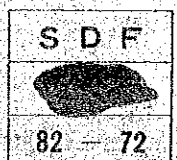


**REPORT OF STUDY**  
**ON THE DEVELOPMENT PLAN**  
**OF**  
**INDUSTRIAL PORTS IN MEXICO**  
**(SECOND PHASE)**

1982 March

Japan International Cooperation Agency





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**1982 March**

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## PREFACE

In response to the request of the Government of the United Mexican States, the Government of Japan decided to conduct a survey on the Coastal Industrial Zone Development Project (2nd phase) and entrusted the Japan International Cooperation Agency (JICA) with the survey.

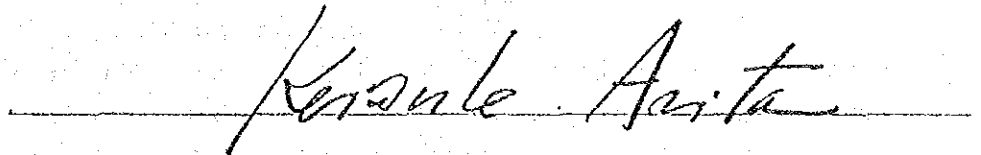
The JICA sent to Mexico a survey team headed by Mr. Yoshio Takeuchi two times in a period from September 1981 to February 1982. The team exchanged views with the officials concerned of the Government of Mexico over the project and conducted a field survey.

After submitting an interim report to the Government of Mexico, the team made further studies on the project and has completed the present report.

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

I wish to express my deep appreciation to the officials concerned of the Government of the United Mexican States for their close cooperation extended to the team.

March, 1982

A handwritten signature in cursive script, reading "Keisuke Arita", is written over a horizontal line.

Keisuke Arita  
President  
Japan International Cooperation  
Agency





## LETTER OF TRANSMITTAL

Mr. Keisuke Arita, President  
Japan International Cooperation Agency

Dear Mr. Arita,

It is my great pleasure to submit the report for the technical cooperation to C.P.I. on the coastal industrial zone development study in Mexico (2nd phase), in the United Mexican States.

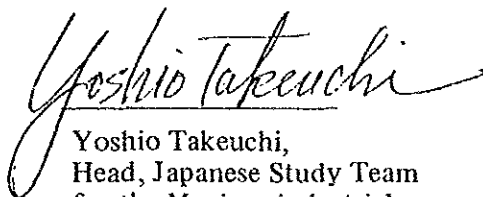
The Japanese study team which I headed carried out field surveys in Mexico from 30 September to 18 October 1981 and 29 January to 14 February 1982, at the request of the Japan International Cooperation Agency. This report was formulated in an intention to contribute the transfer of planning techniques for ports to the Coordinación General del Programa de Puertos Industriales in the Secretaría de Comunicaciones y Transportes of the United Mexican States, through the discussions and recommendations on the problems and studies accompanied within the planning and construction of new industrial ports in the country.

It is regarded as significant and urgent to complete the port project in Mexico, so I hope the results of our study will contribute to the development of the project.

On behalf of the Japanese Study Team, I would like to express my deep appreciation to the Government of Mexico, Coordinación de Proyectos de Desarrollo, Secretaría de Comunicaciones y Transportes and other organizations concerned for their ultimate cooperation and assistance.

I am also indebted to the Japan International Cooperation Agency, the Ministry of Transport, the Ministry of Foreign Affairs, the Japanese Embassy in Mexico City, the J.I.C.A. office in Mexico and many Japanese companies having branches in Mexico city, for giving us valuable suggestions and assistance in the field study and in the preparation of this report.

Sincerely yours,



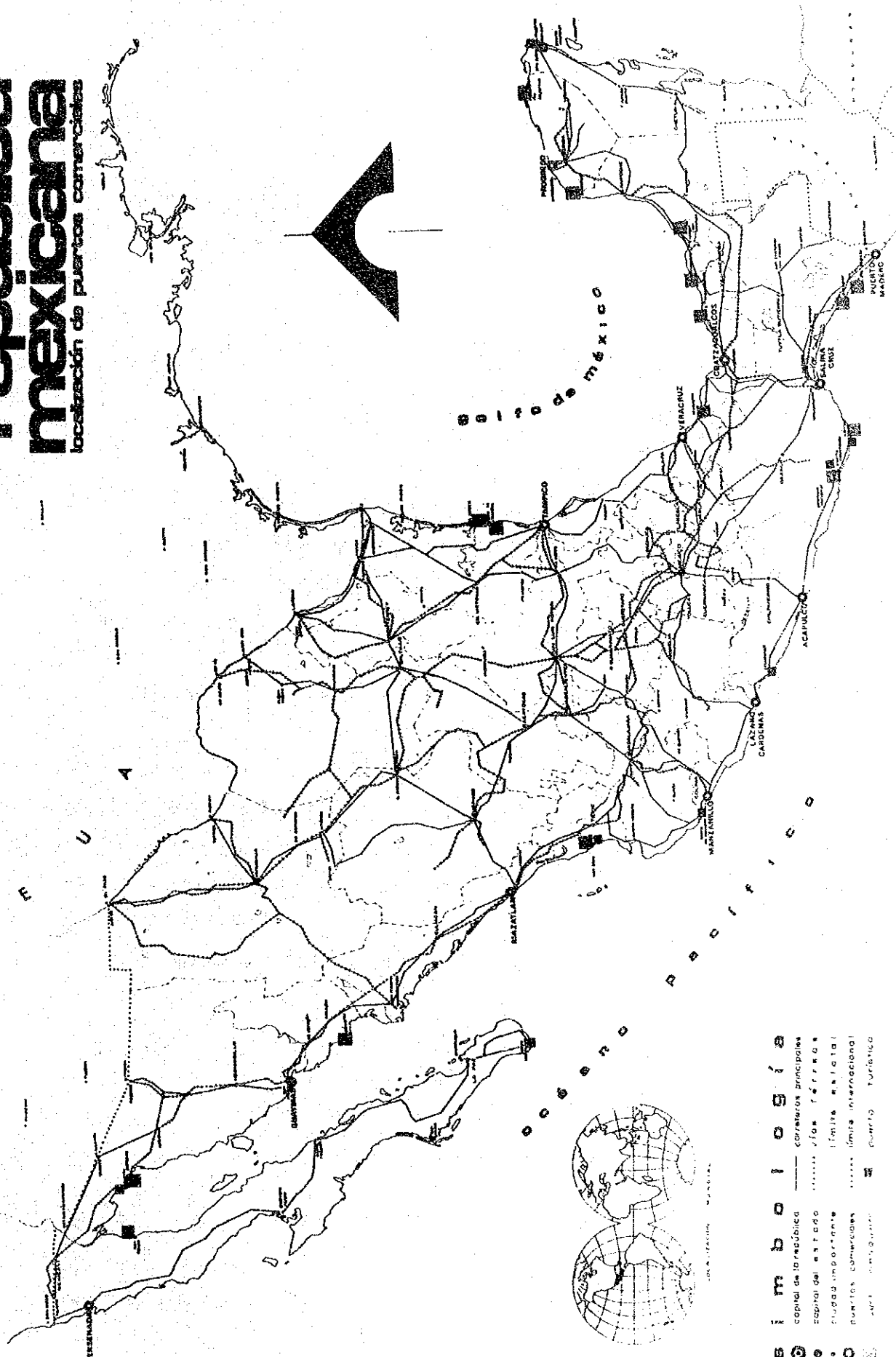
Yoshio Takeuchi,  
Head, Japanese Study Team  
for the Mexican industrial  
Port Project (President,  
Overseas Coastal Area Development  
Institute of Japan)

25 March 1982



# república mexicana

localización de puertos comerciales



**Simbología**

- capital de la república
- carretera principal
- capital del estado
- ..... vía férrea
- ciudad importante
- límite estatal
- ..... límite internacional
- puertos comerciales
- puerto turístico



## CONTENTS

Preface

Letter of Transmittal

Contents

List of Tables

List of Figures

Summary

Chapter 1	Recommendations .....	1
1-1	Report of the First Mission .....	1
1-2	Report of the Second Mission .....	19
Chapter 2	Outline of the Study .....	27
2-1	Background of the Study .....	27
2-2	Object and Content of the Study .....	28
2-3	Field Surveys .....	29
Chapter 3	Outline of the Development of Mexican Ports .....	37
3-1	Development of Industrial Ports .....	37
(1)	Altamira Port .....	37
(2)	Lazaro Cardenas Port .....	39
(3)	Ostion Port .....	41
(4)	Salina Cruz Port .....	44
(5)	Dos Bocas Port .....	46
(6)	Ensenada Port .....	48
(7)	Topolobampo Port .....	50
(8)	Tuxpan Port .....	55
(9)	Cobah Port .....	60
3-2	Development of TUM, MPV .....	61
(1)	Altamira Port .....	62
(2)	Lazaro Cardenas Port .....	77
(3)	Ostion Port .....	79
(4)	Salina Cruz Port .....	82
(5)	Dos Bocas Port .....	85

Chapter 4	Supplementary Reports for Recommendations .....	89
4-1	Procedure of Industrial Port Development .....	91
4-2	Method to Determine the Scale of Industrial Ports .....	111
4-3	Port and Harbor Development System .....	125
4-4	Investigation System for the Development of Industrial Port .....	137
4-5	Method of Planning of Port Facilities .....	151
4-6	Soft-Ground Treatment .....	177
4-7	Environmental Protection and Administration of Ports and Harbours .....	195
4-8	Counterplans of Safety and Prevention of Disasters for Ports and Harbours .....	219
4-9	Execution and Supervision of Port Construction .....	247
4-10	Port Administration and Operation .....	274
Chapter 5	Record of Discussions .....	293
5-1	The First Mission .....	293
5-2	The Second Mission .....	294
Appendix	.....	295
1.	Ports and Harbours Laws of Japan .....	295
2.	The Authority's System for Rent Determination and Income and Expenditure Plan .....	323
3.	Dangerous Cargo Handling Wharf and Operation .....	355

## LIST OF TABLES

Table No.	Title	
3-1-1	Cargo Handling Volume in Ensenada Port (1979) .....	48
3-1-2	Cargo Handling Volume in Topolobampo Port (1979) .....	51
3-1-3	Cargo Handling Volume in Tuxpan Port (1979) .....	55
3-2-1	Cargo Movement Forecast by Commodity .....	62
3-2-2	Berth Occupancy in 1985 .....	62
3-2-3	Number of Berths for MPV .....	62
3-2-4	Material Handling Equipment .....	63
3-2-5	Number of Berths for TUM .....	65
3-2-6	Cargo Movement Forecast by Commodity .....	77
3-2-7	Number of Berths .....	77
3-2-8	Cargo Movement Forecast by Commodity .....	79
3-2-9	Number of Berths .....	79
3-2-10	Cargo Movement Forecast by Commodity .....	82
3-2-11	Number of Berths .....	82
3-2-12	Cargo Movement Forecast by Commodity .....	85
3-2-13	Number of Berths .....	85
4-1-1	Merits and Demerits Between Inland and Coastal Bases .....	97
4-1-2	Flows in Planning Works .....	99
4-1-4	Site Selecting Factors for Each of Industry Types (Important factors) .....	104
4-1-5	Land-Original Unit, Water Original Unit .....	105
4-1-6	Dimensions of Typical Factories .....	106
4-1-7	Types of Industrial Ports and Topographical Feature .....	107
4-2-1	Water and Labour Force Required in Large-scale Industrial Bases .....	117
4-2-2	Dimensions of Typical Factories .....	119
4-2-3	Land-use in Industrial Port .....	121
4-3-1	Planning and Construction of Four Big Industrial Ports .....	127
4-3-2	History of Mutsu-Ogawara Development .....	135
4-4-1	Natural Conditions to be checked .....	143
4-4-2	Social and Economical Conditions to be checked .....	144

## Table No.

## Title

4-5-1	Classification of Mooring Facilities .....	154
4-5-2	The Standard Dimension of Berth .....	156
4-5-3	Annual Cargo Handling Volume at a Berth for Large Vessels .....	158
4-5-4	Classification of Cargoes .....	158
4-5-5	Standard Width of Apron .....	160
4-5-6	Surcharges for an Ordinary Transit Shed .....	161
4-5-7	Specific Weight of Bulk Cargo .....	162
4-5-8	Width of Channel .....	166
4-5-9	Size of Anchoring Basin .....	167
4-5-10	Size of Buoy Basin .....	167
4-5-11	Critical Wave Height for Cargo Handling .....	169
4-5-12	Critical Condition for Refuge Mooring in the Harbour .....	170
4-5-13	Standard Design Traffic Volume .....	173
4-5-14	Standard Design Traffic Volume per Lane .....	174
4-6-1	Classification of Soil Stabilization Methods .....	181
4-6-2	Structure of Each Revetment .....	187
4-7-1	Content of Pollution Prevention Program .....	200
4-7-2	Countermeasures Undertaken by Local Business and Local Public Bodies, etc. ....	200
4-7-3	Correlation between Environment Affecting Elements and Environment Constituting Factors .....	207
4-7-4	Ambient Air Quality .....	208
4-7-5	Noise .....	208
4-7-6	Noise .....	209
4-7-7	Water Quality .....	209
4-7-8	Water Quality .....	210
4-7-9	Water Quality .....	210
4-7-10	Water Quality .....	211
4-7-11	Soot and Dust .....	211
4-7-12	Harmful Substance .....	212
4-7-13	Nitrogen Oxides .....	213
4-7-14	Effluent Standards into Public Water Bodies .....	214



Table No.	Title	
4-7-15	Volume of Water Discharge .....	215
4-7-16	Volume of Water to be gathered .....	215
4-7-17	Volume of Water Discharge .....	217
4-7-18	Volume of Water to be gathered .....	217
4-8-1	Operating Large Tanker Berth of 200,000 DWT in Japan .....	227
4-8-2	Safety Measures for Berthing .....	229
4-8-3	Safety Measures for Oil Handling .....	231
4-8-4	Safety Measures for Unberthing and Emergency .....	233
4-8-5	Patrol System, Watch System and Communication System .....	235
4-8-6	Disaster Prevention System, Recovery System and Maintenance .....	239
4-9-1	Comparison of Execution Control Method .....	250
4-9-2	Problems and Means of their Settlement in the Construction of the KASHIMA Port .....	269
4-9-3	Problems and Means of their Settlement in the Construction of the TOMAKOMAI Port .....	272
4-10-1	Outline of Port Situation and Government Participation .....	281
4-10-2	Measures for the Promotion .....	292

## LIST OF FIGURES

Figure No.	Title	
2-1-1	The Location of New Industrial Ports in Mexico .....	27
2-3-1	Organization of CPI .....	31
3-1-1	Altamira Industrial Port .....	38
3-1-2	Lazaro Cardenas Industrial Port .....	40
3-1-3	Tehuantepec Land Bridge and Panama Canal .....	42
3-1-4	An Example of TUM and Land Bridge Terminal Layout in Ostion .....	43
3-1-5	Salina Cruz Industrial Port .....	45
3-1-6	An Example of Dos Bocas TUM .....	47
3-1-7	Plan of Ensenada Port .....	49
3-1-8	Plan of Topolobampo Industrial Port .....	53
3-1-9	Alternative Site of Tuxpan Industrial Port Development .....	57
3-1-10	Plan of Tuxpan Industrial Port (Alternative) .....	58
3-1-11	Plan of Tuxpan Industrial Port (Alternative) .....	59
3-2-1	Plan for the Year 1985 at Altamira Port .....	64
3-2-2	Master Plan of Altamira TUM .....	66
3-2-3	Container Flow-A .....	67
3-2-4	Container Flow-B .....	68
3-2-5	Container Transportation System .....	69
3-2-6	An Example of Container Berth Layout in TUM .....	70
3-2-7	General Cargo Flow Conventional Berth .....	72
3-2-8	Flow Diagram .....	74
3-2-9	General Layout .....	76
3-2-10	Master Plan of Lazaro Cardenas TUM (Linear Type) .....	78
3-2-11	Plan of Moduro Polivalente at Ostion Port .....	80
3-2-12	Master Plan of Ostion TUM (Linear Type) .....	81
3-2-13	Plan of Modulo Polivalente at Salina Cruz Port .....	83
3-2-14	Master Plan of Salina Cruz TUM (Linear Type) .....	84
3-2-15	Plan of MPV at Dos Bocas Port .....	86
3-2-16	Master Plan of Dos Bocas TUM .....	87

Figure No.	Title	
4-1-1	Operational Flows in Industrial Port Development .....	93
4-1-2	Concept in Development of an Industrial Port to Achieve Regional Progress .....	95
4-1-3	Procedure to Select the Development Site .....	101
4-1-4	Procedure in Selection of an Industry-type .....	102
4-2-1	The Scale of the Port and of the Industrial Base .....	114
4-2-2	Scale of Production and Cost per Product .....	115
4-3-1	Port Development System in Mexico .....	127
4-3-2	Procedure for Establishment of a Port Authority .....	131
4-3-3	Administrative Procedure of Port Development Project .....	134
4-5-1	Flow of the Industrial Port Planning .....	153
4-5-2 (1)	Pier Type Wharves .....	155
4-5-2 (2)	Marginal Type Wharves .....	155
4-5-3	Berth Length .....	157
4-5-4	Layout of Land Facilities on a Wharf .....	163
4-5-5	Channel and the Prevailing Wind Direction .....	164
4-5-6	Method of Bend Cut .....	165
4-5-7	Basins for Single Buoy Mooring and Double Buoy Mooring (m) .....	168
4-5-8	Turning Basin .....	168
4-5-9	Slip .....	169
4-5-10	Standard Layout of Roads .....	174
4-6-1	Experienced Replacement in Japanese Port and Harbour Construction .....	182
4-6-2	Sand Drain Method .....	184
4-6-3	Execution Order of Sand Compaction Pile .....	185
4-6-4	Plan of Osaka North Port Disposal Station .....	186
4-6-5	Typical Cross Section of Revetment .....	189
4-6-6	Typical Cross Section .....	192
4-6-7	Procedure for the Preparation of Soft Ground Improvement Program .....	194
4-7-1	Procedure of Preparing Pollution Prevention Program .....	198
4-7-2	Environmental Assessment Procedure .....	203
4-7-3	Location of Intake and Discharge .....	216

Figure No.	Title	
4-7-4	Location of Intake and Discharge .....	218
4-8-1	Large Tanker Berth of 200,000 DWT in Japan .....	228

## Summary



## SUMMARY

### 1. BACKGROUND OF PORT PROJECT

The Republic of Mexico, as oil-producing country, has been continuing a high economic growth at a yearly rate of 7.6% (as the average for the last three years). Petroleum has been produced and exported as the source of industrial development of Mexico based on a long-range plan. Most of the fund secured by the production of oil has been invested in the industrialization of Mexico, especially in the development of waterfront industrial areas.

The population of Mexico is about 67,000,000, and the GNP per capita in 1980 is US\$2,438. As shown in the GNP, Mexico has been maintaining a high economic level as one of developing countries and has been catching up with the advanced countries through the social and economic evolution of the nation.

Of late years, Mexico has the center of economic activity in its central tableland, as shown in the centralized population of 13,000,000 in Mexico City, 2,200 m in height. In other words, the development of Mexico has been made mainly in the district of "everlasting spring", located in the north latitude of 18 – 26°.

On the contrary, coastal districts having ports and harbors are tropical climates, some of which has been developed as resort areas like Acapulco and Cancun, but in most of these districts, the delay in the economical aspect is remarkable.

Therefore, the present President, Lopez Portillo, has made the program "Plan Global", aiming at the realization of 5 times the scale of national economy, economic growth rate of 8%, No. of employees of 20,000,000, No. of houses of 8,000,000, a certain scale of food production and Mexico's penetration into the international market in A.D. 2000; and he has carried out the upbringing of basic industries by means of oil export reaching to US\$15,000,000,000.

Thus, as industrial bases, waterfront industrial areas have been planned and the development of those industrial zones has been now conducted. First of all, the construction of two waterfront industrial zones having the scale of twice that of Kashima seaside industrial area, on each coast of the Pacific Ocean and the Gulf of Mexico, totalling to four zones (Altamira, Lazaro Cardenas, Ostion and Salina Cruz), have been already decided and now under the construction of the 1st phase. After that, the construction of some other industrial ports – Dos Bocas port and Tuxpan port on the coast of the Gulf of Mexico, Ensenada port and Topolobampo port on the coast of the Pacific Ocean, and Coba port on Caribbean Sea side – have been scheduled, and the construction work for some of them has been already started.

Mexican participants in these programs have visited Japan several times for inspection of industrial ports such as Tomakomai port and Kashima port, which has contributed to the promotion of technical cooperation and friendship between Japan and Mexico.

In October 1981, Lazaro Cardenas port in Mexico became sister port to Kashima port in Japan.

## **2. CIRCUMSTANCES OF SURVEY**

"Study on the Development Plan of Industrial Ports in Mexico" (hereinafter referred to as "1st Year Study") carried out as development investigation program in the fiscal year 1980 has been highly evaluated as a successful case of technical cooperation with other country, and has been heartily appreciated by the Mexican side with the desire for the continuation of this survey.

After the completion of the 1st year study, the construction programs of these five industrial ports — Altamira, Lazaro Cardenas, Dos Bocas, Salina Cruz and Ostion — have been favorably progressing, some of them already at the stage of enlargement construction and others still at the stage of preparation for the construction. Besides, in the above five ports, the construction of TUM (multipurpose terminal facilities) has been scheduled and their scale, construction plans and others have been investigated. In addition, the studies on their administration and management, including the training of employees, have been planned.

However, it is known from the past visit to Mexico that there have been insufficient surveys and planning in various aspects due to the excessive acceleration of the programs. In Japan, as a considerable number of waterfront industrial areas have been developed, a great deal of technical know-how has accumulated so far, which can be used for the promotion of friendship between Japan and Mexico.

From now on, a closer relationship between Japan and Mexico should be brought about not only for import of oil, but also for the cooperation in the planning, construction and administration of ports and harbors.

Under such circumstances, this survey has been planned as a continuation of last survey, and carried out as "Study on the Development Plan of Industrial Ports in Mexico (Second Phase)" (hereinafter referred to as "2nd Year Study").

## **3. PURPOSE AND CONTENTS OF THIS SURVEY**

In the fiscal year 1981, this survey was determined to be carried out by the Japan International Cooperation Agency for the period of September 1981 to March 1982.

The purpose of this survey is to conduct investigations, submit substituted plans and transfer the technology in order to solve problems arising at various stages in the development of waterfront industrial areas carried out in Mexico.

Further, the analysis and study on various problems, the introduction of experience in the development of ports and harbours in Japan, the investigations that can not be completed only during the stay in Mexico, etc. will be informed of later after those operations have been completed in Japan.

The contents of the survey can be summarized as follows:

- (1) Investigation on the realization policy, administration and management of industrial ports
- (2) A Study on the problems arisen during the planning and designing works of the basic facilities for the new industrial ports
- (3) A study on the systematic survey requirement for the industrial port planning
- (4) A study on the man power planning for the construction, management and operation of the industrial ports



During the stay in Mexico, it was informed that there had been a new plan for developing, as industrial ports, Tuxpan, Ensenada, Topolobampo and Coba. The Mexican Government has decided to request Japan for the survey of Tuxpan port, first of all, and has already submitted the formal request through diplomatic channels.

Further, for the rectification of River Balsas, the dispatch of expert(s) from Japan has been desired, and the request for the technical cooperation about this problem is to be prepared by the Mexican Government based on the Form A-1. The purpose of this dispatch is to make discussions of the water utilization program including the dam for stable supply of agricultural water, industrial water and other types of water in addition to the initial problem of the river section of Balsas on flooding.

#### **4. FIELD SURVEY**

Field surveys were carried out twice as follows:

##### **1st Survey**

Period: 30 September — 18 October, 1981 (19 days)  
Inspection sites: Three ports of Lazaro Cardenas, Altamira and Dos Bocas  
Head, survey team: Mr. Yoshio Takeuchi  
Team member: Mr. Kazuo Shirai  
Participants: Mr. Moriguchi and Mr. Mochizuki specialists (JICA)

##### **2nd Survey**

Period: 29 January — 14 February 1982 (17 days)  
Inspection sites: Four ports of Topolobampo, Ensenada, Altamira and Tuxpan  
Head, survey team: Mr. Yoshio Takeuchi  
Team member: Mr. Takao Saito  
Participants: Mr. Moriguchi and Mr. Mochizuki specialist (JICA)

These inspection tours were arranged by CPI (The former industrial port planning department of CPD, transferred to SCT late in 1981); and the participants in these tours were CPI staff, PEMEX staff, SCT staff and Mr. Moriguchi and Mr. Mochizuki specialists (JICA) dispatched to SCT from Japan.

#### **5. SURVEY REPORT**

In this survey, the results of field investigation's made in Mexico were arranged to be consolidated during the stay, translated into Spanish and submitted to the Mexican side on completing the survey. The contents of the report were the problems to be taken up and the suggestions for the settlement thereof as the result of the investigation and they are included in Chapter 1 of this report. In addition, "Record of Discussions," are included in chapter 5 of this report which are confirmed matters on the operations to be conducted after returning to Japan.

The 1st survey report (Interim Report) prepared in English has been already handled over to the Mexican side, and the 2nd survey report is included in this report.

## **5-1. Results of Field Investigation**

The recommendations suggested as the results of field investigation are described in Chapter 1 but, if they are summarized, the descriptions are as follows:

### **○ 1st Mission Report**

#### **1) The problems from planning to completion of construction and the process control**

The necessity for sufficient presurvey and reliable planning was reemphasized, pointing out that not only in Altamira port but also in other ports. If the construction work is started, due to the excessive expedition of the work, before sufficient survey has been completed, a variety of troubles will take place and the delay in the construction term will be brought out. Therefore, emphasis was repeatedly made on the sufficient survey and the reliable planning with a comprehensive deliberation.

#### **2) Study of shipping policy of Mexico**

As for the container terminal construction program prepared by Mexico, suggestion was made on the investigation and study of the mechanism in marine transportation concerning Mexico in order to utilize effectively the container terminals to be constructed in near future.

#### **3) Lecture made in the 13th Japan-Mexico Economic Conference**

The contents of the lecture made in the economic conference were reported.

#### **4) The "Sister Port" relationship between Kashima port and Lazaro Cardenas port**

Our gratitude was expressed to the persons concerned on the signing for the establishment of the "Sister Ports" relationship between Kashima port and Lazaro Cardenas port.

#### **5) Construction plan of each port**

Technical guidance was made on the planning, scheme of execution and investigation of each port. Especially for Lazaro Cardenas port, suggestion was made on the reinvestigation as to whether or not the dual section system can be employed for the rectification of River Balsas. For Altamira port, suggestion was made on the utilization of dredged soil.

## ○ 2nd Mission Report

### 1) Development system of ports and harbors

The development of industrial ports in Mexico has been planned not only for the construction of ports and harbors as nodes connecting marine transportation with land transportation, but also for the construction of ports and harbors as industrial bases inviting various types of industries, producing employment opportunity and improving the standard of living in local areas. Therefore, it can be said to be quite a proper national project. Accordingly, suggestion was made on the necessity for establishing and observing the development system of ports and harbors. In other words, the strengthening of the CPI in the SCT is absolutely necessary for the cooperation and harmonization between the planners and the construction-experienced men for the success of this project.

### 2) The administrative Bodies on ports and harbors

The construction of industrial ports have been favorably progressing under a powerful guidance of the Government but, in order to establish local cultures and decentralize the population and industries, it is desirable to prepare the port and harbor plans and conduct the administration and operation of ports and harbors, corresponding to the industrial policies and development programs in States. Accordingly, suggestion was made on the participation of States in the administrative bodies of ports and harbors. For the system and duties of a port authority, suggestion was made on the study of the Port and Harbor Law in Japan and the cases of port authorities in London and New York.

### 3) The prosperity of shipping

The prosperity of shipping is necessary not only for goods circulating means but also for the development of local districts. Therefore, suggestion was made on the necessity for planning the construction of ports and harbors in connection with coastal shipping, grasping the desire for the construction of ports and harbors in the local districts. For foreign trade, suggestion was made on the prosperity of Mexican shipping, studying the current shipping conference of each type.

### 4) Construction plan of each port

Technical guidance was made on the planning and the construction of each port according to its stage of construction. For the four ports now under construction, the problems to be taken up for investigation were pointed out. For the newly planned ports of Tuxpan, Topolobampo, and Ensenada, suggestion was made on basic thinking about the planning of ports and harbors.

## 5-2. Results of operation in Japan

The results of operation in Japan are described in Chapter 4. The following is the list of data.

### Data submitted on visiting Mexico for 2nd survey

1. Environmental Protection and Administration of Ports and Harbours.
2. Counterplans of Safety and Prevention of Disasters for Ports and Harbours

### Data submitted on making the final report

1. Procedure of Industrial Port Development
2. Method to Determine the Scale of Industrial Ports
3. Port and Harbor Development System
4. Investigation System for the Development of Industrial Port
5. Method of Planning of Port Facilities
6. Soft-Ground Treatment
7. Execution and Supervision of Port Construction
8. Port Administration and Operation

## 6. COMMENTS

In Altamira port, as dredging works have been conducted by Japanese firm, advice was asked of by them about the execution of those works while visiting Mexico and was appreciated very much.

Further, the signing for the establishment of "System Port" relationship between Kashima port and Lazaro Cardenas port was conducted during this survey (October 1981).

It seems that these technical exchange and the promotion of friendship between Japan and Mexico should be highly evaluated.

Mexico has requested Japan to conduct the survey for the development of Tuxpan port and to dispatch expert(s) for rectification of River Balsas. The continuations of such a favorable relationship between Japan and Mexico is indeed our earnest desire which must be expressed before finishing this summary.

## **Chapter 1**

### **Recommendations**



## 1-1 Report of the First Mission





**Report for Study on the Development Plan  
of  
Industrial Ports in MEXICO**

Report and Recommendations to  
Coordinacion de Proyectos de Desarrollo

Dr. Fernando Rosenzweig H.  
Director of C.P.D.

16th October, 1981

Yoshio Takeuchi  
Head,  
JICA Survey Mission

From Sept. 30 to Oct. 16, '81, discussions were held with respective officers in charge of C.P.D. on the development plans and the progress of work in the Lazaro Cardenas port area, Altamira port area, Ostion port area, Salina Cruz port area and Dos Bocas port area. Also the condition of work at Lazaro Cardenas port, Altamira port and Dos Bocas port was observed.

The following is the report.

Also we attended the XIII MEETING OF THE JAPAN-MEXICO BUSINESSMEN'S COMMITTEE held at Guadalajara from Oct. 3 to Oct. 7 and its report is attached herein.

We wish to extend our appreciation of the cooperation of each officer in charge at C.P.D., persons concerned with S.C.T. and PEMEX and local officers in charge during our stay in Mexico.

**1. General**

Preparatory work on the plan and progress of work at each port area is remarkable.

The progress is much faster compared with similar work carried out in Japan. Expansion work of anchorage and waterway is in progress at Lazaro Cardenas, and dredging and construction of breakwater is rapidly under way at Altamira port and breakwater construction work of a petroleum export port is being undertaken by PEMEX at Salina Cruz port and breakwater work and other work is in progress by PEMEX at Dos Bocas port.

Also at Ostion port, the planned location of the industrial port and the development plan are determined as a result of the study. Inside the above 5 ports, T.U.M. is respectively being planned and a study is being made on its size and planning, etc. and also the study of administration and control and training of employees is being planned.

Other infrastructural work surrounding each port area is steadily progressing and especially roads and railways are being constructed and airport, industrial water line and other works are energetically advancing.

However, in deciding the master plan of a port, a further careful study must be made including the land use plan and related infrastructure.

With regard to the port facilities alone, it seems, a detailed study is generally lacking before deciding the plan.

After the full study of natural conditions such as marine conditions and geological and topographical conditions, an overall plan must be decided and based on such a plan construction must be carried out without making frequent changes.

#### **(1) The Process and Control of Construction Work**

- A. Before undertaking port work, a full study must be made and the plan must be decided. This has been repeatedly pointed out. At Altamira port, after the work is ordered several revisions have been made on the port plan and also at Ostion port, a plan seems to be prepared before carrying out full soil investigation.

A careful study is requested.

- B. In determining the master plan of each port, it has been first proposed that a decision of the master plan should be granted by the president after consulting among government agencies to make it authentic.

For the drawing up of the present Salina Cruz plan, cosignatories of C.P.D., S.C.T. and PEMEX personnel concerned are required, which is an advanced measure compared with the conventional one. However, as it will require the consent of related government agencies and private businesses concerning railways, roads, water, power, industries, land, rivers, agriculture, etc., a system leading to the decision of the master plan must be studied further.

- C. Execution of port work

For the execution of port work, full preliminary studies must be conducted.

The agency ordering the work must take full responsibility for calculation of the cost and the work must be ordered based on the budget. Should the work be ordered before making reliable calculations without completing the study because of hurried work, many troubles may occur and the work could be delayed.

- D. With regard to the control of execution of the plan of each agency, the previous procedure has been shelved and a new procedure has been drawn up by Mr. L.P. Mario Fuentes Ruiz. The previous procedure was rather academic, while the present procedure is more realistic. In present system the report of each department is collected and submitted to the top with comments and we recommend such system. However, the budget and the schedule of work must be always in accordance with the master plan and as such considered practical. If the order is given from the top for execution, it will result in failure in many cases.

## **(2) Study of Marine Transportation Related to Mexico**

The containerization of marine transportation is the most urgent matter in Mexico. Inside each industrial port, T.U.M. is planned and container wharves are included as part thereof, which is considered to be an appropriate measure. However, for containerization, improvements of land traffic facilities in the hinterland of the port, and the study of the loading/unloading work of container cargo as well as the efficiency and freight system of the shipping lines serving Mexico, eg. Far East-North America, Far East-Europe and round the world routes must be carried out.

The movement of bringing containers from the Far East to Mexico via west coast on rail competes with the containerization which directly carry containers to Mexico from the Far East through ports. Therefore measures for improving the Mexican marine transportation must be planned in consideration of these conditions of marine transportation.

## **(3) Report on the XIII MEETING OF THE JAPAN-MEXICO BUSINESSMEN'S COMMITTEE**

The Joint Communique, of the XIII MEETING OF THE JAPAN-MEXICO BUSINESSMEN'S COMMITTEE is attached herein.

On the 2nd day of the Meeting (Panel Discussions -- B Group) we discussed the problems of ports and I took up the following points on the Mexican ports.

- A. Undertaking of the study how to develop industries at industrial ports and how to invite them.
- B. Establishment of a responsible system for the preparation of the port plan and execution of the work. (Establishment of port authorities, etc.)
- C. Improvement of traffic facilities connecting the port with hinterland cities.
- D. Study of marine transportation for containerization

During the discussions, I requested the expansion and development of ports so that each port may not become a bottleneck to the economic development of Mexico.

## **(4) Sister port relationships between Kashima port and Lazaro Cardenas port**

A visit was made by a group of Michoacan governor at Kashima port before and this time a group of the governor of Ibaragi Pref. is visiting Lazaro Cardenas port to sign sister port agreement on Oct. 28. We wish to thank Lic. Julio R. Moctezuma Cid for his efforts.

## 2. Each Port

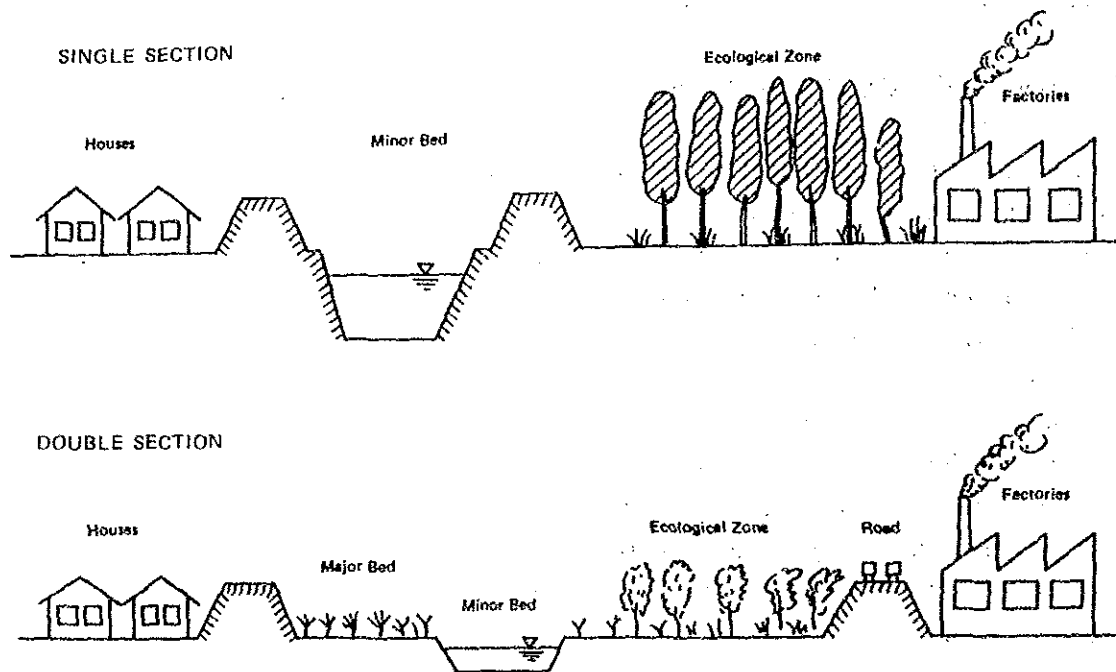
### (1) Lazaro Cardenas Port Area

The development of Lazaro Cardenas port area is advancing smoothly.

For the improvement of the Rio Balsas, single section plan is being promoted, which is considered to have high construction cost.

Double section may be advisable including an ecological zone in the river employing single section if necessary, which are shown below.

We would like to recommend you to consult an expert in the river work similar to the Rio Balsas.



### (2) Altamira Port

- A. At Altamira port, breakwater work and dredging work have already been undertaken, however, since the issue of the order, the location of the overall plan and center line, etc. have been frequently altered.

Also along the progress of the dredging work, layers of hard rocks are being encountered.

To cope with the situation, it will be necessary to study the details of the ground and to decide the master plan as early as possible comparing the dredging cost of the hard layers and the cost of land improvement to construct a plant on soft ground.

- B. Land for port and plant site is prepared using earth and sand dredged from the shipping channel and mooring basin together with earth from hills. A calculation must be made beforehand as to what part and how much dredged soil can be used and from what part and how much hill soil must be transported and then the site must be prepared based on the prearranged transportation plan of the dredged soil and hill soil.

- C. The currently dredged soil seems to be of good quality and it may be advantageously used for the site preparation.
- D. The shape of the breakwater at the mouth of the port as shown in the present work plan does not seem to absorb waves inside the port with directly hitting high waves. Therefore studies using three dimensional hydraulic model and measures with wave absorbing rivetment must be undertaken.

### **(3) Ostion Port**

In the Ostion port area, the site of a new industrial port has been moved from the Ostion Lake to the comparatively better ground to the south.

The master plan must be prepared by conducting a full geological and topographical survey and undertaking experiments with three dimensional hydraulic models installing an experimental breakwater.

A full study must also be made for the execution of T.U.M.

Generally, in Japan at least one year may be spent for undertaking the followings.

1. Study of the arrangement of breakwaters at the mouth of the port by using three dimensional hydraulic models.
2. Geological and topographical survey of the plant site, the mooring basin and the shipping channel, the foundation of the breakwater and the ground condition of the pier foundation.
3. Detailed study of waves.
4. Construction materials and method of their transportation.
5. Observation of sediment transport and waves by constructing experimental breakwater.

Whereupon the master plan and calculation and design of the work is prepared.

### **(4) Salina Cruz Port**

In general, the preparation of the plan and the execution of work seem to be smoothly progressing.

However as it seems that waves enter the port mouth at the commercial and industrial port and the water surface inside the port is disturbed, it is better to undertake work after reliable arrangement of breakwaters and location of port mouth is determined conducting experiments with three dimensional hydraulic models to prevent the problem.

### **(5) Dos Bocas Port**

The master plan seems to be well prepared in general. Also the work already started seems to be progressing smoothly.

It may be called as an improvement that the foot protection of the breakwater is devised to use fascine mattress, etc. However well designed, if the work is poorly carried out, the breakwater is liable to be destructed. Therefore, it will be necessary to select a good contractor and to consolidate site supervision.

It also seemed adequate to have installed an oil transport pipe inside the breakwater independent therefrom.

However a study should be made so that the spray of strong waves hitting the south breakwater may not break the pipe and facilities inside, this may be solved after actually observing waves hitting the breakwater.

## JOINT COMMUNIQUE

### THE XIII MEETING OF THE JAPAN-MEXICO BUSINESSMEN'S COMMITTEE

GUADALAJARA, JALISCO

OCTOBER 7, 1981

The XIII Meeting of the Japan-Mexico Businessmen's Committee was held on October 5, 6 and 7, 1981 in Guadalajara, Mexico. The Japanese Delegation led by Mr. Renzo Taguchi, was composed of 30 Delegates, two advisors, 71 associates, assistants and observers. The Mexican Delegation, led by Mr. Julio A. Millan B., was composed of 12 special guests from the Government, six from entrepreneurial organizations and 80 delegates, observers and experts.

The participants of the XIII Meeting were honored by the presence and greetings of H.E. Mr. Francisco Javier Alejo, Ambassador of Mexico in Japan and H.E. Mr. Nobuo Matsunaga, Ambassador of Japan in Mexico.

#### 2. OPENING CEREMONY

Mr. Millan referred to the Joint Communiqué of the 1979 Acapulco Meeting which agreed on the following objectives for the next three years:

- 1) Both sides pledged joint efforts to treble the bilateral trade,
- 2) The Japanese side agreed to support the Mexican efforts to quadruple the Japanese tourists in Mexico,
- 3) The Mexican side expressed its hope that Japanese investment in Mexico would increase by ten times.

Significant progress has been achieved in the right direction and there is no doubt that the objectives will be surpassed. Chairmen of the Meeting, Messers. Julio Millan and Renzo Taguchi noted with optimism and confidence that the achievement of present targets is strengthening further economic and friendly ties between Japan and Mexico.

Mr. Millan pointed out as well that, under the leadership of President Lopez Portillo, the stability of the Mexican economy has played an important role in ensuring a continuous and rapid development of the country.

Mr. Renzo Taguchi, Chairman of the Japanese Delegation explained the current situation of the Japanese economy and reviewed the progress of the bilateral economic exchanges. Citing the recent world development report (IBRD, 1981) which had forecasted the highest growth path in the world for the East Asia and Pacific Region in the 1980s as it had been in the 70s, Mr. Taguchi urged Mexico to intensify its efforts in the Pacific Region Markets including Japan.

Mr. Flavio Romero de Velasco, Governor of the State of Jalisco, welcomed the participants and officially inaugurated the meeting.

### **3. INDUSTRIAL AND FINANCIAL COOPERATION**

The Financial Situation of Mexico and Japan and the Bilateral Financial Cooperation:

Mr. Jesus Silva Herzog, Undersecretary of Finance, stressed the remarkable development of Mexico's financial system offering a free foreign exchange and a modern and functional infrastructure which places it among the best in the world. The undersecretary concluded by predicting a promising horizon for Mexico and a more fruitful relationship with Japan.

The Japanese side stated that in addition to the loans pledged or committed by Japan's public sector organizations (OECF, EXIM) amounting to well over one billion dollars, private banking community has extended loans of about \$4.4 billion dollars (as of December 1980) to Mexico, placing Mexico as its second largest client. The Japanese side observed that Japan is second only to the United States as a source of private financing to Mexico and encouraged the Mexican side to utilize various financial combinations from Japan.

Support from the Mexican credit institutions for the bilateral joint ventures and cooperative financing between Japan and Mexico was called for.

### **4. INDUSTRIAL DEVELOPMENT IN MEXICO**

Mr. Ramón González Jameson, General Director of Co-Investments and International Affairs, on behalf of the Secretary of National Properties and Industrial Development, elaborated upon the latest achievements in Mexico's industrial growth and the governmental policy for industrialization based, among other factors, on the availability of energy, raw materials and labor. He added that foreign investment is welcome in Mexico and necessary to support the development of the country, mainly in priority sectors such as capital goods, food industry and manufactured products for export for which the Mexican government has established a wide range of incentives. Foreign investment into Mexico grew 15% last year, in real terms, demonstrating that there is a bright outlook for a continued and increasing Japanese investment in Mexico.

### **PANEL SESSIONS**

The panel session for co-investment was chaired by Mr. Ernesto Rubio del Cueto, Vice-President, Corporacion Azteca, and Mr. Hiroshi Toyama, Executive Vice President, Sumitomo Corporation while another panel session including Labor Relations and Transfer of Technology was chaired by Mr. Francisco López Barredo, President of Transportación Marítima Mexicana and Mr. Shukuo Kinoshita, President of Kyowa Hakko Kogyo Co. Ltd.



#### **4.1 JOINT VENTURES**

Having exchanged information regarding the history and perspectives of joint ventures between Japan and Mexico, the Mexican side urged Japanese investors to look into the many opportunities in chemicals, steel, electronics, plastics, petrochemicals, capital goods and agroindustry to be directed to the international markets. Here again, the Mexican side emphasized the existence of fiscal and financial facilities for joint ventures. It was also mentioned that the modernization and economic expansion of Mexico requires new technologies and productive systems such as the ones Japan has developed. Finally, it was proposed that the Committee should be supported by specific industrial associations to identify the right opportunities and partners to help realize the national goals of both countries.

#### **4.2 CHEMICAL**

The Mexican delegation emphasized the desirability of promoting co-investments in petrochemical projects in the priority areas. The tax incentives and the special prices for raw materials for a company with 25% of its capacity devoted to exports for a minimum of 3 years, should be carefully considered by the Japanese companies since it adds attractiveness to those investments. Other foreign countries have been very successful in their investments in Mexico in the petrochemical areas.

The Japanese delegation hoped that the Mexican Government take a more flexible attitude regarding the fees for technical cooperation contracts. While bilateral tax treaty is not yet concluded between our two countries, lower corporate and dividend taxes would help attract foreign investment, it noted. A tax incentive for research and development would enhance technological activities in Mexico by foreign firms, it observed.

#### **4.3 STEEL**

A report on the development of a forging and foundry co-investment project in Mexico was made by a Japanese delegate who explained how various supports in infrastructure, training facilities, market development, etc., are required for the success of the venture.

The Mexican delegation noted that due to the accelerated development, Mexico contemplates the rapid expansion of the steel industry at a rate of a minimum of one million tons of crude steel per year. The areas of such growth are located in Altamira and Lázaro Cárdenas, where industrial ports are being built with a future improvement envisaged on the present infrastructure, once the projects are finalized.

#### **4.4 FISHERY**

Since Japan is the largest consumer, importer and producer of fishery products in the world, there should be possibilities to increase its imports from Mexico and also to establish joint ventures in this field.

Bearing this in mind, the Japanese side asked the Mexican delegation to assist them before their government to deal more flexibly for the temporary use and employment of foreign fishery boats and technical personnel, and observed that a further improvement in distribution system in Mexico would permit an expansion of domestic consumption.

The Mexican delegation pointed out that the fishery sector also offers attractive opportunities for co-investments, and joint efforts should be intensified with the aim of bringing about concrete results in the near future.

#### **4.5 ELECTRONICS**

Both sides agreed that the growing domestic market, the sufficient labor in Mexico and the high technology and quality control levels in Japan offer very favorable prospects for co-investment in the manufacture of electronics products.

The Japanese side stated that joint ventures in this field would become even more promising if cheaper parts and components are allowed to be imported in a more flexible way and the related industries are fostered and strengthened.

On the other hand, a Mexican delegate elaborated upon the advantage of using the incentives provided by the Mexican government for the production of manufactured goods (CEPROFIS). He added that joint ventures in this specific area should also contemplate foreign markets for exports, emphasizing Central America and the United States. He recognized that the Mexican electronics industry still requires technology for efficient production and called for a closer cooperation by Japan to manufacture such components and parts in Mexico and comply with the Mexican policies of national integration.

#### **4.6 TECHNOLOGY AND LABOR RELATIONS**

The Representative of the National Council for Science and Technology of Mexico mentioned the progress of the present programs for transfer of technology and development of new techniques. He also cited the incentives established for corporations engaged in these programs and research activities. The transfer of technology in the automobile industry was analyzed by the Japanese delegation, pointing out that this industry has been growing very rapidly in Mexico and the technology desired should be export-oriented.

The rapid technological progress is making the risks of investment in parts and components production too high. This may not facilitate the desired technological advancement, it observed.

Taking into account that the best of the Japanese technology rests on the combination of hardware and software; latter including human factors and management knowhow, and the policy of the Mexican government regarding vertical integration, joint ventures can be a solution.

The Mexican delegation commented on the basic principles and structure of labor legislation and relations, as well as on the present efforts for education and training of human capability in

order to increase productivity in various industrial activities. Japanese investors were invited to analyze them thoroughly and to cooperate in training programs through co-investments.

## **5. COOPERATION IN TRADE, TOURISM AND SERVICES**

### **5.1 DEVELOPMENT OF BILATERAL ECONOMIC RELATIONS**

Mr. Héctor Hernández C., Undersecretary of Foreign Trade, provided an extensive analysis of the bilateral trade relations, stating that the Mexican government is placing special emphasis on the fact that future bilateral co-investments channel a significant part of its production to exports either to Japan or third markets.

Both sides agreed to combine efforts in order to achieve the targets established by the Committee in 1979.

### **5.2 TOURISM**

Mr. Mario Ramón Beteta, Executive President and General Director of SOMEX, on behalf of Dra. Rosa Luz Alegria, Minister of Tourism, delivered his speech to the Plenary Session, emphasizing the importance and potential of tourism in Mexico and the participation of SOMEX in an important co-investment with Japanese partners for building a new hotel in Mexico City.

The Japanese side elaborated upon 110 million pesos campaign executed by its National Carrier with the support of Mexican Tourism Ministry and CNT (Consejo Nacional de Turismo). The three-year old campaign helped expand the flow of tourists into Mexico. The keen competition with Asian and Pacific nations requires that Mexico's tourism infrastructure and receiving conditions should remain internationally competitive, it stressed.

Prospective Japanese operator of a new hotel, 36 story-high with 750 rooms to be completed by the end of 1984 in Mexico City as a bilateral joint venture, stressed that it would contribute to expanding tourism in Mexico, a target of joint efforts agreed upon by President Lopez Portillo and Prime Minister Ohira.

### **5.3 OIL POLICY OF MEXICO AND ITS RELATION WITH JAPAN**

Mr. Francisco Ruiz de la Peña, Financial Advisor of PEMEX, presented a speech prepared by Mr. Julio Rodolfo Moctezuma Cid, General Director of PEMEX, outlining the oil policy in Mexico which has the objective of promoting the general development of the country in order to benefit all sectors of the economy. It referred to the friendly cooperation on oil supplies established with Japan and to the future possibilities of expanding the same, as both sides were showing a very positive attitude. It was stressed that the Japan-Mexico relationship is based on a modern system of cooperation which also includes technological assistance and co-investments in different fields. He informed that for the last quarter of the present year, the sea buoy at

Salina Cruz will be in operation for loading very large tankers which will result in a more efficient and cheaper transportation of oil to Japan.

The volume of Japan's crude oil imports has declined from 5 million BPD in 1973 to about 4 million BPD in 1981. Japanese delegate explained that other energy sources (nuclear, LNG, etc.) have steadily replaced oil, while in more recent years, steel, cement, paper and pulp and other industries have begun to shift to coal and many measures for energy conservation have been taken at factories, offices and homes. The severe environmental regulation and technological difficulty were mentioned as the constraints limiting expansion of Mexican oil imports to Japan. These factors have reduced the consumption of heavier oil in Japan and it is right in the process of developing technology to commercially produce lighter oil from heavy crude. The Japanese side appreciated, in this connection, the PEMEX's thoughtfulness in receiving Japanese mission to study Mexican technology of heavy oil refining.

## **6. PANEL SESSIONS**

Panel sessions including non-oil exports and imports were chaired by Mr. Ernesto Rubio del Cueto and Mr. Hatozo Kondo.

Executive Vice President of Nissho Iwai Corporation, while three panels of shipping, air transportation and ports were chaired by Mr. Francisco López Barredo and Mr. Teru Yagi, Senior Managing Director of the Nippon Yusen Kaisha.

### **6.1 NON-PETROLEUM EXPORTS AND IMPORTS**

Mr. Raúl Salinas Lozano, General Director of the Mexican Foreign Trade Institute touched upon several aspects of the trends of our bilateral trade.

Both delegations expressed their interest not only for increasing their bilateral trade but also for improving its composition. In this respect, the Mexican side asked the Japanese businessmen to back Mexican efforts to diversify the sales of non-oil products in the Japanese market. Points of view were exchanged regarding promotion of exports of the 80 products listed by the Mexican Foreign Trade Institute.

The Mexican delegation gave assurance that the private sector was also prepared to receive the Japanese visitors including the November mission by MITI and to refer them to counterparts in accordance with their specific areas of interest. The Mexican Committee will act as a liason with IMCE to secure the necessary contacts with Mexican businessmen.

Japan's exports to Mexico increased by 46% in 1980, slightly less than the rate of increase in Mexico's total imports in that year. Japan's non-oil imports from Mexico increased by 40%. The figure was 93% if oil is included. The Japanese side commended Mexico's current efforts for improving infrastructural and other supports for the expansion of exports.

The Japanese side wished the Mexican side to recognize the Japanese trading companies in Mexico in expanding exports to third country markets, citing an example of a Japanese firm in Mexico which exported as much as \$37 million to third country markets in 1980.

Explaining the purpose and structure of the mission to be sent in November from Japan by the Ministry of International Trade and Industry, Japanese side believed that it would help promote Mexican exports to Japan and elsewhere and find collaborative possibilities in related fields. Various areas for Mexican efforts were cited by the Japanese side including problems related to transportation, standardization, freezing technology in regard to fruits and vegetables, and consideration of Japanese body sizes, humidity of Summer in Japan, etc. in regard to apparels. A view was expressed from Japanese side that petro-chemicals could also be a good area for joint venture in Mexico, eventually leading to exporting to Japan and third countries. Both delegates agreed that a wider inter-permeation of cultures crossing borders offers an impetus for expansion of trade between countries and the bilateral relations should be broadened.

## **6.2 MARITIME TRANSPORTATION**

Liner cargoes bilaterally traded are efficiently transported mainly by the lines of the two countries, and their services have remarkably developed and grown to permit not only the equitable sharing of cargoes between them but also the fulfillment of the requirements to properly handle the growing volume of trade. The situation is similar in the transportation of bulky cargoes. Both countries' carriers have tried to maintain long term stable ocean freight and to offer adequate space for the cargo movement by assigning larger vessels and some cooperation has been achieved under present freight market conditions.

Due to the intense containerization, both sides agreed that modernization of port facilities and related infrastructure in Mexico is desirable in order to avoid diversion of cargoes to other countries' ports.

Japanese and Mexican shipping lines will mutually cooperate in the transportation of oil, subject to the terms and conditions contracted between PEMEX and Japanese buyers.

## **6.3 AIR**

A progress report was presented by the Mexican delegation on the expansion of air transport capacity which would provide opportunities for the promotion and future handling of Mexican and Japanese tourist groups.

## **6.4 RAILWAYS**

The National Railways of Japan has long contributed to the development of Japanese industry and is well experienced in the electrification of railways in valleys and mountains. Japanese technology can therefore very well apply to Mexican conditions, and the mass

transportation experience and knowhows in Japan's densely populated urban areas would be of use to Mexico.

## 6.5 PORTS

For an industrial port to develop and function, it has to offer favorable conditions for locating factories. A study mission organized by Japan Consulting Institute will visit Mexico soon while a study by the International Development Center of Japan is already under way. Such studies will prove instrumental for developing industrial ports in Mexico.

A report on port and harbor planning had been submitted by the head of OCDI (Overseas Coastal Area Development Institute) to the Mexican authority (CPD), including several constructive advices.

The Mexican side stated that the new industrial ports mostly solve the present problem of port congestion. In the meanwhile, the Mexican authorities are working in modernizing and dredging the existing port facilities. Other measures being taken or studied include granting berthing priority to linear vessels, provide ports with additional handling equipment, building additional warehouses and berths at ports, establishing customs facilities and building of warehouses in inland Mexico.

The forthcoming opening of the Servicio Multimodal Transistmico (former ALFA-OMEGA Project) will contribute greatly to Mexico's integration to the modern era of transportation and contribute to the modernization of Mexican ports and containerization as well.

## CLOSING CEREMONY

At the closing ceremony, the head of each delegation gave a perspective for the bilateral economic relations as seen from the respective shore of the Pacific.

An audio-visual presentation was given to illustrate the developments in the bilateral scene since the State visit of President José López Portillo in 1978, which placed the relationship on a higher and broader dimension.

The leader of the Mexican delegation, Mr. Julio Millan hoped that yet more ambitious targets than the ones being achieved should be established in trade, tourism and investment.

Both delegates expressed their deep appreciation to President Jose López Portillo's thoughtfulness in honoring the meeting by his attendance and words, and his personal support for the progress of "amigo" relationship shown in the meeting.

Both delegations expressed gratitude to the people of Jalisco for their warm hospitality and true friendship and agreed to hold the XIV Meeting in Japan at a mutually convenient date.

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Leader of Japanese Delegation

Renzo Taguchi

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Leader of Mexican Delegation

Julio A. Millán B.





## 1-2 Report of the Second Mission



**Report for Study on the Development Plan  
of  
Industrial Ports in MEXICO**

**Report and Recommendations to CPI**

Dr. Fernando Rosenzweig H.  
Director of C.P.I.

12th February, 1982

Yoshio Takeuchi  
Head,  
JICA Survey Mission

At the meeting with the CPI staff from 1 to 12 February 1982, discussion was made on the development plans for Topolobampo port, Ensenada port, Tuxpan port and Cobah port, and further on the administration system for the industrial ports under construction. During this period, inspection trip was made to Topolobampo port, Ensenada port, Altamira port and Tuxpan. We report the results of the meeting and the inspection trip.

We heartily appreciate the cooperation of the CPI staff, SCT and PEMEX personnel, and field supervisors through this meeting and inspection trip.

**I. General**

The population of Mexico is centralized in cities of central tableland, such as Mexico city and Guadalajara city. In order to eliminate such overcrowded cities and accelerate the advancement in industry, the Mexican Government has planned and promoted the development of waterfront industrial areas, centering around four industrial ports and Dos Bocas port constructed under control of Pemex.

In Lazaro Cardenas port, the enterprises invited to the industrial area have been already determined and the construction has been in progress.

In Altamira port, the construction of breakwaters and the dredging of the channel have been conducted, and the wharves for TUM have been steadily constructed.

Even in Ostion and Salina Cruz ports, the construction of breakwaters has been started and, further, in Dos Bocas port the construction of the port and harbor and the construction of Pemex's petroleum-related facilities have been remarkably promoted.

In any of these ports, a commercial port area (TUM) has been scheduled to be constructed and cargo handling program including containers and others has been prepared. Therefore, a great deal of commercial cargo will be handled in near future. The construction of TUM together with industrial ports brings about not only the industrialization of the waterfront area but also the

easy handling of import and export cargoes increasing with the growth of Mexican economy. If no increase in the total port and harbor capability corresponding to the economic growth in Mexico are planned, the port and harbor capability might become the bottleneck of the economic development in Mexico.

The construction of the commercial port areas in five big industrial ports means the great increase in the port and harbor capability in Mexico, which is indeed an effective plan.

To begin with, the port and harbor is not only a node connecting the sea with the land, but also an extremely effective public facilities inviting the development of industry, creating the employment opportunity, and raising the standard of living in the local district. Therefore, it is thought that the industrial port plan for developing the waterfront industrial areas in Mexico is indeed appropriate national projects. Therefore, I am very pleased with the steady realization of the industrial port plan and, at the same time, sincerely hope the Mexican Government will promote the port and harbor construction in accordance with the above idea. Even in this sense, I agree with the new plan of the improvement or construction of such ports as Topolobampo, Ensenada, Tuxpan and Cobah, in addition to the five industrial ports.

For the construction work from now on, I would like emphasize the following three points.

First of all, the system for realizing the above idea should be established and continuously observed.

Secondly, the port administrative organization should be the system in which the ideas of local people, or locality, can be introduced into the system for a better administration of port facilities.

Thirdly, the prosperity in shipping should be planned and the appropriate combination of the shipping with the ports and harbors shall be studied.

For the first problem, the strengthening of CPI in SCT is considered necessary. One method is that the experienced members of the staff in the SCT shall be made the members in the CPI for the purpose of combining the planning with experience in construction.

The second problem is the most important matter in the construction from now on. The construction of ports and harbors and the invitation of the industries under the powerful guidance and control of the Government as conducted now are proper at the early stage. However, it is thought that the people in the local area should think of the development of the local industries and their communities by themselves and the planning of ports and harbors as a part of the industrial development of the whole area, not limited to the waterfront area, should bring about the establishment of local culture and decentralization of population and industries. For this purpose, the port and harbor plan including the aims of the industrial policy and development plan by the State should be prepared, and the State authorities should take part in the administration of the four big industrial ports. The establishment of port authorities composed of the City and State entities is one idea for the introduction of locality.

Concerning this problem, the modification of Article 50 of "La Ley de Navegacion y Comercio Maritimos" in December 1981 was indeed a proper step to be taken. For the change of the port administrator from the Government to the local authorities, the case of Japan will be a reference for deliberation.

In Japan, big ports such as Kobe and Yokohama, was placed under government management before 1950, but after the establishment of the Port and Harbor Law in 1950, the government

management was abolished and the local authorities was assigned as the port administrator. Therefore, Kobe port is now operated by Kobe city authorities; Yokohama port by Yokohama city; and Tokyo port by Tokyo metropolitan government.

In the Port and Harbor Law in Japan, port management is prescribed to be conducted by port authority or local public authorities. In general, the port administrator is the Metropolis, prefecture or city authorities, but in Nagoya port the port administration association is organized by the portions of prefectural and city authorities,

On establishing the Port and Harbor Law, the port construction organization under the direct control of the Government remained for its continuation, and now the important part of the port and harbor is constructed by the Government after the deliberation between the Government and the port administrator. Further, the port administration cost is charged to the port administrator, but the construction cost for the public facilities as the base of a port and harbor are prescribed to be shared with the Government, local authorities and users.

For such legal management, refer to the Laws and Regulations on Port and Harbours of Japan (English version already submitted to CPD), the Ministry of transport Establishment Law, the Port and Harbour Ordinances of Kobe city, Yokohama city, etc., Regulations of Nagoya Port Administration Association, and others.

In addition, a public corporation for the construction of container berths and others in Tokyo Bay and Osaka Bay in Japan has been set up and jointly financed by the Government and the local authorities. The officers in the organization are also composed of the representatives of both the Government and the local authorities. It will be a reference for planning "Administracion Descentralizada" in Mexico.

For the system of the port authority, that is described in Port and Harbor Law of Japan was not effective in the actual administration of ports and harbors due to certain reasons. Therefore, it is better to refer to the cases in London port authorities and New York port authorities.

The third problem is very important not only for commodities circulating policy, but also for the development of the local districts. Especially for the development of Baja California district and Yucatan district, the role of marine transportation is thought to be very important. Even in this respect, "Local ideas on ports and harbors" described as the second problem should be referred to. For that purpose, the request for the construction of ports and harbors by each state and each local city should first be investigated and coastal shipping policy should be considered for the construction plan of ports and harbors. Anyway, it is necessary to bring up the coastal shipping in connection with the commodities circulating policy in Mexico. As for the foreign trade shipping, it is desired to bring up the Mexican shipping studying each type of shipping conference as there are various problems such as containerization.

## **2. Each Port**

### **(1) Topolobampo port**

Topolobampo port has many good geographical conditions. That is, the railway starts from Topolobampo and reaches Houston in North America by way of Ojinaga or Juarez. In the inland area, it reaches the Gulf via Chihuahua. Further, it crosses the railway running along the Gulf coast and the roads are also well developed. This port is not only the entrance to the vast

hinterland but also the possible window of the Mexican side. The Sinaloa State excels in the production in agriculture and fishery, and the development of the state in future is promising. The states behind the Sinaloa State, connected one another with the railway, are also abundant in agricultural products, live-stock products and mineral products. In addition, as these States are located near the North America, vegetables and fruits produced in these areas are exported through the land route.

Accordingly, the Topolobampo port can be used as the feed base for fuel, raw materials, fertilizer, etc. to be furnished for the growth of the industries in the hinterland and, at the same time, can be used as the export and transfer port for the products of the hinterland. Taking into consideration the above conditions, the planning of this port should be carried out. For the time being, those types of factories (fuel, fertilizer, etc.) which provide to the industries in the hinterland should be constructed in the waterfront industrial area, and the process factories for the primary products abundant in those areas should be also constructed. Then, the primary products and processed goods from the process factories can be exported and transported to other areas through the Topolobampo port.

The water depth at the harbor entrance of this port is - 8 m, but it can make deeper by dredging. Besides, there is a great deal of room for the enlargement of the port and harbor and the topography of this port is the configuration in which any improvement can be done. However for the time being, as described above, this port (After the survey, the water depth should be determined, but it should be - 12 m or so for the time being) should be developed as the exit of the products in the hinterland and as the process base at its initial stage. After that, it can be gradually enlarged and improved according to the development of the economy in those districts, and finally it can be made to be a large-scale waterfront industrial area.

## (2) Ensenade port

Ensenada port is the entrance to Baja California State for which the import of living necessities and raw materials and the export of raw cotton are conducted through this port. Further, it is important as the window for bringing the materials of South Mexico to this area through the coastal shipping. On the other hand, it is near the U.S.A., so lots of sight-seers visit this area. Therefore, the resort area utilizing the coast and the marina base can be considered. The water area of this port is comparatively narrow, but the container berth and general cargo berth also are planned. The extension of the breakwater is now under construction. I agree with the most of the plan, but I think that the site for the container terminal will be required much more in future.

The marina base is planned at the deepest portion of the harbor, but for the development of this port and to eliminate the mixed state of small yachts and large-sized vessels in the channel the plan of the marina base in this area is not suitable. This portion should be utilized for the enlargement of public wharves and others. The most suitable marina and resort base is Estero Punta Banda district about 20 km south of the Ensenada port. The port and harbor plan for Ensenada port should be enlarged to this site and the resort base can be planned there.

### (3) Altamira Port

In Altamira port, the construction of railway, roads, service water, TUM, etc. and dredging work are rapidly conducted and, at the same time, the factories of two enterprises are under construction. Although the waterway running north and south was transferred to the west side and the good soils in the western district was used as the land for factories, the iron and steel industries such as HYLSA and SIDERMEX, for which the best ground is required, are scheduled to be located in the eastern district having soft soils according to the present land utilization program. Therefore, the soil improvement in this district and the foundation for heavy-weight structures should be thoroughly studied.

### (4) Tuxpan Port

Tuxpan port is located between Tampico and Veracruz (150 km from Tampico, 200 km from Veracruz and about 300 km from Mexico City) and this port is located rather near Mexico City as compared with the other two ports. This coast is situated close to population and industry-centralized zones such as Mexico City and Monterrey. Therefore, there is a high possibility of forming a largescale waterfront industrial area in this district. In this sense, it is very significant to develop a new port and harbor for a industrial zone.

However, it is necessary to study thoroughly as to what types of industries should be invited to the Tuxpan industrial area because at Altamira a new industrial zone is now under construction. Further, as the scale, configuration and location of Tuxpan port depend upon the scale and type of the industries to be invited to the industrial area in future, thorough investigation and research should be done before planning.

At present, there are three plans as to the location of Tuxpan port as follows:

In the 1st plan; the left-bank area of the mouth of Tuxpan river.

In the 2nd plan; the mouth of Tuxpan river is to be utilized, and excavation is to be done at the right-bank side toward the south.

In the 3rd plan; excavation is to be done at the site about 11 km south of Tuxpan river.

Among these plans, the 1st plan is thought to be unacceptable because of soft subsurface and damp place in the most area as the result of inspection from the sky. Therefore, it seems that the 2nd and 3rd plans are recommendable. My thoughts obtained through the drawings and inspection from the sky are that in the 2nd plan medium-scale industrial zone is considered, judging from the decided size of port entrance, the maintenance of the river mouth, the traffic volume of vessels and other factors. In the 3rd plan, a large-scale industrial zone is considered. That is to say, in the 2nd plan, as the scale is small, the construction cost will be low, but in the 3rd plan, as the scale is large, the construction cost will be high. Accordingly, the decision on what type of port to be constructed at any of the above three locations depends upon the type and scale of enterprises to be located at the area in future. Therefore, after the completion of economic analysis on the enterprises to be located and, further, after the completion of survey on natural and marine phenomena, geology and other factors, the final determination of this project should be made.

**(5) Lazaro Cardenas Port**

The construction work in Lazaro Cardenas has been favorably in progress. Therefore, as the problems from now on, not only the flood countermeasure on Balsas river but also the water utilization program including a dam for the stable supply of service water, agricultural water and industrial water and the generation of power should be studied.

**(6) Ostion Port**

The projects for harbor facilities, enterprise arrangement and others have been gradually settling, and a part of construction work has been in progress. I agree with the arrangement of breakwaters in the plan. For the locations to be assigned to enterprises and water utilization, further studies will be necessary from now on. On thinking of the consumption volume of iron in future, the location of iron and steel companies to this area should be needed, but for doing so, further study on the utilization of water line should be done.

**(7) Salina Cruz port**

The projects for petroleum shipping port and industrial port have been gradually settling, and a part of construction work has been in progress. Judging from the drawing, the configuration of breakwaters in the industrial port may not guarantee the calmness in the port on a stormy weather, further study should be made through experiments, simulation and other means.



## **Chapter 2**

### **Outline of the Study**



## CHAPTER 2 OUTLINE OF THE STUDY

### 2-1 BACKGROUND OF THE STUDY

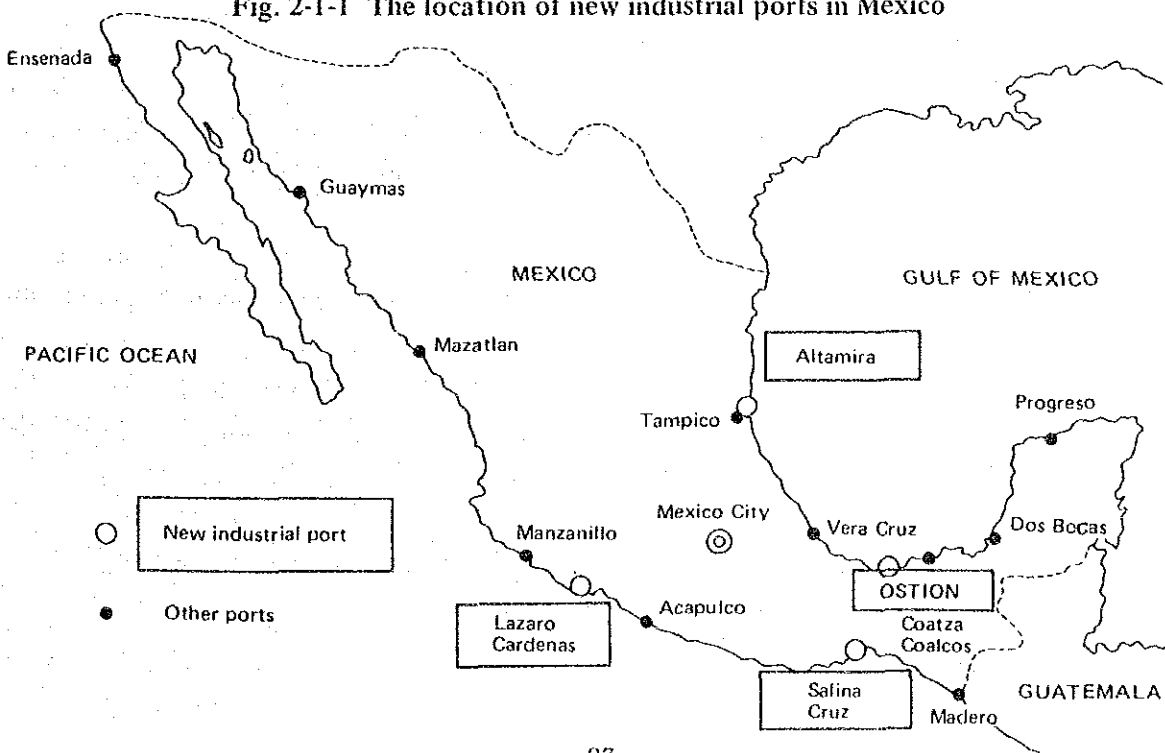
The program "Study on the Development Plan of Industrial Ports in Mexico" carried out in the 1980 fiscal year (hereinafter referred to as "1st Phase Investigation"), has been highly evaluated as a successful case of technical cooperation with Mexico, and the continuation of this investigation has been desired by Mexico.

After the completion of the 1st phase investigation, the construction programs for five industrial ports, Altamira, Lazaro Cardenas, Dos Bocas, Salina Cruz and Ostion, have gradually progressed and now at various stages from the preparation before construction to the enlargement work. Further, in the inside of the above ports, TUM's (Multi Purpose Terminals) have been planned to be constructed respectively, and the study on the scale, working plan and others of TUM facilities have been in progress. In addition, the study on the control and management of the facilities, the training of the employees, and others have been already scheduled. As the above plans are all on a large scale, it is known through the past visit to Mexico for inspection that there have been various problems to be further studied and discussed in those development plans. To solve those problems, Japan's past experience and technical know-how for the development of waterfront industrial areas are serviceable and the friendly relation with Mexico can be promoted through those technical cooperation.

From now on, the relationship between these two countries should not be confined to only the import and export of petroleum, and the maintenance of a close cooperation in the planning, construction and management of ports and harbors has been earnestly desired.

Under these situation, this investigation was successively planned in this fiscal year and carried out as "Study on the Development Plan of Industrial Ports in Mexico (2nd Phase)". The allocation of the industrial ports are shown in Fig. 2-1-1

Fig. 2-1-1 The location of new industrial ports in Mexico



## 2-2 OBJECT AND CONTENT OF THE STUDY

### 2-2-1 Object of the Study

The object of this study is to conduct the technical cooperation on the coastal industrial zone construction in Mexico with the concurrence of the government of the Republic of Mexico, through the study we aim to contribute the industrial port planning currently carried out by Coordinacion de Proyectos de Desarrollo, Presidencia de la Republica by through the discussions and recommendations upon various problems resulted from the planning and execution works for the new industrial ports in the country.

### 2-2-2 Content of the Study

The content is to conduct the following investigations on five industrial ports under development, Lazaro Cardenas, Salina Cruz, Altamira, Ostion and Dos Bocas, and the newly planned industrial port, Ensenada.

#### **(1) Investigation on the realization policy, administration and management of industrial ports**

To establish a powerful port management body for constructing and managing new industrial ports, fundamental points will be studied on its functions and organization.

#### **(2) A Study on the problems arisen during the planning and designing works of the basic facilities for the new industrial ports**

Problems will be studied on planning and designing basic port and harbor facilities, such as navigation channel, mooring basin, break water, quaywall and so on, in the major ports. Especially for the multi purpose terminal planned in major ports, investigation will be conducted and suggestions will be made on the construction plans for major port facilities, including cargo handling system.

#### **(3) A study on the systematic survey requirement for the industrial port planning**

Discussions will be made on a systematic survey for the natural conditions, currently carried out by Mexican authorities and the most required recommendations will be proposed on the fundamental articles in the survey plans and survey techniques through the planning and executing processes of the industrial port project.

#### **(4) A study on the man power planning for the construction, management and operation of the industrial ports**

Discussions will be made on the education and training system of man power for the industrial ports and recommendations will be proposed on a fundamental policy for the education and training operations.

## **2-3 FIELD STUDIES IN MEXICO**

### **2-3-1 Method of Study**

The method of study could be divided into:

- (1) discussion for the reconnaissance
- (2) visiting to the planning sites
- (3) studying on the source materials

The institutions where the team visited during the study mainly as;

- (1) Subsecretario de Comunicaciones y Transportes (SCT) Coordinacion General del Programa de Puertos Industriales (C.P.I.) = Coordination of Industrial Port Planning
- (2) Secretario de Comunicaciones y Transportes (S.C.T.) Subsecretaria de Puertos y Marina Mercante  
Direction General de Obras Maritimas = Port and Harbour Bureau
- (3) Petroleos Mexicanos (PEMEX)
- (4) CIFSAs (Consultant firm)

The sites where the team visited are;

- (1) Altamira industrial port site,
- (2) Lázaro Cárdenas industrial port site,
- (3) Dos Bocas oil loading port
- (4) Topolobampo industrial port site
- (5) Ensenada industrial port site
- (6) Tuxpan industrial port site

### **2-3-2 The Missions**

#### **(1) Site Survey**

Two missions were dispatched to Mexico, according to the schedule as follows:

First mission:

1981, September 30 – 1981, October 18                      19 days

Second mission:

1982, January 29 – 1982, February 14                      17 days

Leader of the survey team;

Mr. Yoshio Takeuchi (for 1st, and 2nd mission)

President, Overseas Coastal Area Development Institute of Japan

Member of the survey team;

Mr. Kazuo Shirai (for 1st mission)

Mechanical Engineer, Overseas Coastal Area Development Institute of Japan

Mr. Takao Saito (for 2nd mission)

Advisor, Overseas Coastal Area Development Institute of Japan

## (2) Interim Report

At the end of each mission a Spanish interim report was prepared in Mexico, which was translated into English in returning Japan and was sent to Mexico.

### 2-3-3 List of Counterparts in Mexico

The counterparts for the study were as follows:

#### (1) SCT

●Ing. Jose Juan Velarde Bonnin

Subsecretario, sub-secretaria de Puertos y  
Marina Mercante

●CPI

Industrial Port Development Planning Department of CPD was transferred to SCT at the end of 1981, and it is called CPI. Fig 2-3-1 shows the new organization in SCT.

Dr. Fernando Rosenzweig

Coordinador General

Ing. J.G. Macdonel Martinez

Dirección de sistemas para Operacion  
y Administracion Portuaria

Ing. J.A. Aguirre Balcells

Direccion de Infraestructura

Ing. J.A. Nyssen Ocaranza

ditto

Ing. F. Rodriguez Tapia

ditto

Ing. R.A. Correa Arenas

ditto

Ing. L. Gonzalez Ponce

Ing. Octavio Diaz de Leon

Gerente del Sistema Nacional de Abastos

●Direccion General de Obras Maritimas

Ing. Mario Enrique Villanueva Reyes

Director, General de Obras Maritimas

Ing. Roberto Bustamante Ahumads

Direccion General de Obras Maritimas

Ing. Hiraku Moriguchi

JICA/SCT Expert

Ing. Noriyuki Mochizuki

JICA/SCT Expert

#### (2) PEMEX

Ing. Antônio Montes de Oca S.

Subdirector de Proyecto y Construcción

Ing. Jaime Hernandez Balboa

Gerente de Construcción

Ing. Roberto Ramirez Guevara

Gerente de Obras Sociales e Infraestructura

Ing. Francisco Garcia Mercado

Residente de PEMEX en Proyectos Marinos

Ing. Juan F. Valera Adam

Ing. Hector Lopez

#### (3) CIFSA

Ing. Daniel Cervantes Castro

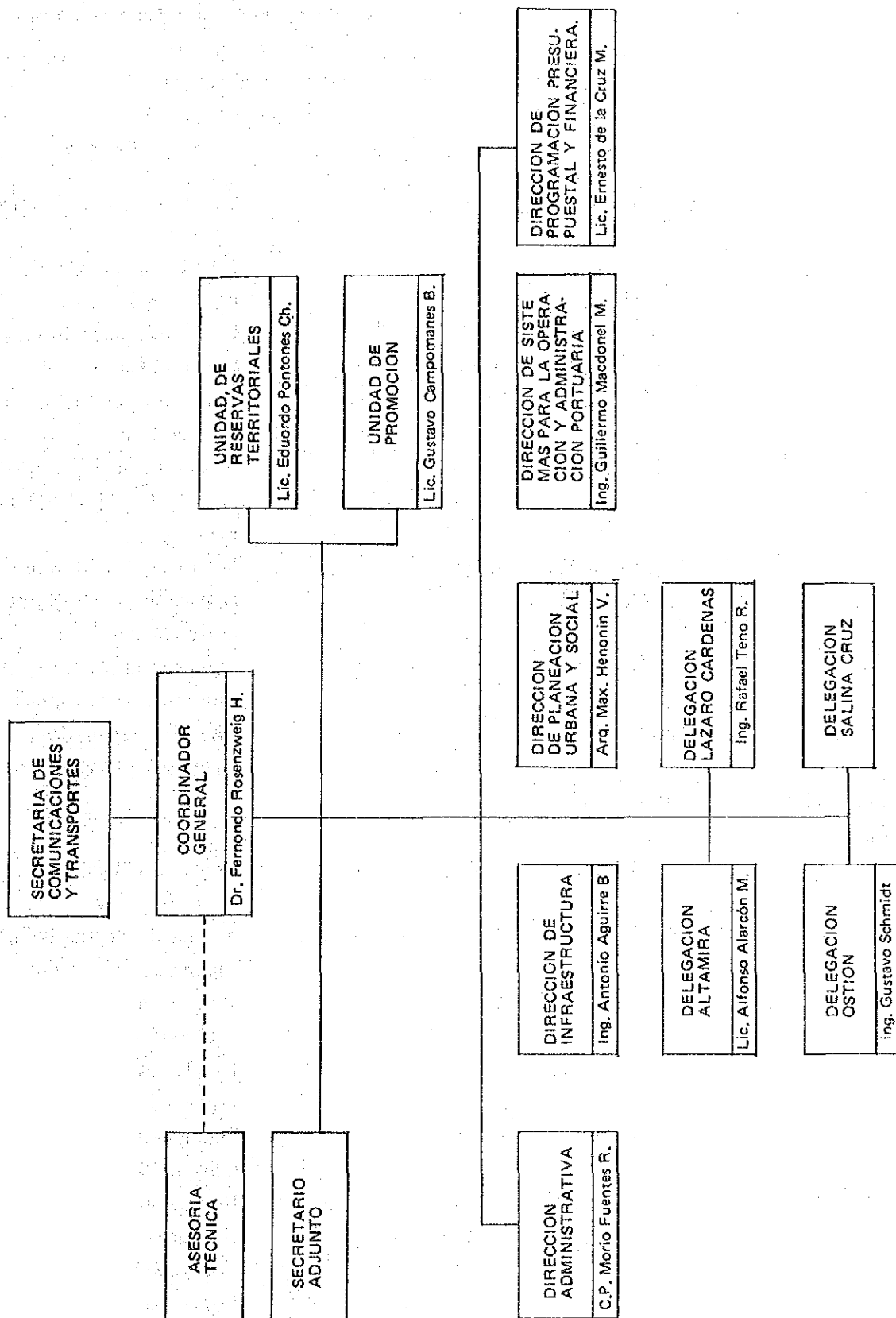
Director General

#### (4) JICA

Nobutetsu Enoshita

Resident Representative JICA México Office

Fig. 2-3-1 Organization of CPI



## 2-3-4 Record of Visits

The itinerary for the visits to Mexico are shown hereunder according to the visiting order.

### (1) Itinerary of the First Survey Mission in Mexico

Date	Time	Place	Remarks
Sept. 30 (Wed.)	18:00-17:40	JL-012	Depart Tokyo and Arrive at Mexico City
Oct. 1 (Thu.)	10:00-14:00	CPD	Scheduling and Confirmation on Survey Policy
	16:00-17:30	JICA	Confirmation on Survey Policy
	17:30-18:30	Japanese Embassy	Courtesy Call
Oct. 2 (Fri.)	10:00-10:30	SCT	Discussion on Technical Cooperation
	11:00-14:00	CPD	Attend Formal Presentation on M.P.V., T.U.M. Development Plan
	17:00-19:00	CPD	Discussion on Altamira Port
Oct. 3 (Sat.)	11:40-12:35	AM-100	Depart Mexico City and Arrive at Guadalajara
	17:00-18:00	Camino Real Hotel	Pre-Meeting for Japan-Mexico Businessmen's Committee
Oct. 5 (Mon.)	10:00-17:30	"	The 13th Japan-Mexico Businessmen's Committee
Oct. 6 (Tue.)	10:00-17:30	"	"
Oct. 7 (Wed.)	9:00-11:00	"	"
	14:30-15:30	AM-183	Depart Guadalajara and Arrive at Mexico City
	20:00-22:00	House of Ambassador	Attend Reception held by Japanese Ambassador
Oct. 8 (Thu.)	9:00-13:30	SCT	Discussion on Altamira and Lazaro Cardenas Port
	17:00-19:30	CPD	Discussion on Lazaro Cardenas Port
Oct. 9 (Fri.)	9:00-14:00	CPD	Discussion on Ostion, Salina Cruz and Dos Bocas Ports
	16:00-16:30	JICA	Internal Meeting
	17:00-20:00	CPD	Discussion on Tuxpan, Topolobanipo, Ensenada and Cobah Ports
Oct. 10 (Sat.)	12:30-13:15	AM-353	Depart Mexico City and Arrive at Zihuatanejo
Oct. 12 (Mon.)		Zihuatanejo	Preparation for the Report



Oct. 13 (Tue.)	8:00—9:00		Depart Zihuatanejo and Arrive at Lazaro Cardenas
	9:00—12:30	Lazaro Cardenas	Site Investigation of Lazaro Cardenas Port
	12:30—14:30		Depart Lazaro Cardenas and Arrive at Tampico
	14:30—17:00	Altamira	Site Investigation at Altamira Port
Oct. 14 (Wed.)	7:00—10:30		Depart Tampico and Arrive at Dos Bocas
	10:30—14:00	Dos Bocas	Site Investigation of Dos Bocas Port
	16:00—19:30		Depart Dos Bocas and Arrive at Mexico City
Oct. 15 (Thu.)	9:30—19:00	CPD	Finalization of the Report
Oct. 16 (Fri.)		CPD	Final Discussion with CPD and Submission of the Report
		JICA	Final Discussion with JICA and Submission of the Report
Oct. 17 (Sat.)	10:20—	JL-011	Depart Mexico City
Oct. 18 (Sun.)	—17:30	"	Arrive at Tokyo

## (2) Itinerary of the Second Survey Mission in Mexico

Date	Time	Place	Remarks
Jan. 29 (Fri.)	18:30-18:00	JL-012	Depart Tokyo and Arrive at Mexico City
Jan. 30 (Sat.)			
Feb. 1 (Mon.)	9:00-14:30	CPI	Submission of the Interim Report, Scheduling and Confirmation on Survey, Policy
	16:30-18:30	Japanese Embassy	Courtesy Call
Feb. 2 (Tue.)	9:00-14:00	CPI	Discussion on Topolobampo and Ensenada Port Planning
	16:00-19:00	CPI	Discussion on Tuxpan and Cobah Port Planning
Feb. 3 (Wed.)	7:30-19:00	Mexico City - Culiacan - Los Moches - La Paz	Site Investigation of Topolobampo Port
Feb. 4 (Thu.)	8:00-19:00	La Paz - Tijuana - Ensenada - Tijuana	Site Investigation of Ensenada Port
Feb. 5 (Fri.)	11:00-19:00	Tijuana - Cabo San Lucas	Site Investigation of Cabo San-Lucas Port
Feb. 6 (Sat.)	15:00-18:00	Cabo San-Lucas - Mexico City	
Feb. 8 (Mon.)	10:00-14:30	CPI	Discussion on Industrial Port
	16:30-20:30	CPI	Discussion on Industrial Allocation of Altamira Port
			Discussion of Port Administration and Operation
Feb. 9 (Tue.)	6:00-23:00	Mexico City - Tampico - Altamira - Tampico - Tuxpan - Tampico - Mexico City	Site Investigation of Altamira and Tuxpan Port
Feb. 10 (Wed.)	9:30-12:00	CPI	Discussion on Site Investigation
	12:30-14:30	Pemex	Discussion on Ostion and Salina Cruz Port Planning
	16:30-17:30	CPI	Discussion on Site Investigation
	18:00-19:00	SCT	Discussion on Altamira Port
Feb. 11 (Thu.)	9:00-14:00	CPI	Preparation of Report
	14:00-14:30	SCT	Reporting to Vice-Minister
	17:00-19:00	CPI	Final Discussion

Feb. 12 (Fri.)	9:30—10:30	CPI	Submission of the Report Confirmation of the Record of Discussion
	11:00—12:00	Pemex	Meeting with Sr. Montes de Oca (Vice President of Pemex)
	14:00—15:00		Reporting to Minister Nakasone
Feb. 13 (Sat.)	11:30	JL 011	Depart Mexico City
Feb. 14 (Sun.)	18:40	JL 011	Arrive at Tokyo



### **Chapter 3**

#### **Outline of the Development of Mexican Ports**



### 3-1 DEVELOPMENT OF INDUSTRIAL PORTS

The general description and the present conditions of the five industrial ports of Altamira, Lazaro Cardenas, Ostion, Salina Cruz and Dos Bocas which Mexico is now developing and those of Tuxpan, Ensenada, Topolobampo and Cobah which the country is planning to develop as industrial ports in the future are as follows:

#### (1) Altamira Port

Tampico-Altamira Area on the Gulf of Mexico is located near the estuary of the Panuco River. It is suitable for the development of agriculture and industry because of its convenience of traffic, advanced labor force and abundant water.

Tampico Port, which calls itself the largest port in Mexico, is on the left bank of the Panuco River and might as well be regarded as a river port since its commercial port wharves continue for about 20 km upstream from the estuary. It first developed as a petroleum port but now also serves as a port for the industrial city of Monterrey in the hinterland. This port has three terminals: a public wharf, a steel and mineral wharf and a Pemex wharf and wharves that each exclusively handle cement, gypsum and manganese but -10 m is now barely maintained as its water depth because siltation makes it difficult to ensure deeper water depth. Further, the commercial port section with eight berths leaves no room for expansion because of its proximity to the town area. There is a plan to turn a baseball stadium into a container yard but this area is already full of cargoes in spite of the fact that the container berth has not yet been completed.

Altamira Port, which is being constructed on a lagoon 20 km north of Tampico Port, is most promising as an industrial site and its multipurpose wharf (TUM) is going to be on the largest scale.

The area selected as an industrial port is near the lake of San Andres. It is mostly flatland with some small hills. It is a strip of land parallel to the coastline. Nearby are the Panuco River running from west to east and the lakes of San Andres, Chairel and Carpintero.

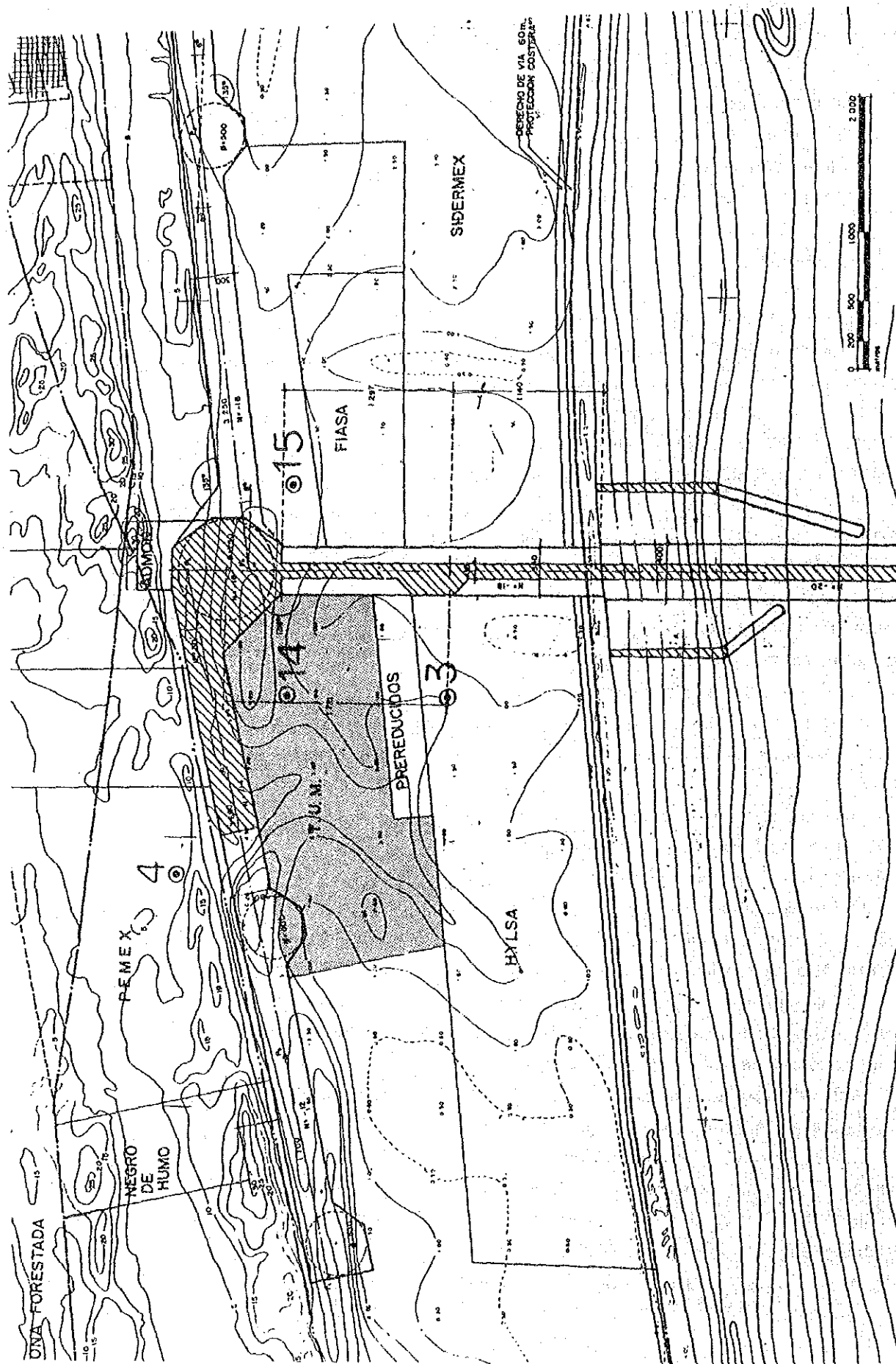
The local climate is tropical and with high humidity and there is much rain in summer. The average rainfall is 1,000 mm. September is the most rainy month while May is the least rainy month. The local agricultural products include sugar canes, fruit and sorghum.

The general lagoon area of Altamira has soft ground and the policy has been changed to constructing the industrial site in the hills behind. The area abounds with water. In the vicinity, there are many oil wells and related industries.

Such infrastructures as railways and roads are being energetically constructed and it will not be long before Altamira will start as a modern industrial port.

The first Modulo Polivalente (MPV: multipurpose terminal), 600 m with two berths, is being hurriedly constructed with a schedule to be opened in November 1982. Also, preparations are being made to start construction of the grain terminal to be located on the opposite side. Dredging and breakwater construction are presently in progress as being necessary for the operation of these facilities. Besides, Pemex, Sidermex and Prereduccidos are studying to operate at Altamira.

Fig. 3-1-1 shows the master plan of Altamira Port.





## (2) Lazaro Cardenas Port

Lazaro Cardenas Port is an artificially excavated port newly constructed on the Balsas River delta approximately halfway between Manzanillo Port and Acapulco Port on the Pacific side of Mexico.

This port was constructed for the import of raw material coal and the export of products as part of the project to construct an ironworks (SICARTSA) to operate, taking advantage of iron ore produced in the vicinity and the abundant local water resource and was generally completed in 1976. The area has favorable geographical conditions, such as large land, abundant water and other natural resources. The local infrastructure construction is well underway. There are a railway and a national highway connecting this fine port with the heart of Mexico. There is also irrigated farmland nearby and abundant power supply is available to this area.

This area on the delta of the Balsas River includes small hills of about 50 m above sea level but is generally flat. Yet, the local ground is very hard as it is composed of sand with some gravel.

The climate is hot and fairly dry and there is no winter. The annual average rainfall is 1,300 mm. Humidity in June and October is relatively high.

Coconuts, bananas, mangoes, tamarinds and oranges are grown in the locality. Maize, sesame and pumpkins are produced from the farmland in large quantities; also, sorghum and beans are produced.

This port is located near the iron ore mine which produces 20% of the Mexican iron ore. Limestone, kaoline, silver, copper and zinc ores are mined in La Union Area.

The Balsas River has much water of 15 billion m<sup>3</sup>/sec at average and can produce 2,630 MW of electric power.

Lazaro Cardenas is now a remarkable port on the Pacific side of Mexico and an increasing number of ships calls it, avoiding the congestion of the nearby ports of Manzanillo and Acapulco. A fertilizer plant is already in operation there after the SICARTSA Ironworks and a grain terminal is under construction and the Pemex site is being prepared. The commercial port section is already being used and the container berth will soon be in operation.

Fig. 3-1-2 shows the master plan of Lazaro Cardenas Port.

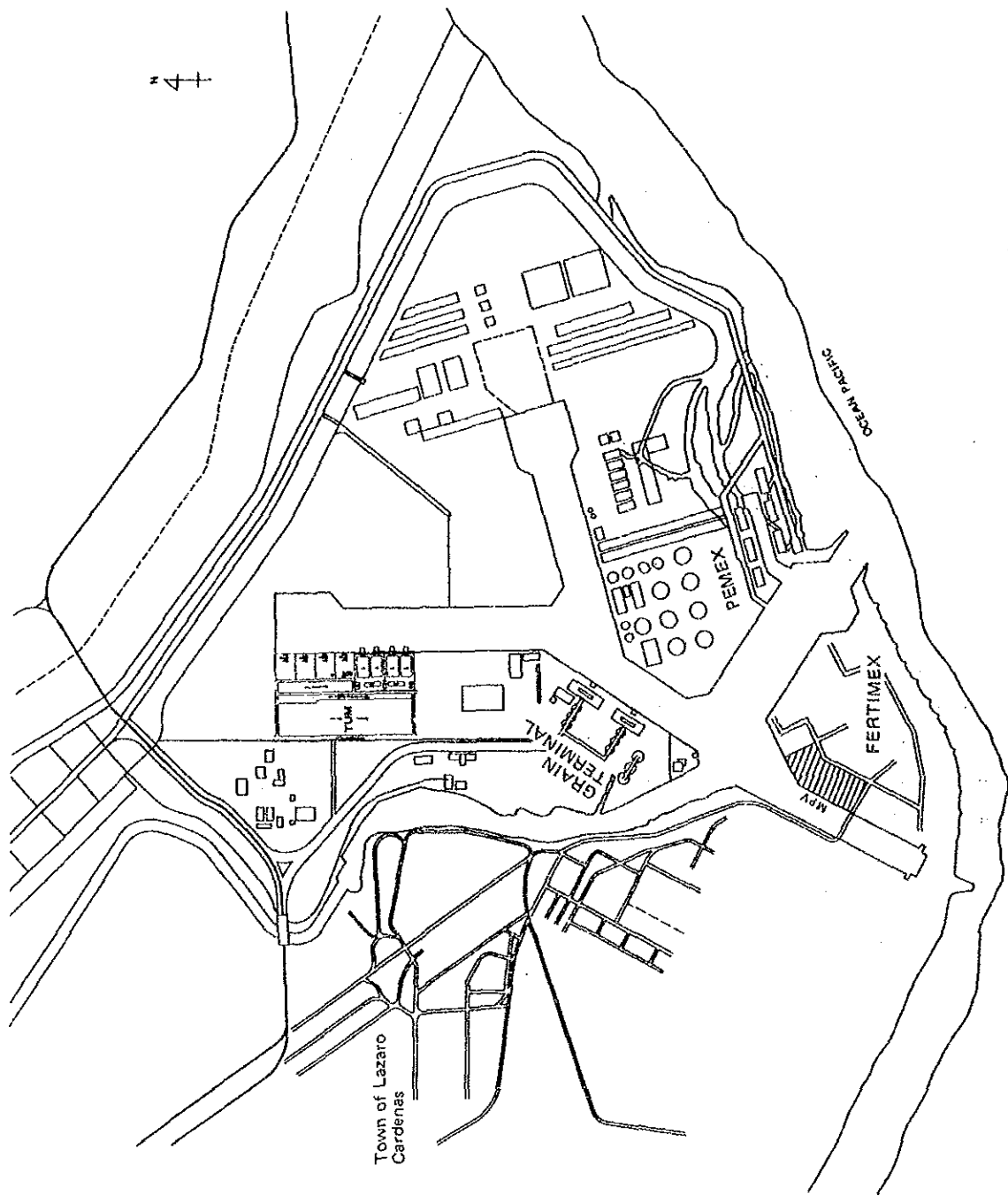


Fig. 3-1-2 Lazaro Cardenas Industrial Port

### (3) Ostion Port

This industrial port is proposed for about 25 km northeast of Coatzacoalcos Port, which is a river port located two miles from the estuary of the Coatzacoalcos River which rises in the center of the Isthmus of Tehuantepec. The river has four ports: Coatzacoalcos (2,860,000 tons in 1979), Pajarintos (38,740,000 tons in 1979), MinaCHitlan (890,000 tons in 1979) and Nanchita (60,000 tons in 1979). Navigation to and from these ports is becoming complicated since they use the same entrance. The general area will be a large petrochemical base in the future as local petrochemical plants are being actively expanded.

The main commercial port is Coatzacoalcos Port and two of the seven berths in its foreign trade section are being remodeled into container berths for the purpose of land bridge transportation. The railway yard is being expanded since containers are transported mainly by railway train.

Railway and road improvements are also in progress and a bridge will soon be built across the Coatzacoalcos River.

Coatzacoalcos Area abounds in primary energy resources: petroleum, gas and hydraulic power and produces much sulfur and agricultural and livestock products.

It is geographically convenient as it faces the Gulf of Mexico. Located north of the Isthmus of Tehuantepec, it is only 300 km from the Pacific Ocean.

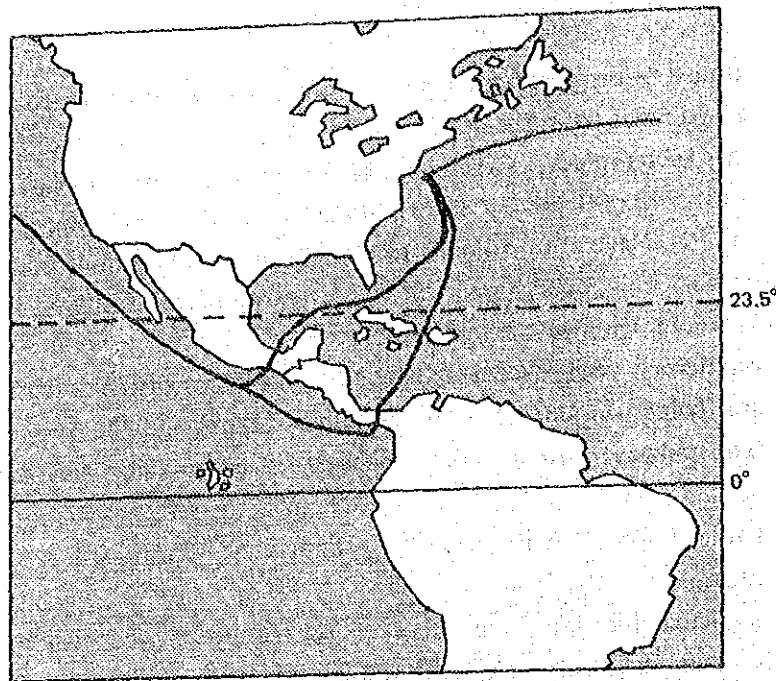
Large oil refining and petrochemical companies are already operating there, taking advantage of the abundant water and superior labor that are locally available.

The climate is tropical with high humidity and the annual rainfall is 2,000 mm. Humidity is highest in December.

Ostion Port was first proposed at the Ostion Lagoon but the site was later changed to the area between the lagoon and the new airport for reasons of environment protection and the problem of land acquisition.

A satisfactory sand layer exists along the coast but the existence of a soft layer in the rear part of the port is a cause of apprehension. Both the Government and Pemex are planning the construction of the port because a Pemex natural gas liquefying and related industries will be located in the center of the industrial area.

This port is involved in the land bridge plan to link the Pacific and Atlantic Oceans via the Isthmus of Tehuantepec, as illustrated in Fig. 3-1-3. Further, a plan to make the port a terminal for the land bridge company to be established with 100% government investment is being considered.



**Fig. 3-1-3 Tehuantepec Land Bridge and Panama Canal**

The New York-Tokyo run can be reduced by 1,200 miles by routing it through this land bridge, compared with the use of the Panama Canal.

The Ostion Port project is now being planned by Pemex. According to Pemex, the area of the industrial complex is 8,000 ha and the total development area including housing is 17,000 ha.

The following industries will be constructed there:

Metal working, automobile assembling, shipbuilding (including repairs), TUM, metals (Steel pipes, etc.), rolling stock, motors, electronics, lumbering, distribution terminal, clothing, etc.

The construction of the port itself is underway. Part of channel to the TUM in the industrial port and part of the breakwater are scheduled to be completed by the end of 1982. Railway and road improvements are also in progress.

Fig. 3-1-4 shows the master plan of Ostion Port.

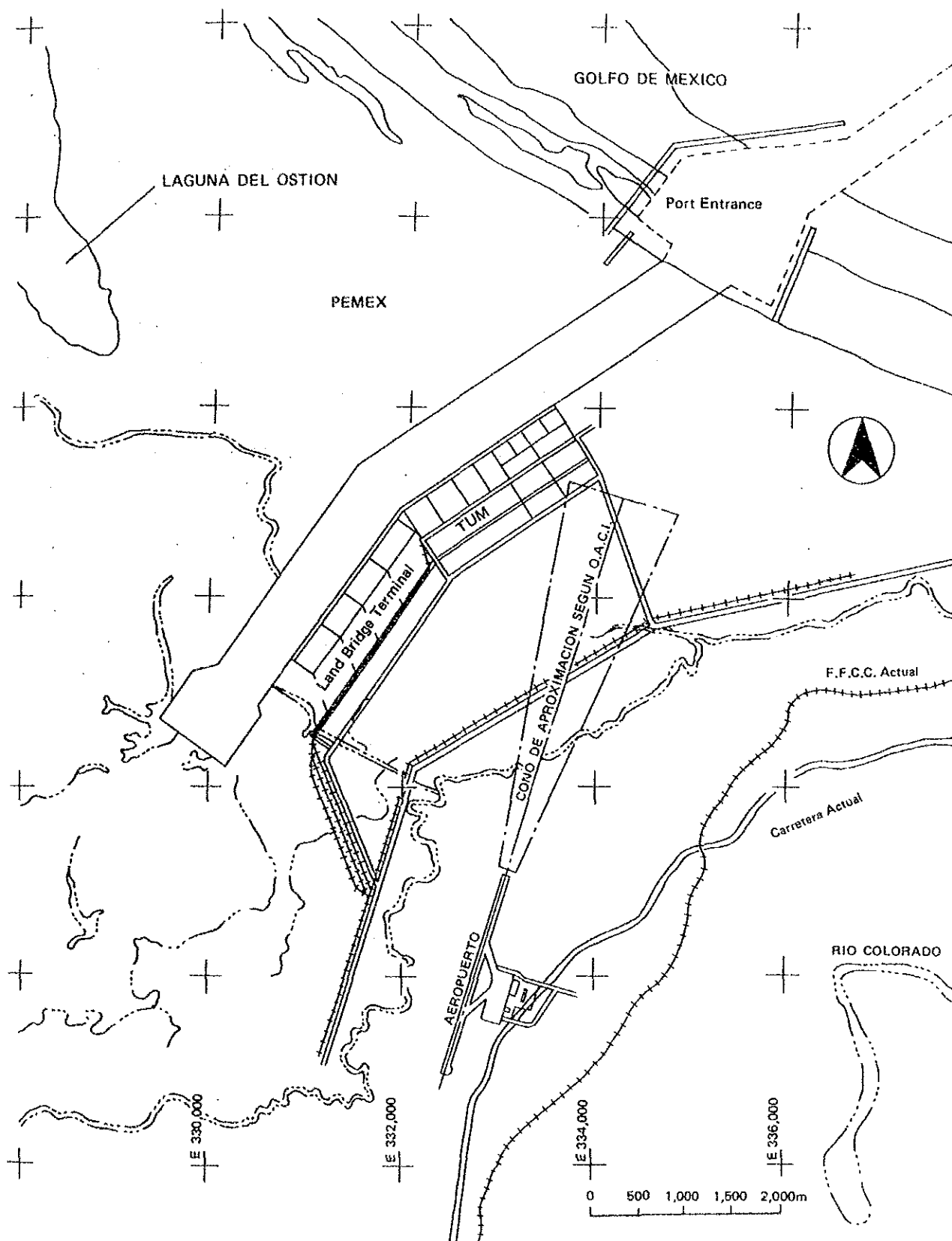


Fig. 3-1-4 An Example of TUM and Land Bridge Terminal Layout in Ostion

#### (4) Salina Cruz Port

Salina Cruz is an old port on the Pacific coast but small with an entrance of 30 m and six berths inside. A container berth for the land bridge is being constructed in the basin on the outside.

It receives crude oil and ammonia from Coatzacoalcos by pipeline and has a Pemex oil refinery. With the recent addition of a buoy berth for a 250,000 DWT tanker to the buoy berth for a 60,000 DWT tanker, the port is used to export crude oil. Further, a petroleum port including two berths for 250,000 DWT tankers is being constructed there by Pemex and the construction of the breakwater is well underway.

To the east of this port is an immense lagoon with a width of about 30 km and a length of 100 km and the construction of a large industrial port was once proposed for this general area, but the plan was abandoned because of unusually strong north winds that blow in the vicinity and it was decided to provide an industrial port at Salinas del Marques.

This area is not sufficiently large but it will be an important commercial and industrial port on the Pacific coast with a TUM and a Pemex petrochemical plant. This is being planned jointly by Pemex and CPI.

The lagoon is geologically so satisfactory that there is even the fear that dredging there may be costly.

The most part of the breakwater for the petroleum port under construction is scheduled to be completed by the end of 1982 and the construction of the pipeline is also well underway. Part of the breakwater and dredging for the industrial port are scheduled to be also completed within 1982. Fig. 3-1-5 shows the master plan of Salina Cruz Port.

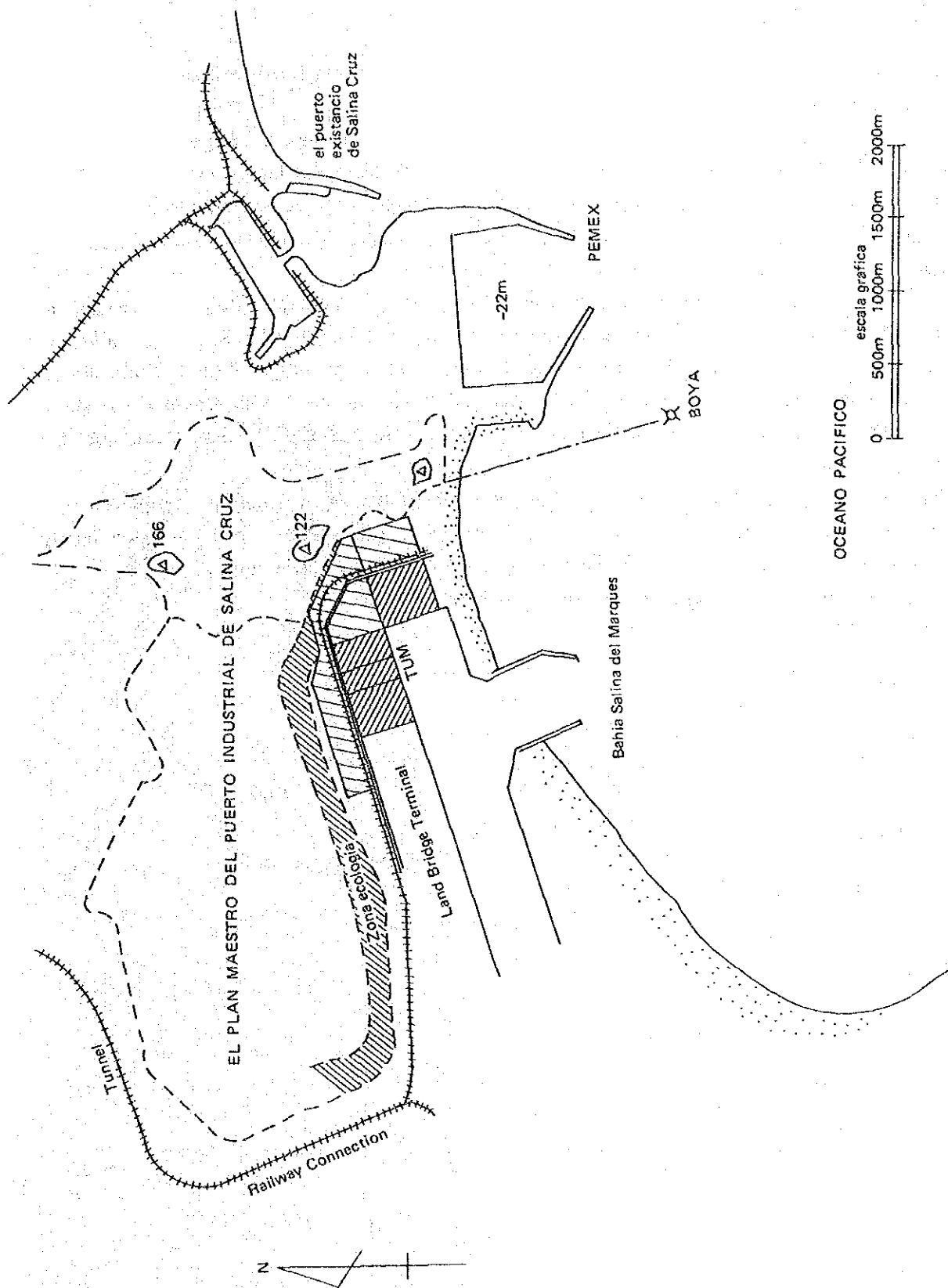


Fig. 3-1-5 Salina Cruz Industrial Port

##### (5) Dos Bocas Port

Dos Bocas Port is located on the Gulf of Mexico about 70 km northwest of Villahermosa, capital of Tabasco State.

This port was recently developed and is being constructed by Pemex as a large petroleum port to export crude oil produced from the Campeche Chiapas Oilfield, the largest in Mexico and one of the largest in the world, which is in front of the port. Besides, there is a plan to construct an artificially excavated port inland from the petroleum port as an industrial port to transport products of industries in its hinterland as well as consumer goods.

The likely hinterland of this port comprises Tabasco State, Campeche State, part of Chiapas State, Yucatan State and Veracruz State and heavy and chemical industries, cement industry, aluminum industry, etc. seem likely to be started there, taking advantage of the various natural resources (including crude oil, natural gas, water and limestone etc.) with which these states abound. Thus, this port is expected to develop in the future also as a commercial port for Tabasco State and its vicinities.

By now, service port to supply oil drilling equipment has been generally completed as a petroleum port. Also, the Phase 1 construction of crude oil storage tanks has been nearly completed and the construction of a breakwater is being vigorously carried out.

Fig. 3-1-6 shows the master plan of Dos Bocas Port.



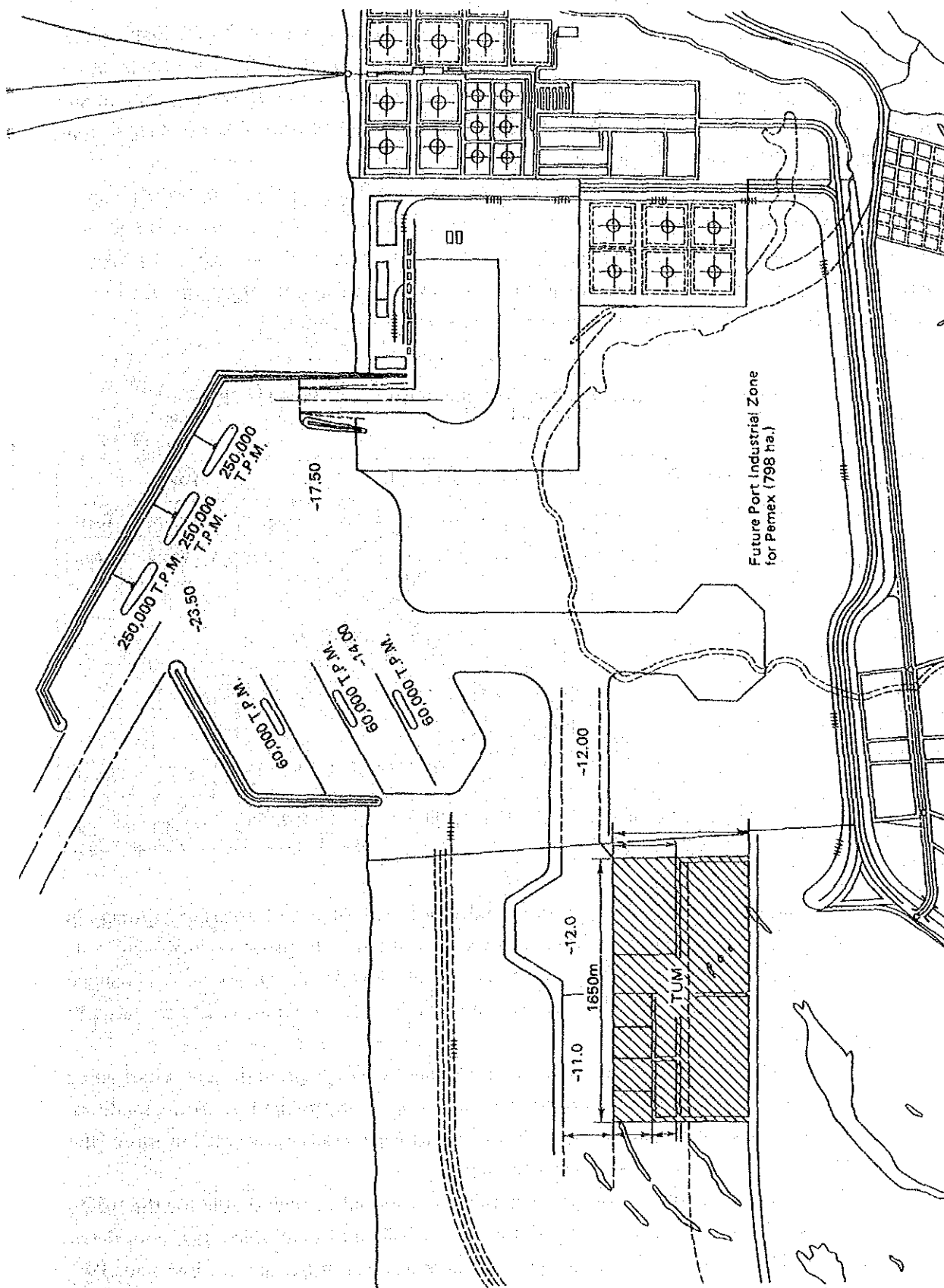


Fig. 3-1-6 An Example of Dos Bocas TUM

# (6) Ensenada Port

Ensenada Port is located in Baja California North State about 80 km south of Tijuana, a city on the border with the U.S.A. Its hinterland is the general area of Baja California State where people mainly engage in fishery and agriculture. As for industries, there are textile, cement and other plants near the port. Many American tourists visit this state because it is a free trade zone and roads crossing the peninsula are well developed.

Ensenada Port has a general cargo berth (-10 m), a fishing boat facility, a berth for cement raw materials and a shipbuilding yard and is generally in good trim. In 1979, it handled a total of 530,000 tons of port cargoes comprising 70,000 tons for foreign trade and 460,000 tons for domestic trade. The main items are the export of cotton wool, the import of steel plates and the receiving of limestone and fishery products from other parts of the country.

Table 3-1-1 Cargo Handling Volume in Ensenada Port (1979)

(Tons)

	Foreign Trade			Domestic Trade			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
General Cargo	22,807	46,848	69,655	5,584	8,705	14,289	28,391	55,553	83,944
Bulk Cargo Agriculture Mineral				344,560		344,560	344,560		344,560
Liquid Cargo Petroleum Others									
Petishable Cargo				96,631	103	96,734	96,631	103	96,734
Total	22,807	46,848	69,655	446,775	8,808	455,583	469,582	55,656	525,238

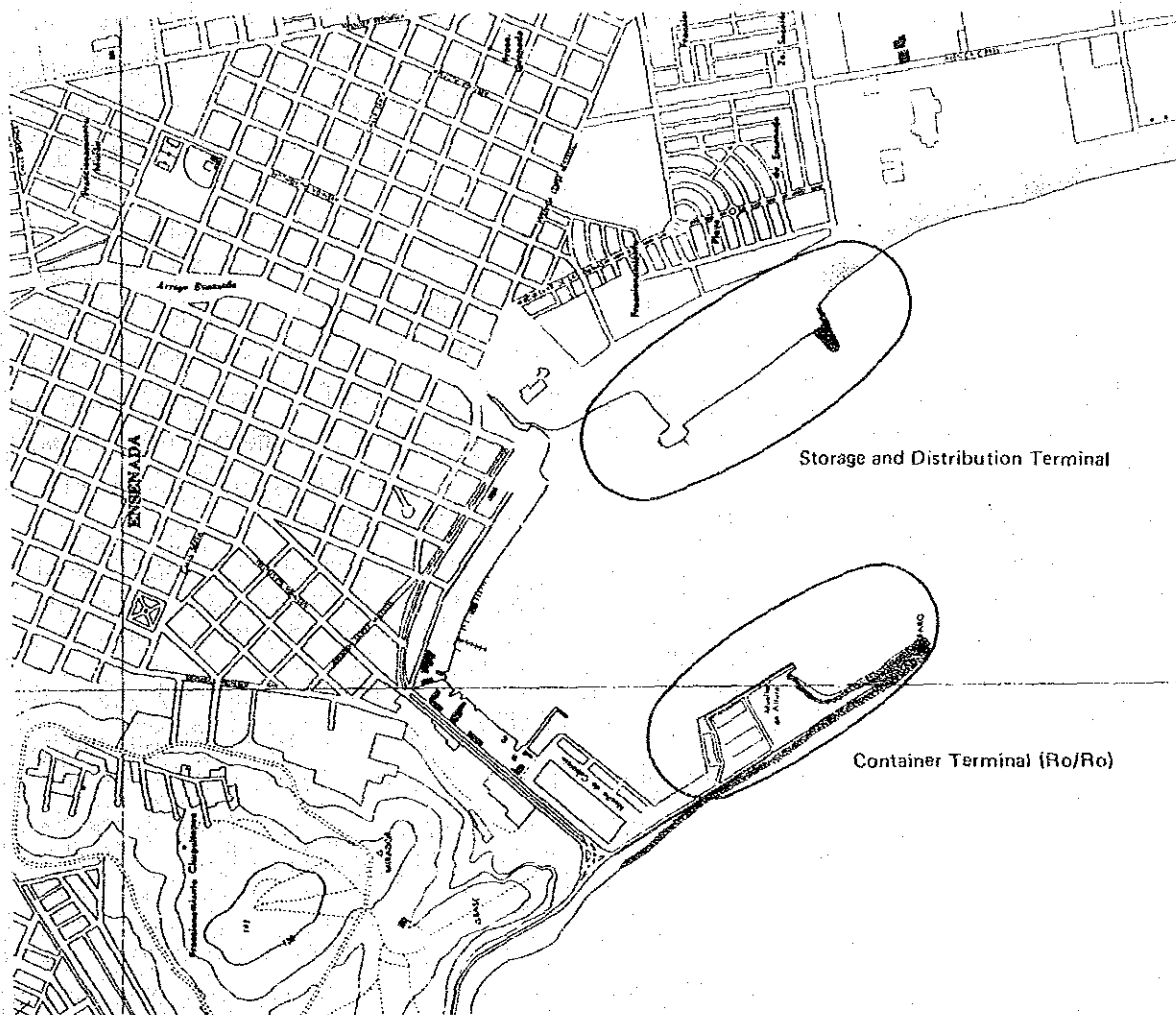
At this port, the breakwater is now being extended with the object of assuring calmness in the harbor and some wharf facilities are being improved. But due to problems involved in its warehousing and cargo handling, it cannot match the nearby port of San Diego in cargo volume and its cargoes are, indeed, limited. Most of container cargoes from Japan is said to come to Mexico via Los Angeles Port.

Under these circumstances, the construction of a container wharf, a general cargo wharf and a marina facility is planned for Ensenada Port besides expanding or improving its existing facilities. The plan of the container wharf and the general cargo wharf is generally agreeable but more land will be necessary in the future for the container terminal.

The use of the recesses of the harbour for a marina, as proposed, is undesirable for the future development of the port and to avoid the mixed presence of large and small ships. It is considered advisable for the vicinity of Estero Punta Banta about 20 km south of the present Ensenada Port to be studied as the site of the marina and the resort base.

Fig. 3-1-7 shows the plan of Ensenada Port.

Fig. 3-1-7 Plan of Eusenada Port



OBRAS DE PROTECCION  
Rompeolas 1 220 m

CANAL DE ACCESO  
1 000 m  
10 m de profundidad

Muelles

	Longitud	Profundidad
Muelle de cebotaje	483 m	4 m a 9.50
Muelle de altura	725 m	10.50 m

Áreas de Almacenaje

Bodegas	15 024 m <sup>2</sup>
Pablos	40 000 m <sup>2</sup>
Cobertizo	30 769 m <sup>2</sup>

Instalaciones y Equipos Especializados  
Banda Transportadora para el manejo de  
piedra caliza  
Succionadoras de alto rendimiento para ma-  
nejo de graneles  
Descarga de atún y anchoveta por medios  
mecanizados

## **(7) Topolobampo Port**

Topolobampo is a port on the Pacific side and located about 20 km south of Los Mochis, a principal city in the northern part of Sinaloa State. The estimated population of Sinaloa State in 1980 was about 1,880,000 or 2.8% of the national total and its population density was 32.4 persons/km<sup>2</sup> or somewhat smaller than the national average. It ranks among the most important agricultural zones in Mexico and its staple crops are soybeans and grains. Its capital, Culiacan, has a population of about 200,000. Food processing plants and canneries are well developed there with the local agricultural production as the background.

Inland transportation about Topolobampo Port is under relatively favorable conditions in both railway and road transportation. The railway specifications are similar to those in the U.S.A. and Canada. There is railway service that links Topolobampo with Houston of the U.S.A. via Ojinaga or Juarez in Chihuahua State. The port is also linked by rail with Tampico and Altamira on the Gulf of Mexico via Chihuahua, Torreon and Matamoros. As for road connection with the U.S.A., there is a well developed coastal road routed through Tijuana and Nogales. The port is also linked by road to Mexico City via Guadalajara and has road connection with Tampico and Altamira on the Gulf of Mexico via Mazatlan, Durango and Matamoros.

Topolobampo Port presently has a Pemex petroleum wharf (base for receiving in domestic shipment), a general cargo wharf and a fishing port facility, which are as outlined below.

### **1 Pemex petroleum distributing function**

Topolobampo Port receives Pemex petroleum products refined at Salinacruz and supplies them to the inland parts of Sinaloa State, Sonora State, Chihuahua State and Durango State. Pemex is now constructing a new petroleum distributing base for ship sizes of 35,000~45,000 DWT. The water depth in front of the dolphins is 16 m but the water depth at the harbor entrance is only about 8 m and requires dredging. However, this is said to be easy.

### **2 Domestic trade general cargo handling function**

The peninsula of Baja California contains many deserts and receives daily necessities from the mainland. At present, there is ferry service on he runs between the ports of Guaymas, Mazatlan and Topolobampo and La Paz Port and between Guaymas Port and Santa Rosalia. Topolobampo Port has the role as a base for shipping abundant agricultural products of its hinterland.

### **3 Fishing port function**

The fishing port function is one of the important functions of Topolobampo Port because fishing is active in the local coastal area, as a whole, and employs many people.

With these functions as the background, the cargo handling volume of Topolobampo Port in 1979 was approximately 200,000 tons and its details are shown in Table 3-1-2.

Table 3-1-2 Cargo Handling Volume in Topolobampo Port (1979)

(Tons)

	Foreign Trade			Domestic Trade			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
General Cargo				42,851	81,131	123,982	42,851	81,131	123,982
Bulk Cargo Agriculture Mineral					36,835	36,835		36,835	36,835
Liquid Cargo Petroleum Others				33,256	386	33,642	33,256	386	33,642
Perishable Cargo				799	1,291	2,090	799	1,291	2,090
Total				76,906	119,643	196,549	76,906	119,643	196,549

Topolobampo Port was unimportant under the National Development Basic Plan but, with the improvement of local conditions through the development of railway and road transportation in recent years and the geographical condition of proximity to the U.S.A. and Baja California, it recently began to be noted. There is now a plan to develop it mainly in conjunction with agriculture in view of its hinterland where irrigation is developed more than anywhere else in Mexico.

For the present, its existing functions will be expanded and improved and, in addition, the construction of a salt refining plant is being planned so that it can refine crude salt brought from the Guerrero Negro salt farms. Further, there is a long-range plan to construct a fertilizer plant to supply the local agricultural zone.

The development of a Topolobampo industrial port is proposed for Santa Maria Bay as shown in Fig. 3-1-8. This is a naturally favorable bay and requires no large breakwater. Moreover, immense space — tentatively estimated at 30,000 ha — is available for development in this area and a waterline of 13 km reportedly can be assured for the development. Furthermore, Topolobampo already has an airport.

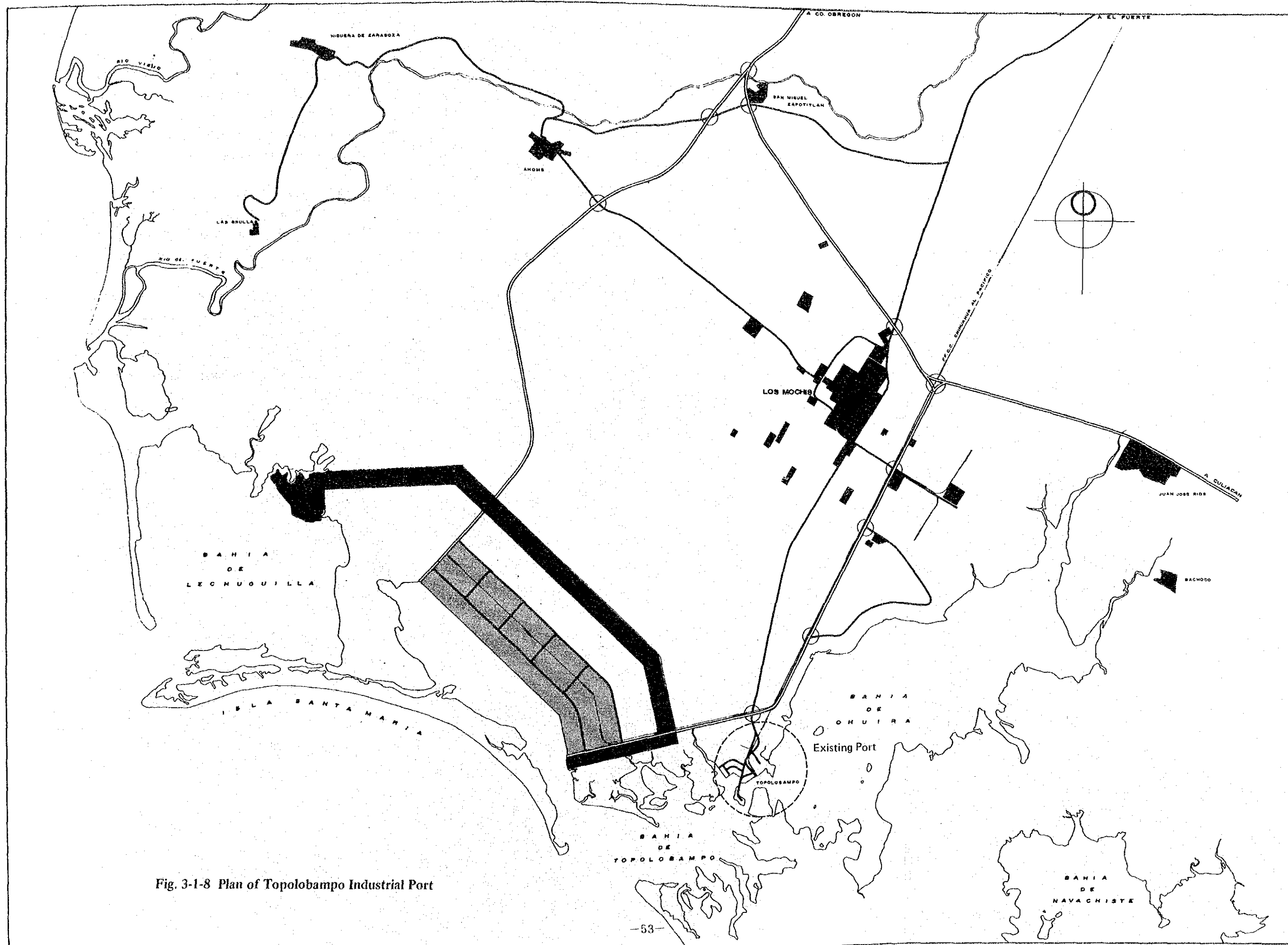


Fig. 3-1-8 Plan of Topolobampo Industrial Port



(8) Tuxpan Port

Tuxpan Port is located in Veracruz State. It faces to Gulf of Mexico and located intermediate between Tampico Port and Veracruz Port. These ports are close to plateaus containing such population and industrial centers as Mexico City and Monterrey. Particularly, Tuxpan Port is about 300 km from Mexico City and closest to it, compared with Veracruz (about 400 km) and Tampico (about 550 km). This area is an important oil mining zone of Mexico and is also noted for fruit production and stock farming.

Regarding inland transportation, a coastal railway line between Tampico and Veracruz is presently under construction. With its completion, railway transportation will be available all long the Gulf of Mexico coast. As for roads, the road to Mexico City and the coastal roads are well developed. For air transportation, there is the Poza Rica Airport for B727 planes about 60 km from Tuxpan.

Tuxpan Port developed as an estuary port of the Tuxpan River and its present facilities are composed of a general cargo wharf, a container wharf (Ro/Ro), Pemex single buoy mooring and product wharf and a fishing port facility. Its volume of port handled cargoes in 1979 totaled 3,200,000 tons, namely, 400,000 tons for foreign trade and 2,800,000 tons fro domestic trade (see Table 3-1-3). The main items handled are as petroleum products, crude oil, containers, caustic soda and other general cargoes.

Table 3-1-3 Cargo Handling Volume in Tuxpan Port (1979)

(Tons)

	Foreign Trade			Domestic Trade			Total		
	In	Out	Total	In	Out	Total	In	Out	Total
General Cargo	96,242	35,253	131,495	39,128	18,719	57,847	135,370	53,972	189,342
Bulk Cargo Agriculture Mineral	138,117		138,117	800		800	138,917		138,917
Liquid Cargo Petroleum Others		127,008	127,008	610,805	2,114,174	2,724,979	610,805	2,241,182	2,851,987
Perishable Cargo									
Total	234,359	162,261	396,620	650,733	2,132,893	2,783,626	885,092	2,295,154	3,180,246



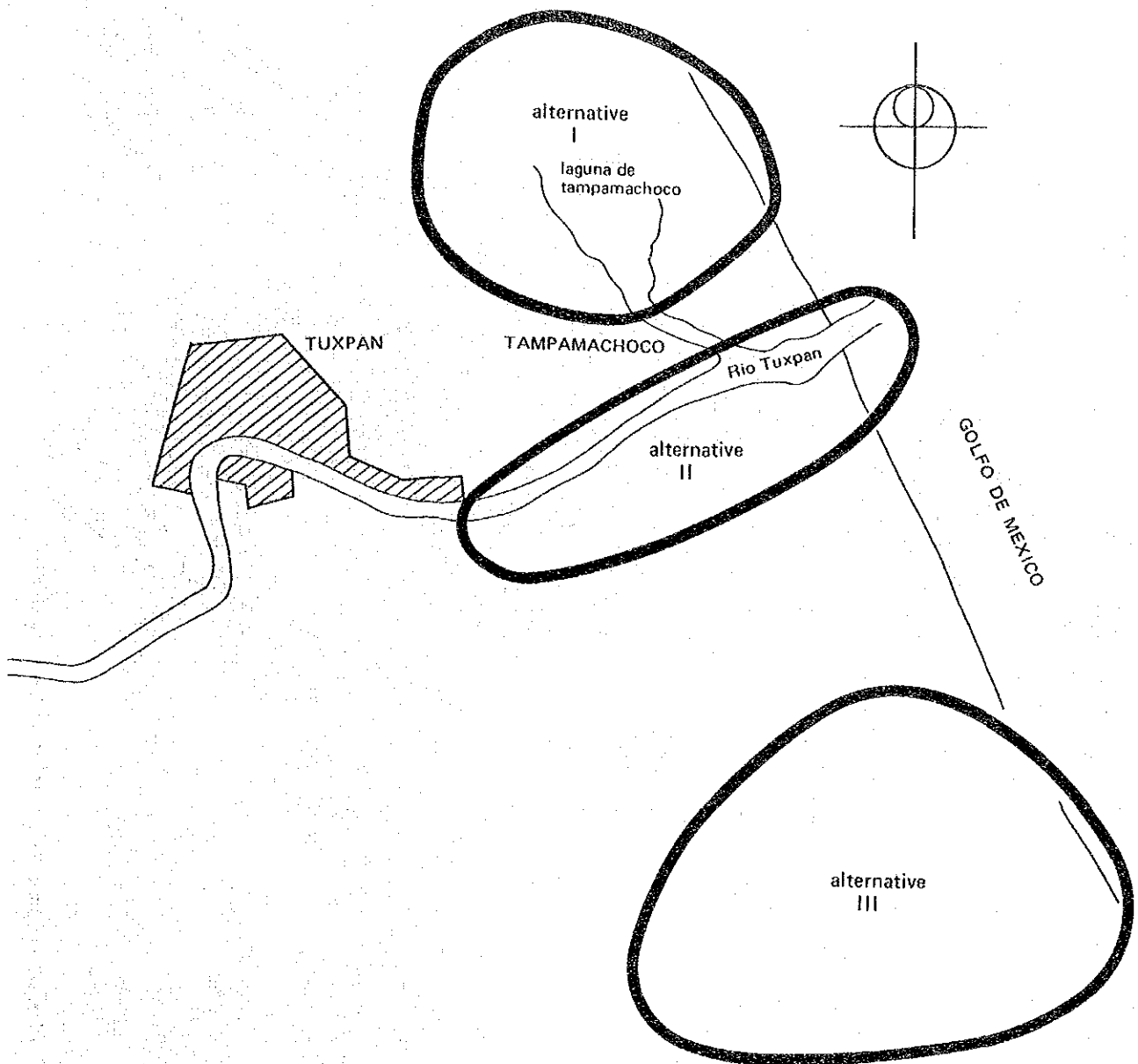
The plan to develop Tuxpan Port in the future is aimed to develop industries there, taking advantage of the abundant water resource that is locally available, so that population and industries developed mainly on the plateaus such as Mexico City and Monterrey can be dispersed to the coastal areas.

For the present, Tuxpan Port will function to supplement the ports of Tampico and Altamira, ease ship congestion at these ports and seek to reduce freight rates by the advantage of its geographical conditions. As to the introduction of industries, food processing and leather product plants are promising because of agriculture and stock farming which are key industries in this locality. For the future, the introduction of large heavy and chemical industry plants is being considered but, since a littoral industrial zone is presently being constructed at Altamira, decision on the types of industries suitable for Tuxpan will have to be made hereafter from the overall plan on the arrangement of the nation's industries.

As the site of development of the industrial port, the following alternatives to which the Tuxpan River is central are now being studied:

- 1 Using the left bank of the Tuxpan River.
- 2 Using the estuary of the river and excavating the southern part of the river's right bank.
- 3 Excavating the area about 11 km south of the river.

Figs. 3-1-9 to 3-1-11 show the development plans that have been studied so far.



**Fig. 3-1-9 Alternative Site of Tuxpan Industrial Port Development**

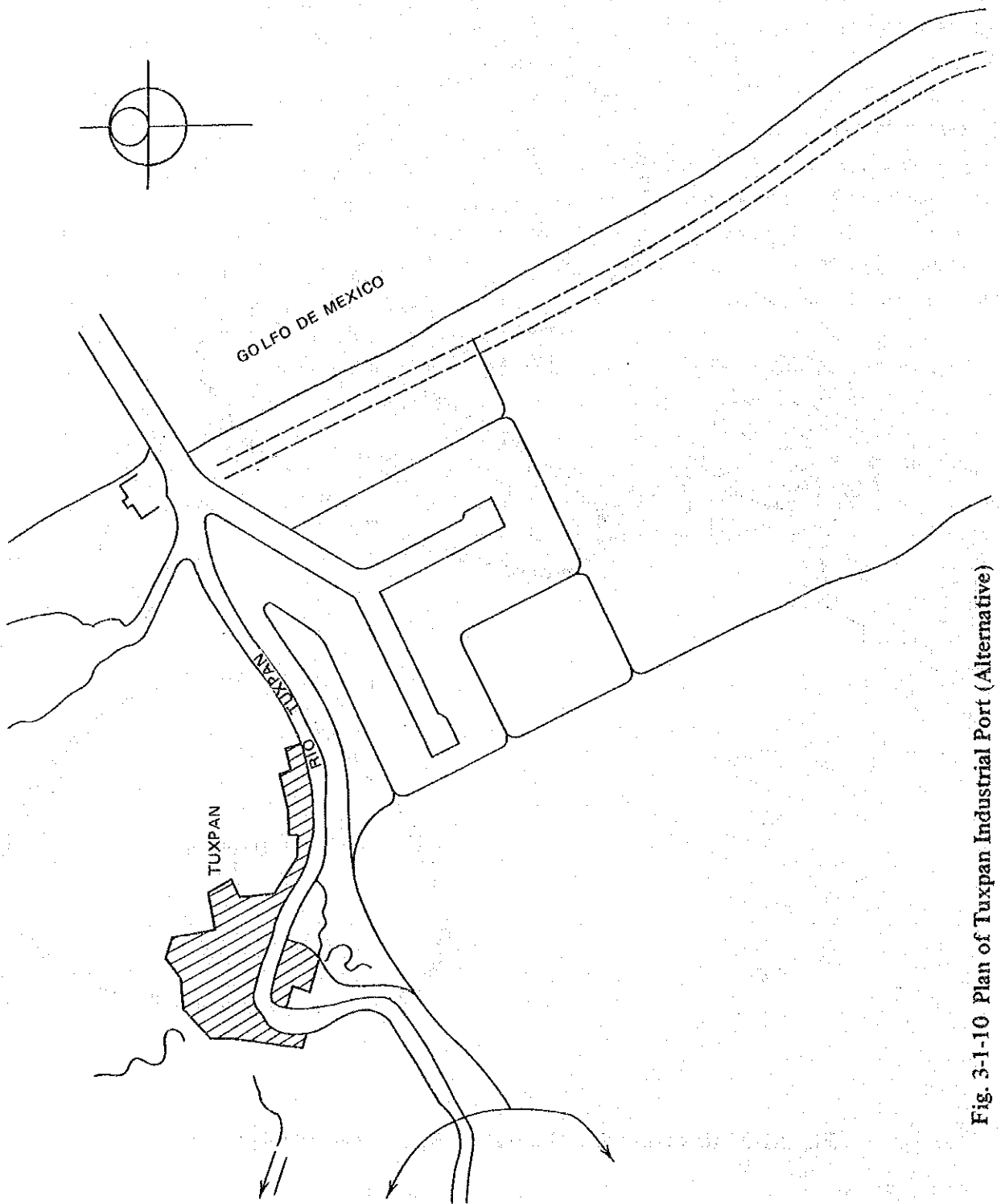


Fig. 3-1-10 Plan of Tuxpan Industrial Port (Alternative)

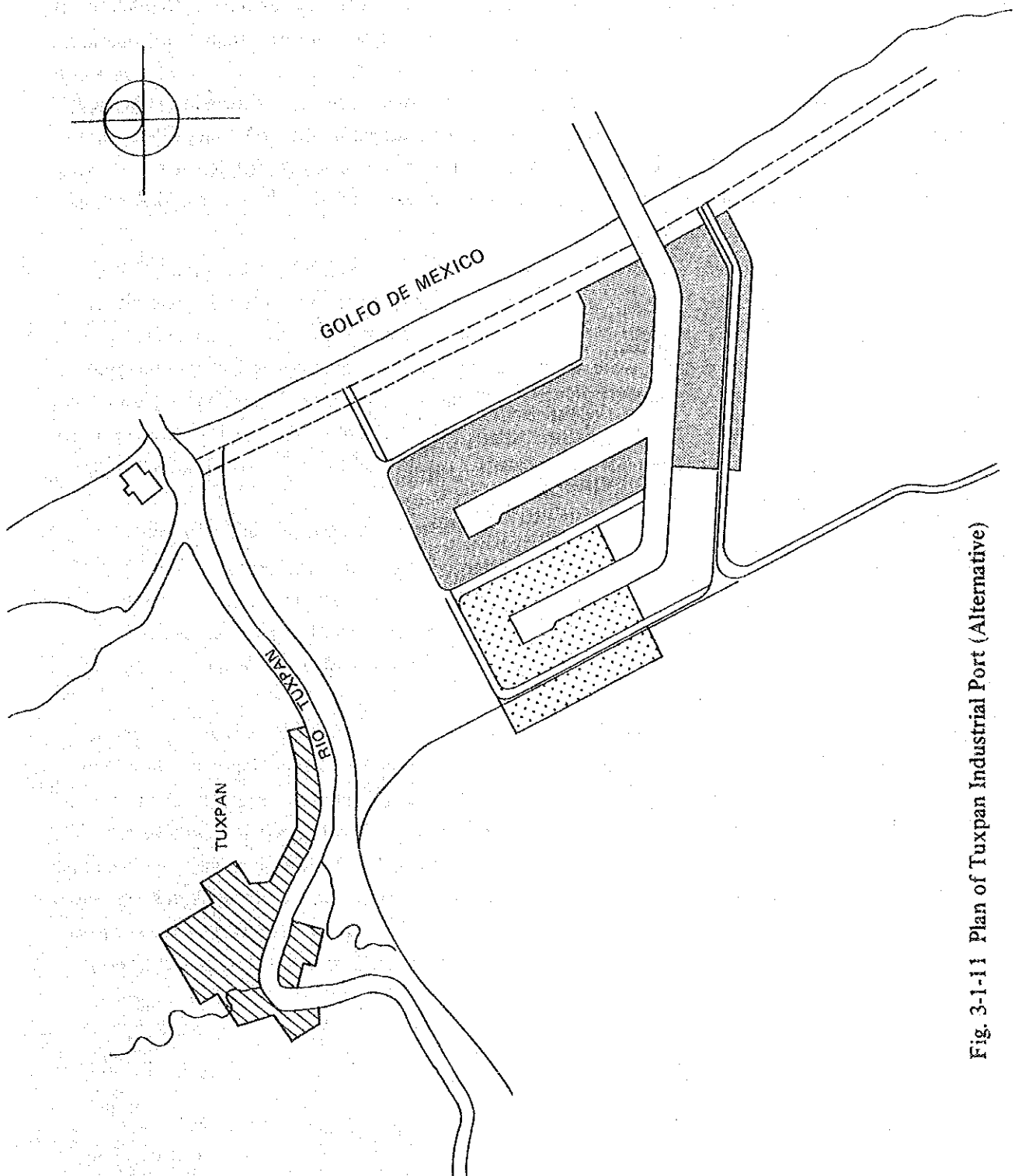


Fig. 3-1-1.1 Plan of Tuxpan Industrial Port (Alternative)

(9) Cobah Port

Port development is backward in Quintana Roo State where Cobah is located. There, the volume of port handled cargoes is, indeed, small and at present, most cargoes are handled by railways.

There is the likelihood that, in the future, facilities for use by sight-seeing ships will be constructed at Cobah to meet the growing demand for tourism mainly in Yucatan Peninsula and also port facilities to ship forest products from the hinterland will be constructed there.

However, the development site has not yet been decided and the character and the scale of the port still remain to be studied.

### 3-2 DEVELOPMENT OF TUM & MPV

In Mexico, a plan has been made on the development of commercial port areas for handling public cargoes in each of five industrial ports, Altamira, Lazaro Cardenas, Ostion, Salina Cruz and Dos Bocas. These commercial port terminals are called "Terminal de Usos Multiples (TUM)", or multipurpose terminal. The target year of this "TUM" plan is aimed at the year 2000, and as the major operation in the "TUM", handling containers has been scheduled. Even in the TUM program, there is a portion to be completed in a short term, which is called "Modulo Polivalente (MPV)". Target year of this "MPV" plan is 1985.

In this way, the CPD has got to the preparation of the master plans for TUM and MPV.

As for the estimation of the demand for cargoes in each of the four industrial ports, Altamira, Lazaro Cardenas, Ostion and Salina Cruz, it has been investigated by the "Le Havre" Ports and Harbors Bureau in France. Therefore, modification has been made by adding Dos Bocas port to the above ports. Then, based on the modified estimation for the cargo volume, the volume of the cargo in each of the above ports has been calculated by the types of cargoes -- "Container Cargo", "General Cargo" and "Bulk Cargo". Further, the following have been discussed.

- Number of berths and their location
- System of cargo handling machines and their location
- Floor area of warehouses and tentative storage yards and their location
- Arrangement of railway and road
- Master plan for multipurpose terminal

In case of Mexico, different from Japan, less restriction has been made by the land required. Accordingly, sufficient space has been secured, taking into consideration the alteration in future. Take an example of a container berth. The total length of the berth is 300 m and the width is 850 m and the land for railway, about 50 m in width, is secured in its center. Accordingly, its capacity per year is estimated as 1,000,000 tons of containers. Further, in case of a general cargo berth, its total length is 200 m, the width is 850 m in total; and the district controlled by the custom house is 250 m in width.

The following is the result of discussion for each port.

(1) Altamira Port

1. **Cargo Movement Forecast**

Cargo movement forecast of the port by kind and style of cargo is shown in Table 3-2-1.

**Table 3-2-1 Cargo Movement Forecast by Commodity**

Unit: 1,000 tons

Commodity	1985	2000
Container Cargo	543	5,743
General Cargo	726	1,303
Bulk Cargo	1,336	3,891
Total	2,605	10,937

2. **MPV Plan**

Based on Cargo movement forecast, Berth Occupancy Rate per one berth is calculated as following Table 3-2-2.

**Table 3-2-2 Berth Occupancy in 1985**

	Cargo Volume (103 tons)		Ship Size (DWT) Max.	Handling Capacity (tons/hour)	Annual No. of Ships	Average Berthing Time/Ship (hrs)	Annual Port Staying Time (hrs)	Berth Occu- pancy Rate
	IM	EX						
General Cargo								
Special carriers	508	25	30,000	90	167	57.6	6,163	$6,163/6,000 \times 100$ = 102.7%
Conventional ships	145	48	30,000	45	193	24.2	4,671	$4,671/6,000 \times 100$ = 77.9%
Container Cargo								
Large size ships	84	70	3,000 TEU load	20 TEU/hr	42	24.0	1,008	$1,008/7,200 \times 100$ = 14.0%
Small size ships	212	177	800 TEU load	20 TEU/hr	142	19.0	2,698	$2,698/7,200 \times 100$ = 37.5%
Bulk Cargo	536		50,000	300	54	35.3	1,906	$1,906/6,000 \times 100$ = 31.8%
		800	30,000	200	80	16.3	1,300	$1,300/6,000 \times 100$ = 21.7%
Total	1,485	1,120					17,746	285.6%

Accordingly number of berth is decided as following Table 3-2-3.

**Table 3-2-3 Number of Berths for MPV**

Container Berth	1
General Berth	3
Bulk Berth	2
Total	6

And the material handling equipments required to handle estimated cargo volume are shown in Table 3-2-4.

Table 3-2-4 Material Handling Equipment

Container Wharf		(General Wharf)	Conven- tional Wharf (1B)	Special- ized Wharf (2B)	Bulk Wharf	
Machinery	quantity	Machinery	quantity	quantity	Machinery	quantity
Container Crane 30.5t	1	Fork Lift 2.5t	18	14	Dozer 6t	
Transfer Crane		3.5t	18	14	Trimming	5
Tire mounted	3	10.0t	0	6	6t Angle	4
Tractor	5	Tractor	2	5	Fork Lift 2.0t	6
Chassis 20'	10	Chassis 20t			Quay Side	
40'	5	Plat bed	4	9	600 t/h U	1
Fork Lift 2.5t	3	Mobile Crane			1,000 t/h L	1
5.0t	3	150t	0	1	Yard	
35.0t	2	Plat Form			1200/1000	2
Truck Scale 50t	2	150t	0	1	t/h SR	
					Dumper Car	1
					Truck	1
					Bagging Plant	
					12 t/h	5
					Hopper Car	3
					Truck	2

Thus, Fig. 3-2-1 shows the 1985 development plan.





### 3. TUM Plan

MPV will be expanded in A.D. 2000 to handle increased cargo volume as shown in Table 3-2-1. Table 3-2-5 and Fig 3-2-2 show the number of berths and master plan for TUM.

**Table 3-2-5 Number of Berths for TUM**

Container Berth	6
General Berth	7
Bulk Berth	2
Total	15

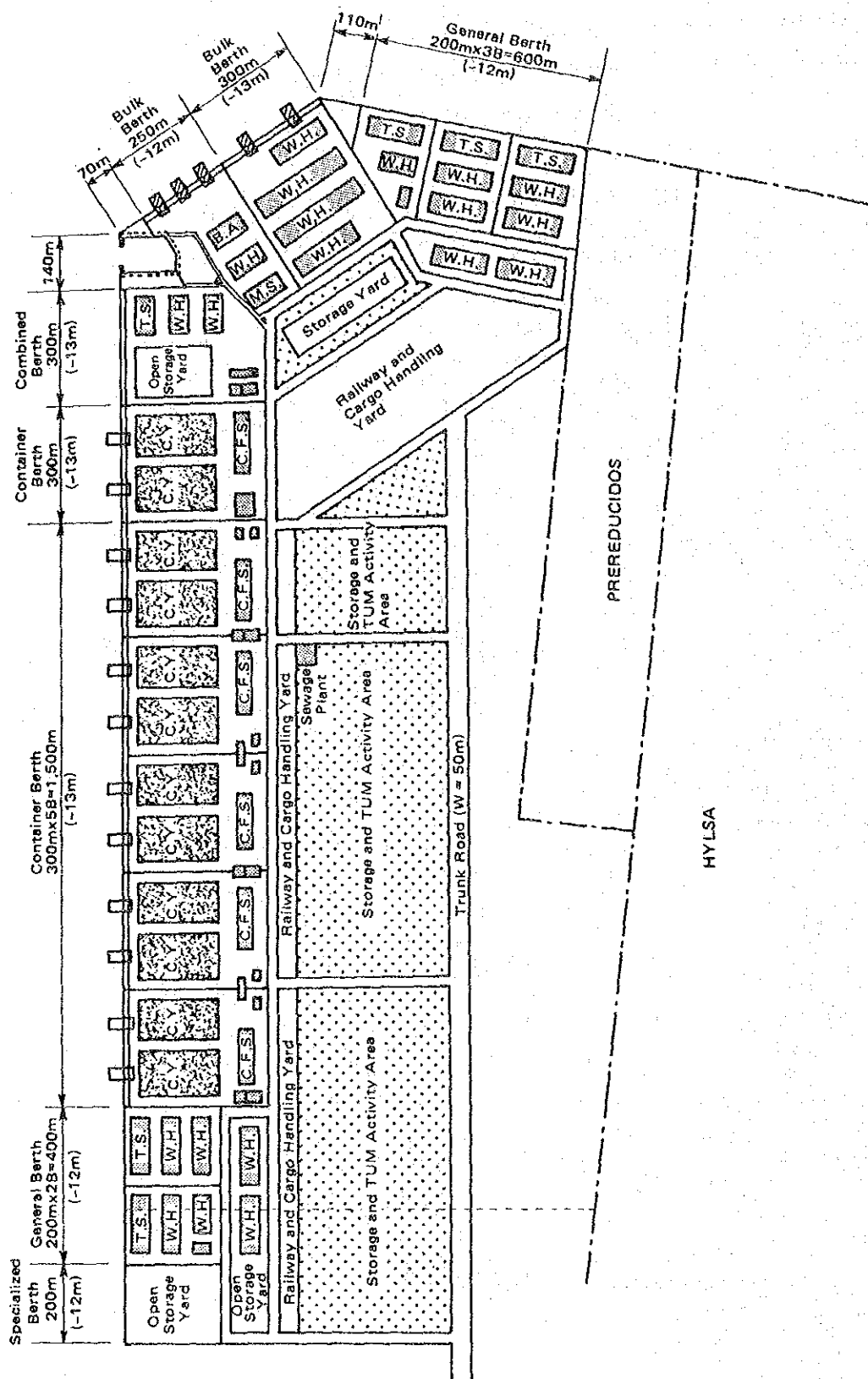


Fig. 3-2-2 Master Plan of Altamira TUM

#### 4. Material Handling System

##### 4-1 Basic concept

The cargoes handled at the TUM (multipurpose terminal) are classified according to their forms into the container cargo, general cargo and dry bulk cargo.

Introduced hereunder is a basic plan of the container terminal, the general cargo terminal and the bulk cargo terminal.

##### 4-2 Container terminal

###### ① General

The container ships calling at the port are full-container ships, semi-container ships and roll-on/roll-off ships. The cargo is transported to the hinterland through the railway and the road.

The infrastructure of this terminal is planned as a terminal having the enough space to handle the container cargo of one million tons annually from the outset.

###### ② Basic flow

The fundamental requirements of container transportation are to control the container itself with speed, accuracy and safety. The basic flow of the container, from a shipper to a ship and from the ship to a consignee, is classified into two main flows.

In the case of export (Refer to Fig 3-2-3 Container Flow-A)

- (1) The Container Loaded Cargoes are delivered directly from a shipper to the container yard.
- (2) The less than Container Loaded Cargoes are sent to the Container Freight Station, sorted, put in containers according to destination and delivered to the container yard.
- (3) All these export containers are loaded on the ship in accordance with the "Loading Sequence List" prepared by the control center.

In the case of import (Refer to Fig. 3-2-4 Container Flow-B)

- (1) All the import containers are unloaded in accordance with the "Unloading Sequence List".
- (2) The Container Loaded Cargoes are delivered to the consignee from the container yard by means of a truck or trailer.
- (3) The Mixed Loaded Cargoes are taken out of the container and sorted according to the consignees at the CFS. The cargoes are then delivered to each consignee.

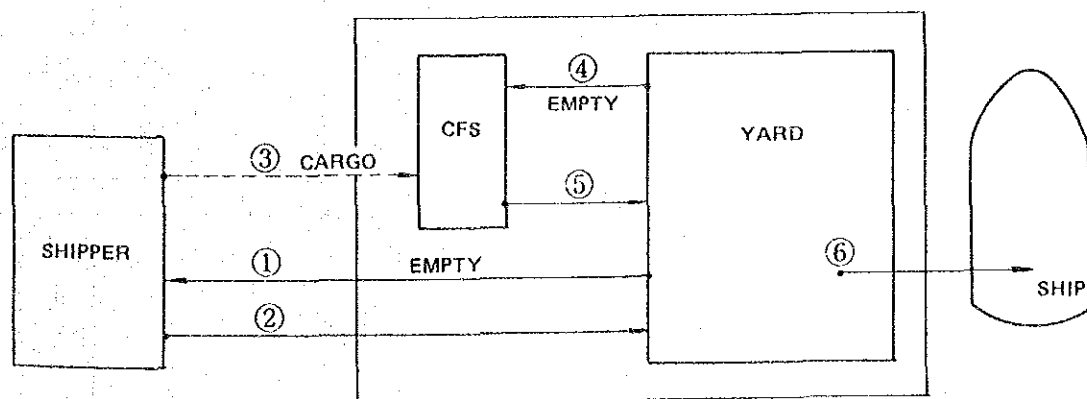


Fig. 3-2-3 Container Flow-A

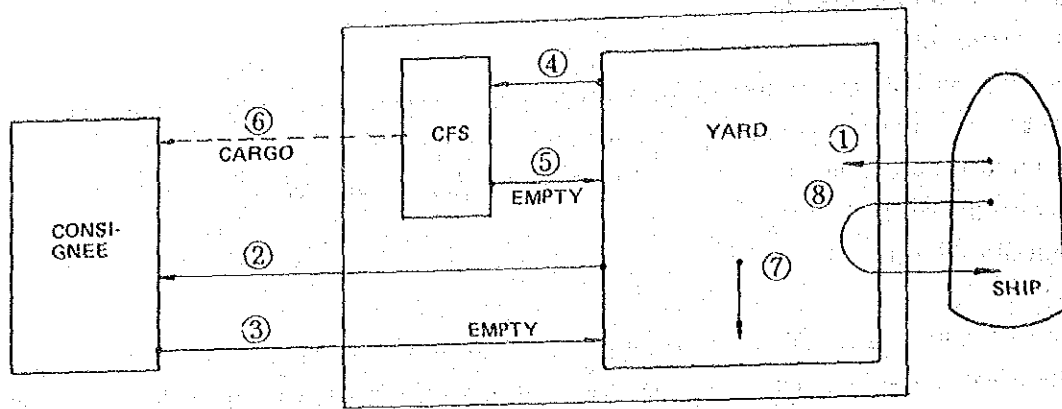


Fig. 3-2-4 Container Flow-B

### ③ Container handling equipment

The delivery of containers between the yard and the container crane or the hinterland is summarized as shown in "Fig. 3-2-5 Container Transportation System".

Transfer cranes are installed both in the container yard and in the railway area to store and deliver containers.

Tire-mounted transfer cranes are installed in the yard and the trailer (chassis + tractor) for exclusive use in the yard are used to deliver containers between the yard and the container crane. Containers transported via roads are directly delivered by the transfer crane in the yard. Loaded containers are stored in three (3) layers in the yard but empty containers may be stored in four (4) layers.

In the railway area, the rail-mounted transfer crane is installed cross over the side-track. The delivery of containers between the container yard and the railway area is done by the trailer for exclusive use in the yard. Containers are stored in two (2) layers in the railway area. 5 ton class forklift trucks are used for marshalling empty containers and for the short transportation in the precincts for repairing damaged containers and washing dirty ones. Low-mast 2.5 ton class forklift trucks are used for marshalling empty containers and for the short transportation C.F.S. (Container Freight Station).

Thus the arrangement of container terminal is shown in Fig. 3-2-6.

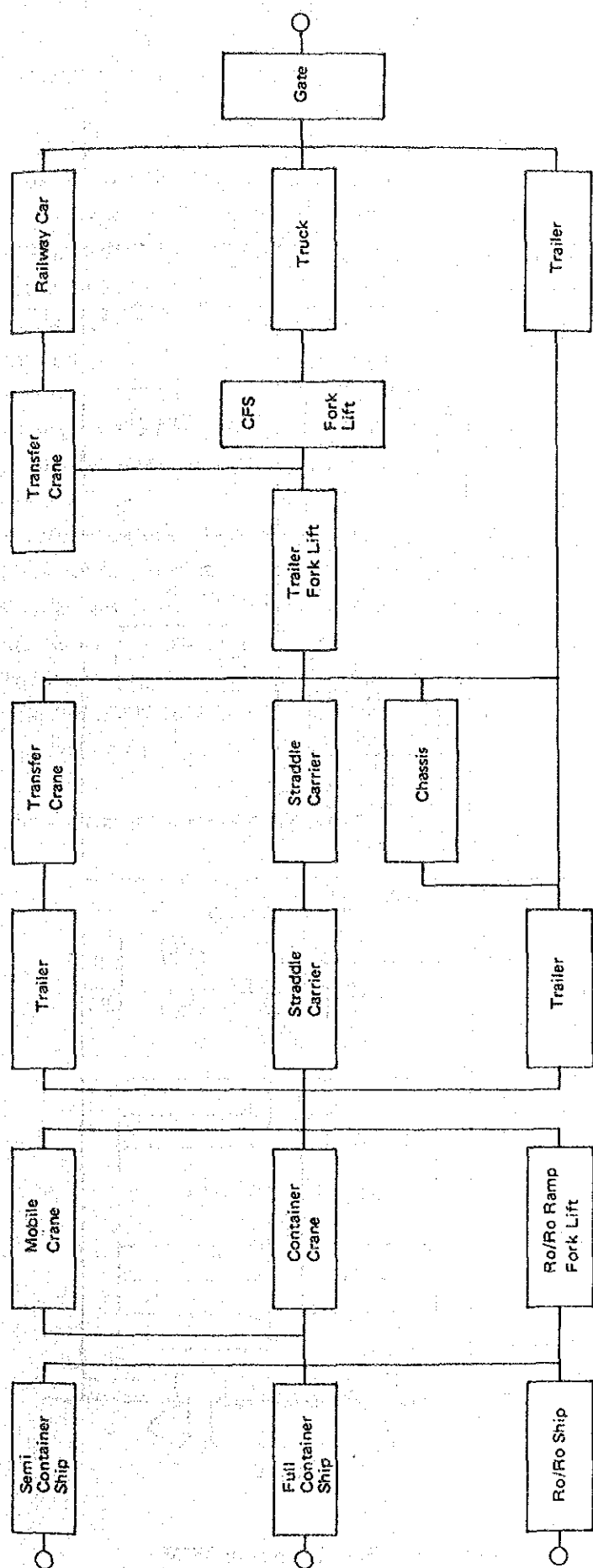


Fig. 3-2-5 Container Transportation System

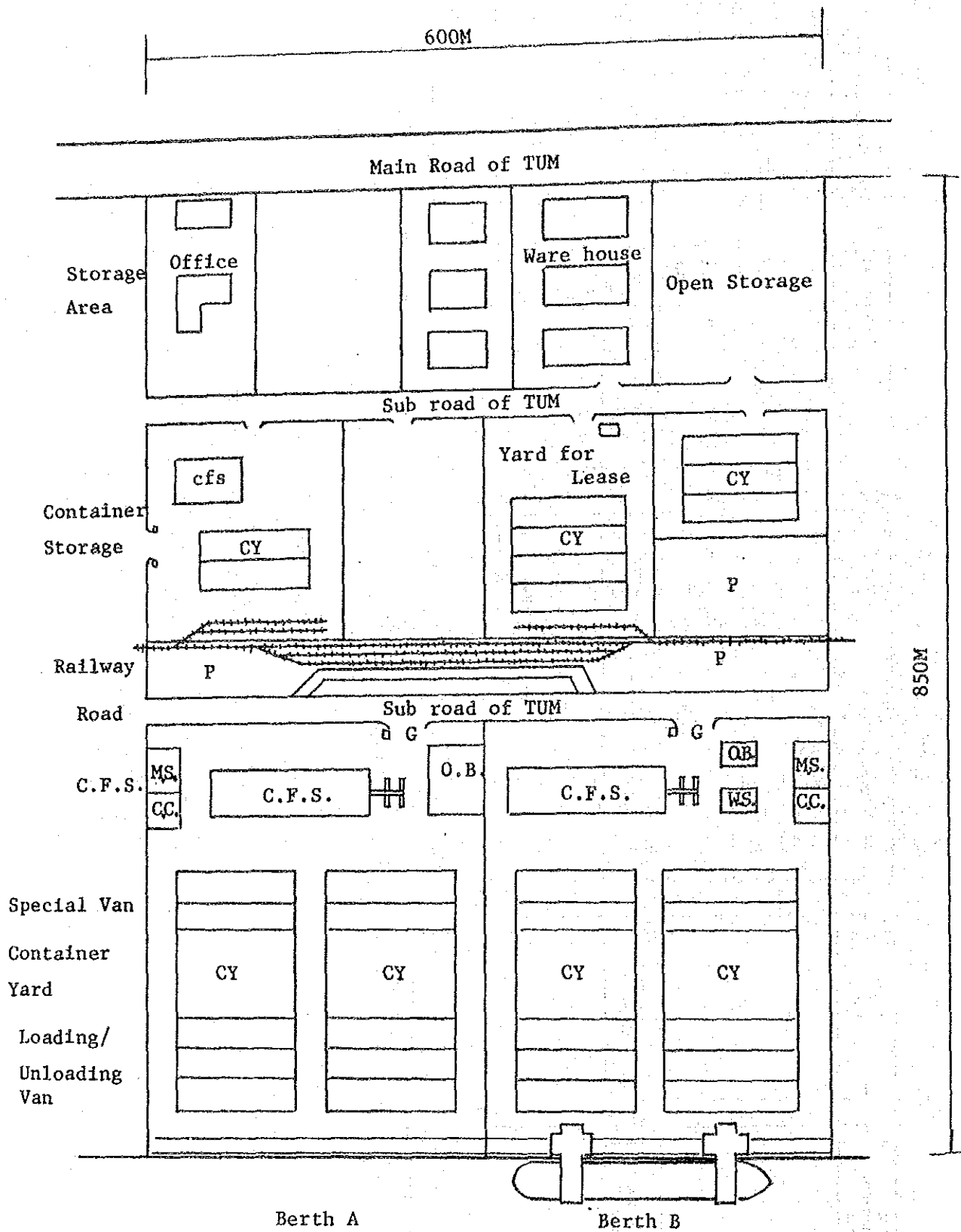


Fig. 3-2-6 An Example of Container Berth Layout in TUM

### 4.3 General cargo terminal

#### ① Function

General cargo berths are classified into conventional berths and specialized berths according to the type of ship called, the cargo handled and the method of storage. These berths can accommodate vessels up to 20,000 DWT and the cargo is transported to and from the hinterland by cars and trucks.

At the conventional berth, agricultural products, capital good and consumer goods are loaded and unloaded. These goods, except for part of the capital goods, are stored temporarily, in a transit shed and warehouses.

At the specialized berth, the iron and steel, tubes and pipes are loaded and unloaded. These goods are temporarily stored in the open storage area in the precincts.

#### ② General Flow

For the purpose of planning, a work group of 3 gangs per vessel is allocated. Light forklift trucks are used, if necessary, for stevedore work aboard the vessel as the auxiliary equipment. Cargoes are delivered between the vessel and the quay with ship's gears. The mobile crane and the platform at the port can be used for loading/unloading the unusually heavy cargo.

The cargo transfer between the open storage area and/or transit shed/warehouses within the port and the railway area is done by the trailer (tractor + chassis).

The stacking and sorting of cargo in the open storage area/warehouse and short distance hauls within the port are generally done with forklift trucks.

The flow diagram of the foregoing is shown in "Fig 3-2-7 General Cargo Flow".



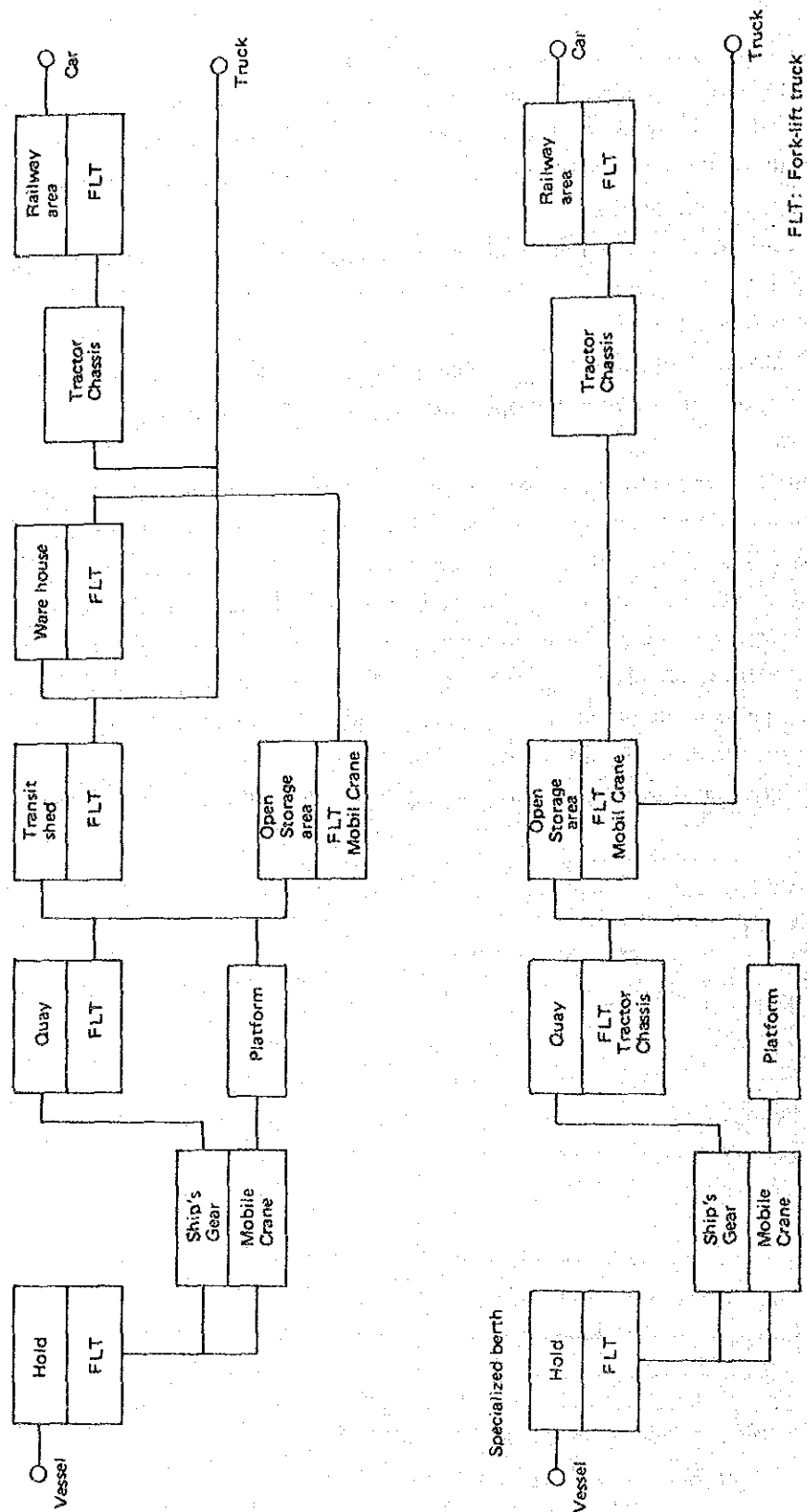


Fig. 3-2-7 General Cargo Flow Conventional Berth

#### 4.4 Bulk cargo terminal

##### ① General flow

Handled mainly at this terminal are dry bulk cargoes: minerals, and other materials except alumina for the aluminium plant and fertilizers. Vessels up to 50,000 DWT and those up to 30,000 DWT enter the No. 1 Berth and the No.2 Berth, respectively.

The minerals are unloaded by two sets of 600 t/h unloaders and stored over the backward yard. Other materials except alumina for the aluminium plant and fertilizers are stored in the warehouse. Though a part of fertilizer is packed into bags, these dry bulk cargoes are transported by railway cars and trucks to the hinterland.

Minerals from the hinterland, on the other hand, which have been unloaded by a car dumper or a truck dumper and stored over the back yard, is loaded onto ships by one set of 1,000 t/h shiploader.

In order to cope with imported fertilizers, two sets of 750 t/h unloaders are constructed adjacent to the shiploader on the No.2 Berth specifically for handling other materials except alumina for aluminium plant and fertilizers. A part of the fertilizer (potassium sulphates) from the hinterland, which has been unloaded by the car dumper or the truck dumper and stored in a warehouse, is to be loaded onto ships from the No.2 Berth.

The above flow is as illustrated in Fig. 3-2-8.

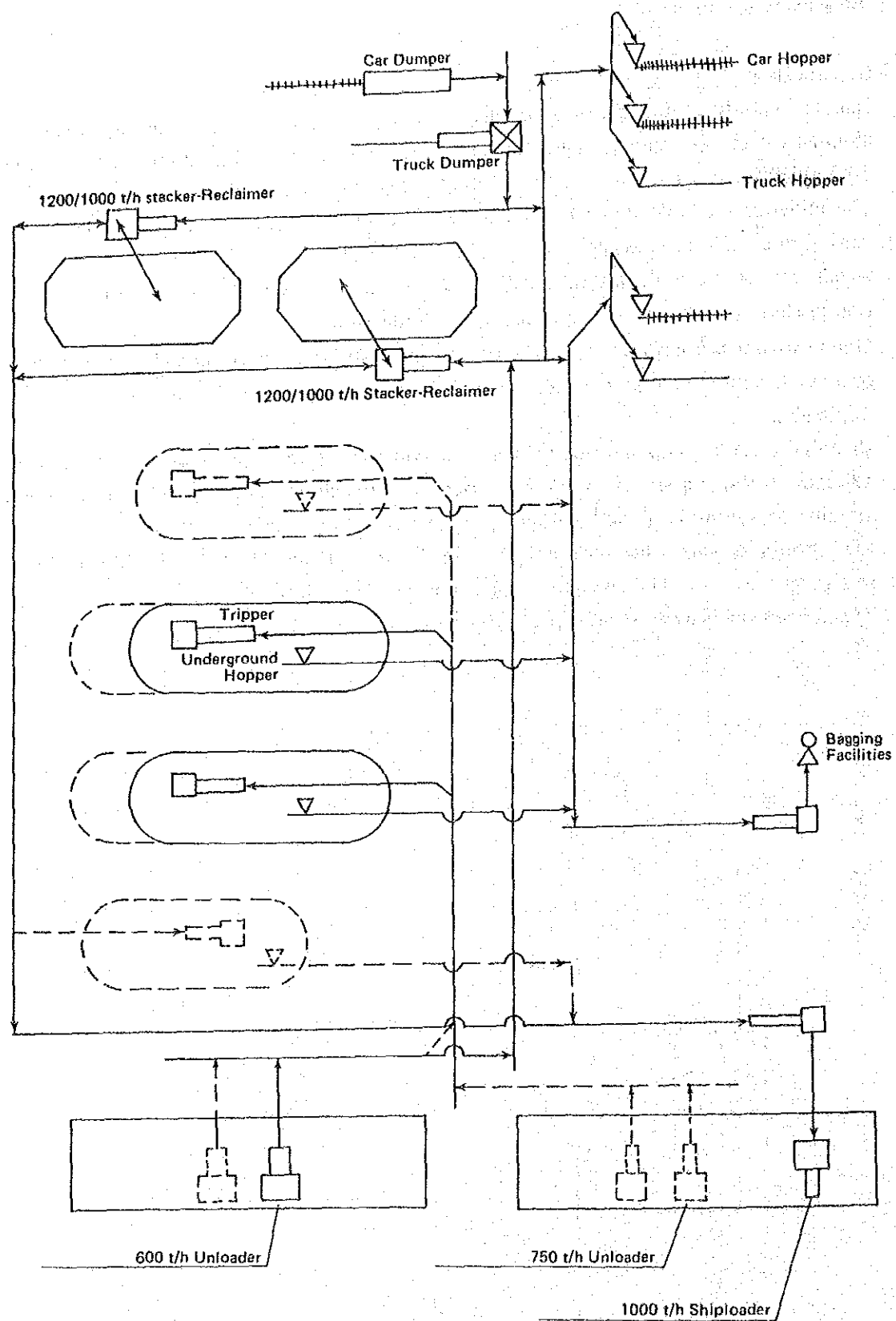


Fig. 3-2-8 Flow Diagram

## ② Unloading system

Since the vessels entering this berth are medium in scale and the unloading capacity is comparatively as small as 600 t/h, the unloaders will be of level luffing and slewing type. With this type, it is possible to pick up the cargoes deep in the hold of a vessel by slewing and luffing, and it is also possible to handle general cargoes by replacing the bucket with a hook. Since various kinds of high dusty fertilizers and other materials for the alumina plant are specifically handled at the No.2 Berth, the bridge type unloader incorporating dustproof equipment will be installed.

The cargoes transported from the hinterland via railway are unloaded by the rotary car dumper. In this case, two short cars at a time, or one long car, are run into the dumper and located correctly on the platform, and the dump turns together with the wagon(s) to discharge the cargoes into the underground hopper. Total time taken for weighing and unloading is 210 seconds or 3-1/2 minutes. This allows approximately 5 minutes for changing cars.

The cargoes being transported by the truck are unloaded into the underground hopper by inclining its bed. The truck dumper will have the capacity of handling fifteen vehicles per hour.

## ③ Storing system

The cargo unloaded from ships by the unloader is conveyed by a wharf conveyor, a connecting conveyor, a yard conveyor and a stacker-reclaimer or a tripper. And those unloaded by the car dumper and the truck dumper are conveyed by the connecting conveyor, then

(1) Minerals are stored over the yard behind the terminal by a travelling stacker-reclaimer; and

(2) Other materials except alumina for the aluminium plant and fertilizers are stored in the respective special warehouses by the overhead conveyor and the travelling tripper.

One 1200/1000 t/h stacker-reclaimer is used for storing minerals from the hinterland at the yard behind the terminal. To load cargoes from the No. 2 Berth, one 1200/1000 t/h stacker-reclaimer is used. Another 1200/1000 t/h stacker-reclaimer is also used to load cargoes onto railway cars and trucks.

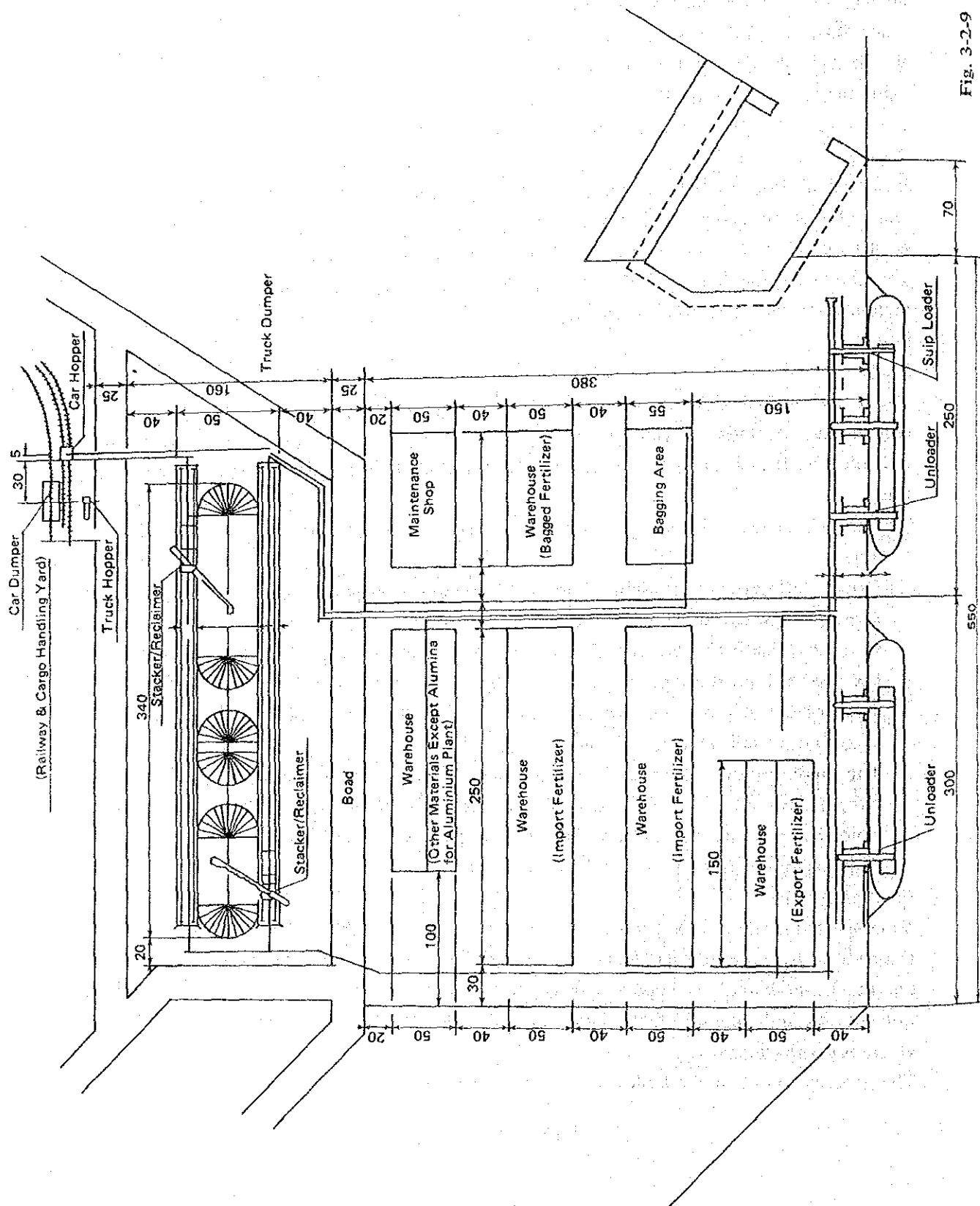
The underground conveyor is installed beneath the warehouse, and several charging hoppers, on the floor. The cargoes will thus be transferred onto the underground conveyor by dropping them freely. The flow of cargoes is uniformly controlled by opening and closing the gate provided below the hoppers.

## ④ Loading system

Minerals from the yard behind the terminal and fertilizers from the warehouse are transported by conveyors and loaded by the 1,000 t/h shiploader on the No.2 Berth.

On the other hand, the imported fertilizer in the warehouse is weighed and loaded onto railway cars and trucks by special hoppers. A part of fertilizer is separated and packed in bags at the bagging station.

The general layout of the bulk cargo terminal is shown in "Fig. 3-2-9 General layout".



For the other four ports same procedures of analysis and studies were conducted. Following pages show the Cargo Movement Forecast, Number of Berths and Master Plans for each port.

(2) Lazaro Cardenas Port

**Table 3-2-6 Cargo Movement Forecast by Commodity**

Unit: 1,000 tons

Commodity	1985	2000
Container Cargo	165	2,000
General Cargo	683	1,174
Total	848	3,174

**Table 3-2-7 Number of Berths**

	1985	2000
Container Berth	—	2
General Berth	—	4
Total	—	6



(3) Ostion Port

Table 3-2-8 Cargo Movement Forecast by Commodity

Unit: 1,000 tons

Commodity	1985	2000
Container Cargo	296	2,858
General Cargo	553	820
Bulk Cargo	204	542
Total	1,053	4,220

Table 3-2-9 Number of Berths

	1985	2000
Container Berth	1	3
General Berth	2	4
Bulk Berth	1	1
Total	4	8





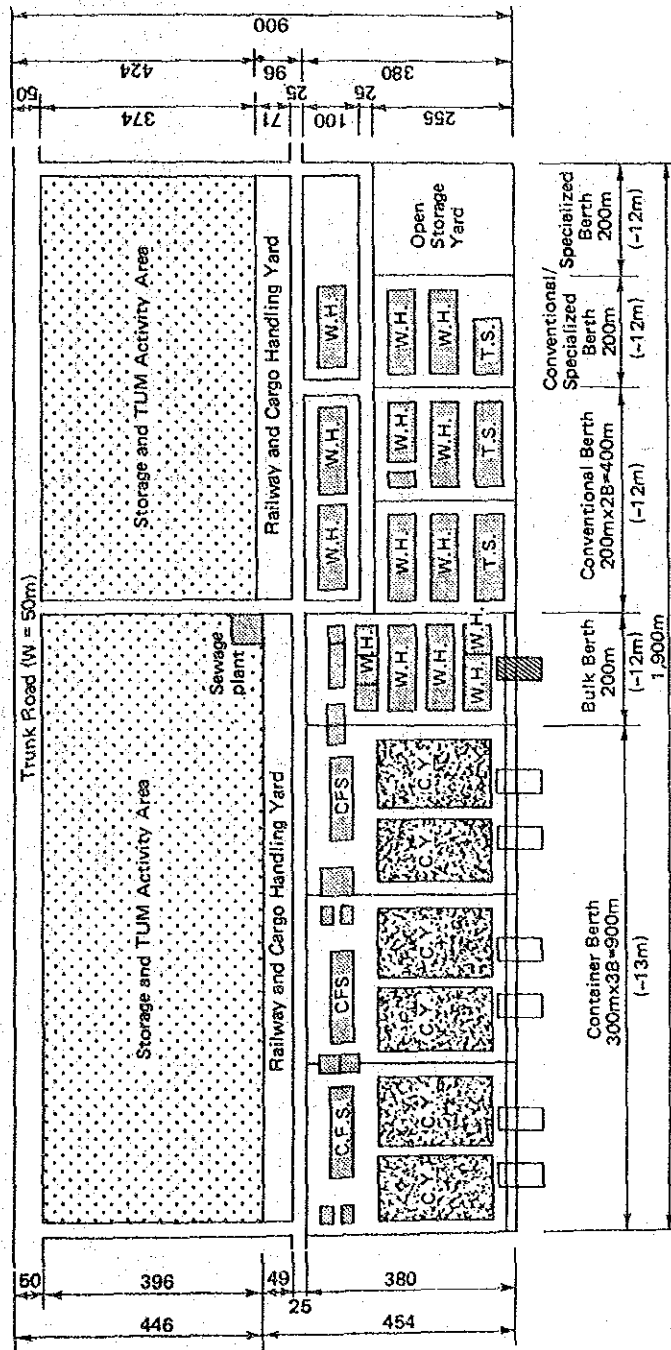


Fig. 3-2-12 Master Plan of Ostion TUM (Linear Type)

(4) Salina Cruz Port

Table 3-2-10 Cargo Movement Forecast by Commodity

Unit: 1,000 tons

Commodity	1985	2000
Container Cargo	95	920
General Cargo	59	115
Bulk Cargo	900	3,508
Total	1,054	4,543

Table 3-2-11 Number of Berths

	1985	2000
Container Berth	1	2
General Berth	1	1
Bulk Berth	2	2
Total	4	5

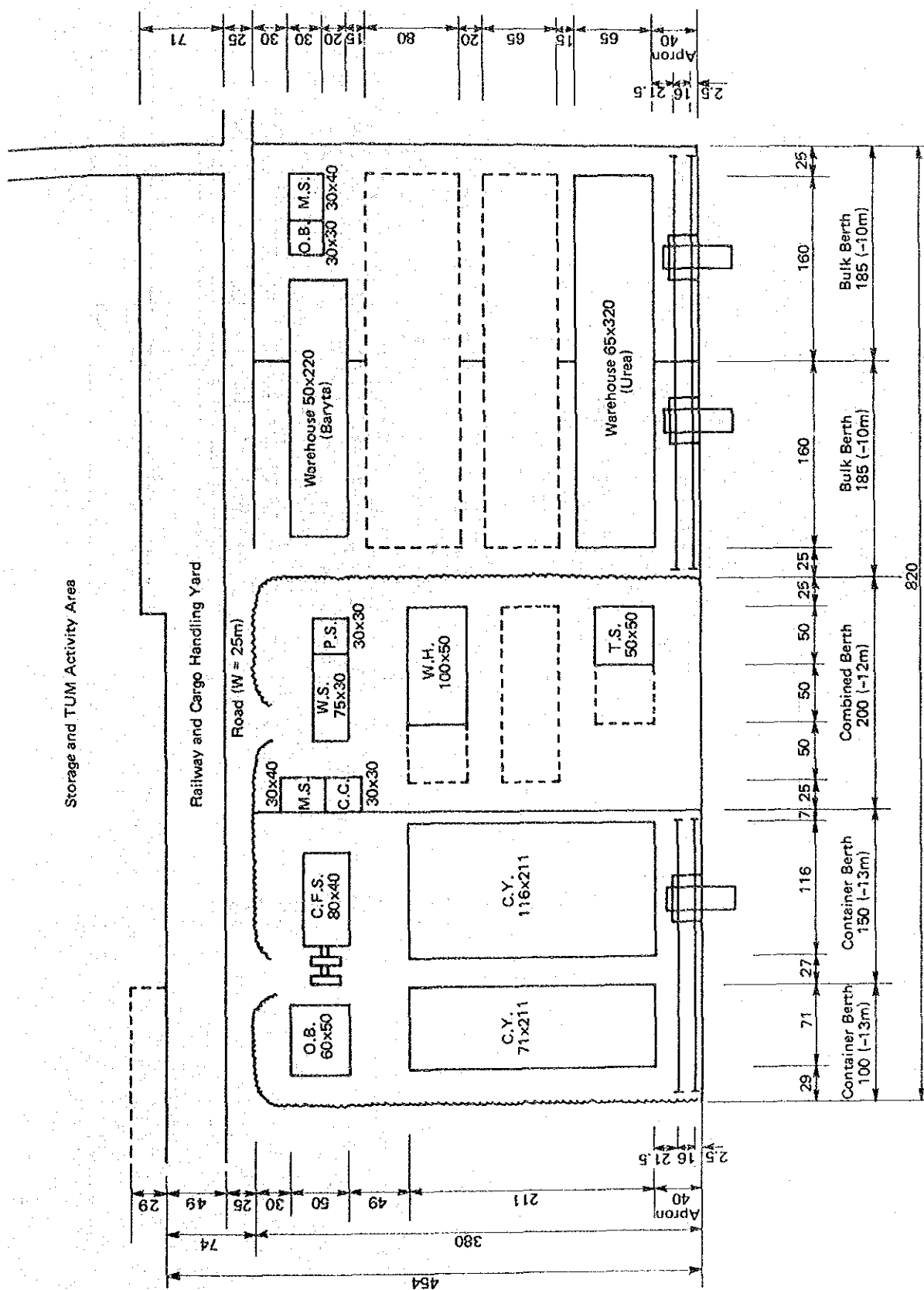


Fig. 3-2-13 Plan of Modulo Polivalente at Salina Cruz Port

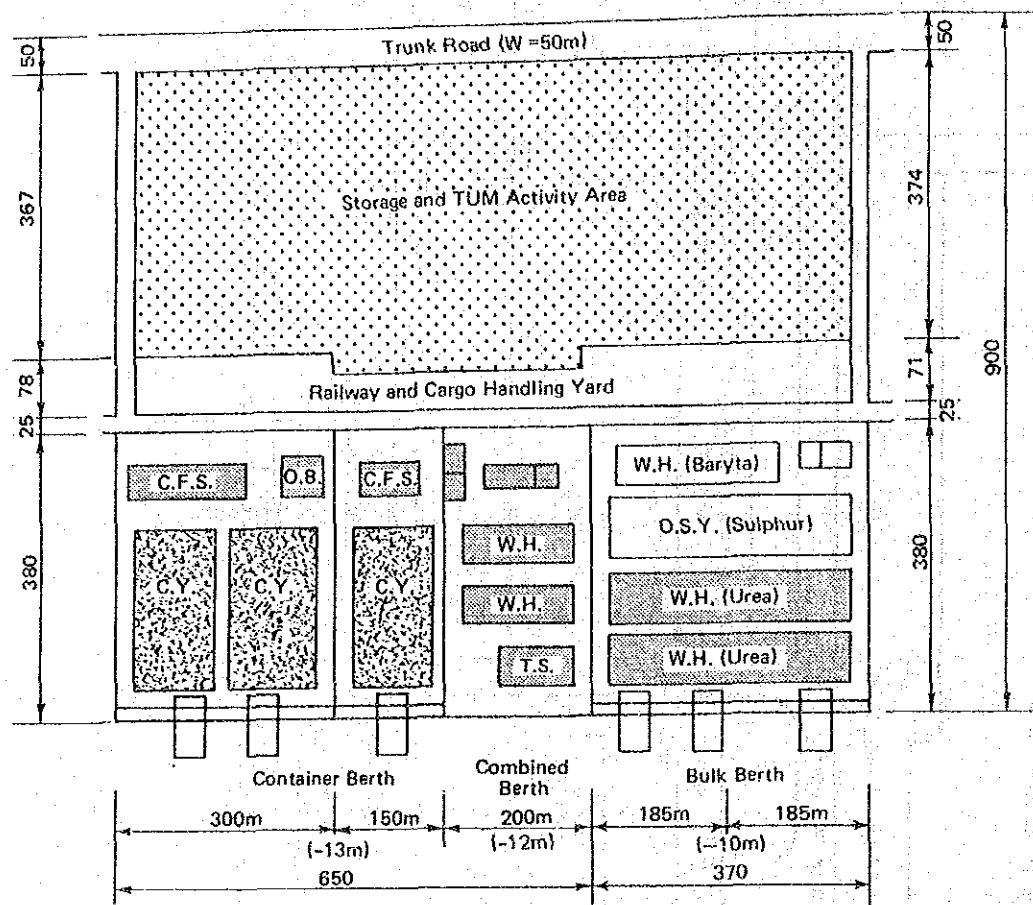


Fig. 3-2-14 Master Plan of Salina Cruz TUM (Linear Type)

(5) Dos Bocas Port

**Table 3-2-12 Cargo Movement Forecast by Commodity**

Unit: 1,000 tons

Commodity	1985	2000
Container Cargo	145	1,052
General Cargo	295	681
Bulk Cargo	0	784
Total	440	2,517

**Table 3-2-13 Number of Berths**

	1985	2000
Container Berth	1	2
General Berth	2	4
Bulk Berth	0	1
Total	3	7

