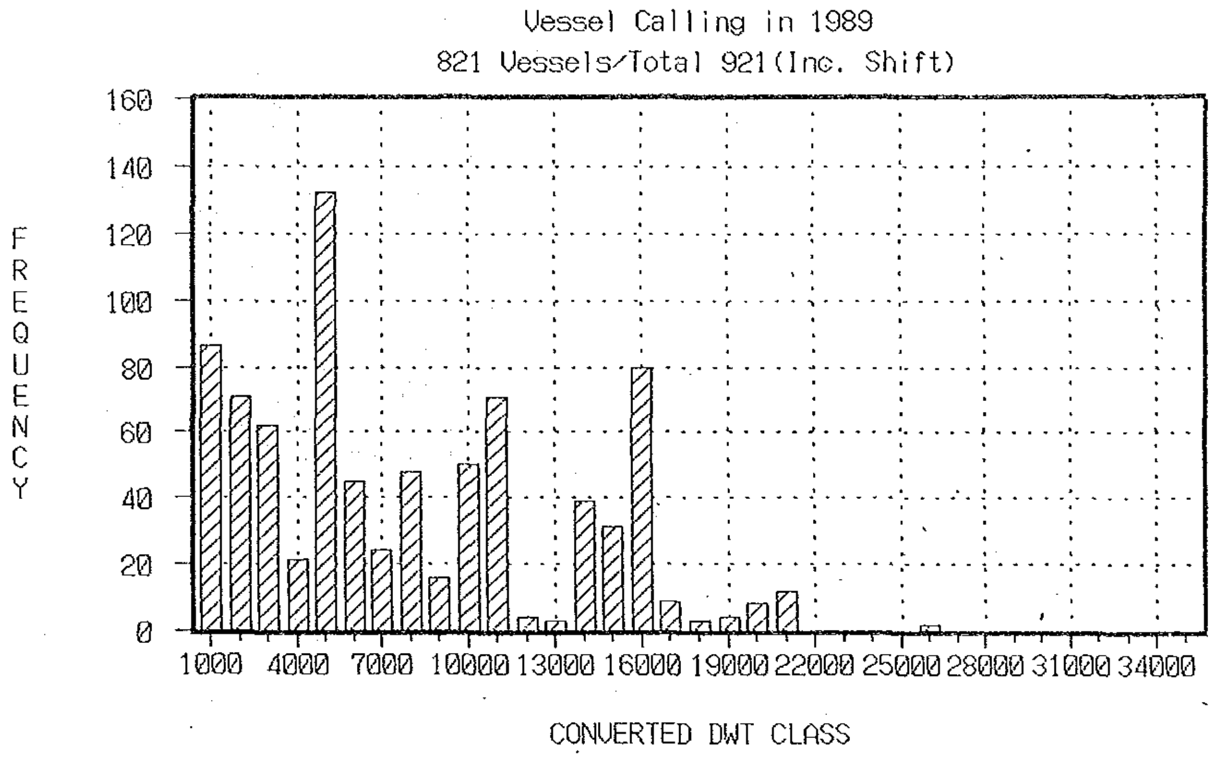


Fig. 4-4 Frequency of Calling Vessels (1989)

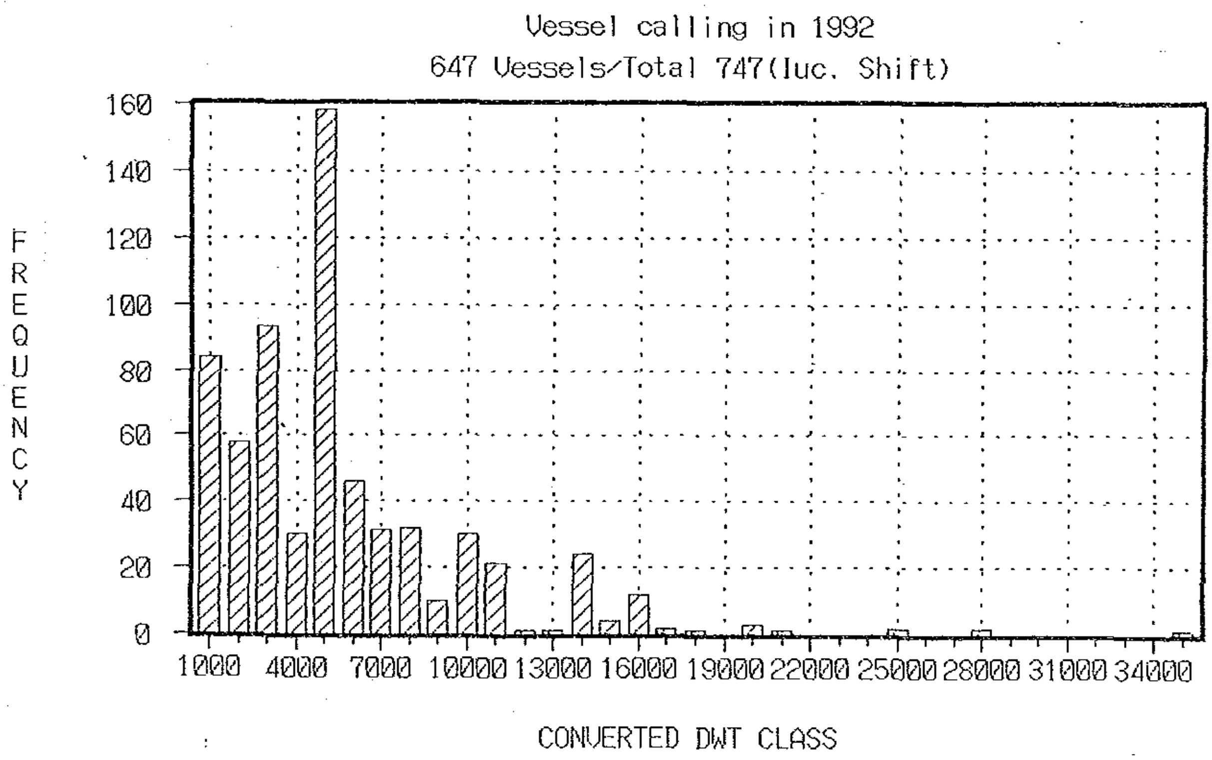
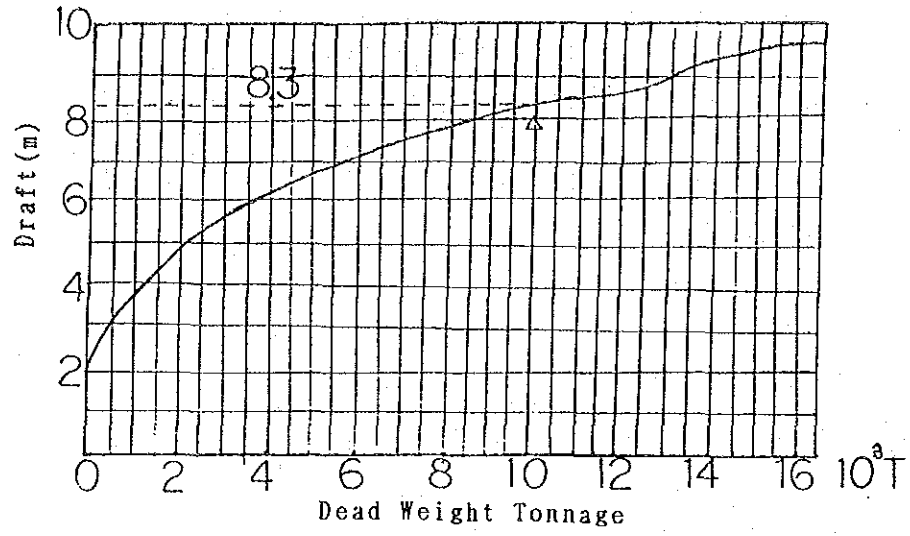


Fig. 4-5 Frequency of Calling Vessels (1992)



Sorce:「The Process For Designing Sea Channels」 From VINAMARINE

Fig. 4-6 Full Draft of Vessel Size used for Channel Design

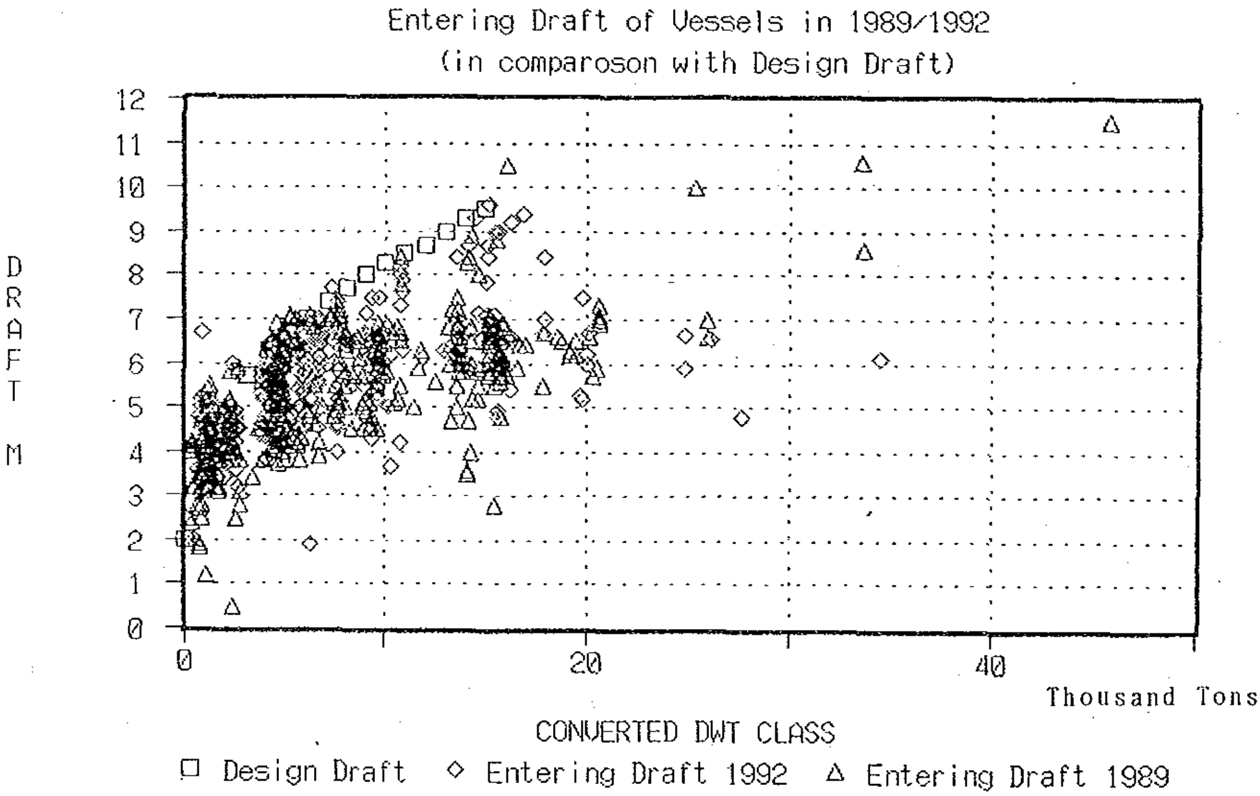


Fig. 4-7 Entering Draft of Vessels (1989/1992)

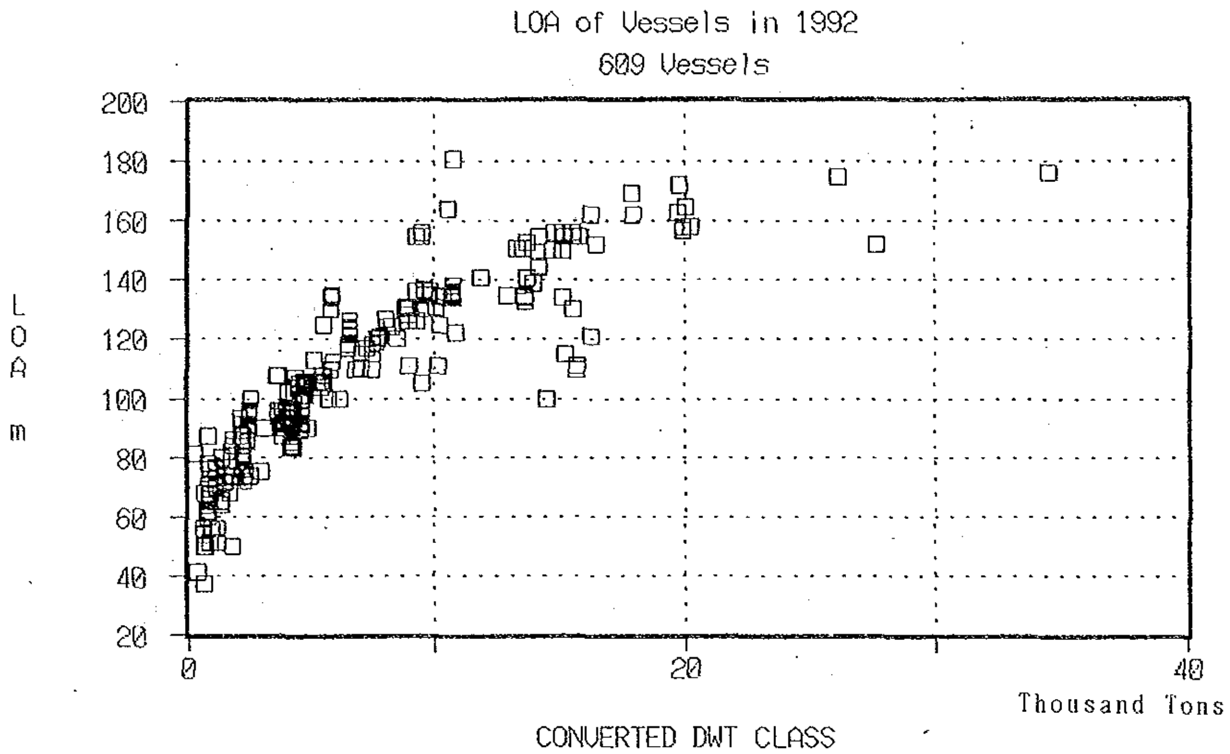


Fig. 4-8 LOA of Vessels (1992)

Chapter 5 Principle of the Rehabilitation Plan

5-1. Relationship with Cai Lan Port

Considering the present conditions surrounding Cai Lan Port, even when Cai Lan Port begins operation, a substantial handling volume cannot be expected for several years. Therefore, in this study,

Handling volume of Cai Lan Port is not considered.

None the less, as for the forecast of cargo in the year 2000, the handling cargo of Hai Phong Port shares a certain volume of export.

5-2. Target year

The plan is completed in 5 years and the target year is 1998.

5-3. Cargo handling volume

The total cargo handling volume of Hai Phong Port at the target year of 1998 is predicted as follows:

4.7 million tons including 1.2 million tons of container cargo (0.15 million TEU)

Considering the various kinds of handling cargo based on the former facilities and the future development plan, the total cargo handling volume is distributed as shown in Table 5-1, and these figures in the table are used for the Rehabilitation Plans.

Table 5-1 Cargo Share in Hai Phong Port

Year / Unit	1992 1,000T	(Container) 1,000TEU	1998 1,000T	(Container) 1,000TEU
Total	2378	(273) 34	4700	(1240) 150
Vat Cach Port Area	310		620	
Main Port Area	1516	(104) 14	2770	(600) 75
Old Chua Ve Port Area	68		70	
Chua Ve Port Area	165	(169) 20	600	(600) 75
Halon Bay Lighter	319		640	

5-4. Access channel and basin

The planned maximum vessel size (which can go in and out of the port during all tidal conditions) is determined as follows:

> Maximum vessel size is planned as 10,000 DWT class in full-loaded (draft -8.3m) condition.

However,

> Considering the actual maintained water depth of the Access Channel, 7,000 DWT(fully loaded, draft -7.3m) vessel size is also planned.

(1) Alignment of the Access Channel (cf. Fig.5-1-(1)&(2))

Since the mechanism of siltation at Nam Trieu Channel is very complicated, it is not clear at this moment how much siltation can be reduced when changing the alignment of the Access Channel. As a consequence,

> The plan of the Access Channel is proposed in accordance with the prediction of siltation under the condition of the present alignment of the Access Channel.

In this Study, in case that the alignment of Nam Trieu Channel is to be altered,

> The investment cost (the initial dredging cost) is estimated for the straight line alignment, and it is examined whether the investment cost is appropriate or not.

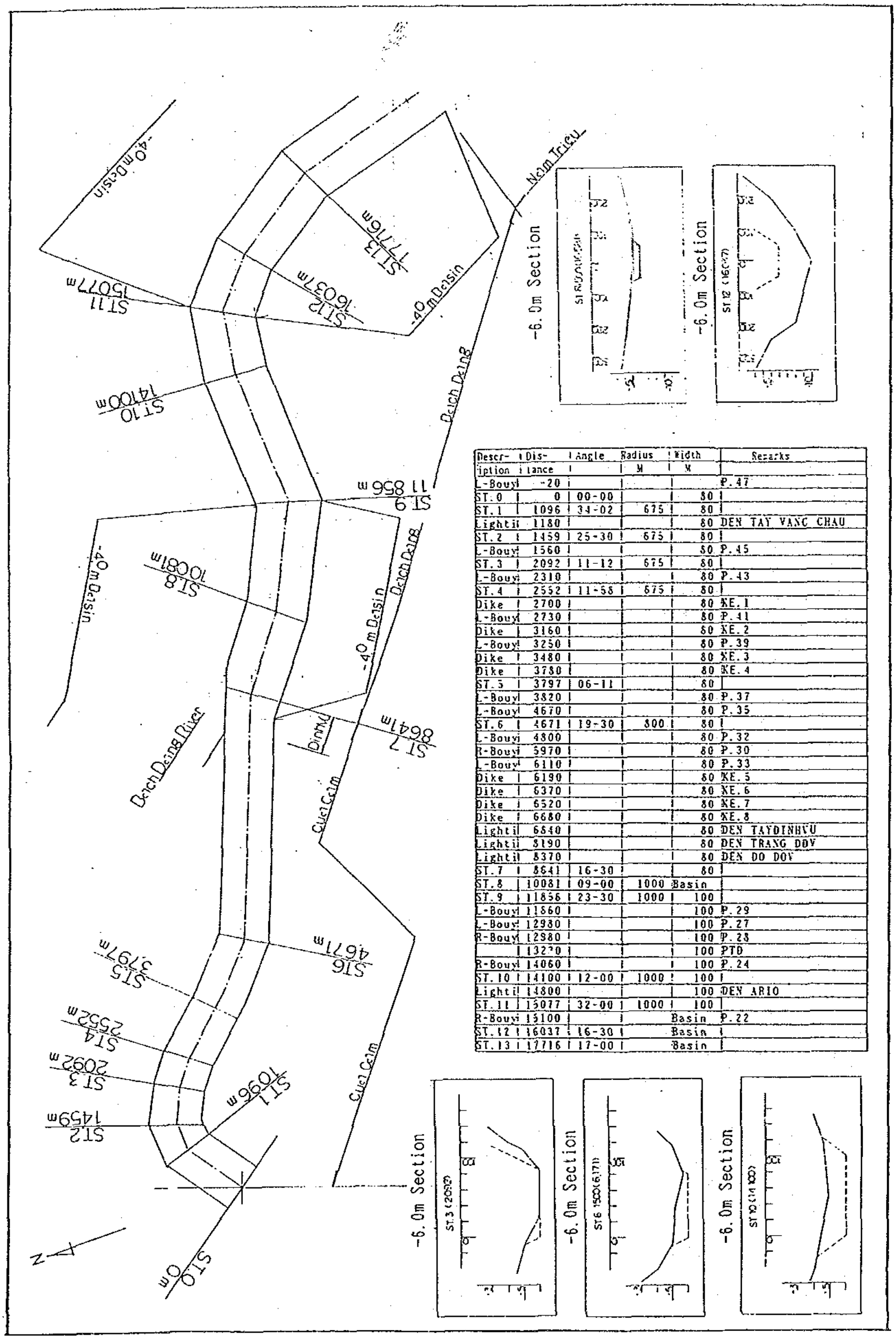
(2) Width of the Access Channel

Widening the Access Channel enlarges dredging volume and siltation volume of the channel, and consequently it becomes uneconomical. Therefore, under the condition that the safe navigation shall be maintained and excess maintenance volume shall be minimized,

> The Access Channel Plan shall be set up such that the width of the channel is not enlarged as much as possible.

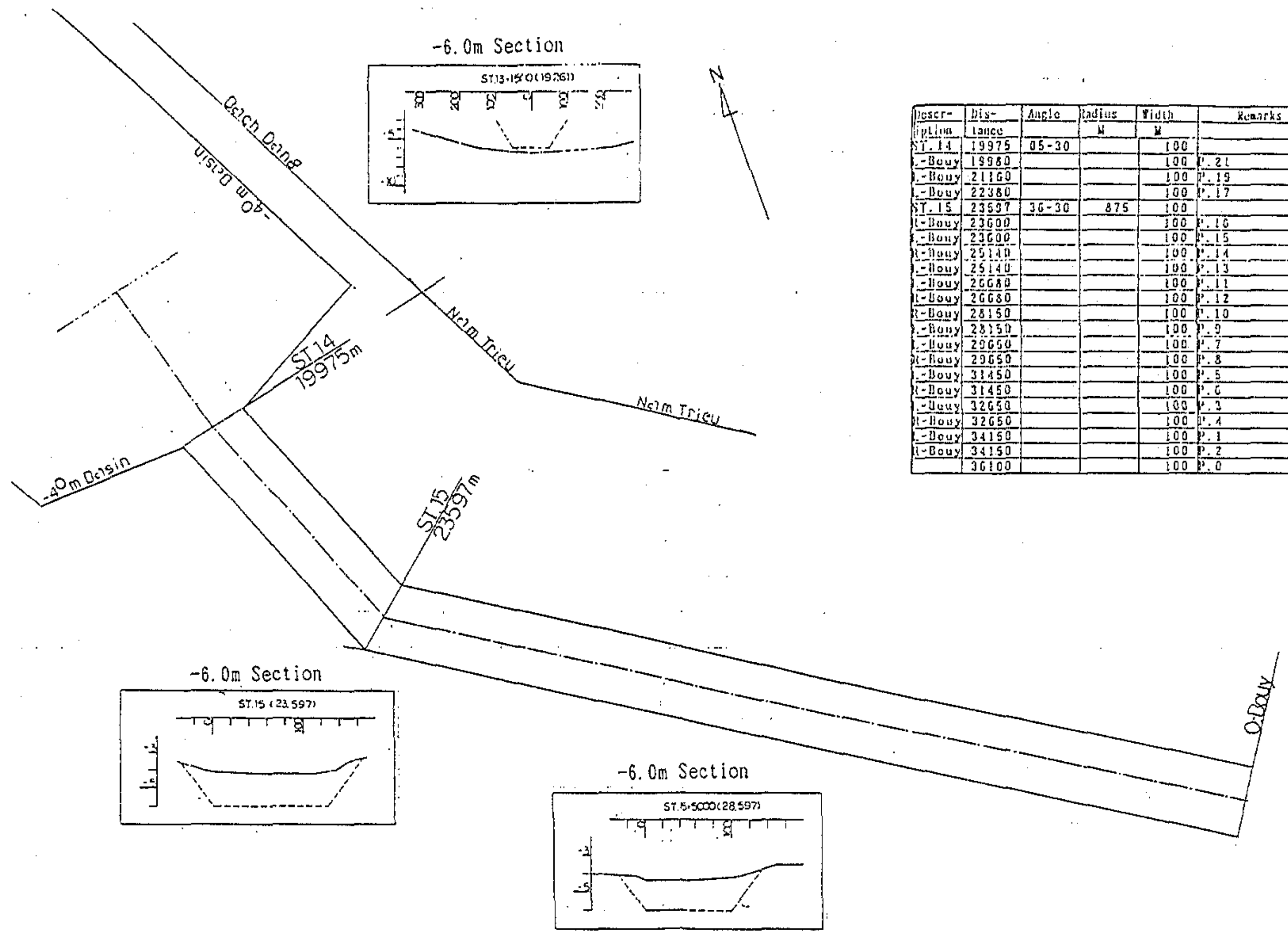
(3) Construction of dikes

Technical methods of dikes have been effective as empirical methods by Vietnamese Government and they have been applied to



Descr- iption	Dis- tance	Angle	Radius M	Width M	Remarks
L-Bouy	-20				P.47
ST.0	0	00-00		80	
ST.1	1096	34-02	675	80	
Lighti	1180			80	DEN TAY VANG CHAU
ST.2	1459	25-30	675	80	
L-Bouy	1560			80	P.45
ST.3	2092	11-12	675	80	
L-Bouy	2310			80	P.43
ST.4	2552	11-58	675	80	
Dike	2700			80	KE.1
L-Bouy	2730			80	P.41
Dike	3160			80	KE.2
L-Bouy	3250			80	P.39
Dike	3480			80	KE.3
Dike	3780			80	KE.4
ST.5	3797	06-11		80	
L-Bouy	3820			80	P.37
L-Bouy	4670			80	P.35
ST.6	4671	19-30	800	80	
L-Bouy	4800			80	P.32
R-Bouy	5970			80	P.30
L-Bouy	6110			80	P.33
Dike	6190			80	KE.5
Dike	6370			80	KE.6
Dike	6520			80	KE.7
Dike	6680			80	KE.8
Lighti	6840			80	DEN TAYDINHVU
Lighti	8190			80	DEN TRANG DOV
Lighti	8370			80	DEN DO DOV
ST.7	8641	16-30		80	
ST.8	10081	09-00	1000	Basin	
ST.9	11856	23-30	1000	100	
L-Bouy	11860			100	P.29
L-Bouy	12980			100	P.27
R-Bouy	12980			100	P.28
	13270			100	PTD
R-Bouy	14060			100	P.24
ST.10	14100	12-00	1000	100	
Lighti	14800			100	DEN ARIO
ST.11	15077	32-00	1000	100	
R-Bouy	15100			Basin	P.22
ST.12	16037	16-30		Basin	
ST.13	17716	17-00		Basin	

Fig. 5-1-(1) The Access Channel Plan



Descr-iption	Dis-tance	Angle	Radius M	Width M	Remarks
ST.14	19975	05-30		100	
L.-Bouy	19980			100	P.21
L.-Bouy	21160			100	P.19
L.-Bouy	22380			100	P.17
ST.15	23597	36-30	875	100	
R-Bouy	23600			100	P.16
L.-Bouy	23600			100	P.15
R-Bouy	25140			100	P.14
L.-Bouy	25140			100	P.13
L.-Bouy	26680			100	P.11
R-Bouy	26680			100	P.12
R-Bouy	28150			100	P.10
L.-Bouy	28150			100	P.9
L.-Bouy	29650			100	P.7
R-Bouy	29650			100	P.8
L.-Bouy	31450			100	P.5
R-Bouy	31450			100	P.6
L.-Bouy	32650			100	P.3
R-Bouy	32650			100	P.4
L.-Bouy	34150			100	P.1
R-Bouy	34150			100	P.2
	36100			100	P.0

Fig. 5-1-(2) The Access Channel Plan

the other ports such as Hanoi Port. Therefore,

These dikes shall be taken into consideration after corroborating their technical basis introduced by Vietnamese Government.

(4) Basin

The Study Team is to investigate site conditions to find an appropriate navigation system and to propose an improved system if applicable.

After examining the necessity of an additional turning basin, improvement of turning basins is to be considered.

(5) Prediction of siltation and maintenance dredging volume

(1) First of all, as for the mechanism of siltation, what kind of phenomenon is to occur is classified based on various sources and interviews with specialists.

(2) Secondly, as much past data on siltation and maintenance dredging volume as possible are scrutinized and classified.

(3) Thirdly, by utilizing those classified actual data, past siltation rate is summarized and the siltation in case that the Access Channel is deepened by dredging is to be estimated.

(4) Finally, the siltation rate of each area is obtained by analyzing past data, and the future siltation volume is estimated. On the other hand, the planned dredging volume includes the siltation volume while executing this Rehabilitation Plan. (This is considered as excess volume during construction.)

(6) Introduction of dredging fleet

In order to maximize the efficiency of maintenance dredging, appropriate dredging fleet in terms of quantity, capacity, and type shall be examined carefully.

5-5. Port facilities

(1) Main Port Area

A complete revision might not be a good idea, considering the investment cost and effects. Therefore, in order to increase the handling capacity,

> An improvement plan will be drafted after determining the priority of the above facilities.

> Containers are arranged to the same area, and berths No.1- No.3 are improved to handle containers intensively.

Berth No.7 will be used only for general cargo.

Proposed handling volume of containers is 75,000 TEU, which is almost limit of geared crane's handling capacity, but considering to take use of a jib crane (14 ton capacity) in spite of its tiny performance,

> In this Study, only expansion of yard and enhancement of yard capacity are considered.

> The warehouse behind berth No.9 is considered as a bond transit shed, and it is equipped to handle foreign cargo such as EPZ.

> Only the railways on the berth that pose obstacle to the transportation system shall be removed.

The area beyond the present boundary of Main Port Area has been utilized for the downtown activity, and in this Study,

> The boundary shall remain the same.

As for the facilities such as electricity, water supply, and buildings for offices, the concept of "Scrap and Build" is adopted to enhance overall management efficiency.

(2) Container terminal at Chua Ve

> A specialized container berth with high efficiency shall be under study to improve the handling capacity, including land reclamation plan.

(3) Cargo handling equipment

1) Equipment in Main Port Area

The main handling equipment in Main Port Area is a jib-typed crane, and 25 cranes from 5 ton to 16 ton capacity are utilized.

> These jib cranes shall be replaced except for ones handling bulk cargoes and heavy cargoes for the reasons of superannuation and effective rate of operation.

The average effective rate of operation of jib crane is 22 %, which is very low.

> Handling of general cargo and bagged cargo shall be left to ship gears.

> Present minor equipment such as forklift trucks shall be replaced by new ones as necessity dictates.

2) Equipment in the Chua Ve Area

i) Gantry Crane

In case that the expanded berth is implemented, one gantry crane handling container cargo is required.

ii) Yard equipment

> The optimum yard equipment shall be determined considering whether up-graded equipment such as transfer crane and straddle carrier is required or not.

5-6. Management and operation systems

> (1) When implementing the Rehabilitation Plan, the management and operation systems related to the plan are first chosen and those systems are considered to be improved.
>
> (2) Efficient cargo handling operation system as well as treatment of documentation for container handling will also be proposed.

Chapter 6 Improvement Plan of the Access Channel and Basin

6-1 Natural Conditions of The Access Channel and Basins

The access channel connecting the Hai Phong Port with the deep sea of Tongking Gulf has a length of 36km. The channel is divided into three sections namely: Nam Trieu, Bach Dang and Cua Cam based on river flows, and into four.

The rate of sediment transport is complicatedly caused by discharged density, current speed carrying grain size, etc. Statistics show that the volume of sediment transport in the Nam Trieu channel area was amounted to 880,000 tons/month in the wet season and 25,000 tons/month in the dry season, with an annual total of 4,500,000 tons.

This channel's section has the worst sedimentation volume and its phenomenon has caused a lot of complex elements. There are two factors that caused siltation: one is the sinking of sediment load flowing down from the river, the other is waves and tides stirring up the fine grain size mud from seabed (deposits) and transporting in the channel. In this siltation including sand grain is considered to be the result of the coastal erosion on the Cat Hai shoreline of Ha Nam Island.

The change on rate of sedimentation in relation to dredged depth in Nam Trieu channel area during the period of 1991-1993 is graphically shown on Figure 6-1.

6-2 Nautical Aspect

The ship, when passing through the outer-section of Nam Trieu channel (about 15 km long), navigates at a cruising speed of 7-8 knots. Sometimes, during this passage, the ship are severely influenced by waves and currents crossing the channel.

The access channel is lighted by 12 navigational aids (odd-numbered buoys) on the right, 22 (even-numbered buoys) on the left and six leading lights. The access channel range lights are installed on the Nam Trieu section and on the Bach Dang section.

Since 1976, large vessel entering the port have been navigated by tidal operation due to the limited depth of the access channel. Tide level of above +2.5m are considerable for operation in view of the navigational time on the channel.

It is called official depth which is obtained by subtracting the underkeel clearance (0.3m) from the shallowest of sounding results.

6-3 Dredging Volume and its Sedimentation Volume in Various Depths

6-3-1 Dredging Volume in Various Depths (-5.0m, -6.0m, and -7.0m)

Based on latest depth sounding records which carried out in

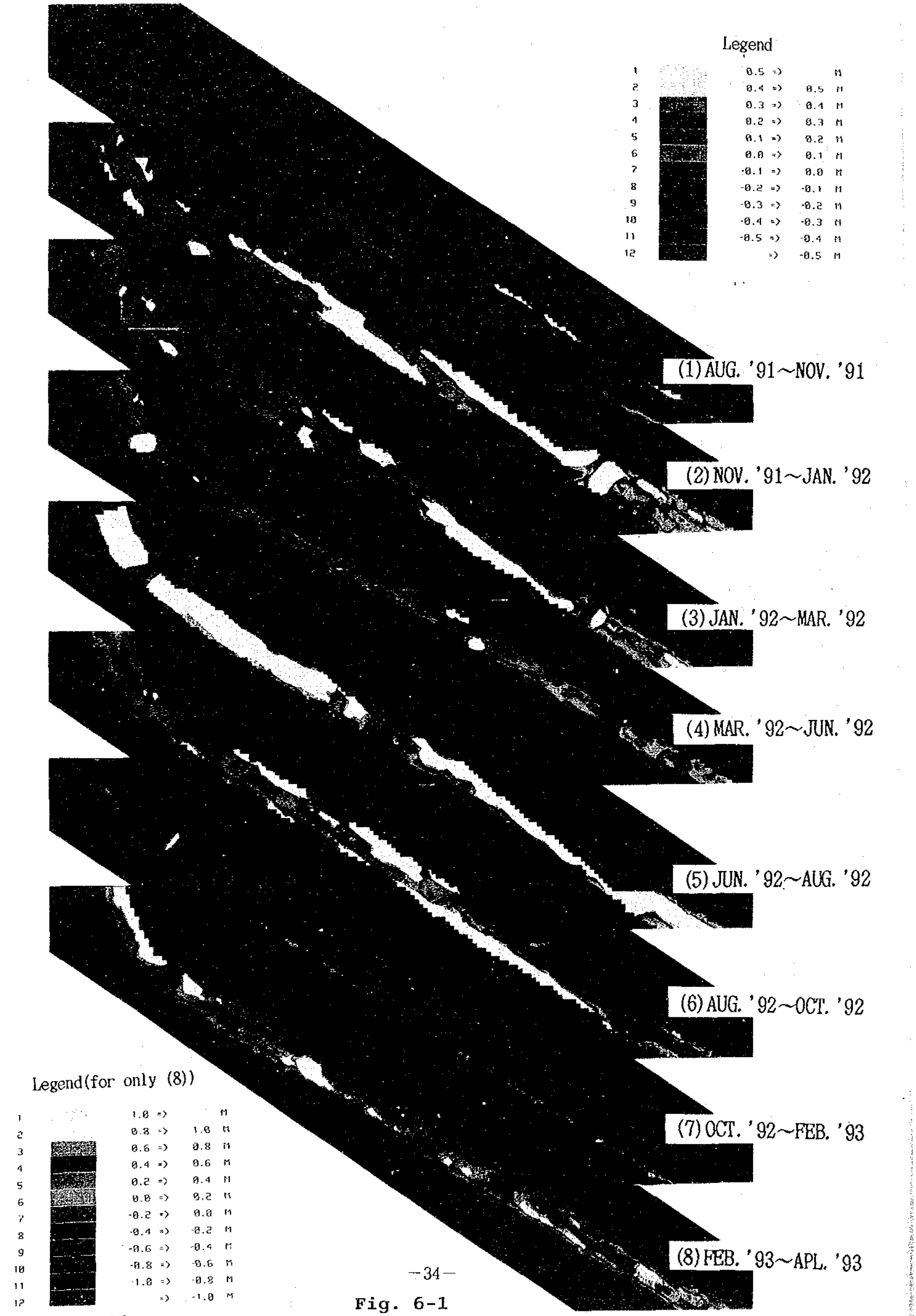


Fig. 6-1
The rate of Sedimentation Speed of Nam Trieu Channel from 1991 to 1993

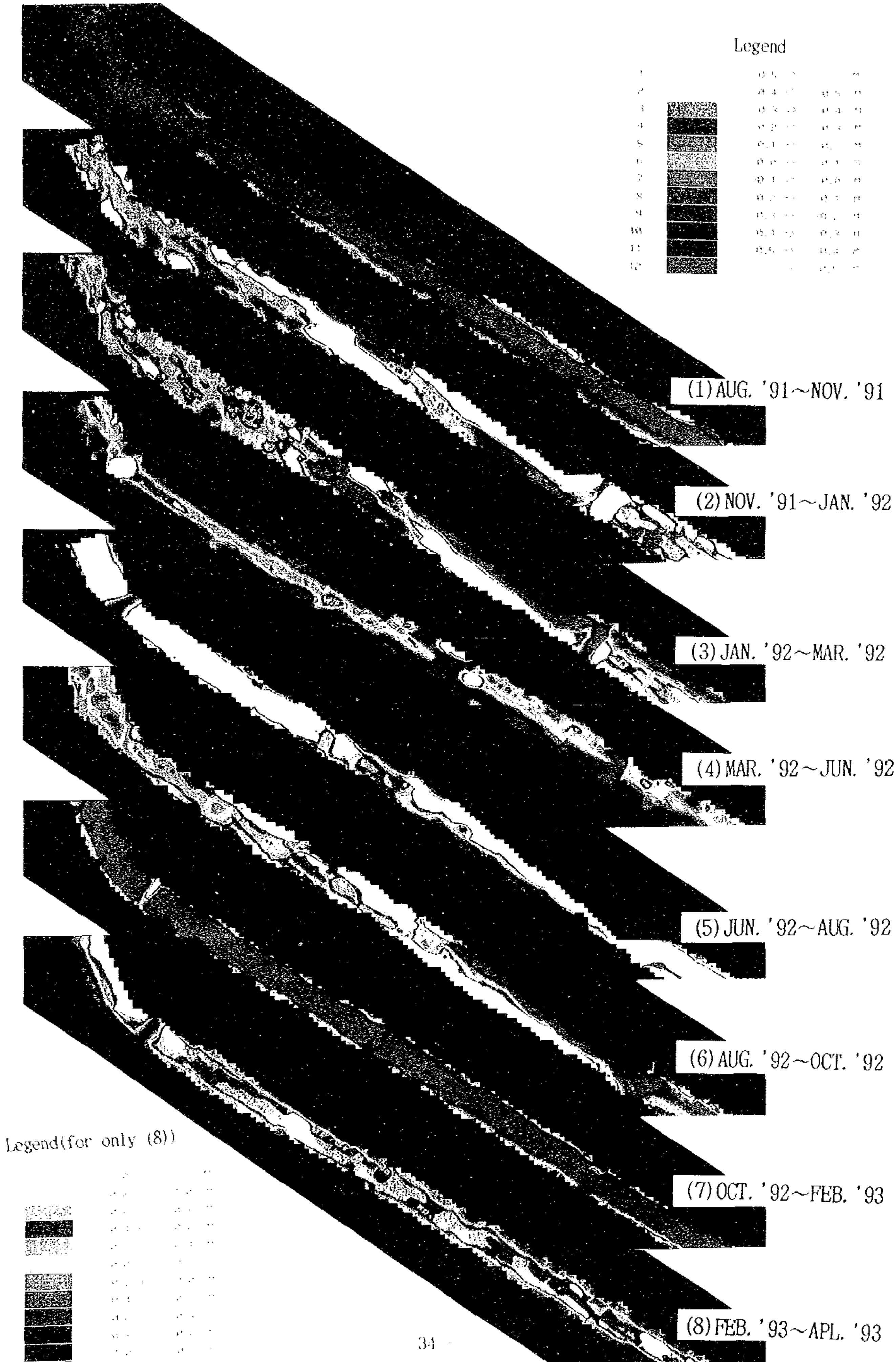


Fig. 6-1
The rate of Sedimentation Speed of Nam Trieu Channel
from 1991 to 1993

June 1993, the volume of dredged earth was calculated at planned depth of -5.0m, -6.0m, and -7.0m, and its Summary of dredging volume are shown on Table 6-1.

Table 6-1 Summary of Dredging Volume

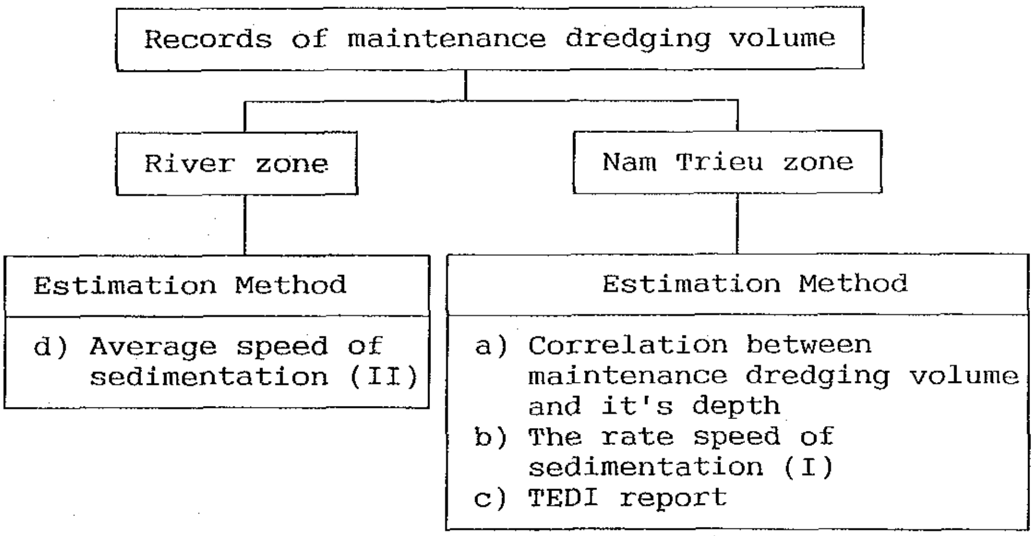
Unit: 1,000 m3

Net Area	From To	Existing -5.0 m	Existing -6.0 m	Existing -7.0 m
1. Channel				
Song Cam	ST0-ST7	50	290	1,230
Bach Dang	ST7-ST14	80	770	1,460
Nam Trieu	ST14-END	880	2,660	4,940
Sub Total		1,010	3,720	7,630
2. Basin				
Basin		920	920	920
Total		1,930	4,640	8,550

6-3-2 Sedimentation volume in various zone

In analyzing the sedimentation volume, the channel will be divided into two zones: the river zone including the Cua Cam and Bach Dang rivers and the Nam Trieu channel zone in Ha Long Bay as shown in Figure 6-2.

Fig. 6-2 Method of Analyzing Sedimentation Volume



Note: b) The rate speed of sedimentation (I)
The dredging records such as the position, period and its depth were used in this method which only available after July 1989

d) Average speed of sedimentation (II)
The method of calculating the total sedimentation volume in the Cua Cam River from 1983 to 1986 was determined from sounding records between 1983 and 1986 adding the dredged volume obtained during these periods, and the results divided by 4 years.

Analysis of the sedimentation volumes summarized from (a) to (d) as shown in Table 6-2.

Table 6-2 Summary of Analyzed Sedimentation Volumes

Unit: 1,000 m3

Area	Nam Trieu	Nam Trieu	Nam Trieu	Cua Cam	Bach Dang
Method	(a)	(b)	(c)	(d)	(d)
Depth					
-5.0m	3,200	3,290	2,459	168	30
-5.5m	4,200	4,060	3,440		
-6.0m	5,100	4,940	4,727	608	560
-6.5m	6,000	6,080	5,996		
-7.0	7,000	7,290	6,965	648	700

The above results induced us to determine the sedimentation volumes with assumption at various case studies of depths as follows.

Table 6-3 Determination of Sedimentation Volumes

Unit: 1,000 m3

Section	-5.0 m	-6.0 m	-7.0 m
Nam Trieu	3,290	4,940	7,290
Bach Dang	30	560	700
Cua Dam	168	608	648
Basin	0	190	Not Estimated

6-4 Improvement Plan

6-4-1 Determination of maintenance dredging depth

The procedure on how to provide an improvement plan for access channel and basin is shown in Figure 6-3.

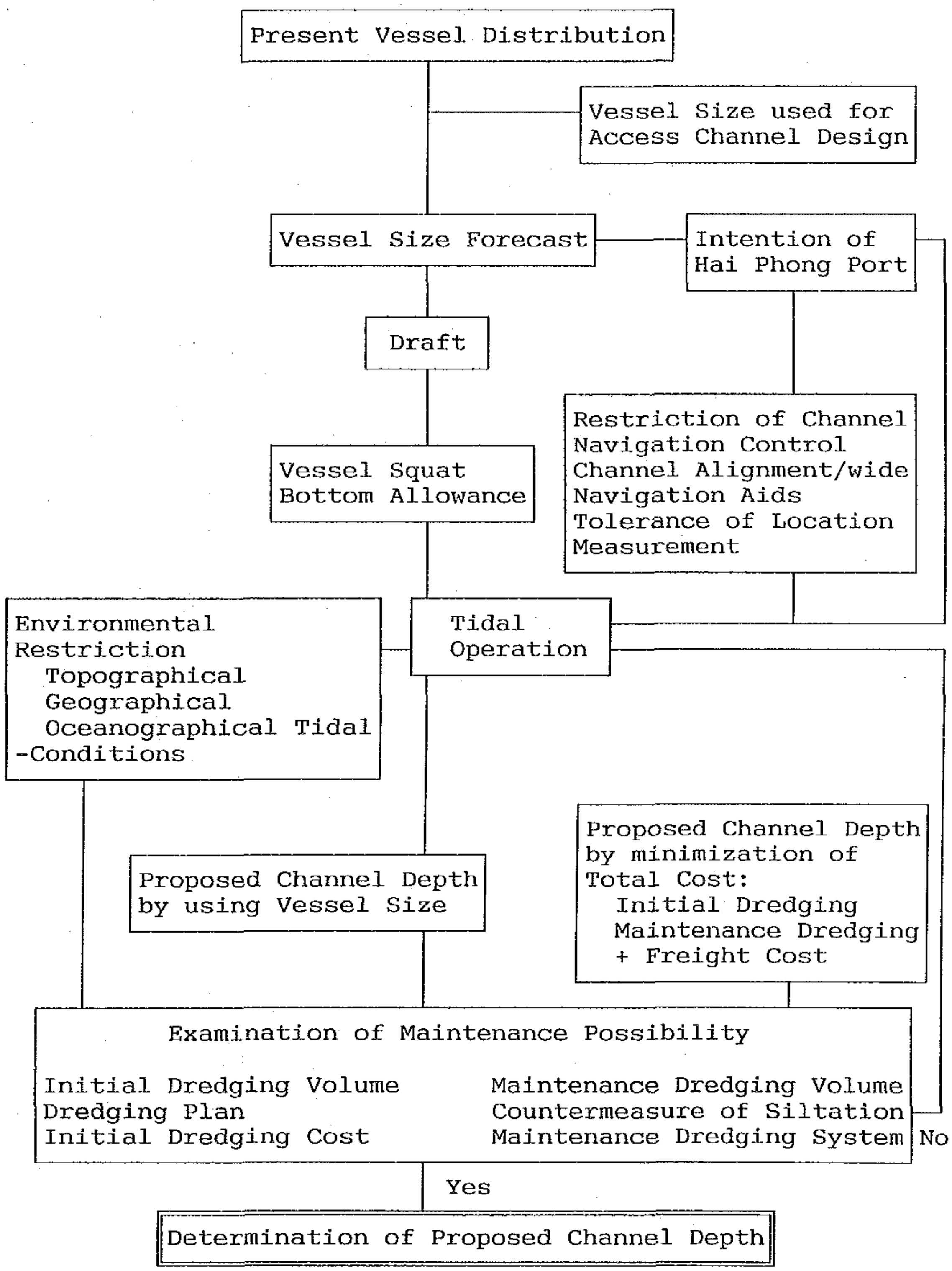


Figure 6-3 Decision Flows of Proposed Access Channel Depth

(1) Vessel size and its draft

A 10,000 DWT, 8.3m draft and 140m-long vessel was regarded as the vessel size.

(2) Bottom allowance

Bottom allowance was determined into the following factors.

1) Rolling and pitching tolerance: DW = 0.25m
2) Trim and squat tolerance : DR = 0.46m
3) Marine geological tolerance : Gt = 0.0 m
4) Bottom allowance : Dw + Dr + Dt = 0.7m

It is important to determine the movement of tidal level on vessel's sizes in deciding channel depth. (Table 6-4)

Table 6-4 Frequency of Tidal Levels and Time Bands

Tide Distribution Table by Tidal Level and Time Bands (1994)

Time Bands	Less 1 h		Over 1h		Over 1.5h		Over 2h		Over 2.5h		Over 3h	
	Freq.	T. hours	Freq.	T. hours	Freq.	T. hours	Freq.	T. hours	Freq.	T. hours	Freq.	T. hours
Tidal Level Over 350cm	2	1.5	12	28	11	27	9	24	6	17	1	3
	0.5%	0.0%	3.3%	0.3%	3.0%	0.3%	2.5%	0.3%	1.6%	0.2%	0.3%	0.0%
Over 300cm	2	1.9	128	591	126	588	122	581	115	566	105	538
	0.5%	0.0%	35.1%	6.7%	34.5%	6.7%	33.4%	6.6%	31.5%	6.5%	28.8%	6.1%
Over 250cm	0	0	243	1816	242	1815	242	1815	238	1807	236	1801
	0.0%	0.0%	66.6%	20.7%	66.3%	20.7%	66.3%	20.7%	65.2%	20.6%	64.7%	20.6%
Over 200cm	0	0	344	3789	341	3786	341	3786	341	3786	341	3786
	0.0%	0.0%	34.2%	43.3%	93.4%	43.2%	93.4%	43.2%	93.4%	43.2%	93.4%	43.2%

Source: These figures are obtained from the calculation by using a computed tidal analysis.

Accordingly, the channel depth (final examination) determine by the vessel's size should be corrected as follows;

10,000DWT vessel's draft:	-8.3m	
Bottom allowance :	-0.7m	
Tidal operation :	+3.0m	
Proposed channel depth :	-6.0m	(Final examination)

(3) Total minimum cost

In case of total costs were assumed for each channel depth. Total cost means the total of expenses incurred for initial dredging and maintenance dredging (one year) and freight cost of each vessel cargo demand volume in the target year.

The results are shown in Figure 6-3. It is known that the total cost tends to rise when the depth deviates from -6m.

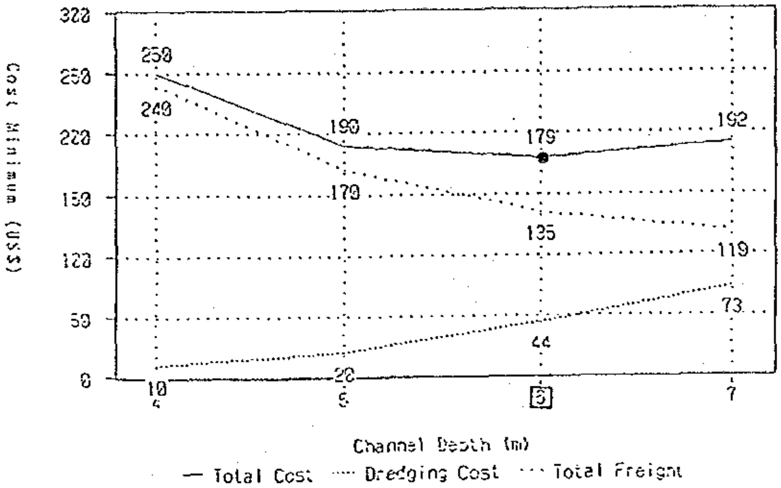


Figure 6-4 Optimum Channel Depth Minimum Total Cost

In this channel depth, vessels can enter the port as shown in Table 6-5.

Table 6-5 Frequency of Vessels Entry into Port with -6.0 m

Type	Full Draft	Tidal	Frequency
10,000 DWT	8.3 m	+3.0 m	32 %
7,000 DWT	7.3 m	+2.0 m	93 %

6-4-2 Dredging Method

(1) Basic dredging plan

In this project, the initial dredging and its period of maintenance dredging work are planned to be carried out simultaneously.
If in case of dividing a two-step execution plan is adopted, it will lead to an increase in sedimentation volume that existed in separate period. Therefore optimum execution plan should match the rate of speed of sedimentation, considering suspension during the rainy season, and deal mainly with an increase in depth before the rainy season and increasing sedimentation after the rainy season, so as to reach the planned depth one year from the start of dredging work as minimum. (See Figure 6-4)

Basic dredging plan is discussed herein.

1) Conditions
i) The dredging volume includes initial dredging and sedimentation during the execution of dredging work.
ii) The dredging period is one year from the start.
iii) The volume of Over-dredging is not taken into consideration on this plan.
iv) The dredging volume of -6.0m is shown in Table 6-6.

v) As an assumption on the planning of the dredging work, a qualified dredging company, which has enough capacity and ability to properly manage the dredging, should be required considering the limited dredging period and the natural sea-conditions.

Table 6-6 Dredging Volumes

Section	Initial DV. (m3)	Sedime. V (m3)	Total (m3)
Basin (Hai Phong)	920,000	190,000	1,110,000
Cua Cam	290,000	610,000	900,000
Bach Dang	770,000	1,720,000	2,490,000
Nam Trieu	2,660,000	3,780,000	6,440,000
Total	4,640,000	6,300,000	10,940,000

(2) Dredger fleets

The dredging working area is divided into the following four areas, and suitable fleets are assembled for each areas so as not to disturb channel's traffic. After positioning in a good condition the work starts to carried out.

Turning basin: In this area, the safety of navigating vessels should be maintained during their turning and berthing operations. Therefore, a grab dredger is employed since it can easily spot other ships' movements and discharge dredged materials in the river bottom and pumped up into the disposal area.

Cua Cam River: The dredging work extends over the entire river area and the dredged depth is rather shallow. In this case, trailing suction hopper dredger can be used efficiently and a dumping area is provided in the planned dike in the Bach Dang river which also serve as reinforcement of the zone. Since the depth of dumping area is too shallow to enter a trailing suction hopper dredger a secondary transport (cutter suction dredger) is also used.

Bach Dang River: In this area, dredging areas can be defined to some extent and the channel's depth (under -4.0m) has a sufficient width of 300-500m. A cutter suction dredger can used the above dumping area directly or indirectly and will work out efficiently.

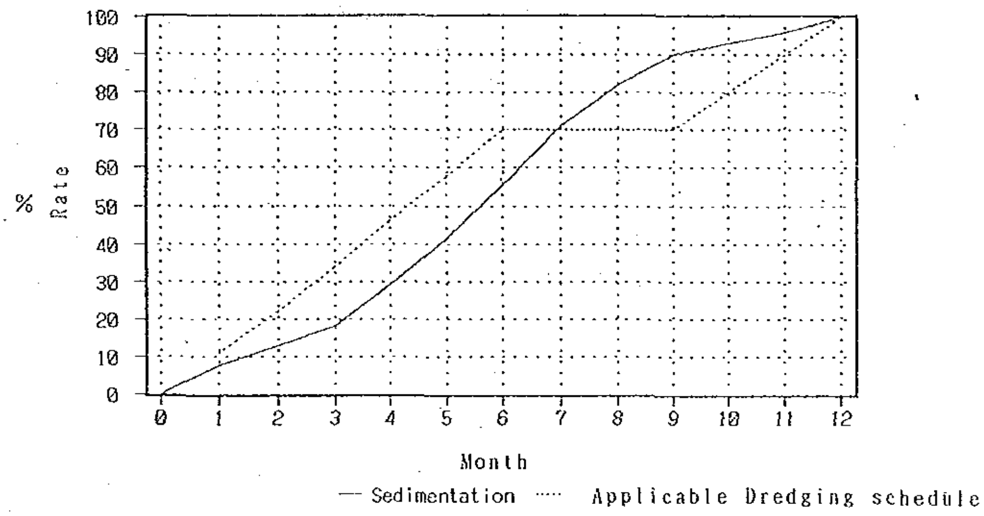
Nam Trieu channel: This area is limited due to dredging periods and natural conditions. In view of the traffic safety of channel and use of an offshore disposal area, a trailing suction hopper dredger or a cutter suction dredger is combined whreas the trailing suction hopper is considerable in this area.

(3) Schedule

Dredging schedule is shown in Table 6-7.

Table 6-7 Dredging Schedule

		1995												1996	
Description	Quantity	1	2	3	4	5	6	7	8	9	10	11	12	1	2
Channel -6.0 m	×1000m3														
Mobilization															
Survey															
Nam Trieu -6.0m															
Initial	2,660			400	400	400	400				400	400	250		
Sedimentation	3,780			200	400	400	600				600	600	600	200	130
Bach Dang															
Initial	770			175	175	175	175				70				
Sedimentation	1,720										320	350	350	350	350
Song Cam															
Initial	290					135	155								
Sedimentation	610											155	155	155	145
Basin															
Initial	920			50	145	145	145				145	145	145		
Sedimentation	190													145	45
1120	10,940	0	0	825	1,120	1,255	1,475	0	0	0	1,535	1,650	1,510	850	720



Note: The curve of accumulated sedimentation analyzed by dredged data in Nam Trieu channel area and applicable D.S. line which was planned at -6m of dredging work will be completely carried out in one year.

Figure 6-5 Applicable Relation Rate of Sedimentation and Dredging

6-4-3 Environment for Dredging Work

Except water quality standards, there are practically no environmental standards concerning material dumping and dredging work since the water is not potable to drink, the rate of river's turbidity is high most of the years and yet constructing dikes and silt ponds are necessary to consider as much as possible in order to reduce the rate of overflowing density in the dumping area discharging to river.

6-5 Study on Maintenance Dredging System

6-5-1 Maintenance Dredging

1) Maintenance dredging capacity

The improvement plan proposes to study whether the present dredging capacity can maintain the channel depth of the Nam Trieu particularly, in the maintaining the channel, and, if not, to introduce a new dredger.

A monthly dredging volume analyzed is 440,000m3 considering the foregoing elements and it is used for the succeeding study.

2) Channel depth to be attained by maintenance dredging

The most essential part of the work schedule for maintenance dredging is the preparation of a comprehensive plans on how to distribute the accumulated sedimentation volume assuming no *dredging work has been done for a period of three (3) months in* the rainy season.

In this process, the optimum execution of the dredging plan before rainy season in each area will produce turning points in March in the dry season and in June just before the rainy season, as seen in Figure 6-6. These turning points indicate the channel depth to be attained. When calculated inversely from the rate of sedimentation speed, over dredging depth are required to be 10-50cm up to March and 50-110cm up to June.

3) Schedule

Table 6-8 is the schedule of maintenance dredging work during and after 1996. If the dredging volume fails to reach 90% by the beginning of the rainy season (end of June), dredging work after the rainy season must be started in August. In the Nam Trieu section, particularly even if dredging is resumed in August or September, the planned maintenance dredging volume cannot be attained before the end of the year and it may not be possible to maintain the required channel depth.

Therefore, prior maintenance dredging should be 100%.