APPENDIX 5

SEMINAR ON ENVIRONMENTAL PROBLEM

SEMINAR ON DRAFT FINAL REPORT

1. **Seminar in Environment**

SEMINAR OF ENVIRONMENTAL PROBLEM IN BAI CHAY BAY AREA BY JICA STUDY TEAM FOR CAI LAN PORT CONSTRUCTION PROJECT

on 27th, June, 1994

Item	Content	Presentator	Time
1. Opening Address	Greeting, Aim	Dr. La Noi Vice Director of TEDI	9.00-9.05
2. Embassy' address	Greeting, Foreword	Mr. K. Koinuma Counsellor of Japanese Embassy.	9.05-9.15
3. Introduction	Port Development Concept, Environmental Consideration Scheme	Mr. T. Sogabe Team Coleader OCDI	9.15-9.30
4. Demand Forecast	Demand forecast up to the year 2000, 2010	Mr. S. Shiratori Engineer OCDI	9.30-9.40
5. Regional Planning	Urban Development Concept Industries likely located Tourism Development	Mr. J. Saito Engineer OCDI	9.40-9.50
Break			9.50-10.0
6. Environmental Assessment for Port Development	TOR and results	Dr. R. Bartlett N.K Expert	10.0-10.10
7. Tentative Environmental Standards	Air, Water, Discharge from Industries ect	"	10.10-10.20
8 Environmental Management	Regulation Monitoring plan	"	10.20-10.30
9. Comment from MOSTE	National Environment Agency	Mr. Nguyen Khac Kinh Vice Director	10.30-10.45
10. Comment from Other Organization			10.45-11.30

List of Participants in the Seminar held in TEDI office 27th, June 1994

I - EMBASSY OF JAPAN

1. Koinuma
   Counsellor of Japan Embassy

2. Sasaki
   Secretary of Japan Embassy

II - SPC

3. Head of Industry Department
   SPC

4. Mr. Toai
   Expert of Transport Department
   SPC

III - SCCI

5. Nguyen Bich Dat
   Deputy Director
   SCCI

6. Nguyen Quang Toan
   Trung tam dau tu phat trien
   Quan he voi nuoc ngoai

IV - OFFICE OF THE GOVERNMENT

7. Pham Quang Minh
   Deputy Director
   In charge of transport
   Specialized Economy Department

8. 02 expert
   Deputy Director
   Specialized Economic Department

V - MINISTRY OF ENERGY

9. Nguyen The

Director
International Cooperation Department
MINISTRY OF ENERGY

VI - MOSTE

10. Nguyen Khac Kinh
Deputy Director
Environment Department
MOSTE

11. Ms. Sang
Expert
Environment Department
MOSTE

VII - MOTC

12. Mr. Thuong
Internation Relation Department
MOTC

13. Mr. Tien
Internation Relation Department
MOTC

14. Mr. Tru
Department of Science and Technology
MOTC

15. Mr. Hinh
Department of Science and Technology
MOTC

16. Mr Nguyen Sinh Hy
Expert
International Cooperation Department
MOTC

17. Mr. Phan Duc Huyen

MOTC

18. 03 expert
Chairman of VINAMARINE

19. Mr. Sang
Head of Science & Technology Department
MOTC

20. Nguyen Duc Truy
Director
TESI

21. Mrs. Hanh
Expert
TESI

VIII/- VIETNAM NATIONAL ADMINISTRATION OF TOURISM

22. Tran Thi Thom
Export
Economic Planning Department
Vietnam Tourism
VIETNAM NATIONAL ADMINISTRATION OF TOURISM

23. Vu Tuan Canh
Director Tourist Institute
IX/- MOC

24. Mr. Tri
Institure for Rural & Urban planning
MOC

25. Expert
Institute for Rural & Urban planning
MOC

26. Nguyen quoc Quyen

International Relation Department
MOC

27. Mr. Ly
Expert of Urban Department
MOC

28. Mr. Dich
Head of Science and Technology Department
MOC

X- MOHI

29. Mr. Nguyen Xuan Chuan
Director
International Relations Department

XI/- QUANG NINH PEOPLE COMMITTEE

30. Mr. Dung
Expert

XII/- JICA TEAM
08 expert

XIII/- VIETNAM COUNTERPARTS

31. Mr. Dao Xuan Lam
Director of TEDI

32. Mr. La Noi
Vice director of TEDI

33. Mr. Tran Van Dung
Director of SDEWA
TEDI

34. Mr. Nguyen Ngoc Hue
Port Department
TEDI

35. Mr. Le Toan Thanh
Management of TEDI

XIV/- MOF

36. Mr. Le Dinh Qui
Deputy Chief of Division
Investment Department
MOF

37. Mr. Nguyen Ba Tai
Expert
Post, Transport & Communications Department
MOF

38. Mr. Thai Ba Can
Ministry of Finance

FEASIBILITY STUDY
ON
CAI LAN PORT CONSTRUCTION PROJECT
IN THE SOCIALIST REPUBLIC OF VIETNAM

AGENDA
OF
SERMINAR ON DRAFT FINAL REPORT

Date: december 10, 1994 (Saturday)
Place: Guest House of Ministry of Defence
33A Pham Ngu Lao - Hanoi
Chaired: By Dr. La Noi, TEDI

Time	Title	Presentator
<Morning Session>		
8:30 - 8:40	Openning Address	Dr. Le Ngoc Hoan Ministry of Transport & Communication
8:40 - 8:50	Openning Address	Mr. S. Sadoshima Counsellor, Embassy of Japan
8:50 - 9:20	Signficance of Port	Mr. Y. Aoki
9:20 - 9:50	Regional Planning & Demand Forecast	Mr. S. Shiratori
9:50 - 10:10	**Coffe break**	
10:10 - 11:00	Channel and Port Planning	Mr. T. Sogabe
11:00 - 11:40	Facilities Design and Implementation Program Including Budget Plan	Mr. K. Naito
<Afternoon Session>		
13:10 - 13:50	Port Operation and Management Economic & Financial Analysis	Mr. T. Sasaki
13:50 - 14:40	Environment Impact Accessment & Environment Protection Plan	Mrs. R. Bartlett
14:40 - 15:00	**Coffe break**	
15:00 - 17:00	Comments	Various Agencies
17:00 - 17:15	Closing Address	Dr. Le Ngoc Hoan
18:00	**Reception Party**	

LIST OF SEMINAR ON 10th of December

I. MOTAC

1.	Dr. Le Ngoc Hoan	Vice Minister	
2.	Mr. Tran Doan Tho	Director	Planning & Investment Dep.
3.	Mr. Le Duc Huyen	Expert	Planning & Investment Dep.
4.	Mr. Phan Vi Thuy	Director	Assurance Dep.
5.	Mr. Truong Tr. Chinh	Expert Assurance Dep.	
6.	Mr. Thuong		

II. TESI

7.	Mr. Nguyen Duc Truy	Director	
8.	Mr. Nguyen Quang Bau		

III. VINAMARINE

9.	Mr. Dao Trong Long	Chairman	
10.	Mr. Le Van son	Expert	
11.	Mr. Vuong Dinh Lam	Director	
12.	Mr. Dinh Kim Khoi	Director	
13.	Mr. Dinh Nho Duyet	Vice Dir.	
14.	Mr. Mai Viet Bao	Expert	
15.	Mr. Mai Ngo Nghiem	Expert	
16.	Mr. Nguyen Van Hau	Director	Quang Ninh Port Authority
17.	Mr. Vu Van Mau	Director	Quang Ninh Port
18.	Mr. Cao Tien Thu	Director	Hai Phong Port
19.	Mr. Le Duc Kinh	Vice Dir.	Hai Phong Port
20.	Mr. Nguyen Duc Chuom	Director	Hai Phong Port Reha. Pro.
21.	Mr. Truong Van Thai	Deputy Dir.	Hai Phong Port -
22.	Mr. Nguyen Van Tu	Hai Phong Port	

IV. QUANG NINH PROVINCE

23.	Mr. Nguyen Tat Dung	Chairman	
24.	Mr. Tran Quyen	Head	External Economic Dep.
25.	Mr. Minh	Construction Dep.	

26.	Mr. Nguyen Thanh	
27.	Mr. Vu Van Tu	
28.	Mr. Nguyen Quang Hung	Transport Dep.
29.	Mr. Nguyen Duy Hung	Head of Transport Dep.
30.	Mr. To Van Tu	Head of Construction Dep.
31.	Mr. Nguyen X. Truong	Ha Long City People's Committee

V. OFFICE OF THE GOVERNMENT

32.	Mr. Le Quoc Hiep	

VI. SPC

33.	Mr. Hoang Minh Thang	
34.	Mr. Nguyen Canh Kham	
35.	Mr. Nguyen Ngoc Nhat	General Dir.
36.	Mr. Nguyen Vuong Ta	General Dir.
37.	Mr. Ha Tan	

VII. MOC

38.	Mr. Nguyen Ngoc Khoi	Director
39.	Mr. Ngo Duc Tri	Vice Dir.
40.	Mr. Ngo Trung Hai	Architect

VIII. CCIDC

41.	Mr. Tong Van Nga	Director
42.	Mr. Du Ngoc Long	Engineer

IX. VIETNAM STEEL CORPORTATION

43.	Mr. Nguyen Huu Tho	Project manager

X. MINISTRY OF SCIENCE, TECHNOLOGY AND ENVIRONMENT

44.	Mr. Nguyen Khac Kinh	Deputy Dir.
45.	Ms. Chu Thi Sang	Expert
46.	Mr. Nguyen Dac Hy	

XI. VINAFOOD

47.	Mr. Nguyen Hoa Binh	Deputy Dir.

XII. MINISTRY ENEGY

48. Mr. Le Manh Thu
49. Mr. Nguyen The

XIII. PETROLIMEX

50. Mr. Nguyen quang Kien

XIV. MINISTRY OF FINANCE

51. Mr. Le Dinh Quy

XV. TEDI

52.	Dr. Dao Xuan Lam	General Director
53.	Dr. La Noi	Vice Gen. Director
54.	Mr. Dang quang Lien	Chief Engineer
55.	Mr. Tran Van Dung	Director
56.	Dr. Nguyen Ngoc Hue	
57.	Mr. Le Van Chinh	
58.	Mr. Bui Trong Hien	
59.	Ms. Pham Thi Nhuong	
60.	Ms. Pham Tuyet Mai	
61.	Mr. Pham Quang Vinh	
62.	Mr. Pham Huu Thai	

XVI. SCCI

63. Mr. Tran Hong Ky

XVII. ENTERPRETERS

64. Ms. Bich Nguyet
65. Mr. Ngoc Long

XVIII. TV. NESWSP.

66. Mr. Truong Giang

67. Ms. Bich Thai

XIX. FERCHEMCO

68. Mr. Do Xuan Hao

69. Mr. Pham Duc Phat

70. Mr. Vu Ta Hai

1. SIGNIFICANCE OF PORT

Dr. Y. AOKI

Thank you Mr. Chairman. Good morning Dr. Hoan, Vice Minister of Ministry of Transport and Communication, ladies and gentlemen. Thank you very much for your participation to this seminar. We are the feasibility study team on Cai Lan port construction project despatched by the Japan International Cooperation Agency. We started our study last December. The draft final report which is being presented today represents the conclusion of our study. I would like to take advantage of this opportunity and express our heartfelt gratitude for cooperation. We received throughout the course of the study. All of you in attendance this morning helped realize the successful completion of the Study. We should especially acknowledge the work done by Transport Engineering and Design Incorporated as the partner of joint work.

Each team member will present that part of the report for which he was responsible. In advance of those presentations, I would like to briefly discuss ports in general.

First I would like to discuss the functions of a port in general. Port is not a simple transportation infrastructure but has various functions such as supporting economic activities in the hinterland and contributing to the socio-economic development of the nation. These days the international division of work is inevitable. Import of raw material or semi-products for industries in the hinterland from foreign countries or other parts of the country and export of products to foreign countries are through ports. This function of port includes export terminal of mineral products and distribution of petro-product for consumption in the hinter land. This is a very fundamental and important function of ports from the point of view of the national economy.

The 2nd function of port, which is also very important especially from the regional development point of view, is to provide the infrastructure for industries. It is very advantageous for industry to establish factories in the vicinity of port in order to minimize transportation cost. Therefore once a new port is constructed, various factories will follow. In this context a port both triggers and acts as the core of regional development. These factories, besides industries directly related to port, create many job opportunities and income increases. For the government, tax income will increase and then they can afford to provide the citizens with a higher level of service. This is the essence of socio-economic development.

Thirdly, ports function as bases of miscellaneous economic activities such as fishery, tourism or recreation. Although our study does not deal with this aspect of ports, this function could also be important to Cai Lan port. Because the sea area in front of the port is rich in fishery and tourism resources. The port could play an important role in fishery and tourism development. For example, cruises along Ha Long bay could begin from here and a terminal for could be provided. A marina for recreational boats might be required in the near future. Ports can grow not only in terms of size or capacity but also the number of their functions, if the fundamental facilities have been once constructed. Therefore Cai Lan port will, I hope, soon have the above mentioned functions.

I would like to discuss two points related to what I've said so far. First, the body who receives benefits generated by port development is not mainly the port operating body. Rather, a large portion of the benefits go to the regional economy, in other words, to provinces in the hinterland and the whole nation. It is very difficult for the port management body to take all benefits generated by the port into their income. Port is a sort of public infrastructure. This is why in Japan the central government subsidizes about 50% of main port facilities and port managing body is regional government itself rather than an independent organization.

The second point I want to discuss here is that if port capacity does not keep pace with the speed of economic development, port function will impede economic development. An example of this type of problem can be cited from our own experience. About 15 years after the world war II, Japanese economy started to take off. At that time we had very serious port congestion. Dozens of ships were waiting to berth every day at all main ports in the country. The port capacity was the bottle neck of the economic development.

After the so-called oil shock, a large amount of money was flowing into oil producing countries like Saudi Arabia. They tried to develop their countries with those oil revenues. And they started to invest in industries and urban facilities. But unfortunately they did not pay enough attention to port capacity. What happened was that there was very serious port congestion. They were forced to use helicopters to unload cement from the ship anchoring offshore. Of course they could afford it, but they wasted much energy and time.

(OHP 1)

This figure shows the configuration of Japan. What I want to point out is that the shape of our country is quite similar to that of yours. Both are narrow and extend from north to south. The only difference is that your country faces the sea on one side but ours on both sides. Though it is very simple way of thinking, ports or sea transportation could play a similar roles in both countries because of their similar shapes.

(OHP 2)

This graph shows the growth of cargo volume handled at ports and GNP during the period of a high economic growth in Japan, from 1955 to 1975. We can see that the correlation between growth rate of GNP and cargo volume is quite close. During this period we had serious port congestion.

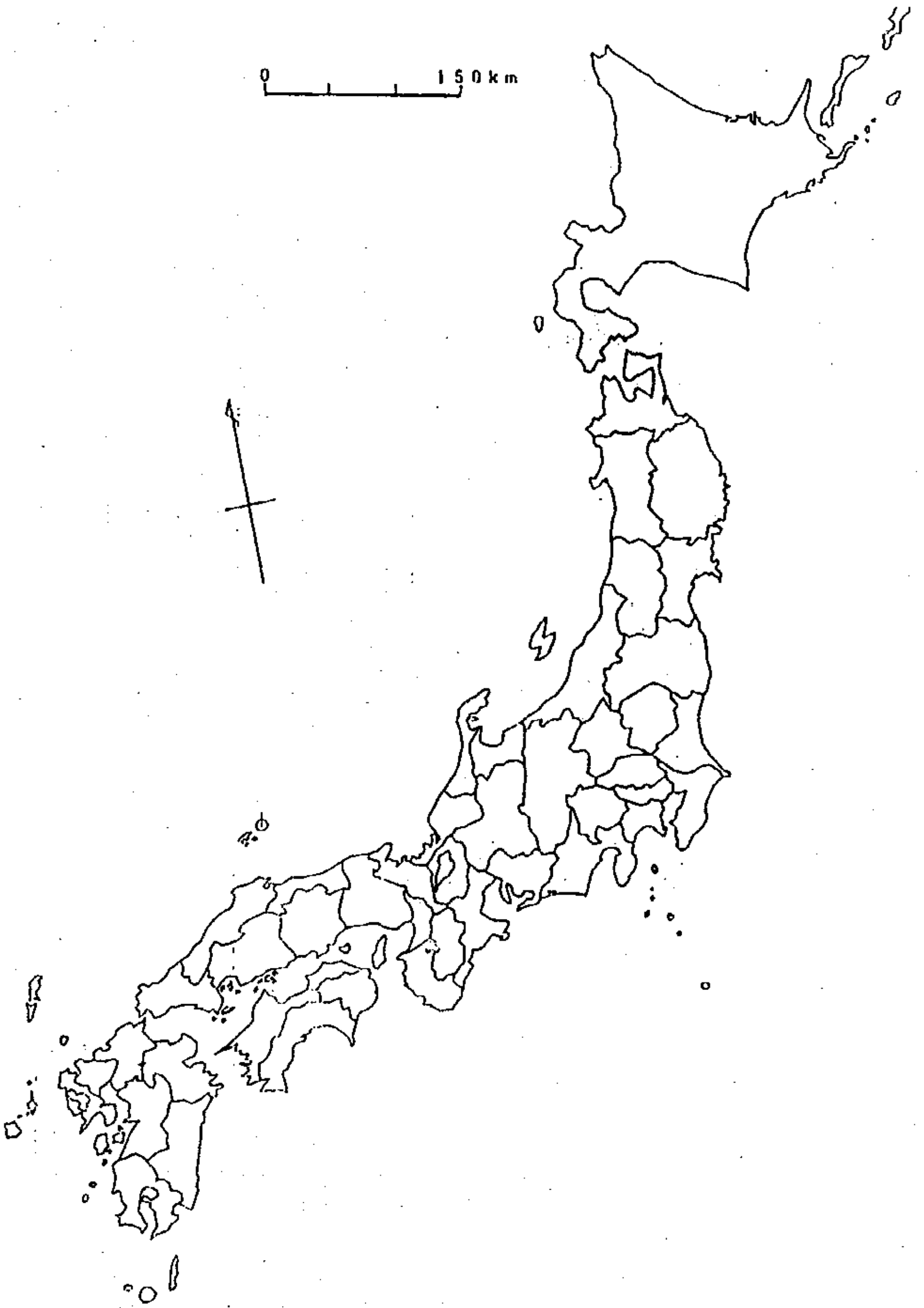
(OHP 3)

In order to simplify the previous graph, I divided both the cargo volume and GNP by population. It is more clear why the serious port congestion occurred. The cargo volume per capita increased sharply. With a very bold assumption concerning the special cargo such as coal and petroleum, which are out of the scope of our study and shown in the graph, the same values for the Northern part of Viet Nam are also plotted in the graph. We can see that the values of your country are slightly small but look to be on the same trend. Based on this, we can gues that a considerable increase in port capacity will be needed in the very near future. Though it was a reasonable decision for you to put the highest priority on Cai Lan port construction project, at the same time, I feel that you are already at the time to start preparation for the construction of the next port. Because even after completion of Cai Lan port, the port capacity in the Northern part of your country seems to be much smaller than the growth potential and to select the suitable construction site for a new port seems to be a difficult and rather time consuming job.

I will now change course, as it were. I will discuss the relation between port development and environment. Construction work of port facilities and its operations within port itself do not give much impact to the environment. As I explained previously a port has a strong power to attract factories around it and activate regional economic activities. It is this activated economy that tend inevitably to put a heavy load on the environment. Sewage from domestic use of urban residents also increases the load. Even agriculture and aquaculture must be considered when chemicals and feed are used. Therefore the environment control issue is not for only port section but it is an issue for all institutions concerned including local government.

Now I will show you a video introducing the exhausting struggle Japan engaged in an environment damaged by careless development. I hope you do not make the same mistake we did.

OHP 1



OHP 2

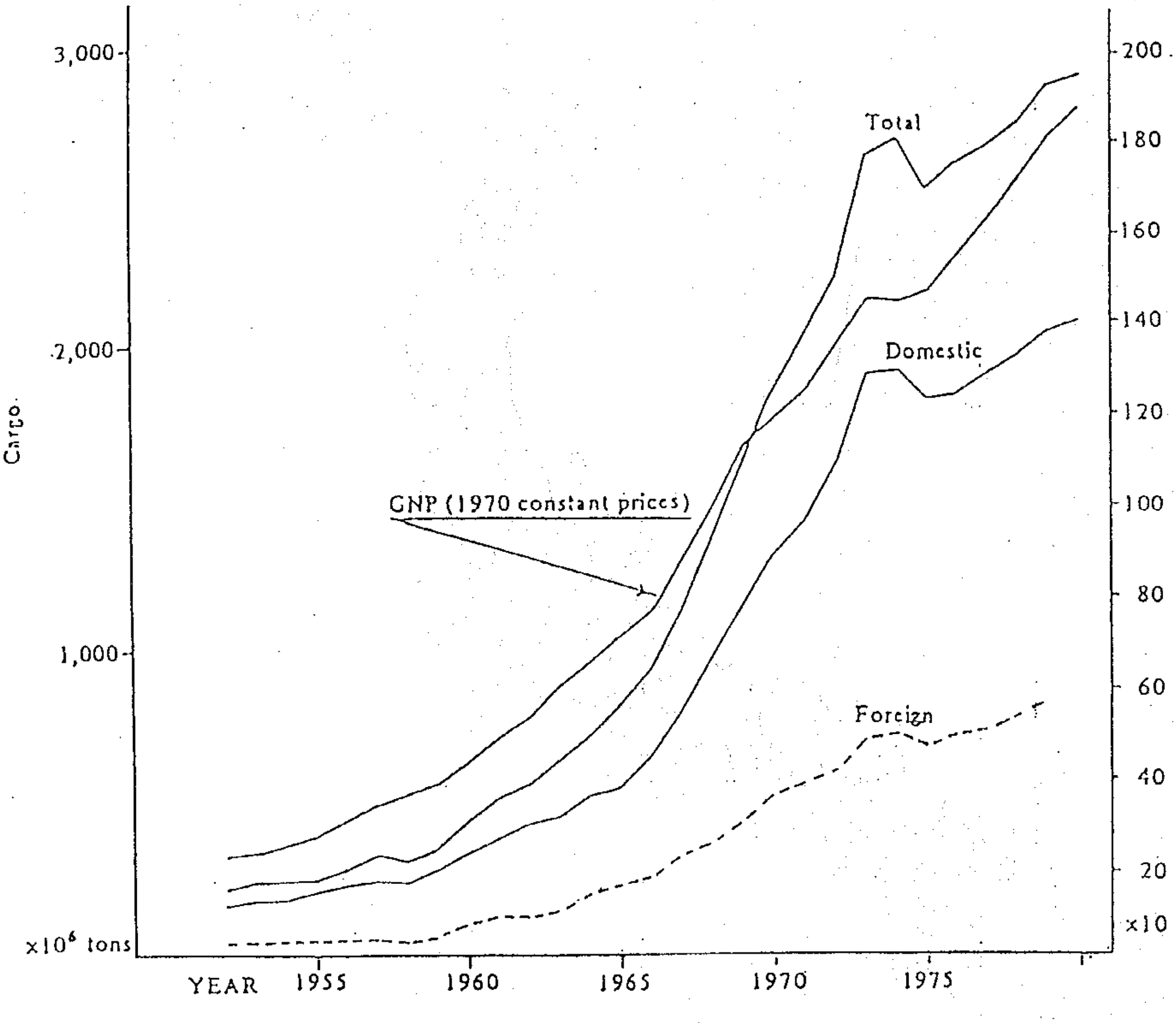
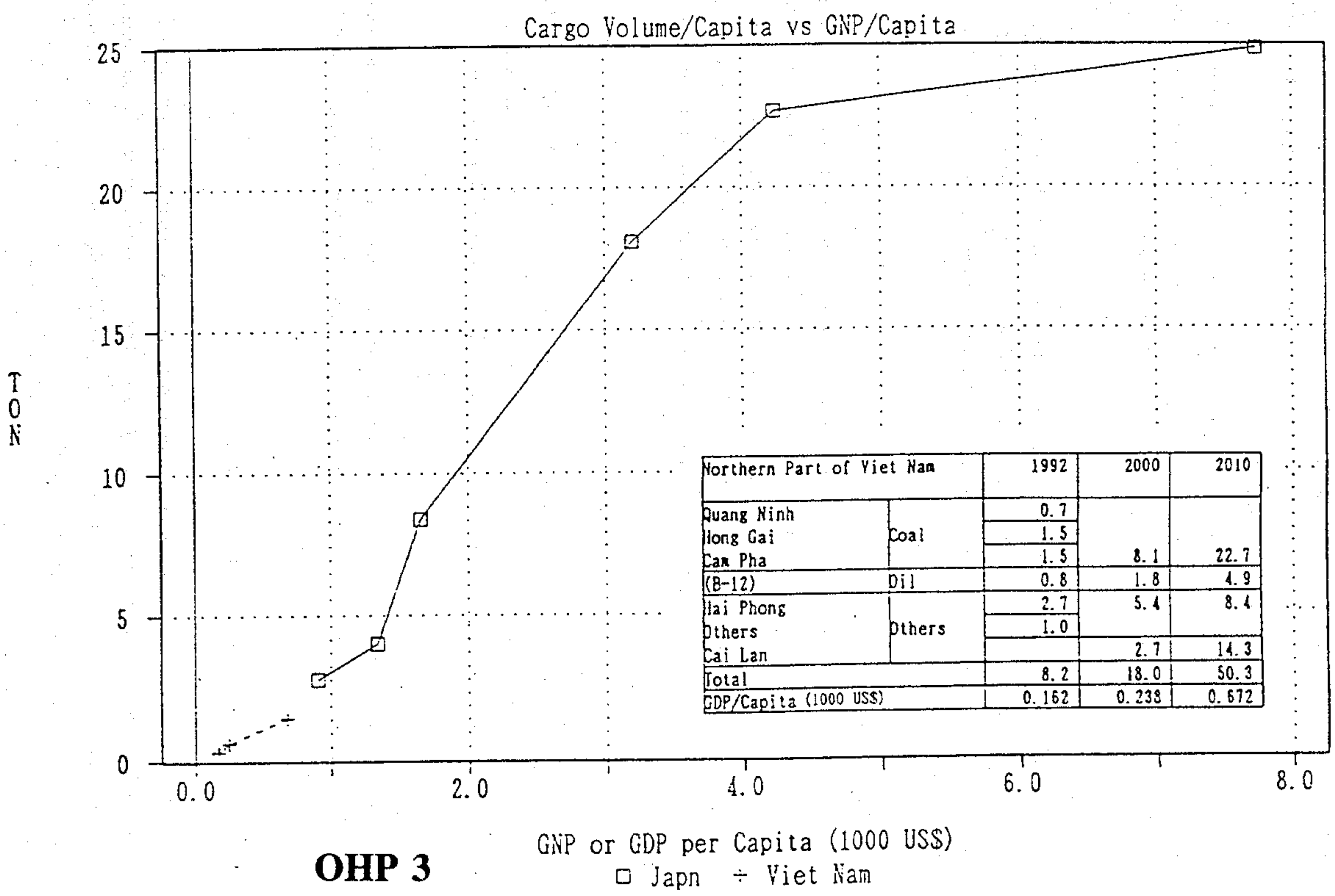


Fig. 1 GNP and Volume of Cargoes Handled by Ports (1950 - 1980)



Northern Part of Viet Nam		1992	2000	2010
Quang Ninh	Coal	0.7		
Hong Gai		1.5		
Cam Pha		1.5	8.1	22.7
(B-12)	Oil	0.8	1.8	4.9
Hai Phong	Others	2.7	5.4	8.4
Others		1.0		
Cai Lan			2.7	14.3
Total		8.2	18.0	50.3
GDP/Capita (1000 US$)		0.162	0.238	0.672

OHP 3

2. Regional Planning and Demand Forecast

Mr. S. SHIRATORI

Thank you Mr.Chairman. Ladies and gentleman.

I am going to speak about Bai Chay Bay Regional Planning and Demand forecast of Cai Lan port. First of all, I will explain the Regional Development Direction in the northern part of Viet Nam and in Bay Chay Bay which we referred to in our study.

(OHP 1)

Quang Ninh province is located in the north east coastal zone of Vietnam adjacent to south China. In the strategy for general socio-economic development of Vietnam, Quang Ninh is identified as an important province within the development triangle, Hanoi - Hai Phong - Quang Ninh.

(OHP 2, CF. Figure 3-1-1)

Quang Ninh Province is endowed with many natural and industrial resources. Many agricultural and aquacultural products are consumed in Vietnam and other foreign countries. Ha Long Bay is famous for its unique scenery that attracts many domestic & foreign tourists. People also enjoy marine sports and fresh sea foods. Quang Ninh is also known as an industrial state. Coal mines, limestone mines, sand, clay and rock fields stretch along the mountain area.

(OHP 3, cf. Figure 9-2-1)

Ha Long City, newly created in December, 1993, is recognized as the center of the developing province, therefore, a master plan is necessary. Since Cai Lan Port and is considered as a sea transportation terminal, future regional development direction of Ha Long City should be taken into consideration.

An institute under the Ministry of Construction has been chosen to make a master plan of Ha Long City. In the first year of the master plan study direction of land use will be decided and submitted to the Prime Minister.

This study follows the master plan in general.

Bai Chay Bay is located at the meeting point between future industrial and tourism zones and simultaneously is a closed area into which 6 rivers flow. To prevent environmental impact, industries around Bai Chay Bay should be non-polluting and existing hills, rivers and residential area should be preserved as much as possible.

(OHP 4, cf. Figure 9-2-2)

Based on the master plan Ha long city will expand three times by the year 2010.

- In the 1st stage (1994-2000) Hon Gai town, base of Ha Long city will annex two communes, Viet Hung and Dai Yen. Area: 21,550 HA
- In the 2nd Stage, the city will include the whole Bai Chay bay area. Total Area: 41,170 HA
- And in the 3rd stage, the city will annex Cam Pha town. Area: 72,700 HA

(OHP 5, cf. Table 9-2-1)

The forecast future population in the master plan considers natural increase and mechanical increase (labor demands for new industries) due to expansion of the city.

(OHP 6) Stage Plan

Based on the Master Plan, 5-7 cement factories, high-tech industry and cement berths will be located at the northern part of the Bay. Cai Lan Port, Export Processing Zone, shipyard and brick factories will be located near the entrance of the bay by the year 2010.

Based on the master plan and our survey we propose the stage plan. Cai Lan port will be constructed in each stage. We modified some parts of the master plan, because we have to arrange many port related industries that are willing to be near the port.

(OHP 7)

1) During Stage 1 (by 2000)

- Construction of Cai Lan Port (1st stage)
  Cai Lan Port is expanded toward the east from the existing berth.
  6 berths, cargo handling equipment, access roads.
- A cement factory (Lang Bang), a steel billet factory, a wheat mill factory, a fertilizer factory, and related residences.

A steel billet factory and a wheat mill factory are located behind the port. These two industries are closely related to the port and environmental impact is relatively small. Moreover, products (steel billet & flour powder) and some wastes from the factories can be used for the future development of Ha Long City.

- Grade up of route 18A (expand to 4 lanes, Hong Gai-Chi Linh)
- Cam Pha Port expansion
- Tourism development (4-5 major hotels in Bai Chay)

2) In the Stage 2 (2000 - 2010)

- Construction of Cai Lan Port (2nd stage)expand toward east and west
- Export Processing Zone, high tech industry, new electric power plant and related residence. Waterfront of the EPZ is used for public berth.
- Two cement factories will be established by the year 2010
- Hon Gai Port redevelopment
- Grade up of all route 18, Bai Chay bridge, railway through Hanoi
- Water supply and sewage system
- Expansion of tourism development (Tuan Chau island and Yen Lap lake)

3) In the Stage 3 (after 2010)

- Development of Cai Lan Port (3rd stage)Future expansion area is at west of Cua Luc Straight.
- Minh Thanh airport
- Removal of Hon Gai coal handling facility

In Bai Chay area, many small to middle industries, for example, coal, brick, construction material, shipbuilding tourism and fishing, are found. The Master Plan recommends that new industries, i.e., cement, high-tech, steel, food-processing and port related industries will be set up in addition to the existing industries.

Development direction by industry

(OHP 8)

1) Export processing industry

Quang Ninh province plans to create an export processing zone to promote the exporting industry and generate employment. Industries in the EPZ should utilize domestic materials and be non-polluting. A list of suitable industries, prepared by an Australian consultant, includes wood-processing, leather production, printing, food- processing, plastic, electronics, and heavy equipment fabrication.

(OHP 9, cf. Table 9-3-5)

2) Cement industry

Three factories are planned to be located in the north of Bai Chay Bay. Among these factories, one joint venture factory with a Korean company will start production by the year 2000. Another factory, a joint venture with Japanese and French companies, will start production after 2000.

(OHP 10)

3) Steel industry

Vietnam Steel Corporation and a Japanese steel company are planning to build a Steel Mill factory near Cai Lan Port. The detailed information is

- Location: Next to the port
- Scale: 20 ha
- Completion: by the year 2000
- Present Situation: Preparing Pre-Feasibility Study
- Materials: scrap 600,000 tons/year and other additives
- Industrial Wastes: Slag (200,000 tons/year), Waste water (160 m^3/days)
- Number of labors: 500

(OHP 11)

4) Chemical Industry

Northern Vietnam has abundant mineral resources. The Fertilizers and Basic Chemicals Corporation (FERCHEMCO) plans to construct a fertilizer factory. The materials (apatite) are loaded from Lao Cai by railway. Other information of the project is.

- Capacity : 148,500 tons/year
- Location : Dai Yen
- Market : 100% local
- Construction 30 months
- Scale : 10 ha
- Materials : apatite : 200,000 tons/year, sulfuric acid : 56,000 tons
  ammonia : 33,000 tons

FERCHEMCO plans to start production by the year 2000

(OHP 12)

5) Wheat Mill Factory (VINAFOOD 1)

The demand for flour is still increasing in line with the recent growth of the Vietnamese economy and VINAFOOD 1 is eager to construct a wheat mill factory in the Cai Lan area. The outline of the wheat mill is.

- Capacity (Products) : Wheat powder 270,000 tons/year
  Rice 200,000 tons and maize 300,000 tons
- Location : Behind Cai Lan Port
- Construction period : 36 months, by 1996
- Scale : 7 ha

- Plan by stage :

  1st stage : capacity 300 tons/day

  2nd stage : capacity 600 tons/day

  3rd stage : capacity 900 tons/day
- Port related cargo : 770,000 tons
- Situation : Waiting for approval by MOC & Quang Ninh Province
- Materials : wheat (360,000 tons/year) import,

  Rice (260,000 tons) domestic, Maize (400,000 tons) domestic
- Water demand : 40 m^3/day
- Employees : 400

(OHP 13, cf. Table 9-3-6)

6) Coal industry

Coal industry is concentrated in Uong Bi, Hon Gai and Cam Pha area. Quang Ninh provence plans to relocate these facilities to Cam Pha in future.

(OHP 14, cf. Table 9-3-2)

7) Tourism industry

Halong City Master Plan forecasted that the number of tourists will increase up to 2.7 million in 2010, three times more that at present. Number of hotel rooms should be increased to 9900, ten times more that at present. To construct these hotels, Tuan Chau island and Yen Lap lake will be developed in addition to the Bai Chay area. Hon Gai Port will be redeveloped to accommodate passenger ship and pleasure boats.

(OHP 15, cf. Table 9-3-1)

8) Shipbuilding and Machinery Industry

A major shipbuilding and repairing factory is located along Bai Chay Bay. When Cai Lan port is completed, the shipyard will be required to repair or build ships up to 30-50 thousand DWT. The model factory, capacity of 50,000 DWT, needs 20 ha.

Other port oriented industries, such as handling machine repairing, container making require 3 ha near the port.

9) Other related projects

Since Quang Ninh Province has abundant fishery resources, following large aquaculture projects in need of joint venture partners are planned.

a. Hai Chau Sea product Farm

b. Development of swamp land in Ha An, Yen Hung

c. Pearl Culture in Cam Pha district

d. Fish Port Project

e. Aquaculture Project

Next, I am going to explain the demand forecast of Cai Lan port. To prepare the Long term Development Port Concept up to the year 2010 and the Short term Development Plan up to the year 2000, "Demand Forecast" is carried out to determine the cargo volume handled at Cai Lan port in the target year. JICA Study team held the discussion meeting of demand forecast for the confirmation of cargo handling volume with organization concerned and expert of TESI several times. This demand forecast is the results of the discussion meeting.

(0HP 16, cf. Figure 8-1-2) Hinterland of Cai Lan port

In order to forecast the future cargo volume for Cai Lan port, the hinterland should be defined.

Based on the functions and roles of Cai Lan port, the hinterland of Cai Lan port consist of 13 provinces in the Northern Mountain and Midland and 7 provinces in the Red River Delta. However, in the year 2000, it is estimated that the general cargo of five provinces (Quang Ninh, Cao Bang, Bac Thai, Lang Song, Ha Bac) of Cai Lan port's main hinterland will be handled for the general cargo.

(OHP 17, cf. Table 8-3-1, Table 8-3-2, Table 8-3-3) Macro-economic Indices

Basic economic indices like GDP, GRP, GPI or GPA are of most importance to the Study, from which demand forecast can be conducted and then the quantity and scale of facilities to be planned can be determined. The indices in the Transport Master Plan Study are revised and compared with the latest available statistics. Unless a major discrepancy is apparent, indices of the Transport Master Plan Study will be applied in this study.

After reviewing the future socioeconomic framework described in the Transport Master Plan Study no revision was deemed necessary for this Study except one item, the growth rate of regional GPI up to the year 2000. The value in the Transport Master Plan Study is defined to be 9 % which is below the targeted figure for the whole country basis announced at the 7th national Congress 1991.

However according to the newest statistics, the growth rate of GPI in the Northern part of Viet Nam in 1993 has already exceeded that of the whole country as shown in Table "Yearly Growth Rate of GPI by Region".

(OHP 18, cf. Table 8-3-4, Table 8-3-5)

The regional growth of GPI was revised to 12%, which is around the value set in the frame announced at the 7th National Congress 1991. In conclusion the following economic indices listed in this Table are applied in this study. These figures 12%, 17% & 15% are almost the same values as socio-economic indicators in Institute of Long-term Strategy under State Planning Committee in 1994.

(OHP 19) Methodology for Demand Forecast

Two methods are used to forecast the cargo volume handled at Cai Lan port and Hai Phong port within limits of Hai Phong port. One is a macro forecast which estimates the cargo volume as a group including entire commodities, regardless of the volume of each commodity. The other is a micro forecast which estimates the cargo volume of each commodity individually. In the forecast of the cargo volume though the Cai Lan port and Hai Phong port in the target years, the total volume through the two ports was projected in the first step. And then it was broken down to the respective volumes in the next step because of the overlap in their hinterlands. According to the assumptions in these flow-charts, macro and micro forecasts are conducted.

(**OHP 20, cf. Table 10-2-2, Figure 10-2-1**) Results of Macro Forecast

Generally speaking, the cargo handling volume of ports has a close relation with the socio-economic indices. Based on the total cargo volume of 1992 in Hai Phong port, the percentage of industrial cargo is about 80%. Thus, GPI is correlated with total cargo volume with elasticity (coefficient 0.96) between 1982 and 1989.

Based on the planned growth rate of secondary sector of GDP with elasticity, the results summarized in these Table and Figure show cargo volume growth by year.

In the target year, total cargo volume of Hai Phong port and Cai Lan Port is estimated at about 6 million ton in year 2000 and 24.5 million tons in the year 2010.

(**OHP 21, cf. Table 10-3-21**) The Results of Micro Forecast

In the year 2000, Cargo volume generated from four planned factories around Cai Lan port and general cargo volume of five provinces(Quang Ninh, Cao Bang, Bac Thai, Lang Song, Ha Bac) are forecast. In the year 2010, total cargo volume of Hai Phong port is forecast at approx. 8.4 million tons due to the expansion of berth and the improvement of cargo handling operation. The forecast volume of Cai Lan port in the year 2010 is obtained by deducting the cargo volume of Hai Phong port from the total forecast cargo in the northern part of Viet Nam. The results of the forecast are shown as this Table Micro forecast by commodities in the target years.

(OHP 22, cf. Figure 10-3-2)

This pie chart shows Results of Micro forecast in the target year 2000. The cargo volume at Cai Lan port from four factories (the Cement Factory, the Steel Billet Factory, the Wheat Mill Factory and the DAP Fertilizer Factory) by micro forecast is estimated at 1.8 million tones in the target year 2000, which represents about 70% of the total cargo volume.

Cargo volume of others (about 30%) includes cargo fertilizer import volume, agriculture domestic cargo, diverted general cargo from Hai Phong port and rough materials and equipment volume of projects in the target year 2000.

(OHP 23, cf. Table 10-3-18) Diverted Cargo of Hai Phong Port

Assuming the cargo volume handled at Hai Phong port will exceed port capacity(about 8 million tons) in the target year 2010, surplus general cargo volumes diverted to Cai Lan port are considered to be export and import cargo volume of Cai Lan port. However, the cargo volume generated from Hai Phong EPZ is added in rough estimation. This Table shows that Diverted cargo volume from Hai Phong port is estimated at 5.8 million tons in the target year 2010.

(OHP 24, cf. Figure 10-4-1, Table 10-5-1) Containerzation at Hai Phong and Cai Lan port

The percentage of containerization in the target years is estimated by using the containerization ratio of Saigon port in this Figure. Then, the volume of containerzable cargoes in the target years can be obtained by multiplying the percentage of containerization. Cai Lan port is assumed to have the same level of containerization because both ports are in the northern part of Viet Nam and both ports have common hinterlands and same type of cargo is diverted from Hai Phong port. Containerization ratio is estimated at 72% in 2000, and 80% in 2010. In addition, 20% of domestic general cargo is estimated to be replaced by container cargo in the year 2010 with the advance of increasing domestic feeder services.

(OHP 25, cf. Figure 10-3-3) Cross check with the Results of Macro Forecast

The result of the micro forecast almost corresponds with that of the macro forecast in the year 2010. However, there is a discrepancy between the macro and micro forecast in the target year 2000. This discrepancy is mainly related to the products and materials of factories and the construction materials and equipment of projects on regional planning in the Bay Chay area.

Herein, the cargo volumes handled at Hai Phong port and Cai Lan port for the target years will be forecasted by the micro forecast method.

(OHP 26)

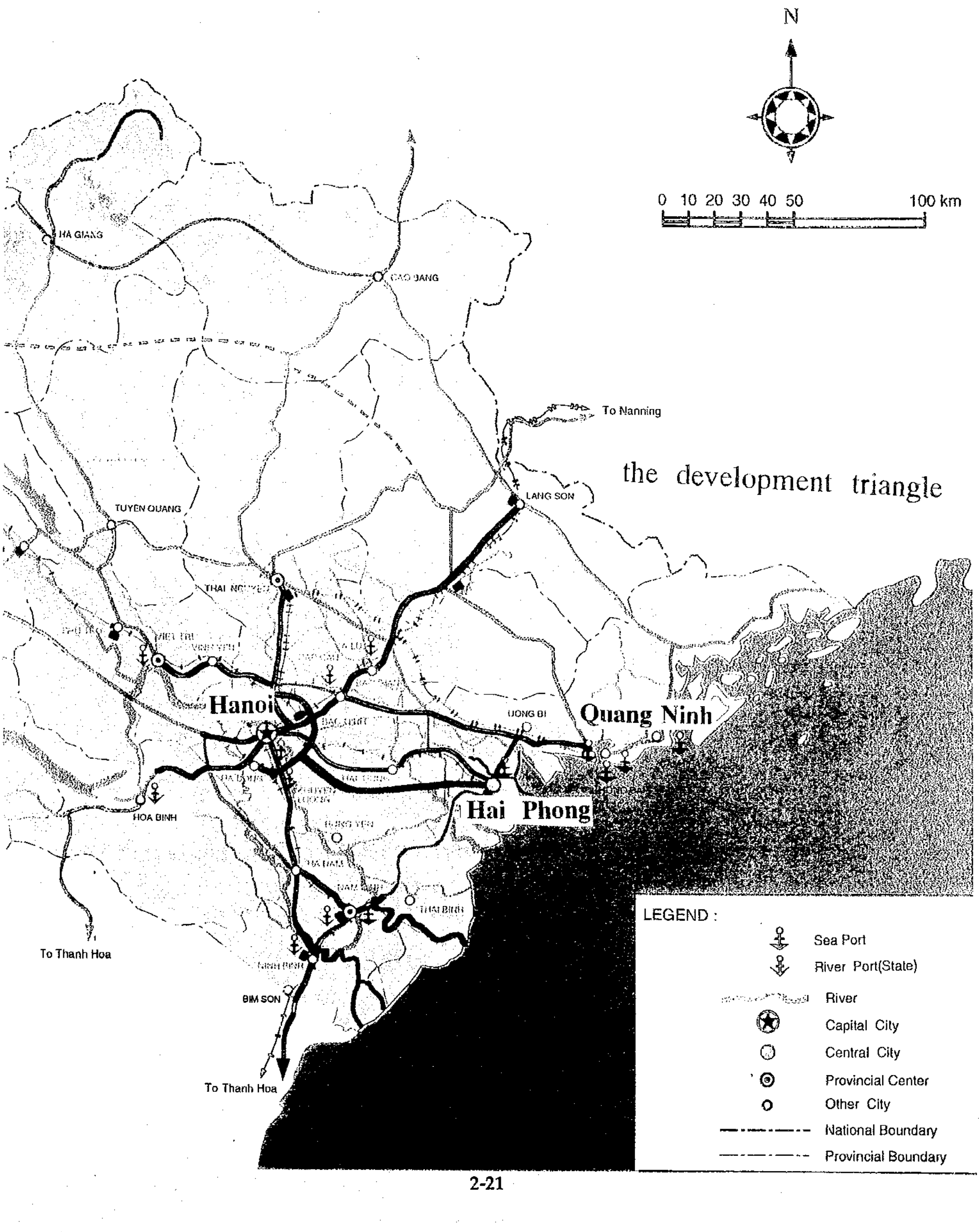
Finally, assuming the cargo volume handled Hai Phong port will exceed its capacity which is about 8.4 million tones in Hai Phong Port in the target year 2010, surplus general cargo volumes which are diverted to Cai Lan port are considered to be export and import cargo volume of Cai Lan port in the target year 2010. This figure represents the comparison of cargo volumes obtained by the macro and micro forecast methods as Cargo volume of Cai Lan Port is 2.7 million tones in the year 2000, 14.3 million tons in the year 2010.

Thank you very much for your attention.

REGIONAL DEVELOPMENT DIRECTION

socio-economic development of northern Vietnam

OHP 1



Stage plan

OHP 6

(1) Stage 1 (by 2000)

1) Construction of Cai Lan Port (1st stage)
   6 berths, cargo handling equipment, access roads

2) A cement factory, a steel billet factory, a wheat mill factory, a fertilizer factory, and related residences.

3) Grade up of route 18A

4) Cam Pha port expansion

5) Tourism development

⇓

(2) Stage 2 (2000 - 2010)

1) Construction of Cai Lan Port (2nd stage)

2) Export Processing Zone, high tech industry, new electric power plant and related residence

3) A cement factory

4) Hon Gai Port redevelopment

5) Grade up of all route 18, railway through Hanoi

6) Water supply and sewage system

7) Expansion of tourism development (Tuan Chau island, Yen Lap lake)

⇓

(3) Stage 3 (after 2010)

1) Development of Cai Lan Port (3rd stage)

2) Minh Thanh airport

3) Removal of Hon Gai coal handling facility

OHP 8

CAI LAN PORT EXPORT PROCESSING ZONE

Principles
a. Production of EPZ shall aim mainly at export b. Utilization of domestic materials to some extent c. Creating jobs for native people d. Application of advanced technologies and technological process e. Small and Large scaled factories f. Minimizing environmental pollution (especially water)

Production Fields
a. Processing & manufacturing of wooden works, bamboo, non-metal, grass, cut glass ware, knitting, garments jewels, cosmetics b. Production from tanned leather c. Manufacturing paper & printing d. Food & beverage processing e. Plastic f. Electronics, cooling electro-mechanics, microelectronics, fundamental metals g: Heavy equipment fabrication,assembly, maintenance and overhaul facilities

STEEL INDUSTRY

Steel Billet Factory(Capacity 0.5 mil.ton)

1) Location	Next to the port
2) Scale	20 HA
3) Completion	By the year 2000
4) Present Situation	Preparing Pre-Feasibility Study
5) Materials	Scrap, Coke, Limestone, Ferroalloys
6) Industrial Wastes	Slag(200,000 tons/year) Waste Water(160 $m^{3/days)}$
7) Employee	500

CHEMICAL INDUSTRY

DAP Fertilizer Factory(Capacity 150,000ton)

1) Location	Dai Yen (Western Ha Long City, along Route 18A)
2) Scale	10 HA
3) Completion	By the year 2000
4) Present Situation	Preparing Feasibility Study
5) Materials	Apatite, Ammonia, Sulfuric Acid
6) Industrial Wastes	Not Decided
7) Employee	100

OHP 12

WHEAT MILL FACTORY

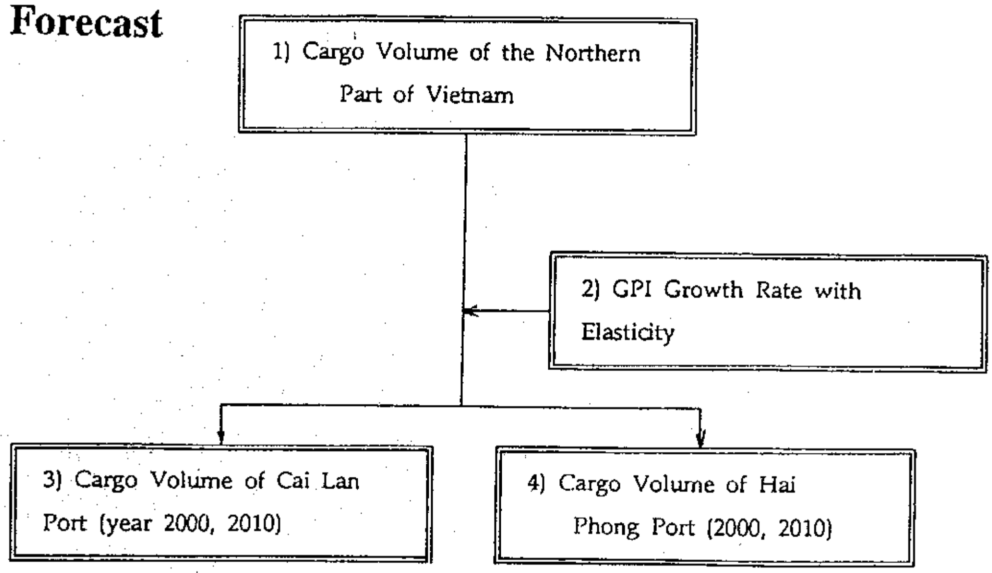
VINAFOOD 1(Capacity 0.5 mil. ton)

1) Location	Next to the Port
2) Scale	7 HA
3) Completion	By the year 2000
4) Present Situation	Preparing Feasibility Study
5) Materials	Wheat, Rice, Maize
6) Industrial Wastes	Not Decided
7) Employee	200

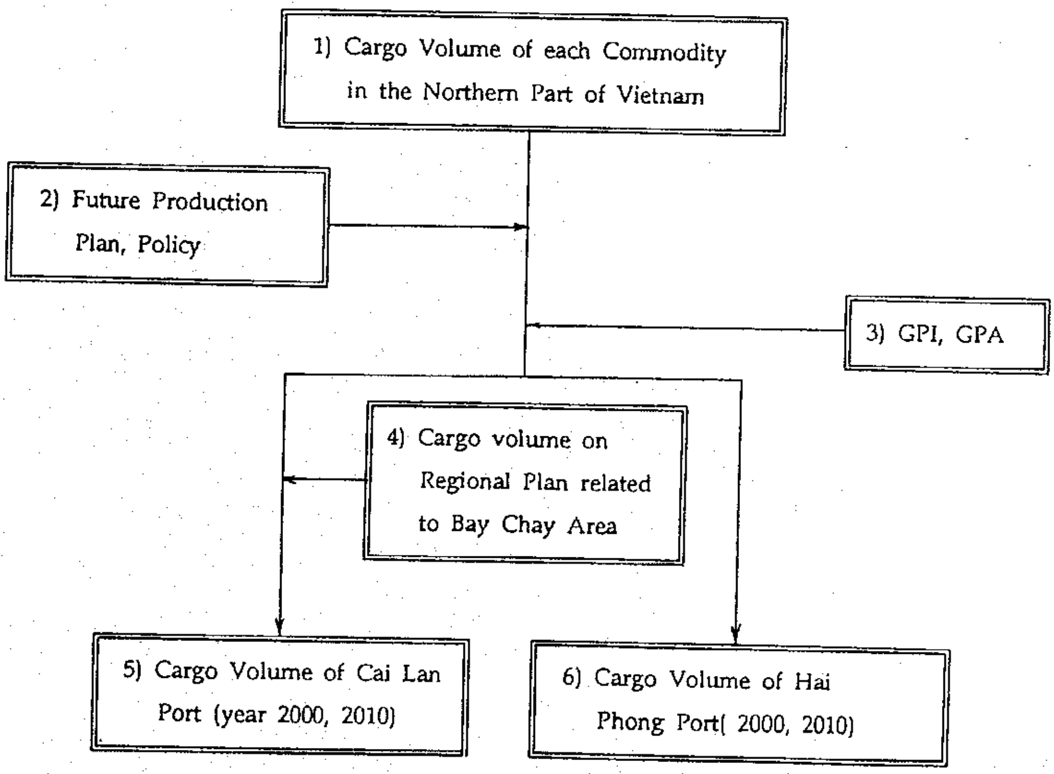
DEMAND FORECAST UP TO THE YEARS 2000 AND 2010

Methodology for Demand Forecast

(1) Macro Forecast



(2) Micro Forecast

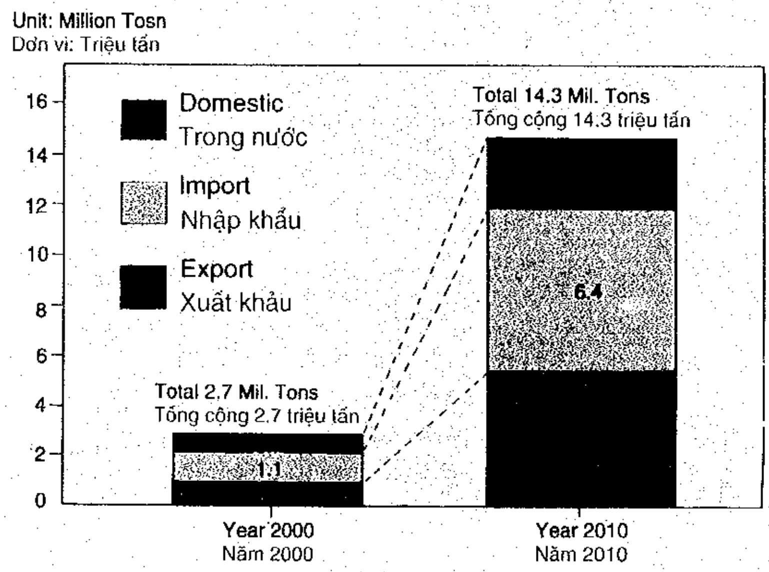


Demand Forecast of Cargo Volume

Dự báo khối lượng hàng hoá vận chuyển

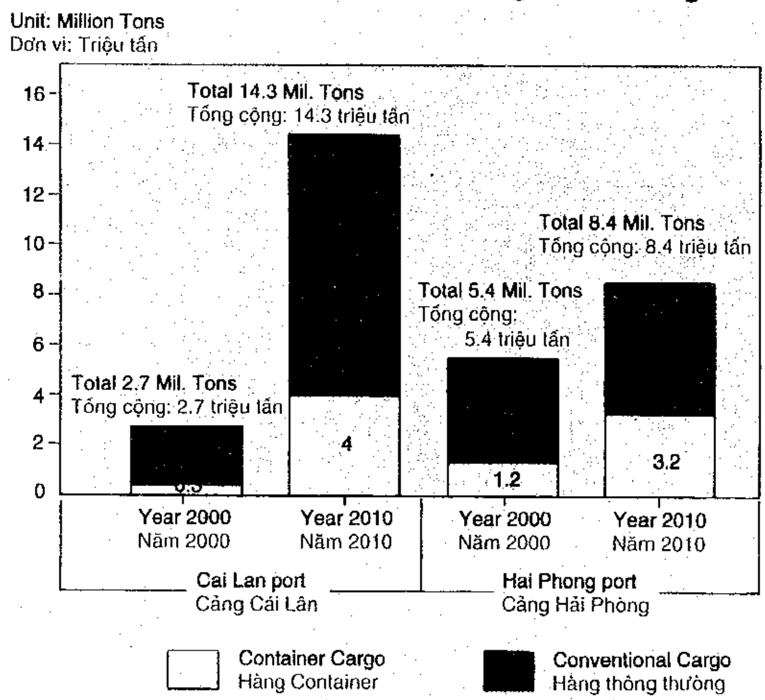
Cai Lan port (2000 & 2010)

Cảng Cái Lân (năm 2000 và 2010)



Demand forecast of Cai Lan port & Hai Phong port

Dự báo cho cảng Cái Lân và Cảng Hải Phòng

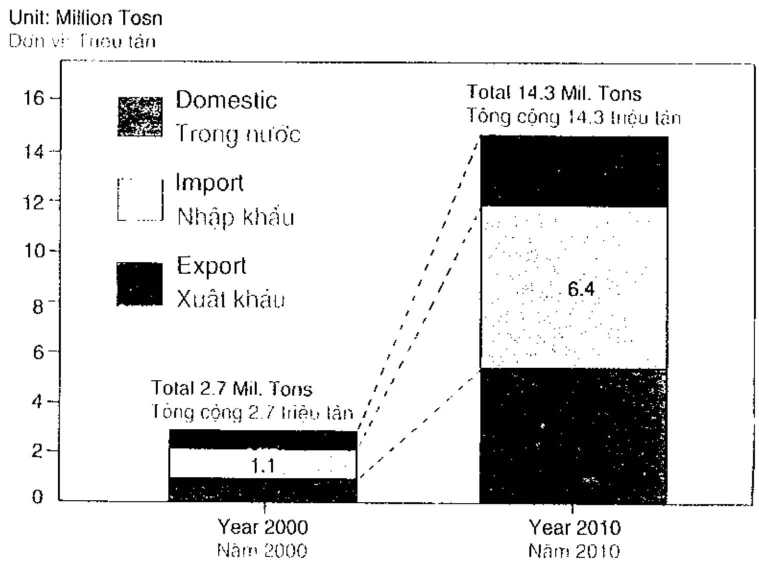


Demand Forecast of Cargo Volume

Dự báo khối lượng hàng hoá vận chuyển

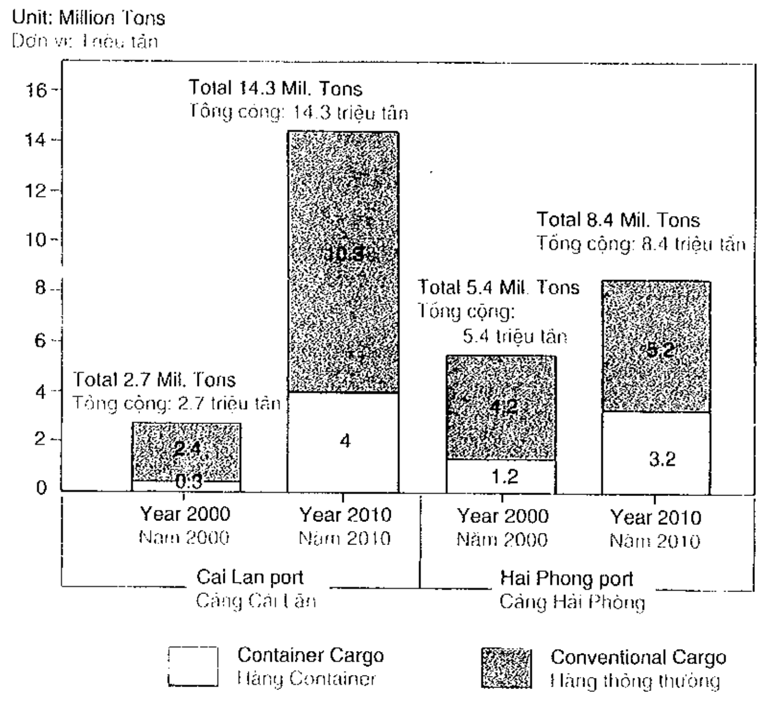
Cai Lan port (2000 & 2010)

Cảng Cái Lân (năm 2000 và 2010)



Demand forecast of Cai Lan port & Hai Phong port

Dự báo cho cảng Cái Lân và Cảng Hải Phòng



3. PORT AND CHANNEL PLANNING

Mr. T. SOGABE

(Opening)

(OHP 1, ef. Bird-eye View Drawing)

Next I will explain the long term and short term port development plan including channel planning.

This bird-eye view drawing is our recommended plan in the year 2010. There are 21 berths in total.

This is Cua Luc strait and here a high bridge is hanging over. The channel stretches from Cua Luc to Hon Mot.

This is the existing berth No.1. Up to the year 2000, it is necessary to construct 6 berths.

I will explain the process and results of our study in more detail.

1. Development Scenario

(OHP 2, cf. Table 11-1-3 Development Scenarios, Table 11-1-4 Evaluation of There Scenarios)

To meet the economic situation and demand in Viet Nam, it can be said that there are three scenarios for the development of Cai Lan Port.

This table shows the development scenarios.

Case - 1 is to develop an industrial port. In this case port operation mainly consists of the heavy industrial productive activities and the port facilities themselves function as one of the factory equipment, thus a large portion of the berth would belong to industrial factories.

Usually raw materials for such factories transported by ships over 100,000 DWT.

(OHP 3)

This is an example of an industrial port in Japan. The name of the port is Kashima Port. The channel and berth are necessary over -16.0m in depth.

(OHP 4 cf. Table 11-1-3 Development Scenarios, Table 11-1-4 Evaluation of Three Scenarios)

Case - 2 is to develop a so-called regional development port. Port operation supports and promotes the regional economic and industrial activities in the vicinity area of the port.

(OHP 5)

This is an example of a regional development port in Japan. The name of port is Ha chi nohe Port.

Behind the berth metal and steel industries, food stuff industries, grain and feed stuff industries and timber industries are located. In this case port would be constructed to accommodate less than 50,000 DWT class vessels which need -13 ~ -14m deep channel and berth.

(OHP 6 cf. Table 11-1-3 Development Scenarios, Table 11-1-4 Evaluation of Three Scenarios)

Case - 3 is to develop a commercial port specializing in the transportation function. It is referred to as a transportation base port. In this case, transhipment general cargo originating from and going to hinterland will be mainly transported as container cargo.

(OHP 7)

This is an example of a rather small scale commercial port in Japan. The name of the port is Aomori Port. The channel and berth require a depth of -13.0m. The port has long berth line thus jetty type of berth is mostly used.

(OHP 8 cf. Table 11-1-3 Development Scenarios, Table 11-1-4 Evaluation of Three Scenarios)

Out of these three cases considering all constraints and development factors including physical, social and economic and environmental condition, we chose case -2, the regional development port case as the most favored one.

2. Allotment of roles and functions between Hai Phong Port and Cai Lan Port

(OHP 9)

Based on the study on transport development in the northern part of Viet Nam (the Master Plan) conducted by JICA Study Team recently and considering the present situation of the two ports and future demand expected roles and functions of the two ports are set out as in this table. Then the role and function allocated to Cai Lan Port is summarized. Finally cargo volume allocated between Hai Phong and Cai Lan Port is as in this table.

3. Planning Ship Size

(OHP 10 cf the Tonnage Ten decoy of Bulk Carrier in the World, Distribution Ship by type an DWT)

Most of the cargo transported through Cai Lan Port is break bulk or bulk cargo. Therefore, it is important to examine the dimensions of the bulk cargo ship.

This Figure shows the tonnage tendency of bulk carriers in the world. It can be said that recently ships between 10,000 DWT to 40,000 DWT have been decreasing, On the other hand over 40,000 DWT ships have been increasing and now represent predominant ship size.

This Table was made by summing up the data from Lloyd's Register of ships (1988) and Japanese ship Details (1987)

It also shows, as far as bulk carriers 15,000 DWT to 50,000 DWT ship size is dominant class in the world.

(OHP-11, cf. Table 11-4-2 Ship Building Number and Tonnage by year)

This Table (11-4-2) shows ship building number and tonnage by year. It is apparent that 30,000 DWT ~ 50,000 DWT bulk carrier is recently dominant class both in number and tonnage. Over 50,000 DWT class is less than 30,000 DWT - 50,000 DWT class both in number and tonnage.

From the point view of ship size prevailing in the future we can choose 40,000 DWT bulk carrier as the representative ship size for planning.

4. Optimum Ship Size and Water depth

(OHP 12)

In order to make a reference to determination of ship size and water depth, the total minimum cost for dredging and freight cost when 3.0 million tons of bulky cargo per year will be transported is examined roughly.

The results are shown in this Figure. It is known that the total cost tends to rise when the depth deviate from -11.0m.

It can be said that the depth around -11.0m, 40,000 DWT class case, is the most optimum ship size and water depth, even if these are simple calculations.

In the same way, from the tonnage tendency and building ship size by each kind of ship and characteristic in Vietnamese sea route, planning ship size by each kind of and berth standard are determined in this table.

5. Long Term Port Development Concept

(OHP 13)

Cargo volume in the year 2010 is forecast as 14.3 million tons and based on this figure long term port development plans are studied.

The premise of planning is as in this table.

(1) Transportation network around Bai Chay Bay will be established: The high bridge hanging over Cua Luc Strait will be completed and the roads No 18A and 18B as well as the connection roads will be upgraded which can pass through the ring traffic around Bai Chay Bay. A port railway will be connected with Ha Long Station.

(2) Hon Gai Port will be relocated to Cam Pha Port and B-12 berth will be removed to Cam Pha Port as well.

(3) The industries and EPZ suggested in regional planning will be operated and three cement factories will have their own private berths for domestic transportation.

Cai Lan Port will be a high efficiency port in cargo handling, then berth occupancy is assumed at 0.65 (this is nearly actual maximum figure). Setting the cargo volume by each cargo handling type and using average handling volume per day per ship necessary number of berths is calculated. The result shows 21 berths and 20 berths should be newly constructed.

6. Cargo Handling Volume and the scale of port facilities.

(OHP 14 Table 11-5-4-(1), Cargo Handling Volume Allocated to Each Berth)

The allotment of cargo handling volume to each berth is set out by following principles.

(1) The cargo will be separated into domestic and foreign commodity for convenience of customs and documentation as much as possible.

(2) Dirty cargo such as coal, ore, and clean cargo will be separately handled.

(3) The same commodity will be handled in the same berth as much as possible.

(4) The grain, maize, wheat and all commodities related to grain will be handled at berth No. 7, the specialized grain berth.

(OHP 15, cf. Table 11-5-4-(2) Cargo Volume Allocated to Each Berth)

Results are shown in this Table.

Total necessary berth length is up to 4,381m.

Based on this allotment of cargo handling volume necessary port facilities are determined as follows.

(OHP 16)

It is necessary to construct 20 berths. Planning ship size and berth dimension is like in this table.

Port Area : Total area -- 200 ha, Berth area -- 130 ha,
green/management area including future expansion area -- 60 ha
Channel : Width -- 130m, depth -- -11.0m (using 2.5m tidal range) for 40,000 DWT class grain carrier.

Berth length : Total -- 4,381m including existing berth length
Port road : Trunk road --4 lanes for motor vehicle 2 lanes for bicycle and pedestrian.

Port railway : estimated cargo volume 1.4 million tons per year
one wagon operating yard is 2 ha.

7. Alternative Plan

(OHP 17, cf. 11-5-1 Alternative Plan)

According to the scale of the port studied so far, three alternative plans can be drawn as in this figure. There are three alternative locations in which the six deep berths could be constructed in a latter stage.

Alternative 1

(OHP 18, cf. 11-5-2 General Layout Plan Alternative 1)

The alternative 1 is the plan starting the construction work from the next berth (B-2) to the existing berth (B-1) toward Cua Luc strait B-3, B-4, B-5, B-6 and B-7 will be constructed in numerical order.

After the year 2000 B-8 and B-9 specialized container berths or B-10 B-11 mainly used for domestic cargo handling should be constructed to meet the demand.

After the year 2000, it is necessary to have deep berths both for container and bulky cargo transportation. In this stage the Bai Chay bridge hanging over Cua Luc strait will be available, therefore in alternative 1, these deep berths will be constructed in Dao Sa To area.

Alternative 2

(OHP 19, cf. Figure 11-5-3 General Layout Plan Alternative 2)

Instead of constructing deep berths in Dao Sa To area, in the alternative 2, deep berths will be constructed west ward of the existing berth against the principle that the deep berths should be constructed near Cua Luc Strait. Then the water front line of EPZ should be used for the berths.

Alternative 3

(OHP 20, cf. Figure 11-5-4 General Layout Plan Alternative 3)

In case of alternative 3, instead of using the water front area for EPZ, the berth construction space for S-1 to S-6 berths will be procured in the opposite side area of EPZ where the shrimp feeding pond is now being constructed.

(OHP 21)

Comparing these alternatives, the alternative 2 seems to be the best if the water front line is available for berth construction. The alternative 1 is also feasible except for the access problem, in which the traffic originating from or destined to Dao Sa To area must pass through the Bai Chay Bridge hanging over Cua Luc Strait or through the new roads connecting with rout No 18B.

This table is shows the evaluation results by criteria for arrangement of port facilities.

8. Channel Planning

(OHP 22, cf. 12-1-1 Access Channel to Cai Lan Port)

This figure (12-1-1) shows access channel to Cai Lan Port.

This channel is approximately 33km long and can be divided into 3 sections; from the offshore Hon Sam, Lach Mieu channel stretches about 19km, from Hon Mot to Cua Luc the channel is 11km long and from Cua Luc to Cai Lan it is 3km long.

Of these parts the approximately 6km channel between Hon Mot and Cua Luc is shallow with a natural depth of -2, -3m. After this section was dredged to -8.4m in 1978, siltation occurred and now the water depth is around -7.5m with a bottom width of 50m-60m.

In order to grasp rock strata a seismic survey using sonic-prospecting was done in this study along the entire channel and no dredging obstacle was found because top level of all type of rocks is under - 15.0m. I would like emphasize this fact.

To ensure safety the width of channel must be at least 130m which corresponds to 5 times of the 40,000 DWT planning ship beam.

(OHP 23, cf. Figure 12-1-4 Tide Distribution Table by Tidal Level and Time Bands (1994))

This figure (12-1-4) shows a tidal distribution table. We adopted the tidal range as over +2.5m with a duration time of over 2 hours. This corresponds to ship manoeuvering time from the entrance to the port. And this frequency was estimated at nearly 78%. This frequency poses no serious problem for ships entering/leaving the port.

(OHP 24)

The water depth of the channel is determined as -11.0m using this formula. The factors considered are tidal range, sinkage of ship movement, reserved depth for safety, depth for sea bed geological condition and reservation for siltation. This figure shows typical section of Cua Luc - Hon Mot channel. The slope is 1 to 7.

(OHP-25, cf. 12-1-7 Initial Dredging Volume by Water Depth, 12-1-9 Initial Dredging Volume by Water Depth)

This figure (12-1-7) is the initial dredging volume by water depth.

The planning dredging volume can be calculated as nearly 6 million m^3 for outer channel and 2 million m^3 for inner channel.

(OHP 26)

In order to evaluate the safety congestion of Cua Luc Strait, the probability of accidents at present is analyzed. Based on the statistics by Quang Ninh Port, the probability of accidents is estimated at the level of 10^{-4}.

This figure shows examples of the actual probability of accidents in Japan. The upper circle group refers to the port area and the lower circle group refers to strait and narrow water area.

The safety level of Cua Luc Strait is quite normal when compared to these figures.

This figure shows a bumper model which gives safe navigation. The capacity of traffic volume at Cua Luc Strait can be estimated from this model. The result shows that safe traffic capacity passing through Cua Luc Strait is 10-15 ships per hour, thus it is no problem comparing the average traffic volume of 10 ships per day estimated in the year 2010 under the appropriate countermeasures.

The countermeasures include one way control for large ship, introduction of self propelled ferry boats and communication system so on.

9. Short Term Port Development Plan

(OHP 27)

On the basis of the long term port development concept plans, the short term port development plan up to the year 2000 will be formulated and according to this plan, the feasibility shall be assured through following rough design, preliminary cost estimation, economic analysis and financial analysis.

The cargo volume that will be handled in the year 2000 is 2,676,000 tons. And the premises and principles of planning are as in this table.

(1) The land transportation facilities should function well and easy access to the B-1 berth should be secured. The road No 18A should be improved for heavy traffic from/to port area. Traffic generated at port area from/to Ha Noi must not pass through the seaside road of Bai Chay.

(2) Hon Gai Port, Quang Ninh Port and B-12 oil berth and oil terminal as well are to continue operating.

(3) The industries in EPZ will be operating and Lam Ban cement factory will have private berths from which cement and clinker for domestic use will be directly transported to others districts.

Required number of berths is calculated as 7 berths using the average berth occupancy (0.5) and average cargo handling volume per day per ship.

10. Cargo Handling Volume

(OHP-28, CF. Table 12-2-4 Planning Cargo Handling Volume by Each Berth Chi the Year 2000)

This table shows the allotment of cargo handling volume to these 7 berths. The same principles as in the case of long term concept planning are used here.

(1) The cargo will be separated into domestic and foreign commodity.

(2) Dirty cargo such as coal, ore, and clean cargo (cf. general cargo) will be separately handled.

(3) The same commodity will be handled in the same berth as much as possible.

(4) The grain, maize, wheat and commodity concerned grain cargo will be handled at berth No 7, that is, the specialized grain berth.

Total berth length is 1461m including one existing berth.

11. Facilities Lay out Plan

(OHP 29)

Alternative plans for berth alignment can be drawn in which the rocks near the light house BT1 are either excavated or avoided.

This figure shows contour map of the rock level and here shallow rocks appear.

(OHP 30, cf. Figure 12-2-1-(1) The Short Term Port Development Plan Alternative 1)

Alternative 1 avoids excavating the rocks and reclaims the area around the rocks to utilize for wharves area for jetty type.

(OHP 31, cf. Figure 12-2-1-(2) The Short Term Port Development Plan Alternative 2)

Alternative 2 also avoids the rocks, however the berth alignment is almost parallel type berth (no jetty type berth).

(OHP 32, cf. Figure 12-2-2-(1) The Short Term Port Development Plan Alternative 3)

Alternative 3 excavates rocks for the access channel and basin and berth alignment is straight.

(OHP 33, cf. Table 12-2-5 Evaluation of Alternatives)

Evaluating these three plans from such factors as the length of the berth, convenience for wharf use, the space for behind the berth, construction cost and impact on environment, Alternative 1 is selected as the most preferable plan.

(OHP 34, cf. Figure 12-2-5 Facilities Layout Plan in the Year 2000)

According to Alternative 1 the detail facilities layout plan is examined.

Vertical length against berth alignment is adopted as 250m which is nearly the maximum length of existing conventional berth. The reason is that it is necessary to strengthen future storage capacity in the form of open yards, warehouses etc.

Berth length is 1,295m (6 berths) and area is 394,450m². When the existing berth No 1 is added the total berth length becomes 1,461m and area is 435,950m².

Front Basin to the berth is 40m or 50m wide corresponding to two times length of ship beam where water depth is the same as berth depth. Adjacent offshore basins are 2.5m shallower than those front basins to the berth because ships can utilize tidal range.

A turning basin is planned as a circular area with the diameter of 300m which corresponds to 1.5 times length of 40,000DWT ship length in case of using tug boats and anchors.

The minimum width of the access channel is 130m which is 0.9 times ship length of a 10,000 DWT in case of berthing after turning her bow toward the entrance of the port.

(OHP 35, cf. Table 12-2-6 Share and Cargo Volume by Each Means of Transportation)

This table shows the estimated share of each transportation mode by kind of commodity. This is done referring to the examples in Hai Phong Port and considering the features of cargo transportation in Cai Lan Port (70% of cargo volume is generated from factories in short distance to the port).

The cargo volume transported by railway is estimated as only 31 thousand tons per year. As this cargo volume is too small to plan port railway, it will be transported by truck.

In conclusion 2,355 thousand tons (88% of total cargo) will be transported by truck and 321 thousand tons (12% of total cargo) can be transported by barge.

(OHP 36)

Using these figure the volume of road traffic generated from port operation can be estimated. The peak traffic volume per hour is estimated at 1,227 vehicles. The formula and results is as in this figure.

According to the technical standards for port and harbor facilities in Japan, four lanes are necessary for passing the above peak traffic volume. A trunk road with the width of 22.0m which composed of 14m (4 lanes × 3.5m for motor vehicle), 2.0m (central separator) and 6m (2 lanes × 3.0m for bicycle and pedestrian) can be planned.

(OHP 37, cf. Figure 12-3-1 Cargo Flow and Handling Ratio by Routes in Main Port of Hai Phong)

This figure shows cargo flow in the berth area in Hai Phong Port. Referring to this example and the features of handling type, cargo flow between ship and quay side cargo transportation methods between apron and transit shed or open yard to road and to factories behind the berth area, is determined.

(OHP 38, cf. Table 12-3-20 Estimation of Route-wise Cargo Volume at Berths in the Target Year 2000)

This table shows the result of these estimation. Cargo flow and volume in the port area, outside area and direct load delivery are indicated.

Based on the figure in this table, cargo handling system is studied.

(OHP 39, cf. Figure 12-3-9 Conceptional Flow of unloading and Transporting Grain)

This is one example of a conceptional cargo flow in the case of grain terminal. The first case is control and operation of silo system and second is control and operation of transitshed type. Cai Lan port in the year 2000 cargo volume of grain is not large volume of grain enough to introduce silo system, therefore we adopt transit shed type operation.

(OHP 40)

This photo shows an example of a grain terminal in Japan. Grain carrier is usually over 30,000 DWT. Up to the year 2010, it is necessary to introduce silo type cargo handling system in Cai Lan Port.

I would like to emphasize that grain berths should be constructed by large scale.

(OHP 41)

We determined the cargo handling system for each type of cargo in the same manner as well as taking into account the efficiency and productivity of cargo handling.

Regarding the container handling system, we selected the fork lift system after comparison with the transfer crane system, straddle carrier system and chassis system.

This table shows which type of cargo handling system can be introduced to berth No.1 to berth No.7. Required equipment is also shown in the table.

(OHP 42)

This table is a summary of the port facilities plan. According to the cargo volume necessary to pass through transit sheds is 853 thousand tons in total and necessary number of transit sheds,necessary number of transit shed is determined.

Beside of transit shed one CFS (container freight station) of 4,400m² and necessary open yards and one container yard are planned.

Administration offices and welfare facilities for port workers are also planned. An administration building of 3000m² is planned for 580 stuffs (unit dimension: 5m²/person).

In order to preserve a good environmental condition a large green area is planned in the surrounding area behind berth No 2--4 and trunk road. Administration offices, welfare facilities and necessary buildings in the future are also planned in this area.

Facilities for water and electricity supply, drainage, communication facilities, light buoys and tug boats are also necessary.

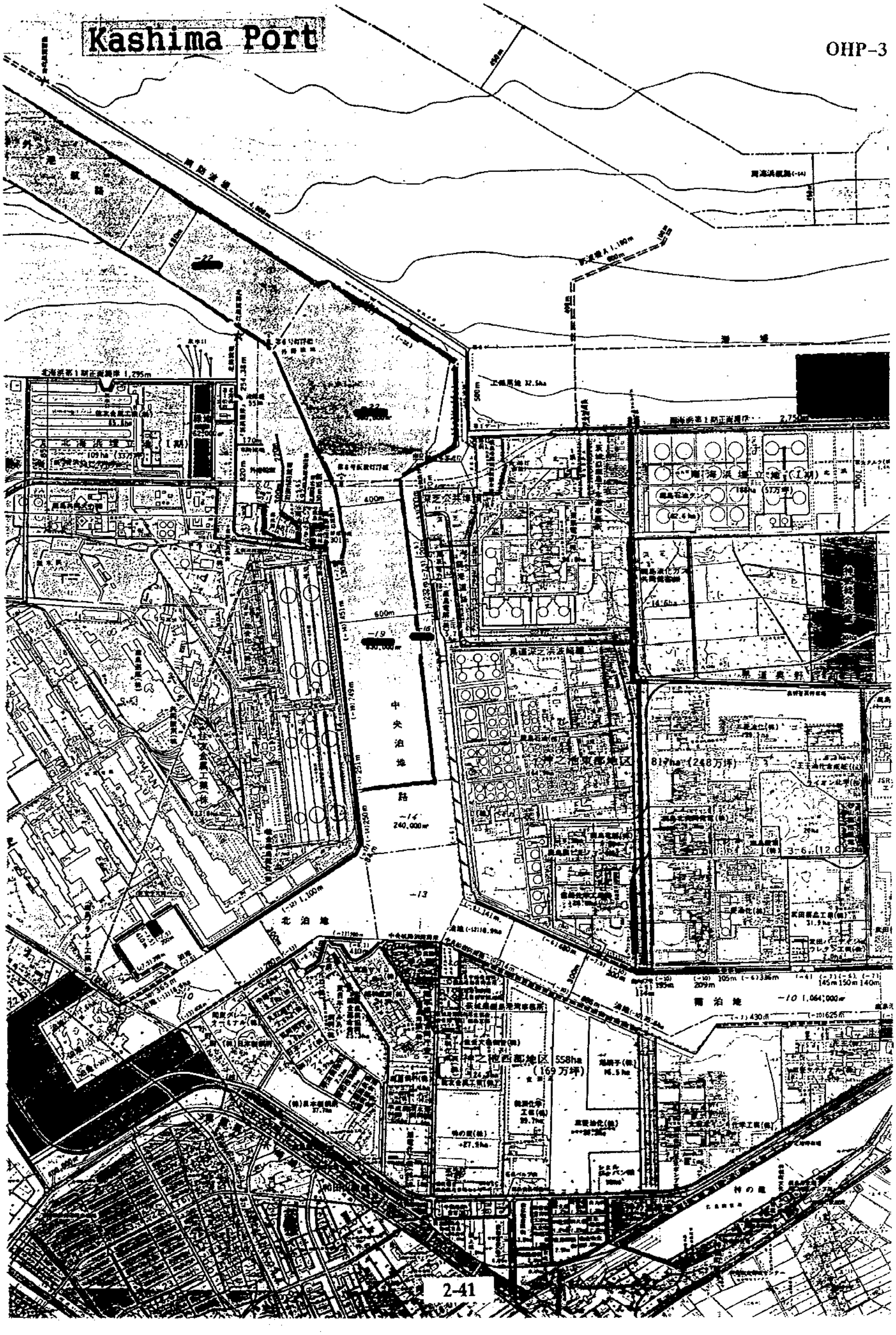
(0HP 43, cf. **Figure 11-5-3 General Layout Plan Alternative 2)**

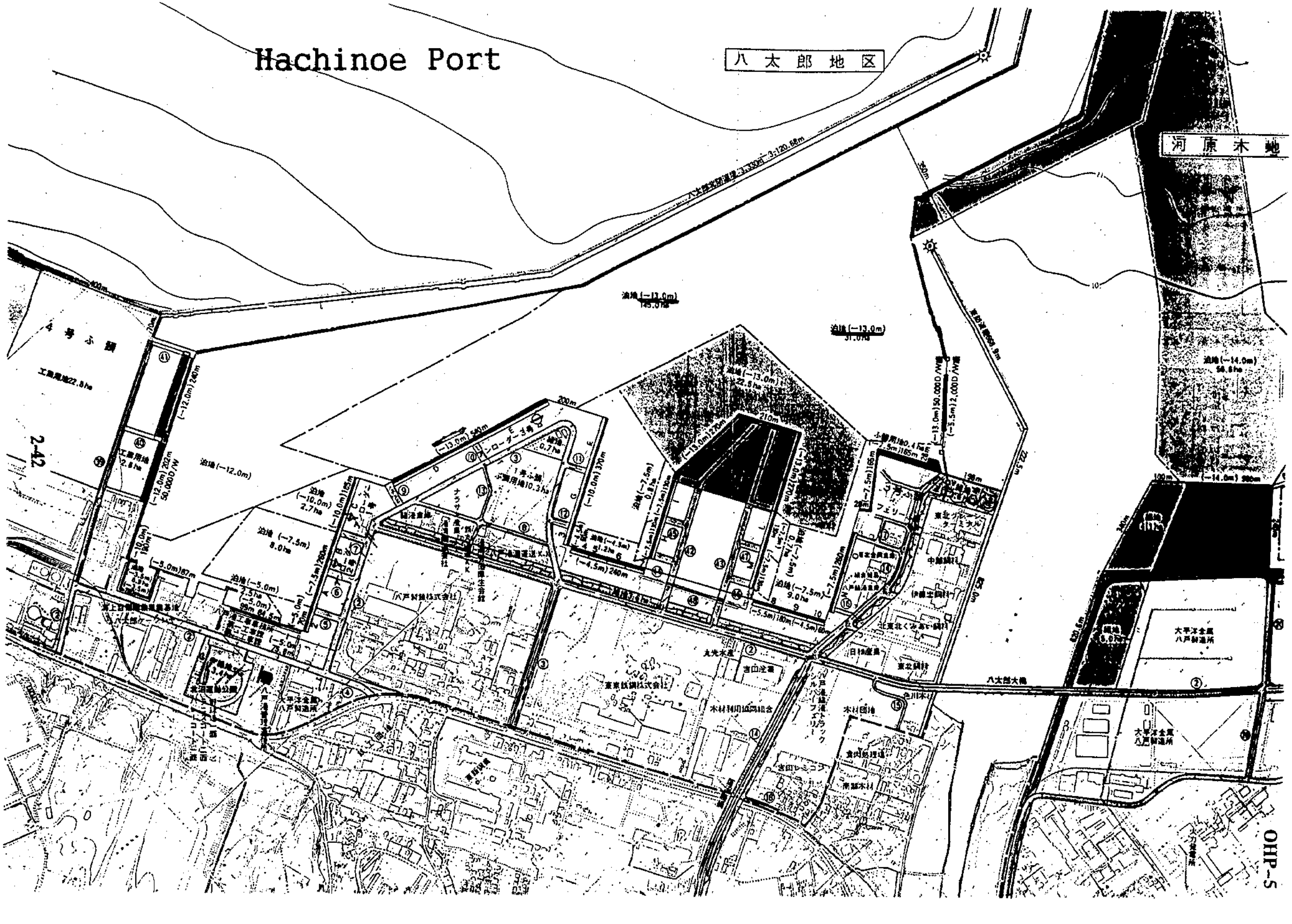
This is our recommended plan.

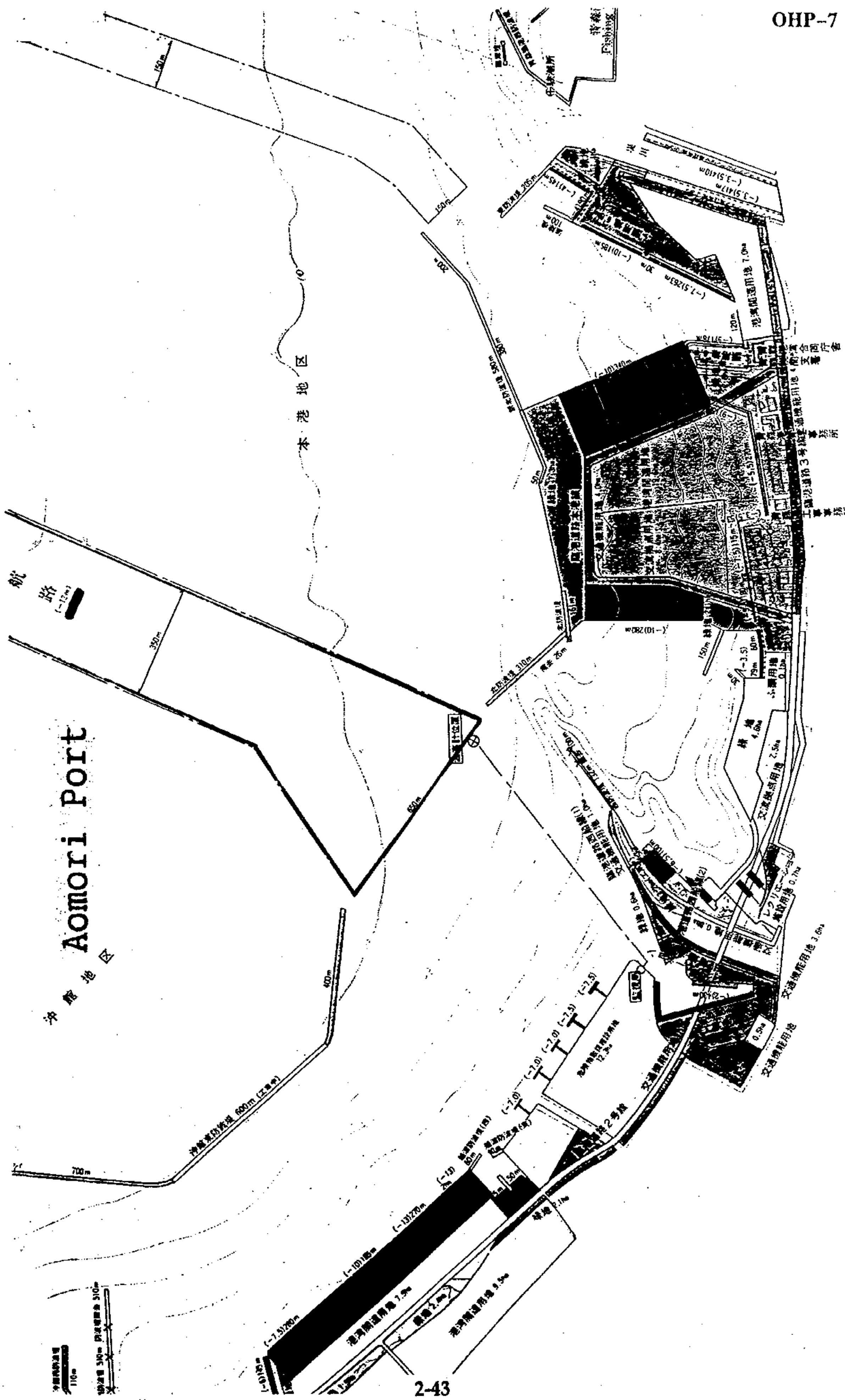
We believe Cai Lan Port will soon play very important role in both the development of the region and the whole country.

Thank you very much for your attention.

Kashima Port




Hachinoe Port
八太郎地区
河原木地
泊地(−13.0m) 145.0ha
泊地(−13.0m) 31.0ha
泊地(−12.0m)
泊地(−14.0m) 56.8ha
4号ふ頭
工業用地22.8ha
泊地(−7.5m) 8.0ha
泊地(−7.5m) 9.0ha
大平洋金属 八戸製造所
八太郎大橋
東北グレーンターミナル
フェリー
木材団地
丸光水産


Aomori Port
沖館地区
本港地区
航路
沖館東防波堤 600m (工事中)
北防波堤 310m
交通機能用地
港湾関連用地

2. Allotment of roles and functions between Hai Phong Port and Cai Lan Port

Considering these development concepts, the present situation of the two ports and the future demand expected, the roles and functions of the two ports are set out below.

Hai Phong Port	Cai Lan Port
International General Commercial Port	Regional Development and Transportation Port
- To handle various kinds of commodities and a variety of types of general and container cargo for hinterland	- To handle limited kinds of high volume cargo in unit commodity such as bulk cargo for the surrounding local industries
- Foreign trade + domestic trade	- Mainly foreign trade
- Middle size ship (less than 10,000 DWT)	- Large size ship (10-40,000DWT)

Thus, the role and function allocated to Cai Lan port is summarized below.

- To encourage,promote and support the development of various kinds of local industries.
- To handle bulky cargo for the factories located in the vicinity of the port
- To transport cargo exceeding the existing port capacity in the northern part of Vietnam.(under the maximum utilization of Hai Phong Port)
- To meet containerization and accept large container ships.
- To promote tourism development.

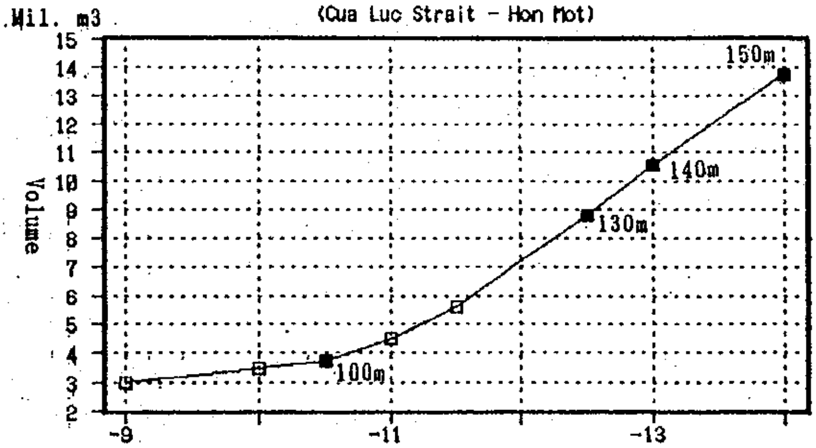
Cargo volume allocated between Hai Phong Port and Cai Lan Port is as follows.

Table 11-1-5 Cargo Volume allocated between Hai Phong Port and Cai Lan Port

Unit:1000 tons

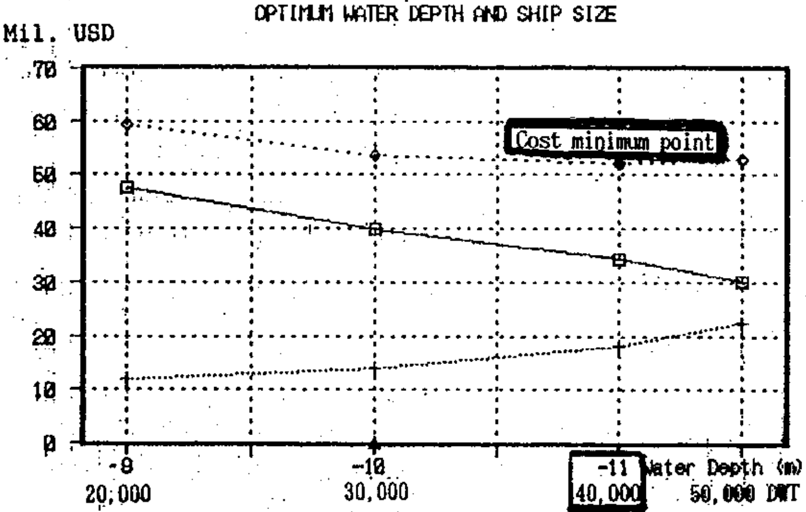
		Year 2000		Year 2010	
		Master Plan	This Study	Master Plan	This Study
Hai Phong Port	Total	4,600	5,424	8,200	8,350
	Container	1,500	1,200	4,500	3,200
Cai Lan Port	Total	1,000	2,676	6,300	14,300
	Container	0	335	600	4,000

4. Optimum Ship Size and Water depth



Note: 100m, 130m, 10m, 150m is channel width
■ — Calculation Value
□ — Estimation Value

Figure 11-4-9 Initial Dredging Volume



Note: □ Total freight cost, + Dredging cost, ◇ Total cost

Figure 11-4-10 Optimum Water Depth

PLANNING SHIP SIZE

Kind of Ship	Ship size (DWT)	Ship Length (m)	Full Draft (m)	Berth Depth (m)	Berth Length (m)
General Cargo Ship	10,000	140	8.4	-9.0	160
	15,000	160	9.3	- 10.0	185
Container Ship	20,000	215	10.5	- 12.0	250
	30,000	225	11.3	- 13.0	300
Bulk Carrier	20,000	165	10.0	- 11.0	210
	30,000	191	11.0	- 12.0	240
	40,000	207	11.9	- 13.0	260

5. Long Term Port Development Concept

The Premises of Planning

(1) Transportation network around Bai Chay Bay will be established

- The high bridge hanging over Cua Luc Strait will be completed
- The road No 18A and 18B as well as the connection roads will be upgraded and completed so as to pass through the ring traffic around Bai Chay Bay (ring road network will be established)
- Railway facilities and track improvement between Cai Lan and Hạ Noi will be completed and necessary branch lines will be constructed.

(2) Hon Gai port will be relocated to Cam Pha port

(3) B-12 will be removed to Cam Pha port or outer Ha Long Bay

(4) Tourism development will be separated from port development

(5) The industries and EPZ suggested in Chapter 10 Regional planning will be operated.

(6) Three cement factories will have each private berths which will be used for domestic transportation and the cement and clinker for export will be transferred mainly by barge from these private berths to public berths.

Berth Plan

Berth Plan (2000)

	Ship size DWT	Depth (m)	Number of Berth	Berth Length (m)	Berth Area (m2)
Berth	10,000	-9.0	2	326	81,500
	15,000	-10.0	1	185	46,250
	20,000	-11.0	1	210	52,500
	30,000	-12.0	2	480	148,200
	(incl.20,000	container	ship)		
	40,000	-13.0	1	260	107,500
Total			7	1,461	435,950

(including existing No. 1 berth)

Berth Plan (2010)

	Ship size DWT	Depth (m)	Number of Berth	Berth Length (m)	Berth Area (m2)
Berth	10,000	- 9.0	8	1,286	321,500
	15,000	-10.0	1	185	46,250
	20,000 (conventional)	-11.0	3	630	149,310
	20,000 (Container)	-12.0	2	500	170,270
	30,000 (Conventional)	-12.0	4	960	316,200
	30,000 (Container)	-13.0	1	300	105,000
	40,000	-13.0	2	520	198,500
Total			21	4,381	1,307,030

(including existing No.1 berth)

Evaluation of the Alternatives

Criteria for arrangement of port facilities in Cai Lan port long term general layout plan are as follows:

1. Technical Point of View
   a. The construction cost of wharf, channel and basin as well as land reclamation is the minimum

   b. The maintenance cost for channel and basin is the minimum
   c. The construction cost access is the minimum

2. Environmental Point of View
   a. The topographical and bathymetrical alternation is minimum.
   b. the impact against inhabitant is minimum
   c. The negative interaction with tourism is minimum

3. Human Right Point of View

   a. The number of families whom have to move is minimum, regardless of whether it is compulsory or not

4. The Possibility of Future Expansion Point of View

   a. Channel and access are commonly used in the future in a maximum extent

   b. preserved land and shore line are left in the continue are to facilities planed.

Criteria	Alternative 1	Alternative 2	Alternative 3
1 - a	◎	0	△
b	◎	△	△
c	0	◎	△
2 - a	△	◎	△
b	△	◎	0
c	0	◎	◎
3 - a	△	◎	0
4 - a	◎	◎	△
b	◎	◎	◎

Note: ◎ Good
0 Normal
△ Not good

The Water Depth of the Channel

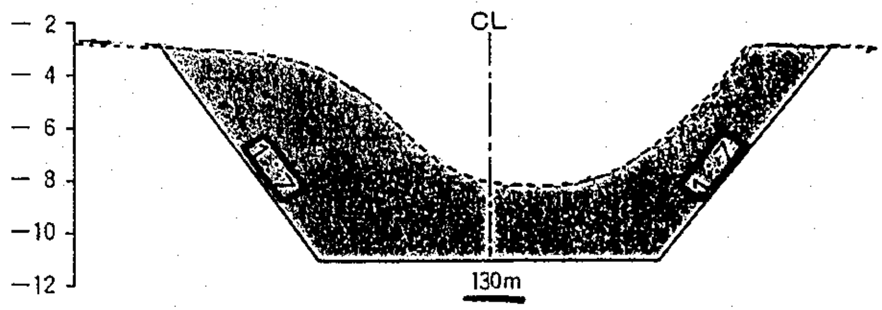
Channel Dredging Plan

Channel depth
H= df+ds+dr+dt+dw=11.9 (40,000DWT case) + 0.5 + 0.56 + 0 + 0 = 13.0m
W= 13.0 + 0.5 (reservation for siltation) –2.5 (tidal range) = – 11.0m
Here;
H – Necessary depth
W – Planning depth
df – Maximum draft
ds – Allowance for Sea bed geological condition
dr – Squat due to the navigation speed
dt – Allowance for turning
dw – Allowance for wave action

Kế hoạch nạo vét luồng

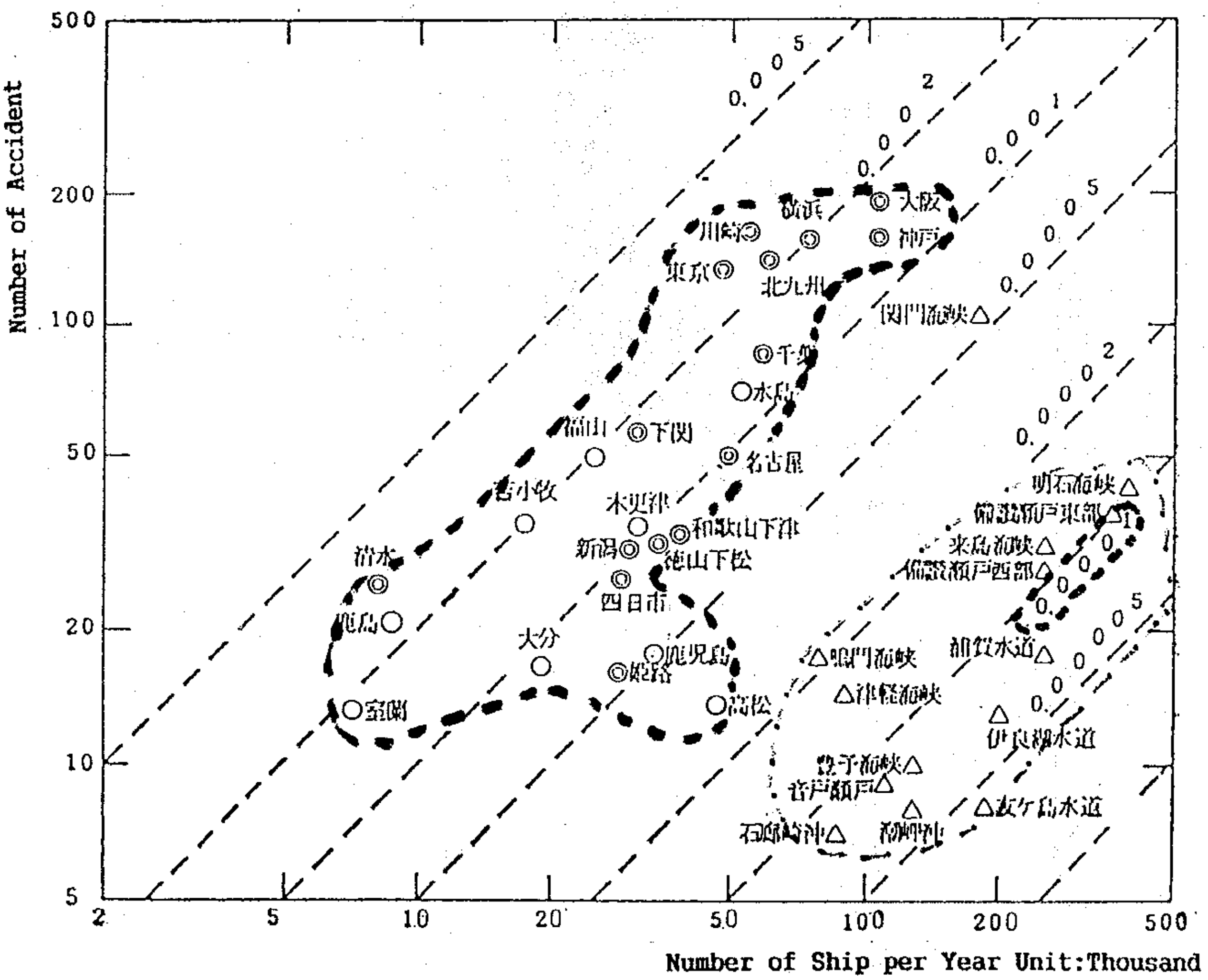
Độ sâu của luồng
H= df+ds+dr+dt+dw=11.9 (trường hợp tàu 40,000 DWT) + 0.5 + 0.56 + 0 + 0= 13.0m
W= 13.0 + 0.5 (Bảo vệ khỏi sa bồi) –2.5 (Mực nước thông thuyền)= –11.0m
Here;
H – Độ sâu cần thiết
W – Độ sân theo thiết kế
df – Mớn nước tối đa
ds – Dung sai cho diều kiện dịa lý dáy bién
dr – Lượng dâng nước do tốc độ hành hải
dt – Dung sai cho quay tàu
dw – Dung sai cho sóng

Typical cross section (Cualuc - Hon Mot)
Mặt cát diến hình (Cửa Lục - Hòn Một)



- - - - Existing sea bed level line
Đường mức đáy biển hiện tại
—— Dregding line
Đường sẽ nạo vét

Evaluation of Safety Traffic in Cua Luc Strait



Note: Bumper Model

1. Fujii and others indicated the presence of the effective domain around a ship into which another ships avoid entering.

2. The domain for co-directional encounter is approximately elliptic with a long radius of 8L and short radius of 3.2L under ordinary navigational condition.

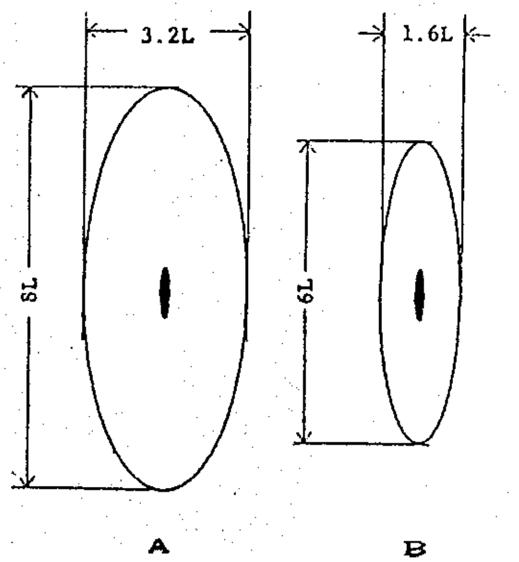


Figure 12-1-11 Bumper Model

9. Short Term Port Development Plan

Premise of Planning

(1) The land transportation facilities should function well and easy access to the B-1 existing berth should be secured.

(2) The road No 18A should be improved for heavy traffic from/to port area.

(3) The road traffic originating from and destined to the port shall pass through the road No 18A separately from the traffic of tourists. That is heavy traffic of port should use the route which is located at the top of the hills and avoid the sea side route facing Ha Long Bay.

(4) The necessity of port railway connected with Ha Long station and such facilities as wagon operating yard will be examined.

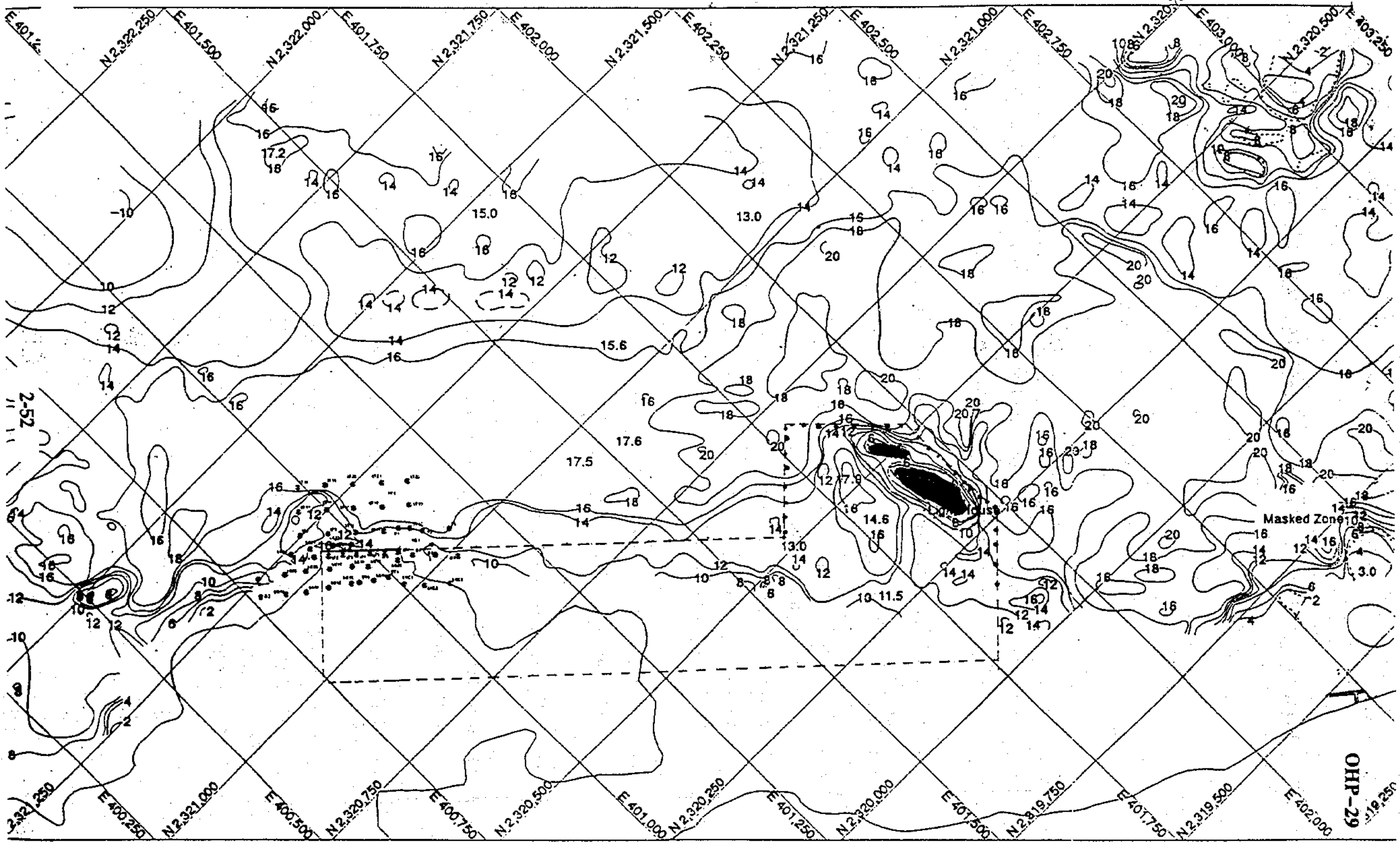
(5) B-12 oil buoy berth and oil terminal are continue operations.

(6) Hon Gai Port, and Quang Ninh Port, continue to operate mainly for coal transportation.

(7) The industries and EPZ suggested in chapter 10 will be operated.

(8) One cement factory will have private berths from which cement and clinker for domestic use will be directly transported to other districts.

Rock Surface Contour Map



Road Traffic

$N = Z \times (\alpha/W) \times (\beta/12) \times (\gamma/30) \times \{(1+\delta) / \epsilon\} \times \theta$

Here : N - Traffic Volume for planning (number of vehicle per hour)

Z - Cargo handling volume per year (ton)

W - Average loading volume per truck (ton)

Bulk and break bulk cargo	6.0 ton
General cargo	2.0 ton
Container	8.0 ton

α - Transportation share of motor vehicle 1

β - Monthly variation ratio (peak volume / average volume) 1.2

γ - Daily variation ratio (peak volume / average volume) 1.5

δ - Number of related vehicle (number of related vehicle / number of truck) 0.5

ϵ - Loading ratio (number of loading truck / total number of truck) 0.5

θ - Hourly variation ratio (peak volume per hour/ volume per day) 0.16

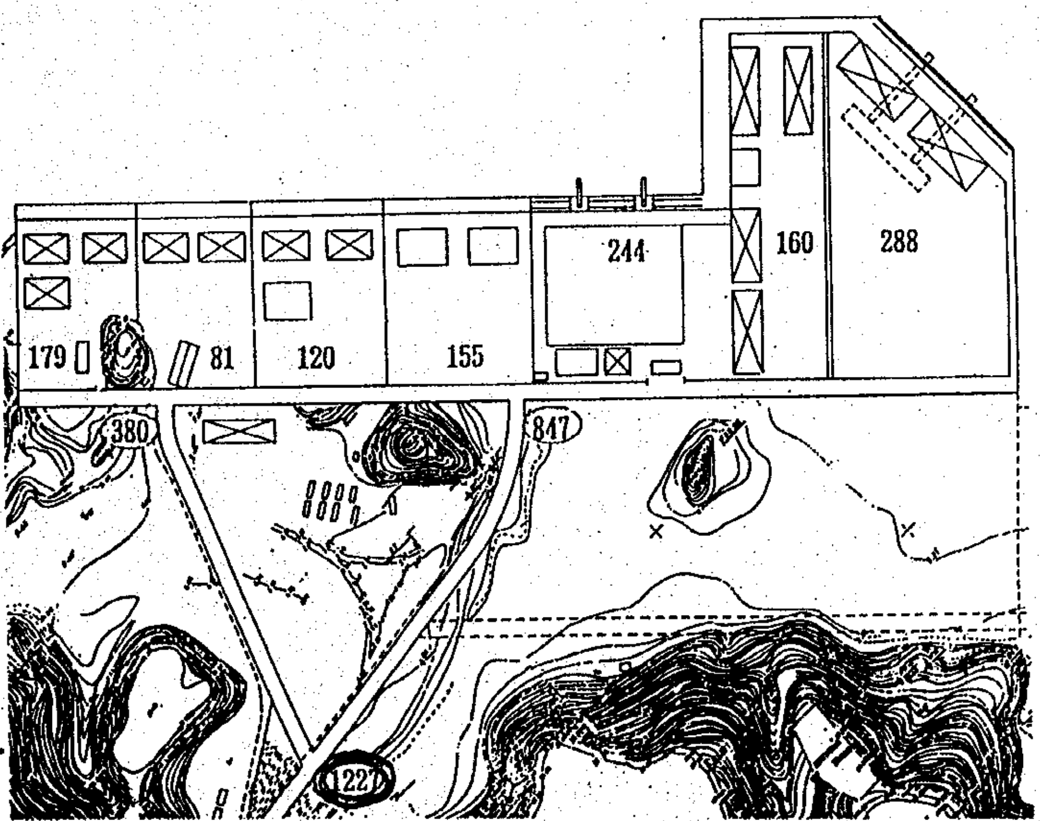
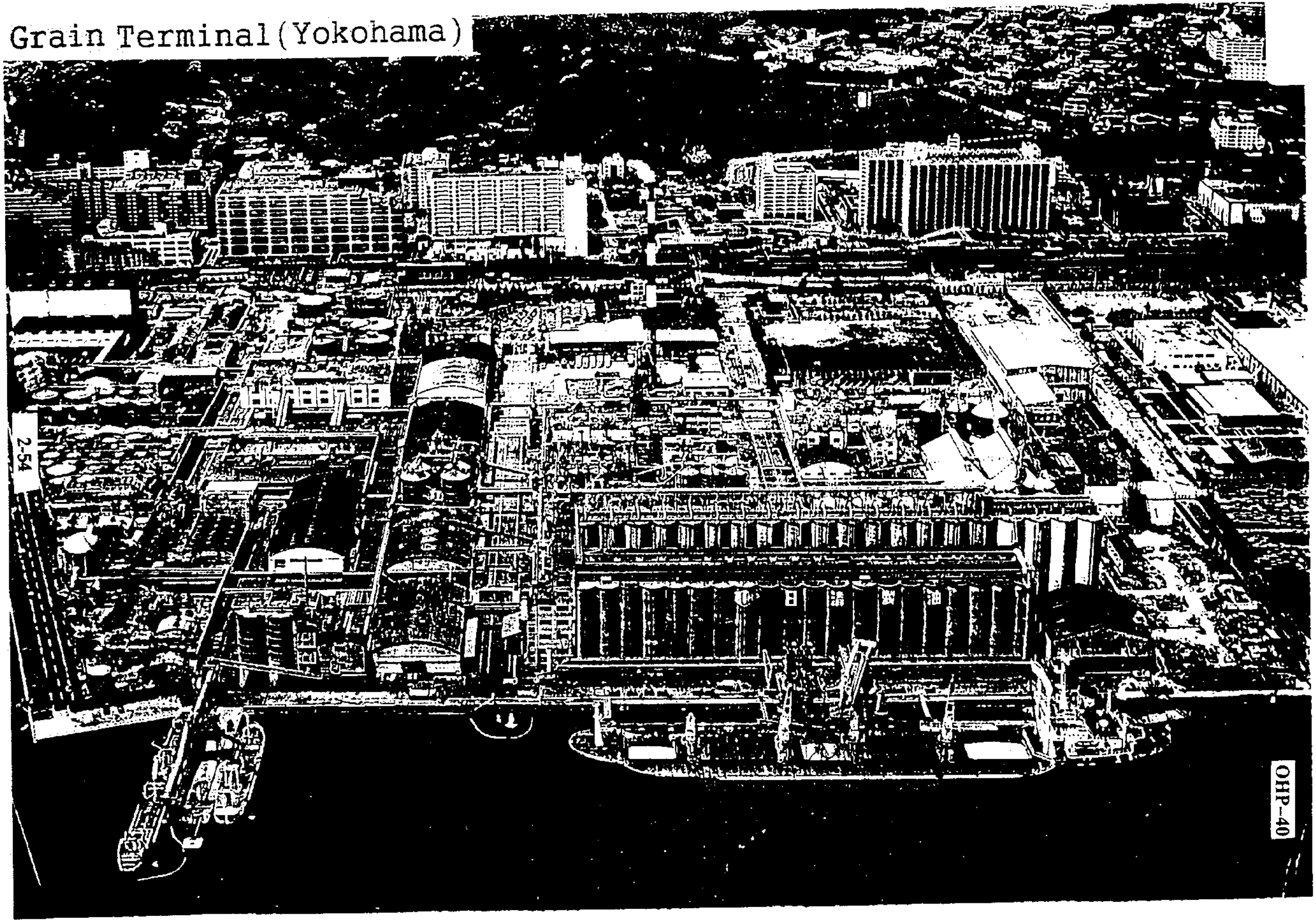


Figure 12-2-2 Traffic Volume Generating from Each Berth

Grain Terminal(Yokohama)



OHP-40

Neccessary Equipment for the Target Year 2000

Cargo Handling System by each berth

B-1 berth to B-3:	Ship's Gear, Forklift System
B-4 berth :	Ship's Gear, Grab Bucket System
B-5 berth :	Shore Crane, Trailer, Tractor, Reach Stacker Forklift System
B-6 berth :	Ship's Gear, Forklift System
B-7 berth :	Ship's Gear, Portable Belt-conveyor, Hopper, Truck, Shove Loader

Berth No.	Cargo	Planned Main Gear	Onboard	Dockside	Warehouse	Yard	Others
No.1	Bag G.C.	Ship's Gear	*Forklift (3KT) 2 UT	*Forklift (3KT) 1 UT (5KT) 1	*Forklift (3KT) 1 UT (5KT) 1 UT		*Trailer for transfering cargo from far T. Shed 15 UT * Tractor for above 5 UT
NO.2	Bag Steel	Ship's Gear	*Forklift (3KT) 1 UT (5KT) 1 UT	*Forklift (3KT) 1 UT (5KT) 1 UT	*Forklift (3KT) 1 UT		
No.3	Steel	Ship's Gear	*Forklift (3KT) 1 UT (5KT) 1 UT	*Forklift (3KT) 1 UT (5KT) 1 UT	*Forklift (3KT) 1 UT		
No.4	Asphalt.Drm Coal. Bulk Scrap.Loose	Ship's Gear	*Forklift (3KT) 1 UT *2-W Dozer 1 UT	*Forklift (3KT) 2 UT	*Forklift (3KT) 1 UT	*Shovel Loader 2 UT *Grab Bucket (For each) 2 UT	
No.5	Container G.C.	Shore Crane (Rail Mount) (Capacity 40 KT) 2 UT	*Forklift (3KT) 1 UT (5KT) 1 UT	*Forklift (3KT) 1 UT (5KT) 1 UT (15KT) 1 UT *Top Lifter (30.5KT) 2 UT	*Forklift (3KT) 1 UT (5KT) 1 UT	*Reach Stacker (30.5KT) 3 UT *Side Lifter (4.5KT) (5 Trs) 1 UT *Yard Tractor 10 UT *Yard Trailer 10 UT	(C.F.S.) *Reach Stack. (30.5KT) 1 UT *Yard Tractor 1 UT *Trailer 6 UT *Forklift (3KT) 3 UT (2KT) 2 UT
No.6	Bag/Drum Cement. BLK	Ship's Gear	*Fork Lift (3 KT) 2 UT	*Fork Lift (3 KT) 2 UT	*Fork Lift (3KT) 1 UT		
No.7	Bulk	Ship's Gear	*2-way Dozer 1 UT	*Grain Truck (22 m³) 6 UT *Hopper 2 UT		*Hopper 2 UT *Grab Bucket 2 UT (Each Cargo) *Shovel Loader 2 UT *Conveyor 2 Set	
Shore Crane		*Mobile Type Crane 4 UT (For Gealess Ships)					

Port Facilities Plan

Facilities	Item	Depth	Num. length	Area
Berth	10,000 ~40,000 DWT	-9.0~-130 m	7 1,461m	435,950 m2
		Depth	Width	Length
Channel	Cua Luc-Hon Mot	-11.0 m	130 m	11 km
		Depth	Width	
Basin	Turning Berth	-11.0m Same as berth	300 m circle 40m , 50m	
		Width	Lane (Motor vehcle)	Lane (bicycle & Pedes)
Road	Trunk Semi-trunk Branch	22.0 m 11.0 m 7.0 m	4 2 2	2 2 -
	Berth	Width x Length (m)	Number	Square (m2)
Transhit shed	B-1	40 X 60	3	7,200
	B-2	40 X 60	1	2,400
		40 X 65	1	2,600
	B-3	40 X 65	2	5,200
	B-5	40 X 100	1	4,000
	B-6	40 X 120	1	4,800
	B-7	40 X 120	1	4,800
		50 X 110	2	11,000
	TOTAL	-	12	(42,000)
C.F.S	B-5	40 X 110	1	4,400
C. Yard		190 X 160	1	30,400
Open Yard	B-3	60 X 50	1	3,000
	B-4	50 X 70	1	3,500
	B-6	40 X 55	1	2,750
	TOTAL	-	3	(9,250)
Cargo Handling Facilities	Fork lift	Grab Bucket Tractor truck	Shore Crane Reach Stacker Shovel Loader	Trailer Belt-conveyor
Other Facilities	Green Area (11.5 ha) Light Buoy	Office Build. (3000 m2) Tug Boat	Water Supply Drainage	Electricity Supply Communication

4. Facility Design and Implemation Program Including Budged Plan

Mr. K. Naito

I. Preliminary Design

(OHP 1, cf. Figure 13-4-1) Plan

The length of quaywall is 1,295 meters from Berth No. 2 to Berth No. 7 in the development of the Cai Lan Port Project excluding existing Berth No. 1.

The water depth of the basin in front of the quaywall is from -9.0 m to -13.0 m and can accommodate general cargo vessels of 10,000 DWT and dry bulk cargo vessels of 40,000 DWT.

(OHP 2, cf. Figure 13-1-1) Physical Condition

The physical condition of base layer in the new port expansion area is relatively good, the depth of the bedrock layer is not deep, only a few meters below the planned water depth of the basin.

(OHP 3, cf. Figure 13-3-2) Geological conditions and others

The geological conditions are important factors for the determination of type of quaywall within constraints established by the design criteria.

According to soil boring investigation conducted in Cai Lan port area, the top soil running plasticity and bedrock appears below the sandy silt at -6.0 m to -12.0 m elevation, fluctuating across the area.

On the other hand, as the waves are relatively small throughout year and there are no invading waves from the entrance of Bai Chai Bay area, vessels approaching the quaywall can move smoothly. The slow tidal currents, also facilitate entry.

(OHP 4, cf. Figure 13-1-2) Quaywall Type

The gravity type is recommended over the steel sheet pile wall or open structure with concrete piles on the basis of construction costs.

(OHP 5, cf. Table 13-4-1) Evaluation

As a result of evaluation considering various factors such as the natural conditions regarding depth of foundation layer, construction period, availability of materials construction method and cost, the quaywall of concrete caisson was selected over concrete block, concrete cellular block and steel sheet pile cellular cofferdam types.

(OHP 6, cf. Figure 13-2-1) Structural Analysis

Subsequently, the structural analysis will be carried out to determine whether structural dimensions satisfy the allowable stress/safety factor or not. Methodology of the calculation in Vietnam is almost the same as that in Japan excluding special case of seismic force at earthquake, so these calculations are carried out based on "Technical Standards for Port and Harbor Facilities in Japan".

(OHP 7, cf. Figure 13-4-5)

Typical cross section of berth 5 for the container terminal is shown in Figure 13-4-5.

(OHP 8, of. Figure 13-4-8) Section of concrete caisson

(OHP 9, cf. Figure 13-4-9) Section of revetment

(OHP 10, cf. Figure 13-4-12) Container freight station

(OHP 11)

1–Introduction of floating dock (3,800 t)

2–Ditto

3–Corner setting of concrete caisson production

(OHP 12)

4–Complet ed roofing works

5–Arrangement of steel forms

6–Composition of big forms

(OHP 13)

7–Erection of steel bars

8–Ditto

9-Installation of form

(OHP 14)

10–Partial completion of form installation

11–Casting concrete to caisson body

12–Partially completed concrete work quality

(OHP 15)

13–Erection of steel bars at 5th lot

14–Completed steel erection at 5th lot

15–Erection of form at 5th lot

(OHP 16)

16–Completed form installation at 5th lot

17–Casting concrete at 5th lot

18–Completed concrete work quality

(OHP 17)

19–Completed of caisson production

20–Temporary installation on sea

21–Preparation for towing caisson

(OHP 18)

22–Temporary installation on sea by the next work

23–Filling water inside caisson to sink

24–Completed temporary installation of caisson for stock by the next work

(OHP 19)

25–Discharge water from caisson for afloat

26–Ditto

27–Towing caisson on sea

(OHP 20)

28–Ditto

29–Installation of caisson on sea

30–Ditto

(OHP 21)

31–Filling water inside caisson

32–Ditto

33–Installation of caisson with work boat

(OHP 22)

34–Ditto

35–Filling sand inside caisson

36–Casting cover concrete of caisson

(OHP 23, cf. Figure 14-5-1) Tentative Implementation Program

(1) Preparation works

1-Obtain Funding and Land Acquisition

2-Selection of Consultant

(2) Detail design

1-Reviewing work on Feasibility Study

2-Detail Design

3-Preparation of Tender Documents

4-Prequalification of Tenders

(3) Preparation works for construction

1-Tendering

2-Tender Evaluation

3-Award of Contract

(4) Construction

1-Mobilization

2-Open access/work site

3-Construction

(5) Maintenance Period

1-for 12 months after completion of construction

(OHP 24, ef. Figure 18-2-1) Schedule of Construction Works

(OHP 25, ef. Table 18-3-1)

Rough Cost Estimation		
1-Sub total of construction:	$99,221,000	(64.3%)
2-Sub total of Handling Equipment:	$43,083,000	(27.9%)
3-Administration:	$100,000	(. %)
4-Engineering Service:	$12,000,000	(7.8%)
Total	$154,404,000	(100 %)
5-Physical Contingency:	$4,966,000	
6-Price Contingency:	$5,095,000	
Grand Total	$164,465,000	

II. Basic Conditions for Cost Estimation

The main conditions for the cost estimation are as follows:

1) Construction costs have been estimated in principle using the prices and rates obtained in July 1994.

2) The inflation factor has been excluded from estimation.

3) The exchange rates of US$ against the Vietnam Don (DON) and the Japanese Yen(J¥) are as follows:

US$1 = DON10,953.90 = J¥100.10

4) Rents or compensation for land have been excluded from the estimation.

5) The cost of foreign portion of the operation include the following:

(i) Foreign currency portion of equipment (Depreciation cost for imported equipment)

(ii) Imported materials and products

(iii) Foreign currency portion of indirect cost

(iv) Cost for engineering services by foreign consultants

6) The construction costs of water and electricity supply, drainage and communication facilities are included in the utility works.

7) Physical contingency is 5.0%. Price contingency is 3.3%.

8) The engineering services fee is 10.0%.

III. Recommendation

Most of the existing quaywalls are applied open type pier with reinforced concrete piles or wall of steel sheet piles in Hai Phong Port located in Red river delta.

It seems that structure type of quaywall is depending on physical conditions of subsoil in the site as well as the availability of local construction equipment.

In the case of deep sea port, the dimension of concrete pile is not sufficient on it's length, only 16 meter long per pile.

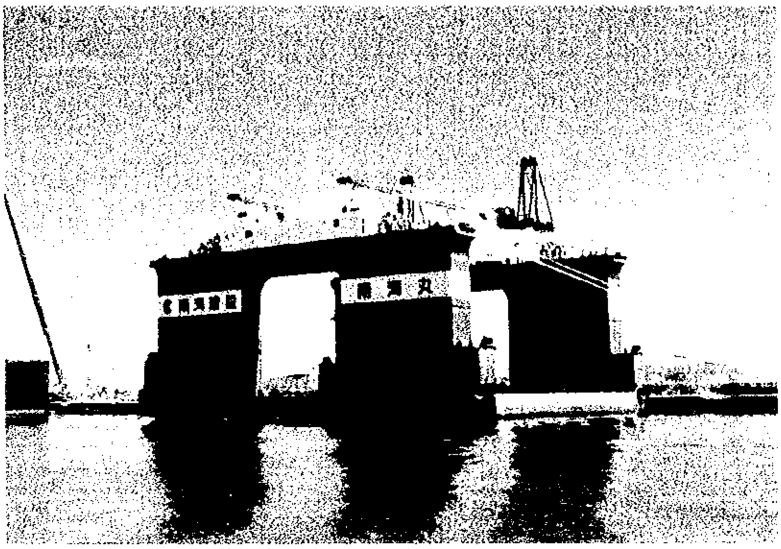
The depth of embedment of the pile will not be sufficient for the structure stability. On the other hand, the subsoil conditions of the Cai Lan Port Construction Project area are relatively good, the depth of the bedrock layer is not deep, only a few meters below the planned water depth of the basin.

Consequently, a gravity type structure of concrete caisson was adopted rather than open type quaywall considering subsoil conditions, safety, construction and cost, etc.

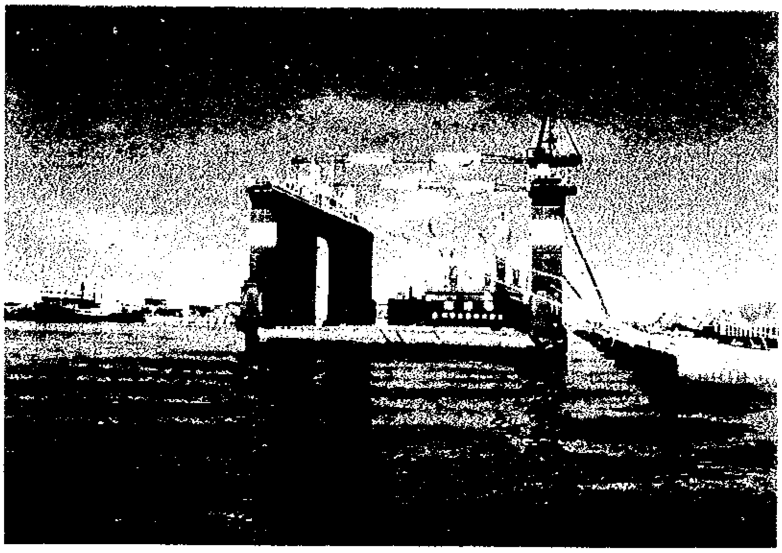
A caisson is a floating structure like a ship, so water tight concrete is required to ensure accurate dimensions of the wall avoiding slant or sinking the caisson due to imbalance and over weight in launching work.

The floating docks are available locally by the joint venture system with qualified foreign contractors.

1 Floating Dock(3800t)



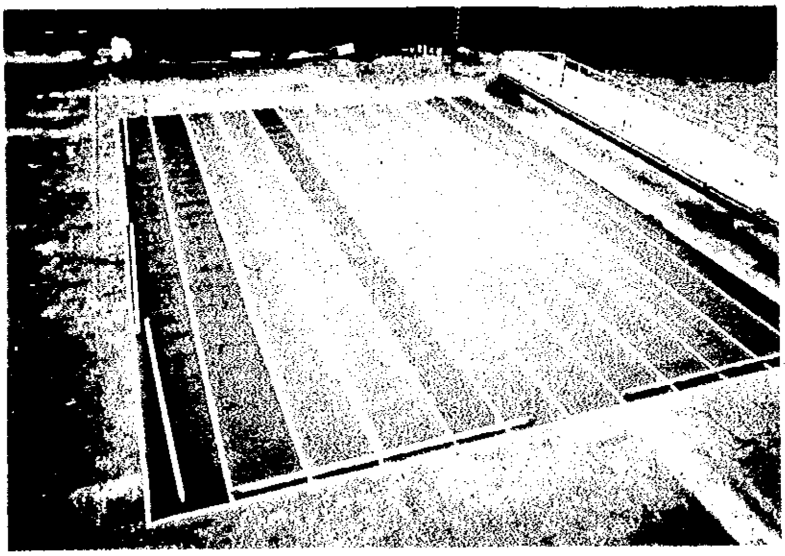
2 Floating Dock(3800t)



3 Corner Setting of Caisson Production

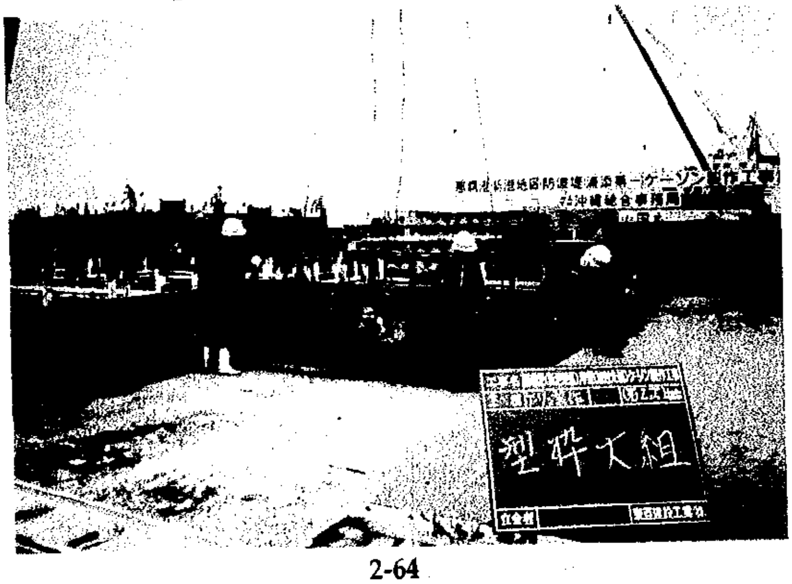
OHP 12

4 Completed Roofing Works

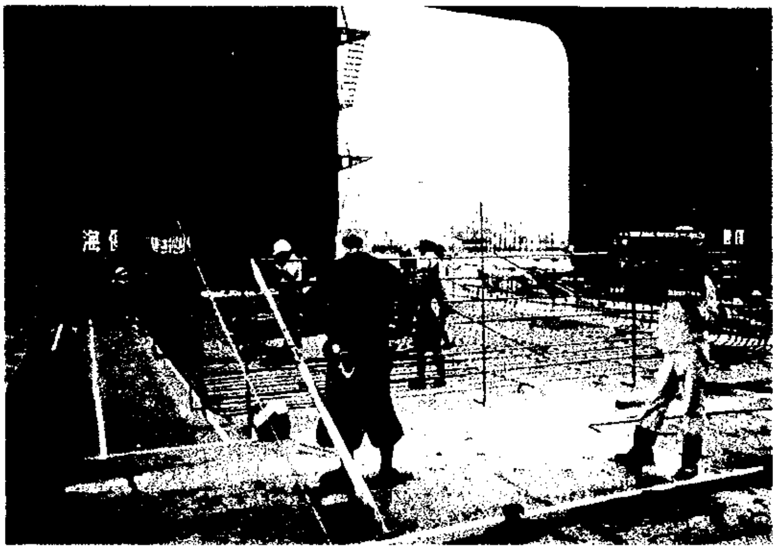


5 Arrangement of Steel Form

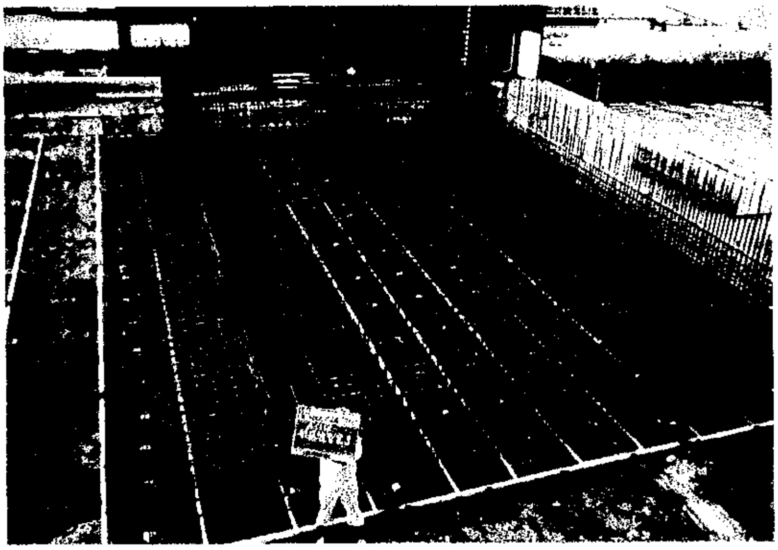
6 Composition of Big Forms



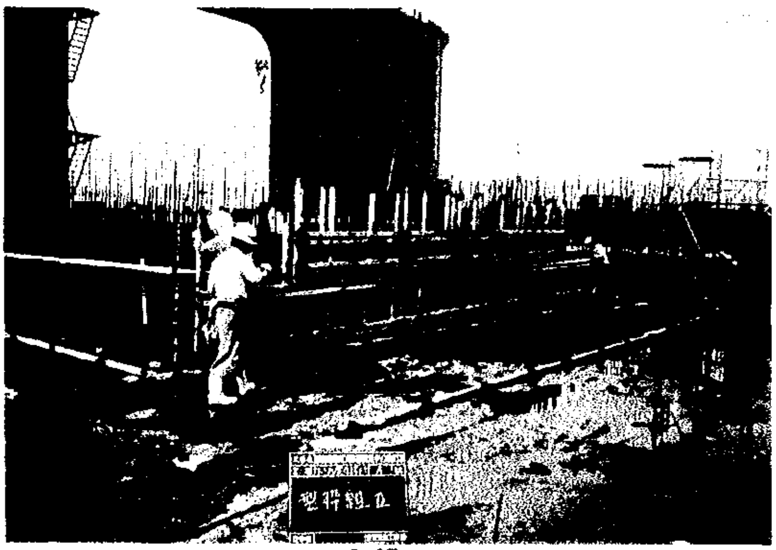
7 Erection of Steel Bars



8 Erection of Steel Bars

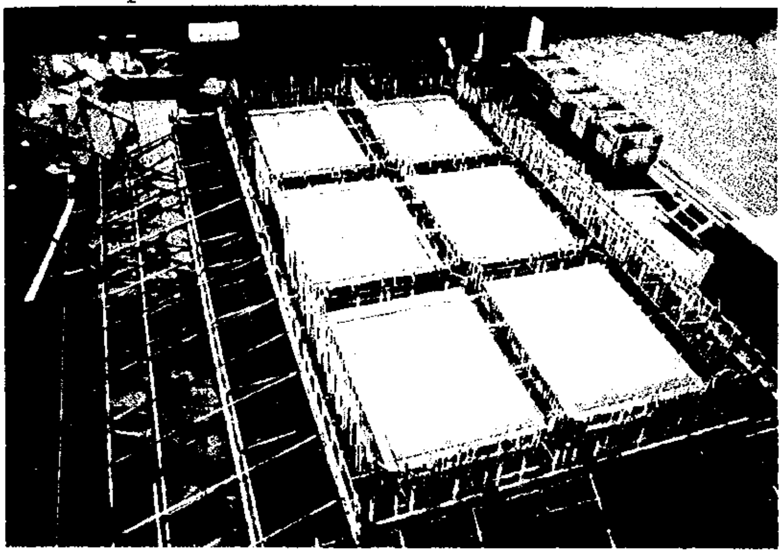


9 Installation of Form



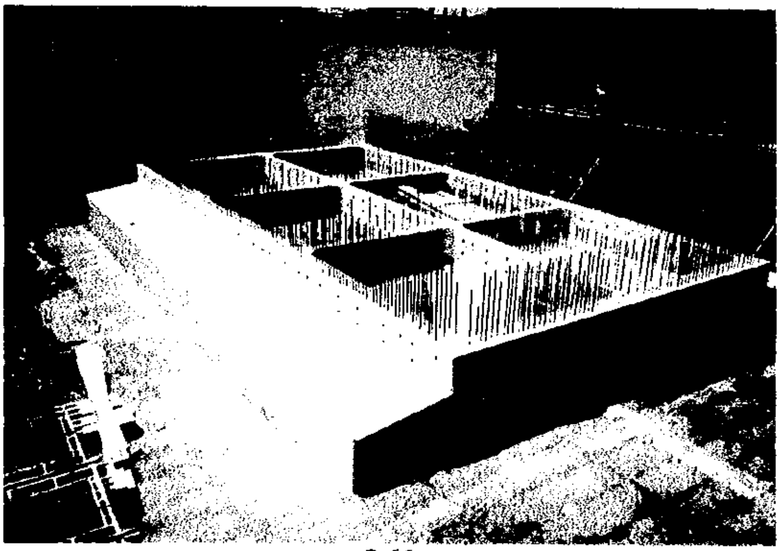
10 Completion of Form Installation

OHP 14

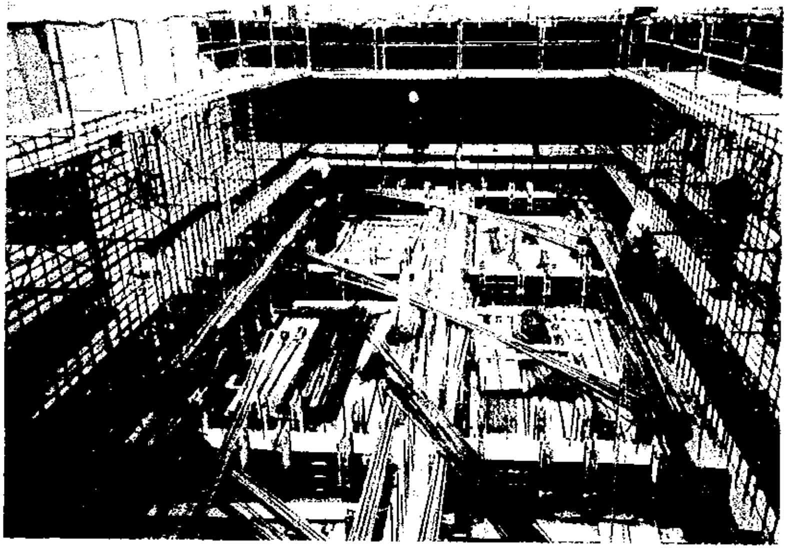


11 Casting Concrete

12 Completed Concrete Work Quality

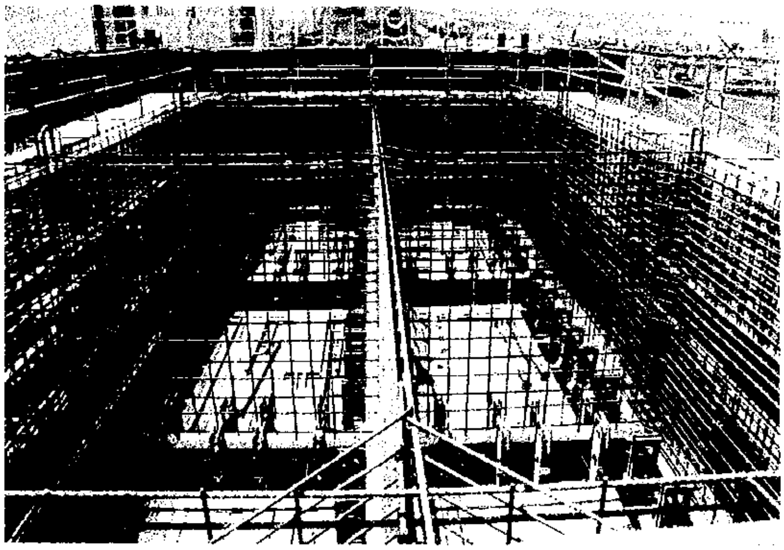


13 Erection of Steel Bars at 5Lot

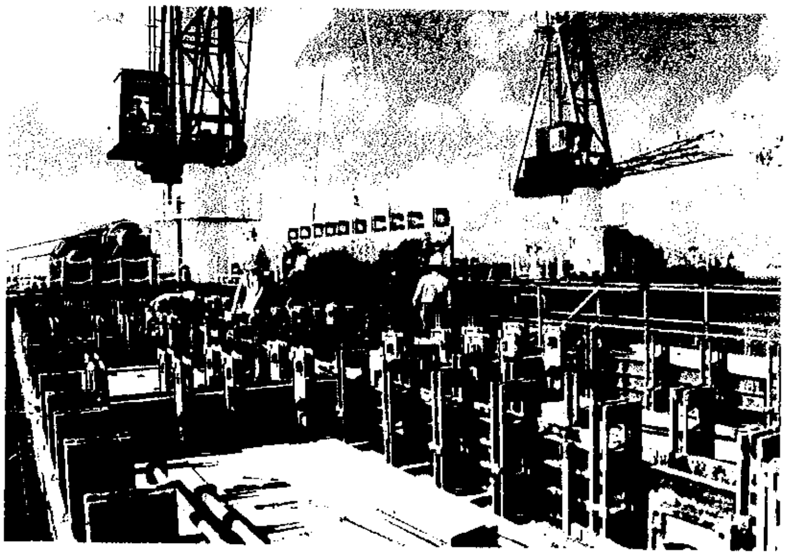


OHP 15

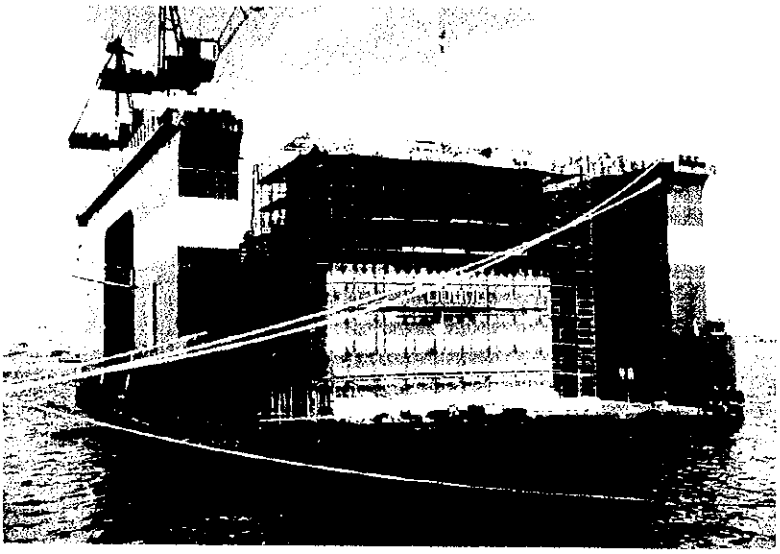
14 Completed Steel Erection at 5Lot



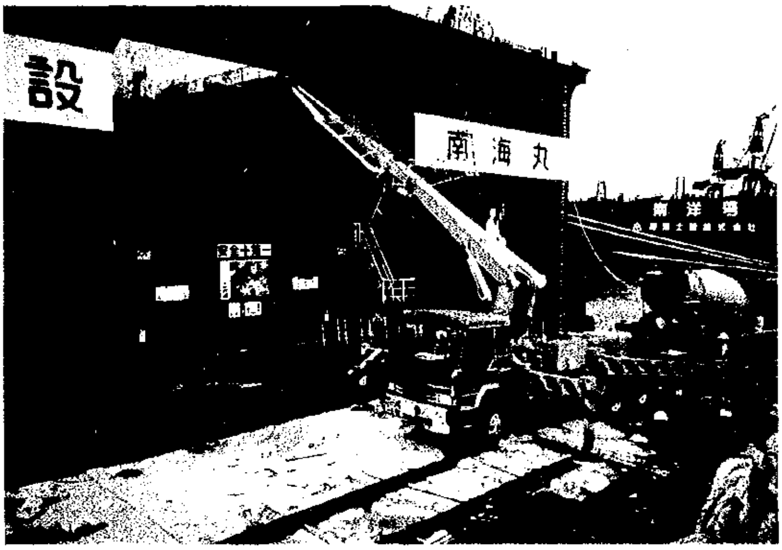
15 Erection of Form at 5Lot



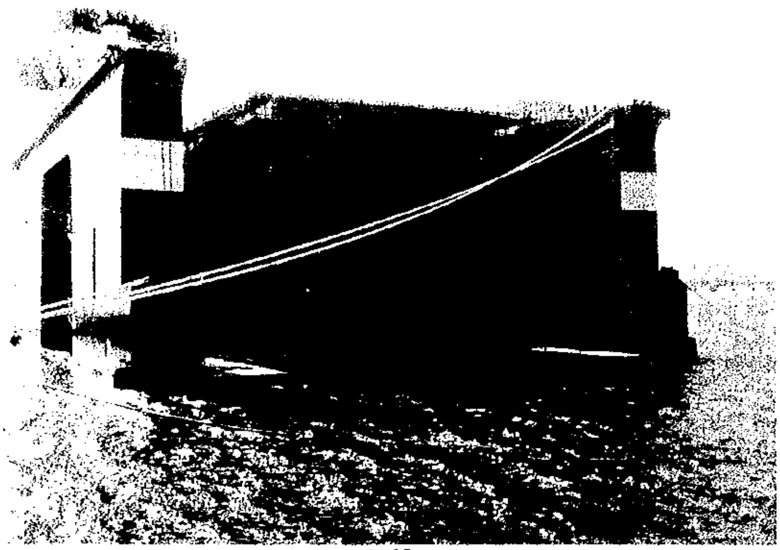
16 Completed Form Installation at 5Lot



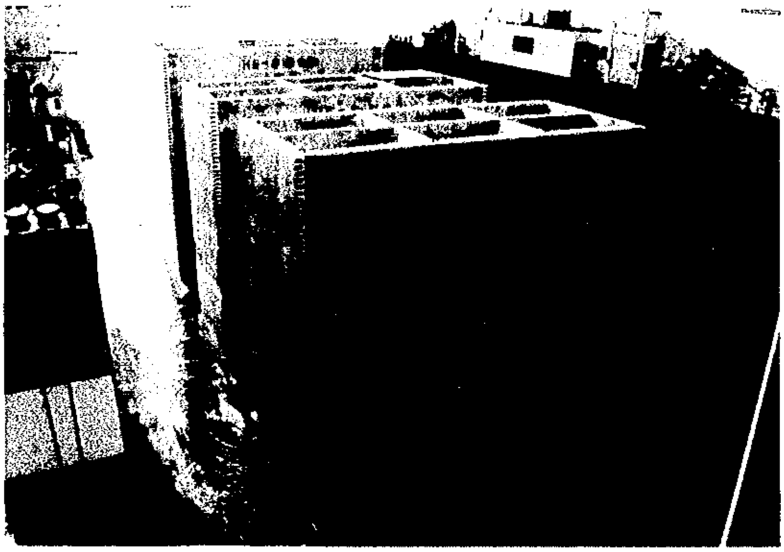
17 Casting Concrete at 5Lot



18 Completed Concrete Work Quality

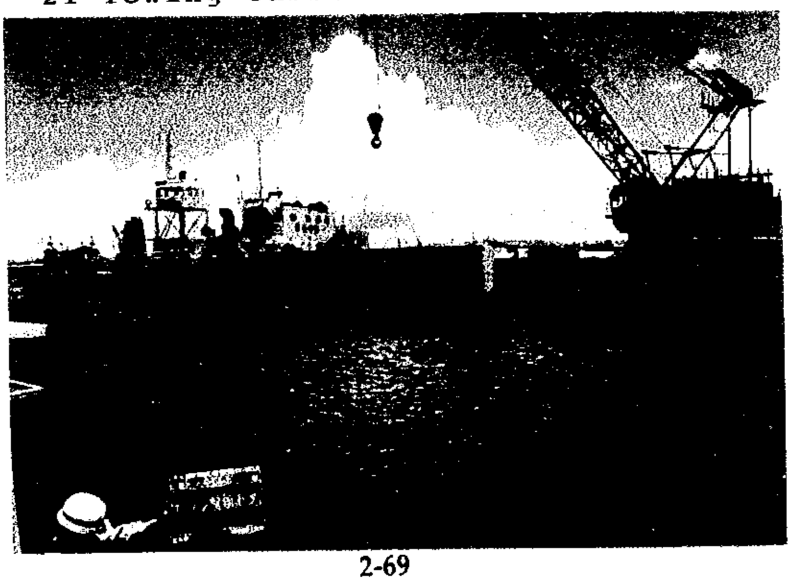


19 Completion of Caisson Production

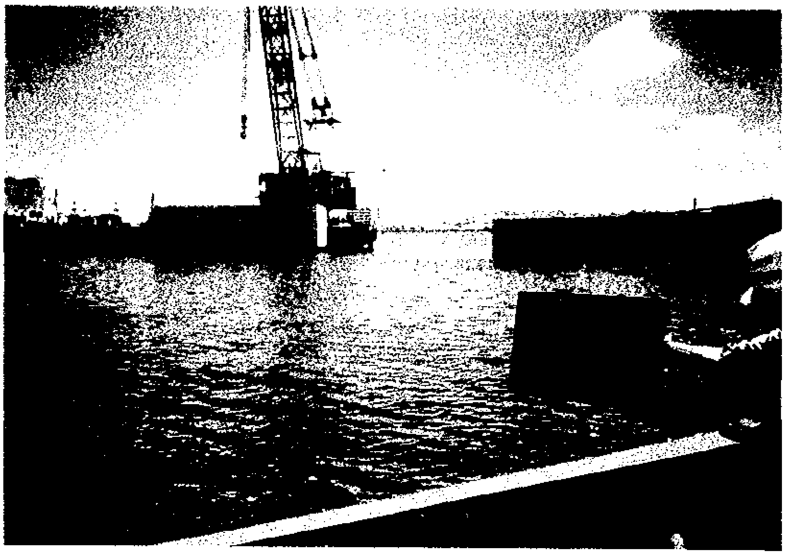


20 Temporary Installation on sea

21 Towing Caisson

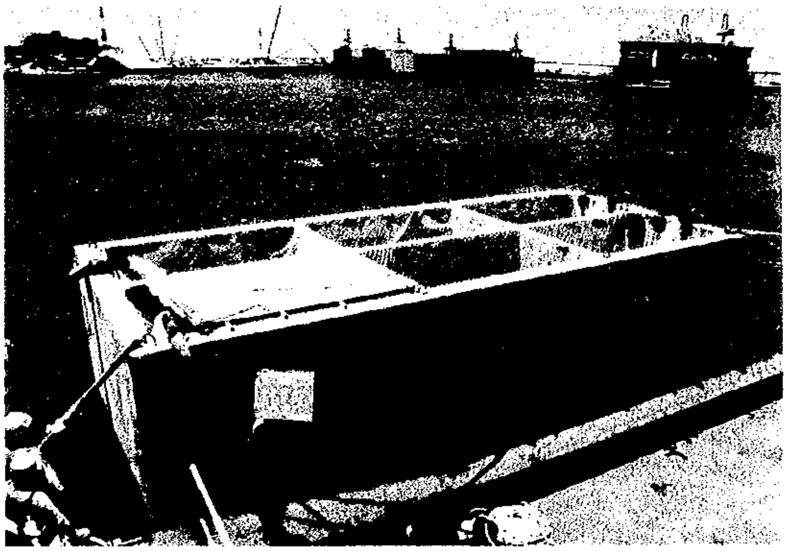


22 Temporary Installation on sea

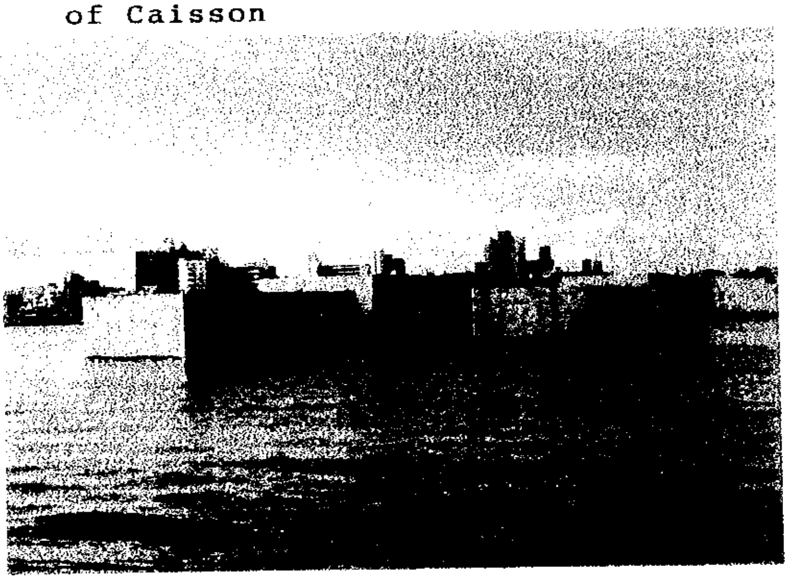


OHP 18

23 Filling Water inside Caisson



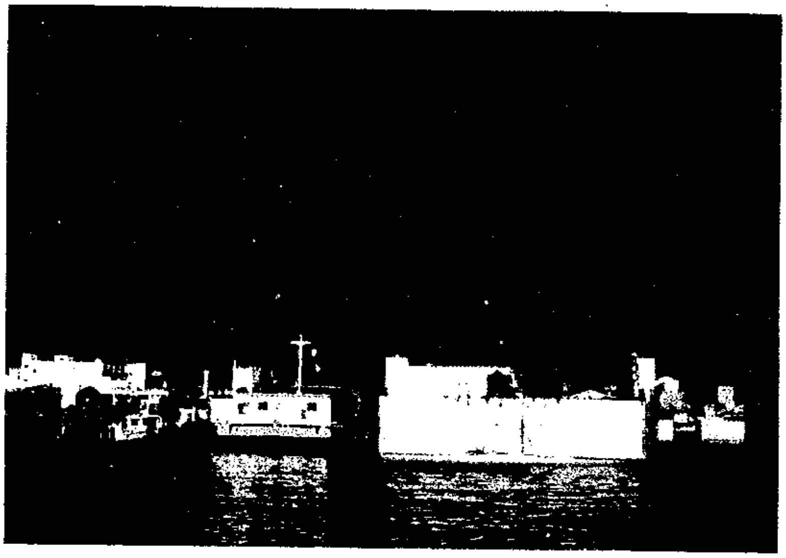
24 Completed Temporary Installation
of Caisson



OHP 19

25 Discharge Water from Caisson for afloat

26 Discharge Water from Caisson for afloat



27 Towing Caisson on sea