Chapter VII. Master Plan

1. Location of Industrial Complex

(1) Selection of desirable site for industrial location

In selecting a site from the standpoint of industrial location, the main requirements are as follows:

1) The area must provide a vast flat land area for industrial plants location.
2) The area must be able to provide solid foundations for heavy plant facilities.
3) It must be possible to construct a deep sea port.
4) From environmental aspect, it must be at some distance from the residential area.

(2) Site of the project

For the project, the Mexican government had the following three site plans.

Site I: North of the Tuxpan river around Tampamachoco lagoon
Site II: Tuxpan river estuary
Site III: South of the Tuxpan river

Among of these three sites, we decided to reject the site I as a main development area. So, the new industrial port is to be located south of the Tuxpan river.

2. Urban Planning of Tuxpan Port City

(1) Introduction

The basic viewpoints in city planning to be carried out here are as follows:

1) The new city proposed here is an attractive city with a population of 400,000 as a regional core in the northern part of Veracruz State. In this sense, the new city is regarded as a sort of ideal target.
2) The principle frame works of the new city are proposed here as desirable future goals based on the past experience from various planned cities in Japan.
3) From the standpoint of actual project implementation, we will also make a short study of a more realistic plan.
4) It is necessary to make a Feasibility Study on the new city taking into consideration the socio-economic conditions of the country and the regional characteristics of Tuxpan, at the time when the work is to be started.

(2) Basic development policies

1) To develop a multi-faceted and comprehensive city that is supported by, but not dominated by the simultaneous build-up of large-scale coastal industries.
2) To develop a city that serves as the core of a regional development area, and in addition, is the main urban center in the northern part of Veracruz State.
3) To systematically build up social capital at the designated site in order to realize the above goals. This includes the manufacturing and commercial infrastructure (industries, business centers and tourist facilities) and the urban infrastructure (housing, schools,

water, sewage, electricity, communication facilities, parks and green zones) as well as the regional transport infrastructure (airports, ports, railways, roads).

4) To organize scientific, cultural and artistic facilities, for the benefit of the entire region while paying special attention to environmental protection and urban disaster prevention.

(3) Site selection for the new city

When selecting the site of the new city, each of the five alternative sites was assessed with respect to six evaluation items: economic efficiency, comfortability, convenience, safety, regional impact and future expansion (see Table 7-1). From the results of the assessment, the western part of the industrial port (D) and the northern part of the existing city of Tuxpan (A) seem to be best.

Table 7-1 Assessment of Alternative Sites

Item \ Alternative Site		A	B	C	D	E
Comfortability	Air Pollution	O	O	O	Δ	×
	Drainage Conditions	Δ	Δ	Δ	O	O
Convenience	For Commuting	Δ	Δ	Δ	O	O
	For Regional Transport	O	O	O	O	Δ
Safety		O	Δ	Δ	O	O
Regional Impact	on Existing City	O	O	Δ	Δ	Δ
	on the Natural Environment	O	Δ	Δ	O	O
Future expansion		O	O	O	O	O
Economic Efficiency		Δ	Δ	Δ	O	Δ
Total		O	Δ	Δ	O	Δ

Note: O Good Δ Fair × Poor

In making a final decision between these two sites, the different categories of comparison should be given different priorities. We attach most importance to environmental quality, transportation convenience, and economic efficiency. On the other hand, regional impact problems can be dealt with through appropriate planning. The former has been selected as the site for the new city.

Although the above assessment is a qualitative analysis, it will be necessary before the time of actual project implementation to quantitatively analyze drainage and soil foundation conditions, and construction costs.

(4) Setting of city frame

The population and the number of households in 2000 are estimated at, respectively, 405,000 and 90,000. Setting the gross population density in the residential district at 100

person/ha (net population density 275 person/ha), it is considered that 4,050 ha are necessary for the residential district and 6,200 ha are necessary for the entire new city including commercial and business districts, public facilities area, roads, parks/greens, etc. What is noteworthy about the composition of facilities in the new city is that the city not only has all the urban facilities required for a city of 400,000 people but it also includes a fully array of cultural, research, medical, business and recreational facilities, such as the university, the marine research institute, the general hospital, the distribution business center, the light industries area, the marine recreational park, the concert hall and the golf links, thus making Tuxpan a regional core for northern Veracruz State.

The residential district is composed of 11 districts comprising 45 neighborhood units and residential areas, commercial and public facilities, parks and greens, etc. are distributed in each neighborhood unit to make ideal communities.

Table 7-2 Planned Land Use for the New City in the year 2000

Land Use	Area (ha)	Percentage (%)
Residential Area	4,050	65.3
Commercial/Business Area	405	6.5
Public Service Area	392	6.3
Amusement/Recreational Area	118	1.9
Light Industry	230	3.7
Road	400	6.5
Open Space	605	9.8
Total	6,200	100

Table 7-3 Division of Residential Land Use

Land Use	Area (ha)	Percentage (%)
Housing Land	1,471	36.3
Land for Commerce/Business Facilities	237	5.9
Land for Public Facilities	309	7.6
Road	820	20.2
Open Space	1,213	30.0
Total	4,050	100

(5) Transportation planning

In the composition of the local road network, National Highways No. 180 and 130 and the Tuxpan-Tamiahua Road form main access roads. Within the industrial base, a main road is laid out at the west end and the different industries are connected to each other by port roads.

In the new city, the main roads are laid out according to the land use and road sections are decided from the forecast values of generated traffic volumes. The railway has been planned exclusively for cargo transportation, runs north to south parallel to the main road at the west end of the industrial base and connects Veracruz and Tampico, along the Gulf coast line.

(6) Public facility plan

A water purification plant and a sewage disposal plant are proposed on the basis of estimation of the required capacities of water supply, sewage and electric power. The amount of power supply from Chile Frio is determined accordingly.

Fig. 7-1 shows the New City planning.

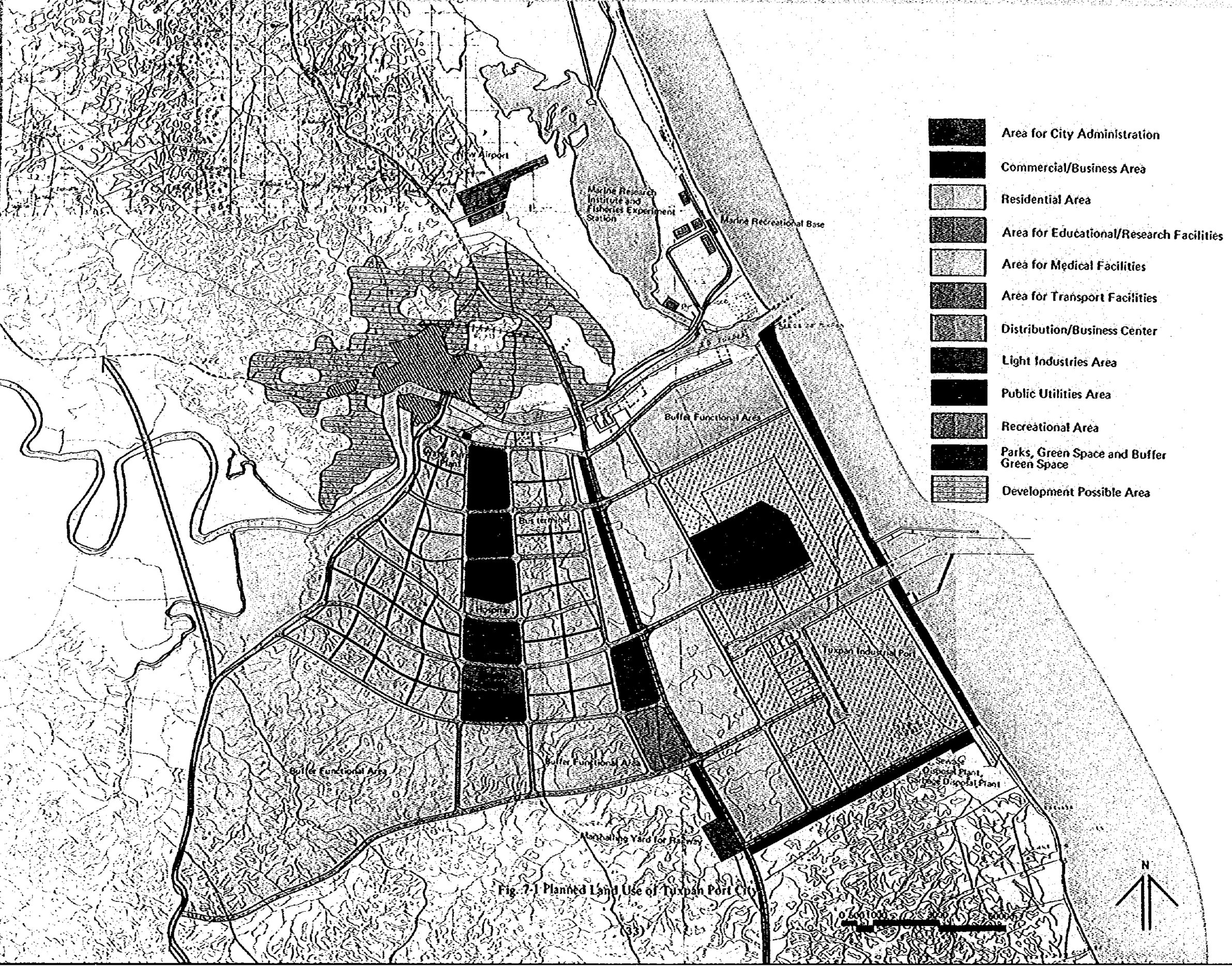


Fig. 7-1 Planned Land Use of Tuxpan Port City

3. Port Planning

(1) Conception of development

The site chosen for the plan is a relatively flat coastal plain about 15 km long and 8 km wide extending from Tampamachoco lagoon to Punta de Piedra.

The existing port facilities of the Tuxpan river are important for the future and especially the ones on the right bank of the river must be improved and expanded.

The PEMEX oil base on the left bank of the river mouth has to be maintained at the present scale, in order to maintain present conditions around Tampamachoco lagoon, so any further expansion should be planned in the newly developed industrial port.

(2) Port functions

The port will have 4 functions i.e.: commercial port, industrial port, fishery port and pleasure port (marina).

The industrial port is planned to secure the plant area, the water line length and water depth required by the located industries.

For the commercial port, TUM are planned in the industrial port as in the preceding five ports such as Lazaro Cardenas and Altamira. But to provide early utilization of the commercial port facilities, the use of the right bank of the Tuxpan river is considered.

The fishery port is planned to meet the requirements of coastal and as well as offshore fishing. The existing coastal fishery facilities in Tampamachoco lagoon and Tuxpan river will continue to be used in the future.

A fishery product processing plant will be constructed in the vicinity of the port.

A marina is planned around Tampamachoco lagoon.

(3) Shape, site and scale of the port

The port should be constructed by excavating into the present shoreline, since a great deal of land-fill sand is required for the industrial locations and a long water line is needed for wharves.

The space for a 200 m wide inland navigation canal from Matamoros to Cazones will be reserved parallel to the coastline.

Three location sites are considered.

A) North part, near the estuary of Tuxpan river

B) Central part, near the mouth of Tumilco drainage

C) South part, between Tumilco drainage and Punta de Piedra

For economy and safety, the ships for crude oil export up to 250,000 DWT will be accommodated only in the outer port (along breakwaters). The inner channel (excavated waterway) is planned to accommodate up to 150,000 DWT iron ore carriers.

The fishery port will be located on the adequate right bank of the Tuxpan river to avoid congestion between cargo vessels and fishing boats. It is planned to accommodate up to 200 GT fishing boats.

The marina will be located on the outlet channel from Tampamachoco lagoon to the Tuxpan river, with capacity for accepting 500 pleasure boats.

(4) Breakwaters

The north breakwater is the main breakwater and the south breakwater is the auxiliary breakwater so as to shield the predominant N-E wave direction.

The length of the north breakwater was decided to be 2,000 m based on the need to maintain the necessary distance for stopage of 250,000 D/W vessels between the harbour entrance and the mooring dolphin.

(5) Channels and basin

The width of the main channel is planned to be about 1.5 times the ship length. The ship length of the 250,000 DWT oil tanker is 348 m and of the 150,000 DWT iron ore carrier is 313 m. Thus for the outer port area the width of the channel is designed to be 500 m. The width of the inner channel is 600 m having a 50 m mooring space on both sides of the designed channel width of 500 m.

Similarly a width of 1.5L = 300 m and a turning basin diameter of 2.0L = 450 m are used for the subsidiary channel in expectation of 30,000 DWT – 40,000 DWT ships.

1) The volume of cargoes and the necessary number of berths in the industrial port and the commercial port are as indicated in Table 7-4 and 7-5.

Table 7-4 Industrial Cargo and Private Berth

	Production capacity	Area (ha)	Port handled cargoes			Necessary number of berths (tentative)		
			In. 1000 tons	Out. 1000 tons	Total 1000 tons	Water depth (meter)	Number of berths	Length (meter)
Food industry complex	Flour 116,000 tons/year Vegetable oil 26,000 tons/year Feeds 120,000 tons/year	100	324	0	324	12	1	240
Paper and coarboard	500,000 tons/year	200	760	50	810	12	1	240
						10	1	185
						10	1	185
Petroleum refining	500,000 BSD	1,000		13,600			(3)	(610)
				4,300		22	1	500
				1,700	24,100	19	1	500
				4,000		16	1	450
						15	1	300
						13	1	260
						11	2	420
Petrochmicals	Ethylene 500,000 tons/year	500		299	538		(7)	(2,430)
			245			12	1	240
						10	1	185
Iron and steel	5,000,000 tons/year	1,500	7,000				(2)	(425)
			2,240		12,130	19	1	370
			760			18	1	330
			130	2,000		14	1	270
						11	2	420
						10	3	555
						7.5	3	330
Machine industries		200	26	83	109		(11)	(2,335)
Motor vehicles	360,000 Pieces/year	220	90	2,160	2,250	7.5	1	130
						10	5	925
Shipbuilding	250,000 tons x 5 ships/year	200	42		101	Handled on Public wharf		
Seafood stuff		20	50	9				
Total					40,362		30	7,055

Table 7-5 Berth Required for Commercial Port

	Volume of cargoes handled (1,000 tons)	Number of berths	Cargo volume per berth (1,000 tons)
Container berths	2,752	4	688
For large ships	1,850	2	915
For small ships	922	2	461
General cargo berths	1,132	6	189
For special ships	729	3	243
For general ships	403	3	134
Bulk cargo berths	976	3	325
Total	4,860	13	374

Note 1: One container berth for small ships and two general cargo berths are planned on the right bank of the Tuxpan River.
2: It is enough to plan two bulk cargo berths according to later detail study.
3: 9 berths will be constructed in the new port area.

2) The berths and functional facilities in the fishing port are as indicated in Table 7-6.

Table 7-6 Proposed Fishery Wharf (a)

Type of wharf	Berth length (m)	Landing wharf		Preparatory wharf		Rest wharf		Total length (m)
		Number of berth	Length (m)	Number of berth	Length (m)	Number of berth	Length (m)	
-2 m	-	-	160	-	40	-	700	905
-4	30	6	180	3	90	-	160	430
-4	35	5	175	2	75	-	100	345
-4.5	45	2	90	1	45	-	30	165
Total		13	610	6	225	-	990	1,845

Facilities for Fishery (b)

Facility (Unit)	Anchorage basin m^2	Freight handling place m^2	Ice making cold storage m^2	Oil supply kl x unit	Open storage yard m^2	Parking lot m^2	Apron width m	Road width m
Scale	149,000	21,600	2,800	500 x 3	21,300	10,250	10	20

3) The berths and functional facilities of the marina are as indicated in Table 7-7.

Table 7-7 The Number of Pleasure Boats for Planning (a)

	Small type (less than 20 feet)	Larger type (20 feet or more)	Total
Yachts	180	70	250
Motorboats	180	70	250
Total	360	140	500
Average length	6.0 m (20 feet)	9.0 m (30 feet)	
Average width	2.0 m	3.5 m	
Draft	1.0 – 2.0 m	1.5 – 2.5 m	

Proposed Functional Facilities for the Marina (b)

Facility (unit)	Anchorage basin m^2	Water area m^2	Mooring facility m	Boat yard m^2	Parking lot m^2	Building area m^2	Ramp lane, m	Club house m^2	Total land area m^2
Scale	37,500	40,000	720	17,300	7,000	1,600	31, 90	3,200	63,600

Note: About half of the total land area is occupied by green space, recreational area and so on.

Three alternatives for the master plan are shown in Fig. 7-2 through Fig. 7-4. The facility layout of the commercial port, the fishery port and the marina are shown in Figs. 7-5, 7-6 and 7-7. Land use of each plan is shown in Table 7-8.

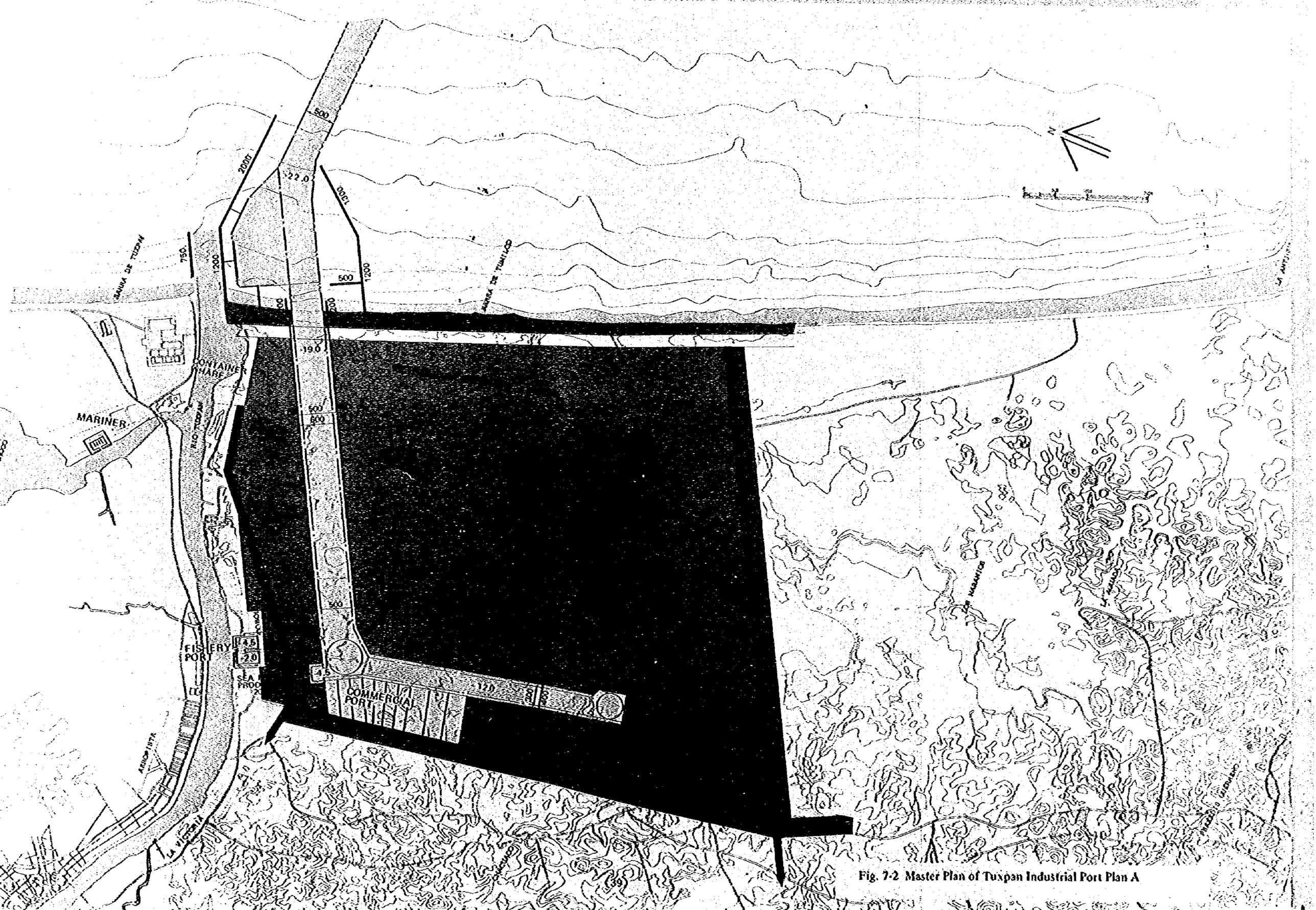


Fig. 7-2 Master Plan of Tuxpan Industrial Port Plan A

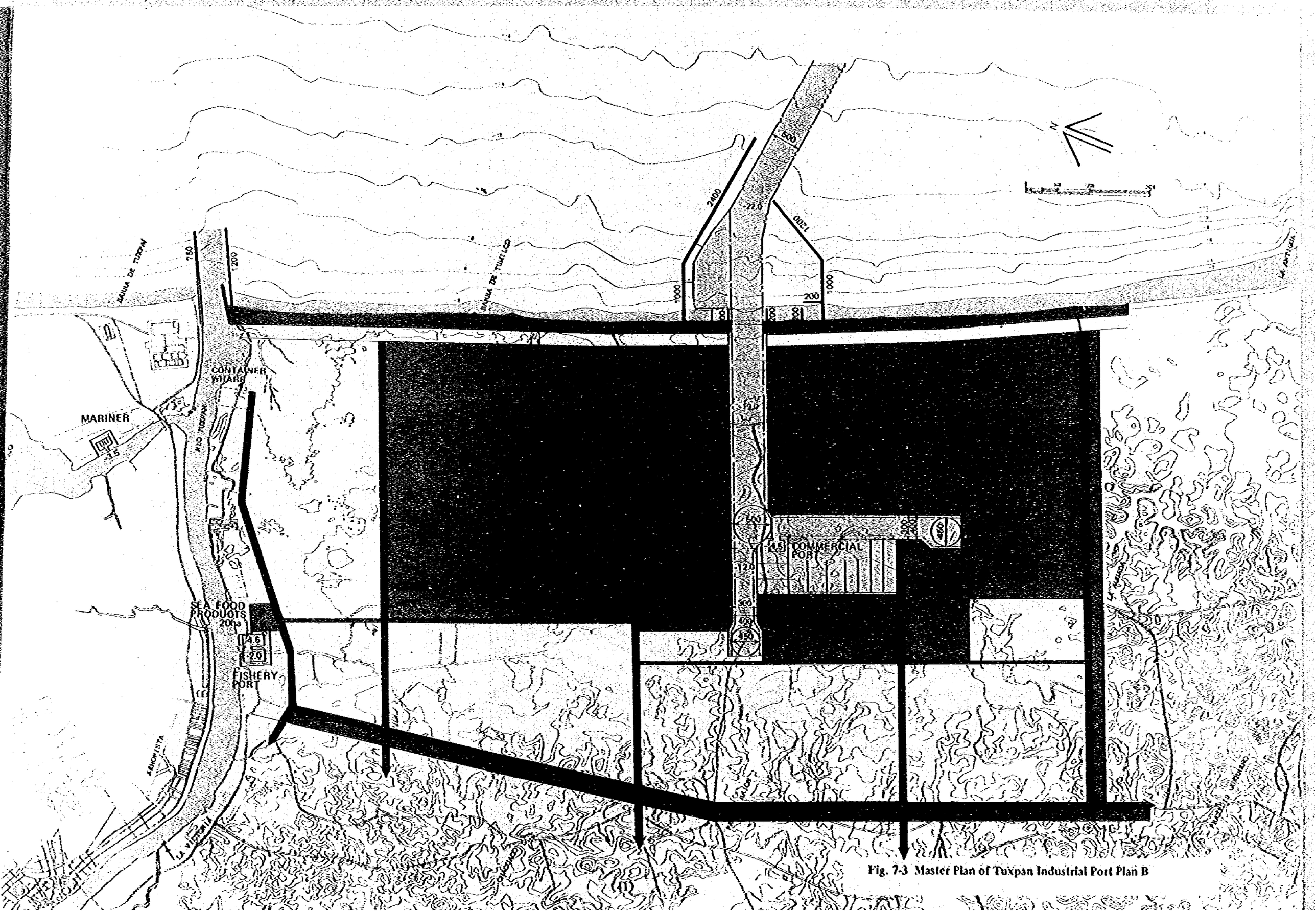


Fig. 7-3 Master Plan of Tuxpan Industrial Port Plan B

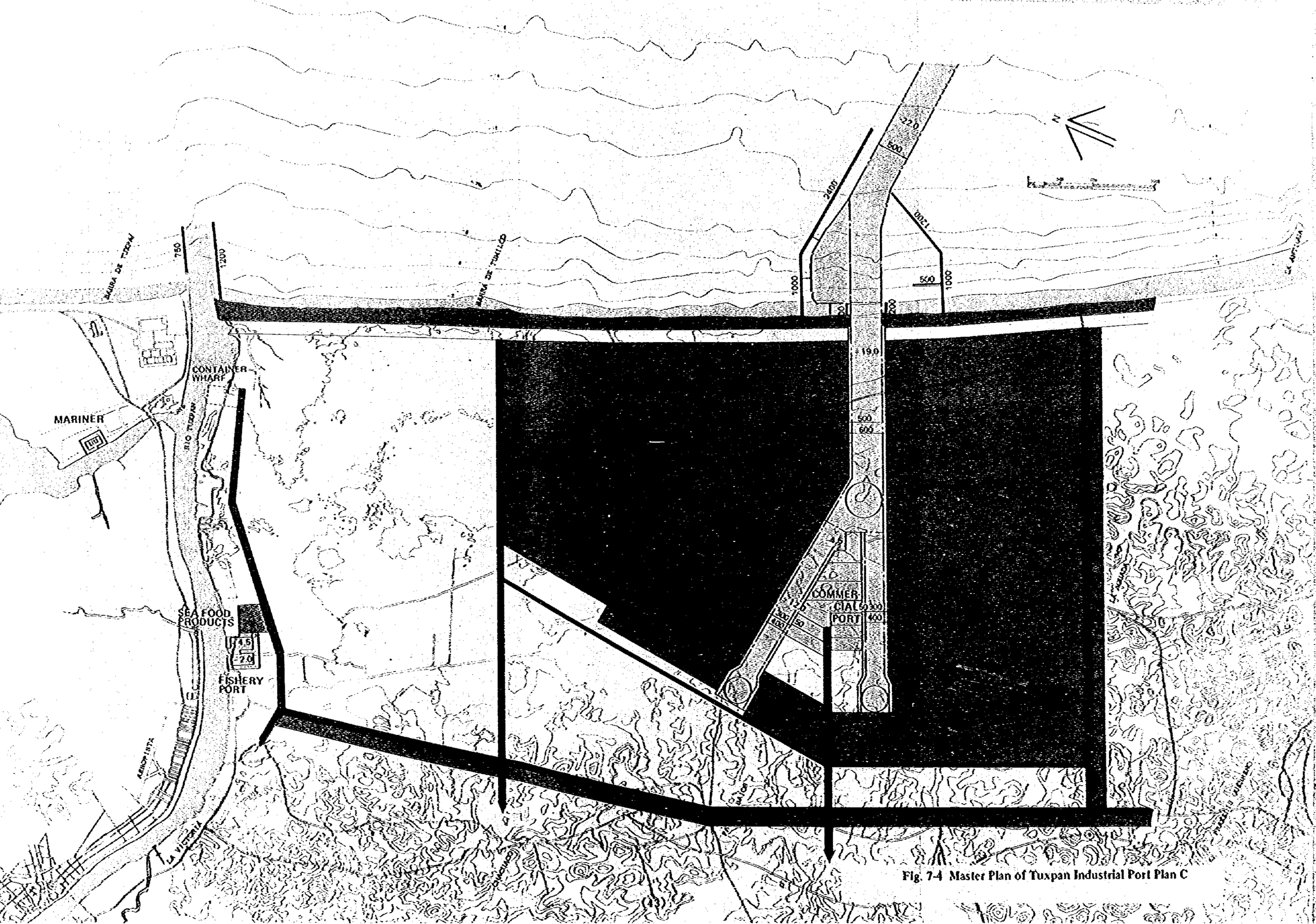


Fig. 7-4 Master Plan of Tuxpan Industrial Port Plan C

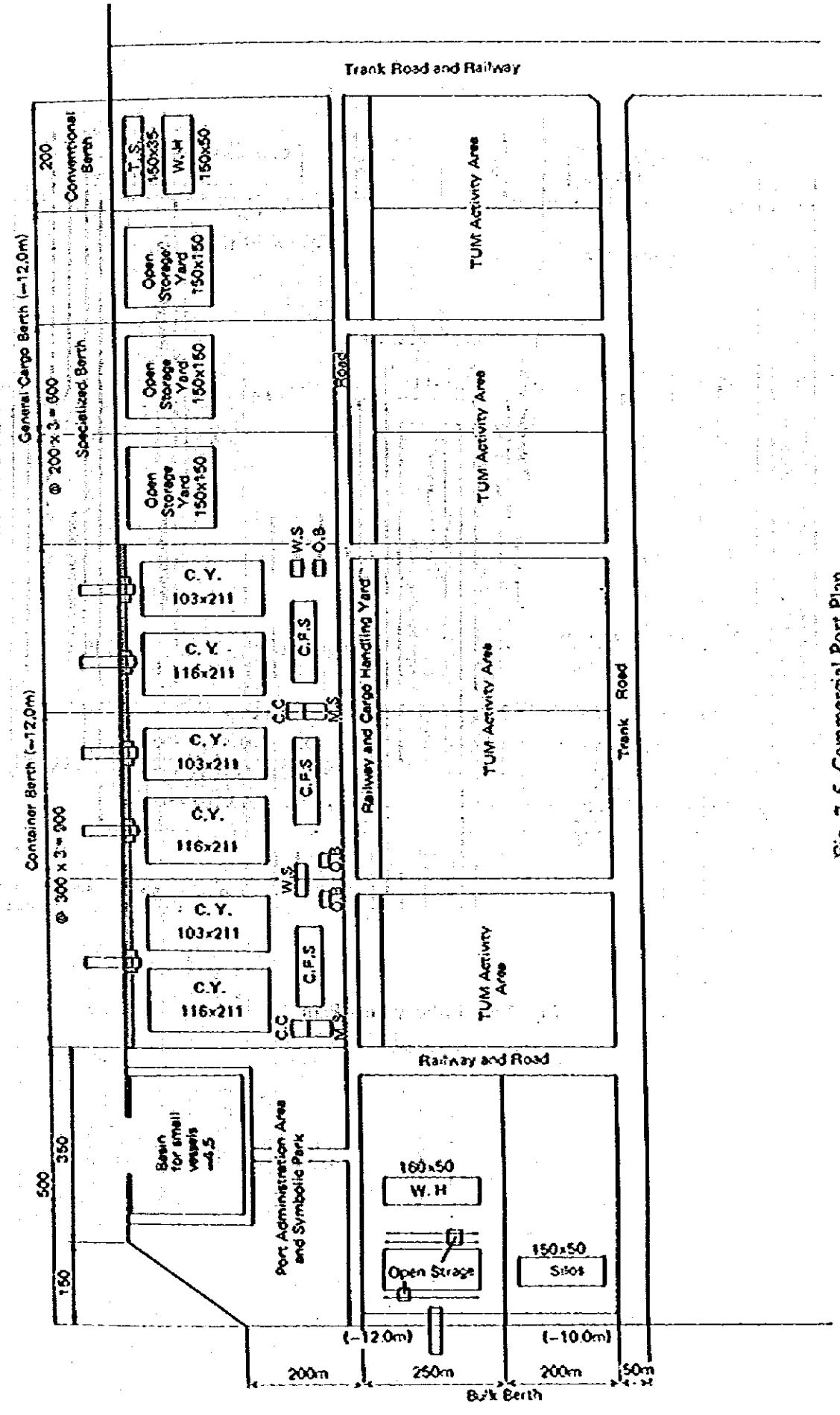


Fig. 7-5 Commercial Port Plan

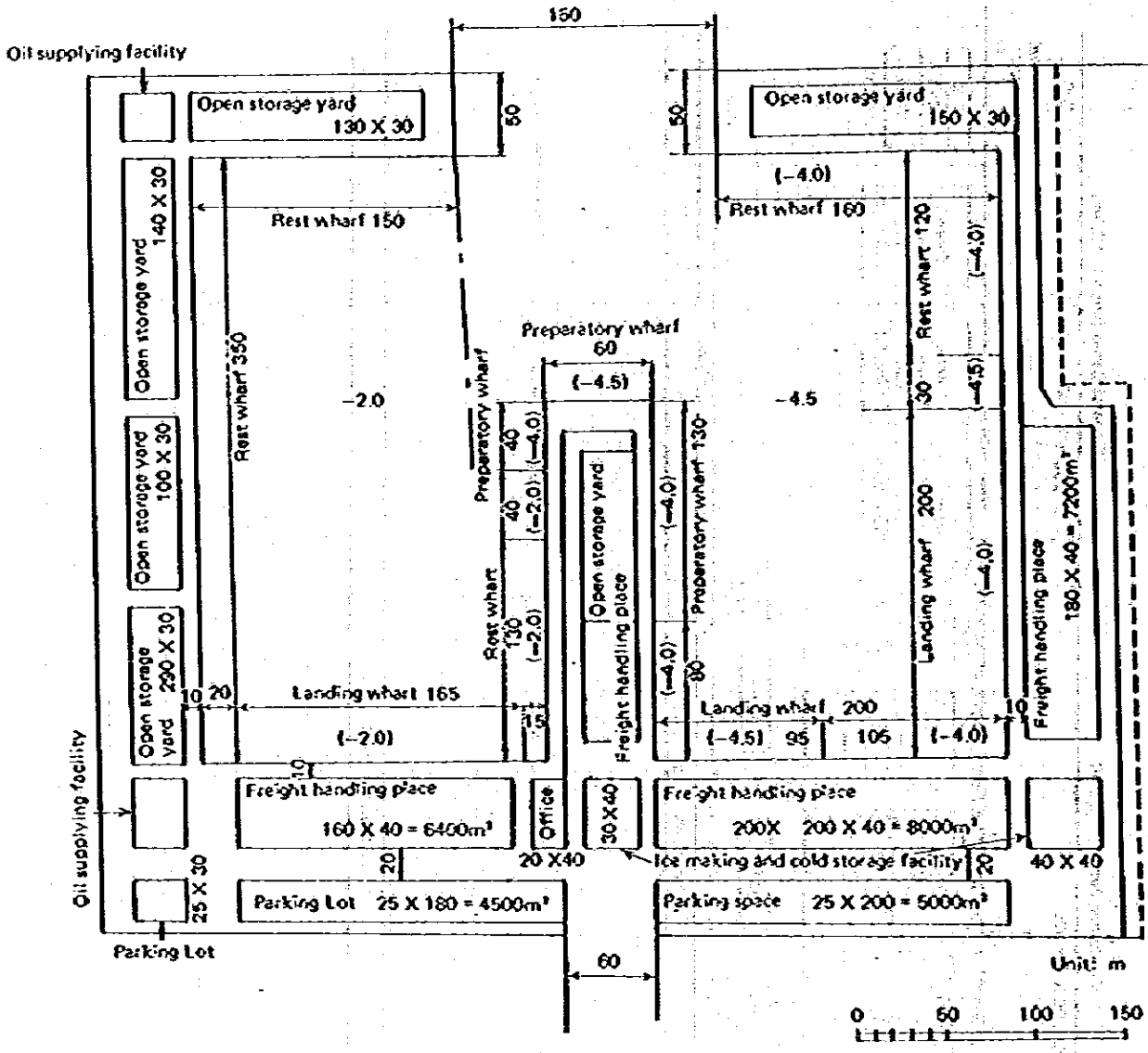


Fig. 7-6 Fishery Port Plan

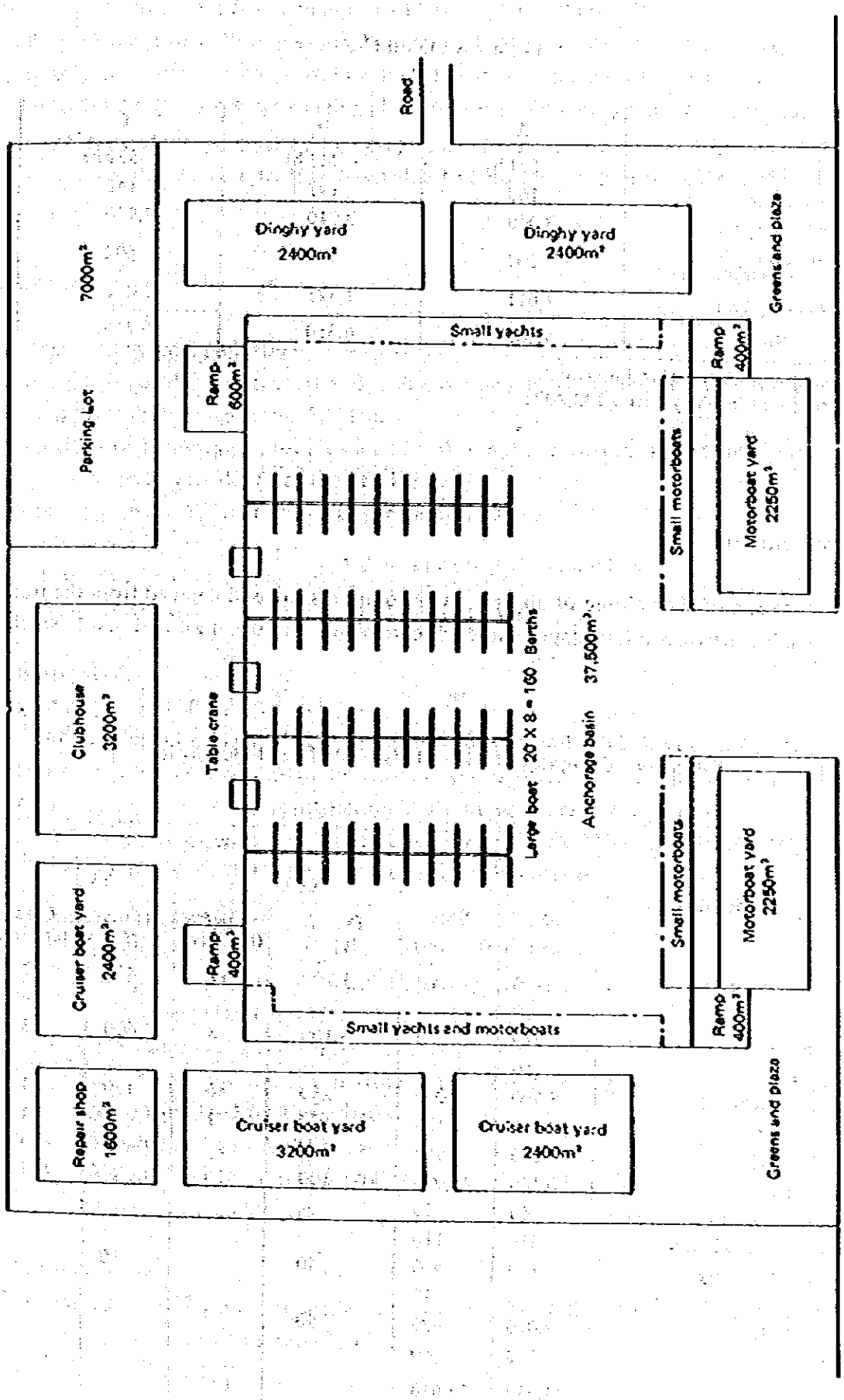


Fig 7-7 Marina Layout

Table 7-8 Land Use

	A	B	C
Channel and basin	571 ha	443 ha	522 ha
Wharf space	160	192	142
Industrial space	3,940	3,940	3,940
Space for roads (including Railway)	207	482	402
Park and greens	1,011	1,323	1,240
Total	5,889	6,380	6,246

The space for marina is 63,600 m^2.
The space for fishery port is 132,200 m^2.

4. Environment Plan

The estimation of the volume of air and water pollutants to be discharged from the iron and steel, oil refining, petrochemical, paper and cardboard plants and other located plants are shown in Table 7-9.

Table 7-9 Estimates of Air and Water Pollutant Quantities

Type of Industry	Air		Water			
			COD		SS	
	SOx (ton/year)	Soot (ton/year)	Density (ppm)	Load (ton/day)	Density (ppm)	Load (ton/day)
Sea food products	490	90	1,700	11	450	3
Wheat flour	20	–	–	–	–	–
Vegetable oil	280	20	3,100	3	2,600	3
Feedstuff	10	–	–	–	–	–
Paper and cardboard	5,500	9,000	280	86	180	31
Petroleum refining	10,950	1,430	50 – 100	1	50 – 100	1
Petrochemicals	5,000	650	5 – 46,000	18	10 – 100	3
Iron and steel	8,460	45,000	10 – 100	56	10 – 800	621
Fabricated metals for ocean use	60	40	–	–	–	–
Construction machinery	210	110	–	–	–	–
Chemical machinery	800	430	40	–	30	–
Heavy electric machinery	60	10	–	–	–	–
Motor vehicles	2,070	830	90	2	–	–
Shipbuilding	140	60	–	–	–	–
Total	34,050	57,670		177		662

It is possible to reduce SOx and Soot to 1/10 – 1/20, COD to 1/10 – 1/20 and SS to 1/30 – 1/100 by placement of pollution control equipment. The environment of the Tuxpan port city can probably be protected by providing such facilities as an industrial waste disposal plant, a waste oil treating plant, a sewage treating plant, a garbage disposal plant, green space, etc.

A brief study on the impact of this project on the Tuxpan river flood has revealed that the deterioration of the water retarding basin due to land reclamation for plant area will have the worst impact.

5. Cost Estimation and Evaluation

(1) Design of basic port facilities

Cross section of the breakwaters and such mooring facilities as container berths, general cargo berths and small craft berths were decided.

Two types of breakwaters, rubble mound and composite caisson type are presumed according to the position and water depth of the breakwater.

As for mooring facilities, following types were assumed.

Container berths General cargo berths	}	: Open type using steel pipe pile
Small craft berths		: Steel sheet pile type

(2) Construction

1) Materials and Machinery

All construction materials except steel pipe piles and steel sheet piles can be procured in Mexico. The necessary construction machinery is often used in the country and is locally available. However, such construction craft as dredgers are not available in Mexico, and foreign construction craft will be chartered for this project. As for labor forces, construction workers are abundant and their service can be easily procured.

2) Outline of construction methods

i) Breakwater

Riprap and armor stones will be transported from the quarry by dump trucks and dumped from land and sea.

ii) Piled wharf and quaywall construction

Steel pipe piles are driven from sea by a pile driving barge and steel sheet piles are driven from land by a pile driver.

iii) Dredging and reclamation

Dredging and reclamation will be executed by pump dredgers and reclaimed land will be graded by bulldozers.

(3) Cost estimation

General cost estimation was made in accordance with the structural types. The following conditions were used for this estimation.

1) Estimate of construction costs is based on the prices of April 1982. for construction materials, unit prices are based on the data obtained through the site survey.
2) Transportation expenses of import materials, construction machinery and construction crafts are not included.
3) Taxes such as import duties and enterprise taxes, land rents and compensations are not included.
4) Private berths are deemed to be parts of the plant facilities and are not covered by the cost estimation.
5) The exchange rates between Mexican currency, Japanese yen and U.S. dollars were assumed to be as follows:

US$1.0 = MN$50 = ¥250

The cost estimation for each alternative plan is shown in Table 7-10.

Table 7-10 Rough Construction Cost

(Unit: thousand pesos)

Facilities \ Alternative	Plan A	Plan B	Plan C
Breakwater	11,452,000	12,856,000	12,856,000
−12 m Piled Wharf	1,763,000	1,718,000	1,608,000
−4.5 m Quaywall	751,600	751,600	710,800
Land Reclamation (dredging of channel and basin)	22,336,000	16,256,000	18,192,000
Land Reclamation (dredging of front sea)	–	12,000,000	6,300,000
Road	–	1,736,000	1,372,000
Railway (including road)	4,140,000	8,400,000	7,060,000
Total	40,442,600	53,717,600	48,098,800

(4) Evaluation

Three alternatives plans: (A), (B) and (C) are evaluated with respect to following seven items:

1) Ship maneuverability
2) Port utilization
3) Industry location
4) Extention possibilities
5) Construction work
6) Siltation in channel
7) Impact on environment

As for the construction cost of the plans, (A) is the lowest, followed by (C) and (B) is the highest. However, full examination, taking into account not only the costs but also the results of the above mentioned evaluation items may lead to the conclusion that plan (B) is most desirable.

Table 7-11 Evaluation of Alternative Plan

Items to be evaluated		Evaluation A	Evaluation B	Evaluation C	Comments
Ship maneuverity	Channel length	△	◎	○	As channel (inside port) becomes long, it takes long time for ships berthing and makes more congestion.
	Ship maneuverity (outside port)	△	○	○	A: Be affected with the current of the river
	Ship maneuverity (inside port)	○	○	◎	C: Ship can enter from main to secondary channel without tugboat.
Port utilization	Commercial port location	△	○	○	Location near the port entrance is favorable for construction
	Shape of the commercial wharf	○	○	△	C: Partly deformed shape.
	Fishery port location	◎	◎	◎	Fishery port is located at inner part of the river near existing facilities. Calm water is procured. Less crowded due to the separation with marina
	Steel iron wharf	○	○	△	L shaped water front is favorable for loading materials and unloading the products.
	Machine industry	○	○	△	C: Not procuring water front for machine industry.
Industry location	Iron and steel	×	○	○	A: Location of steel iron is inner part of petroleum refining and chemicals. Unfavorable of ship passing and cool water procurement.
	Shipbuilding	△	○	○	A: Shipbuilding location is a little distant from steel iron.
	Soil condition	△	○	○	A: Soil condition for industrial area is comparatively bad.
Extention	Open space	◎	○	△	A: Wide open space in south, B: Compact open space in west and north. C: Open space in west leaves partly narrow.
	Channel extention	△	○	○	A: Further channel extension is comparatively difficult.
Construction work	Soil balance	◎	△	○	Balance of the dredging and reclaimed volume is favorable.
	Dredging	○	○	△	C: Dredging area soil is somewhat solid.
	Work	△	○	○	A: Offshore construction work is affected by ship.
	Construction cost	◎	△	○	A: lowest, B: heighest
Siltation in channel	Outer channel	△	○	○	A: More siltation seems to be caused because of flat sea bottom.
	Existing channel	×	○	○	A: Construction of new north breakwater will increase the sand deposit at the existing approach channel.
Impact on environment	Air pollution	△	○	○	A: Iron and steel industry most effectable to air pollution is near residential area.
	Water pollution	△	○	○	A: Drainage water from paper and cardboard industry may pollute river or canal.

Note: ◎ Better ○ Good △ Average × not good

Chapter VIII. Short Term Development Plan

1. Premises of the Plan

(1) Location of industries for short term plan

The scales of the located industries under the short term plan are determined on the basis of the demand forecast data used in the long term plan.

Site area, number of workers, fresh water consumption and volume of port cargoes are calculated as follows: Number of workers, fresh water consumption and volume of port cargoes are determined by the operational ratio relative to the final target production. As for site area, it is assumed that the large plants of paper and cardboard, petroleum refining and the iron and steel industries which are likely to start their Phase I operation by 1988, will be gradually constructed by 2000 after securing the final site area. The results are shown in Table 8-1 for scales of located industries and 8-2 for industrial port cargo volume.

Table 8-1 Industries Located around the Tuxpan Industrial Port in 1988
Short Term Plan per Long Term Plan

Type of Industry	Capacity of production	Unit	Capacity Ratio (%)	Area (ha)	Number of employees (persons)	Fresh Water ($100m^3$/day)
Sea food products	45	(1000 MT/Y	45	9	770	3
Wheat flour	60	(1000 MT/Y)	52		70	0
Vegetable oil	60	(1000 MT/Y)	50	100	-	-
Feedstuff	150	(1000 MT/Y)	30	200	1,050	100*
Paper and cardboard	250	(1000 BPSD)	50	1,000	750	100*
Petroleum refining	2,500	(1000 MT/Y)	50	1,500	3,750	170**
Iron and steel	24	(1000 MT/Y)	100	30	1,500	1
Fabricated metals for ocean use	2,000	(UNIT/Y)	50	60	750	1
Construction machinery	50	(1000 MT/Y)	100	80	5,500	9
Chemical machinery	80	(UNIT/Y)	100	30	1,000	1
Heavy electric machinery	-			3,009	15,180	385
Total						

Note: 1. Retrieval ratio *: 40%, **: 80%
2. Capacity ratio = Short term plan per long term plan

Table 8-2 Industrial Port Cargo Volume Handled at Tuxpan in 1988

(Unit: 1,000 Tons)

Item / Commodity	Type of packing	Foreign Trade			Domestic Trade			Total	Private or Public
		Imp.	Exp.	Total	In.	Out.	Total		
Agricultural and fishery products									
Fish	G				23		23	23	
Grain	B	95		95				95	O
Forestal products									
Chip	B				228		228	228	O
Petroleum-products									
Oil	L.B		2,400	2,400		850	850	3,250	O
Petrochemical products									
Petrochemical products	L.B								O
Petrochemical products	B								O
Minerals and crude oil									
Salt	B								O
Crude oil	L.B		6,800	6,800	4,000		4,000	10,800	O
Iron ore	B	3,500		3,500				3,500	O
Coal	B	1,120		1,120				1,120	O
Limestone	B	380		380				380	O
Scrap iron	B	25		25				25	O
Scale	B	40		40				40	O
Iron and steel									
Steel	B		600	600		400	400	1,000	O
Consumer goods									
Sea food products	G		4	4				4	
Paper	G					15	15	15	
Capital goods									
Industrial machinery	G	3		3				3	O
Fabricated metals for ocean use	G					22	22	22	O
Machine equipment and parts	G	6		6				6	O
Construction machinery	G					17	17	17	O
Parts of chemical machinery	G	9		9				9	O
Chemical machinery	G					20	20	20	O
Parts of heavy electric machinery	G	2		2				2	O
Heavy electric machinery	G		2	2		6	6	8	O
Parts of motor vehicles	G								O
Motor vehicles	G								O
Parts of shipbuilding	G								O
Total		5,180	9,806	14,986	4,251	1,330	5,581	20,569	

Note: O : Handled at private berth
G : General Cargo
B : Bulk Cargo
L.B: Liquid Bulk Cargo

(2) Demand forecast

As already forecast in Table 6-3, the 1988 volume of cargoes handled at Tuxpan Port comprises 859 thousand tons for foreign trade and 334 thousand tons for domestic trade, which means considerable increases from the present level.

Particularly, container cargoes are expected to greatly increase from about 160,000 tons in 1980 to about 260,000 tons in 1988.

(3) Fish catch

The Tuxpan fishery administrative region assumes an 86,000 ton fish catch in 1988. This is a rather large figure, compared with 3,000 tons for 1980. There must be active development of fishery resources and substantive investment in such basic facilities as fishery ports and fishing boats.

2. Tuxpan Port City Planning

The city population and the number of households in 1988 are estimated at, respectively, 190,000 and about 42,200. And total development area is to be 4,153 ha.

The land use composition of the city in 1988 is as follows: The area to be developed for the residential district is 1,900 ha, on the assumption that the gross population density of the residential district is 100 person/ha. This district is composed of five districts comprising 21 neighborhood units and the urban facilities to be assigned to each neighborhood unit are planned by the same standard as in the master plan. Regarding the central commerce and business/administration district, administration facilities, urban operational facilities and bus terminals are on the same scale as in the master plan and are surrounded by commercial and business facilities allocated in the light of population size. All other facilities – with the exception of the marine recreation park, the marine research institute and the fisheries experiment station – are planned to have the same facilities and at the same scale as in the master plan.

Land use of the new city under the short-term development plan is shown in Table 8-3 and 8-4 and in Fig. 8-1.

Table 8-3 Land Use Composition (1988)

Functions and Facilities	Area (ha)	
Residential Facilities	1,900	(100.0%)
Residence	693	(36.5%)
Public Service	158	(8.3%)
Commerce and Business	107	(5.6%)
Open Space	562	(29.6%)
Road	380	(20.0%)
Public Service Facilities	392	
Administration	12	
Urban Operation	42	
Culture/Education	107	
Welfare/Medical Treatment	11	
Distribution Business Center	200	
Commerce and Business Facilities	192	
Commerce	120	
Business	35	
Other Service	37	
Recreational Facilities	111	
Light Industry	230	
Open Space	605	
Road	400	
Ground Total	3,830	

Table 8-4 Required Urban Facilities in the Year of 1988
– Other Facilities Located Outside the New City –

Functions and Facilities	Number of Facilities (Unit)	Total Area (ha)
TRANSPORTATION FACILITIES		300
o Airport	1	(200)
o Marshalling yard of railway	1	(100)
SUPPLY AND DISPOSAL FACILITIES		
o Sewage disposal plant	1	25
o Garbage disposal plant	1	
Ground Total		325

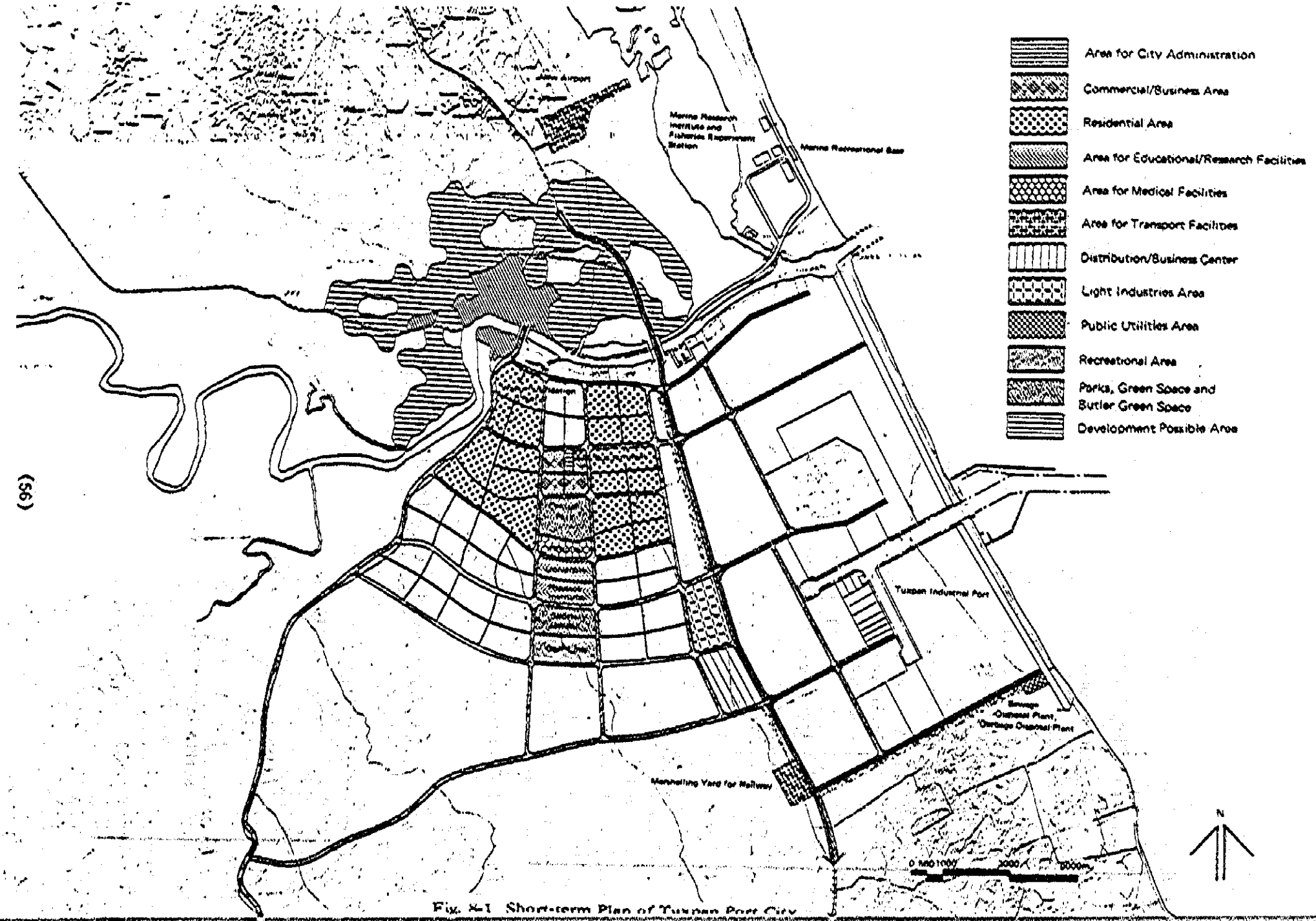


Fig. 4-1 Short-term Plan of Tuzpan Port City

3. Port Planning

The short term development plan is prepared as a first stage plan (target year 1988) for the recommended master plan B. In this connection, a minimum of the necessary facilities will be completed by 1988 so that they can be effectively used. The rest of the facilities will be constructed after 1989 in accordance with the requirements.

In order to avoid overinvestment, the port will be planned so as to accommodate ships up to 100,000 D/W for oil export tankers. The length of North breakwater was decided to be 2,500 meter so as to secure sufficient stopping distance for the tankers.

The main channel of the harbour will be planned to accommodate ships up to 100,000 D/W and inner channel for ships up to 15,000 D/W.

The width of the channel is 1.5L and the diameter of the turning basins are 2.0L, where L means the length of target ships.

The cargo volume and the necessary number of berths in the industrial port and commercial port are shown in Table 8-5 and 8-6. The commercial port plan is shown in Fig. 8-2.

Regarding the fishing port, about 40% of the final facility is proposed so as to handle the estimated fish catch of 25,000 tons.

The requirements of basic facilities for the fishery port are as indicated in Table 8-7. The plan is shown in Fig. 8-3.

The marina is not included in the short-term plan.

Table 8-5 Cargoes Handled by Industrial Port and Private Wharves

Type of industry		Production capacity		Area		Volume of port cargoes handled (1,000 t)				Necessary number of berths (tentative calculation)		
							1988					
		2000	1989	2000	1989	Total	Total	Foreign and domestic trade import	Foreign and domestic trade export	Water depth m	Number of depth	Total length m
		tons 1,000	tons 1,000									
Fishery food products	Fishery product processing	100 t/yr	45 t/yr	20 ha	9 ha	(Handled at fishery port and commercial port)						
Flour	Flour	116 "	60 "									
Vegetable oil	Vegetable oil	26 "	0 "	100 "	100 "	324	95	05		[12]	[1]	[240]
Feed	Feed	120 "	60 "									
Paper and pulp	Paper and pulp	500 "	150 "	200 "	200 "	810	243	228	15	10	1	185
Oil refining	Petroleum products	500 BSPD	250 BSPD	1,000	1,000	(24,100)	(14,050)	4,000	(10,050)		(5)	(1,555)
				Crude oil: outgoing		13,600	6,800		6,800	[19]	[1]	[500]
				Crude oil: incoming		4,000	4,000			16	1	450
		tons 1,000		Products: outgoing		4,800	2,400		2,400	11	2	420
				Products: incoming		1,700	850		850	10	1	185
Petrochemical	Ethylene	500 t/yr	0 t/yr	500 ha	500 ha	538	0					
Iron and steel	Crude steel	500	250 "	1,500 "	1,500 "	(12,130)	(6,065)	(5,065)	(1,000)		(7)	1,440
				Iron ore: incoming		7,000	3,500	3,500		[18]	[1]	[330]
				Coal: incoming		2,240	1,120	1,120		14	1	270
				Limestone: incoming		760	380	380		[11]	[1]	[210]
		tons 1,000	1,000	Scrap iron: incoming		130	65			10	2	370
				Products: outgoing		2,000	1,000		1,000	7.5	2	260
Machinery	Marine structures	24 t/yr	24 t/yr									
	Construction equipment	4,000 tons	2,000 tons									
	Chemical machines	50 1,000	50 1,000	200 ha	200 ha	109	87	20	67	7.5	1	130
	Heavy electrical machine	80 10,000	80									
Automboile	Automobile	36 pc/yr	0	220 "	0	2,250	0					
Shipbuilding	Ship	250,000 t 5 yr	0	200 "	0	101	0					
Total				3,940	3,509	40,362	20,540	9,408	11,132		15	3,550

[ ]: Water depth is temporary.
( ): Sub total

Table 8-6 Volume of Cargoes Handled by Commercial Port and Number of Berths (1988)

	Cargoes handled (100 tons)		Number of berth		Per-berth volume of cargoes handled (1000 tons)	
	Total	New Port	Total	New Port	Total	New Port
Container berth						
For small ships	257		1	-	257	
General cargo berth						
Special carrier	312		1	-	312	
Conventional Ships	101	101	1	1	101	101
Bulk cargo berth	523	523	2	2	262	262
Total	1,193	624	5	3	239	208

Table 8-7 Requirements of Basic Facilities for Fishery Port

Wharf water depth	Berth length	Landing wharf		Preparatory wharf		Rest wharf		Total length
		Number of berths	Length	Number of berths	Length	Number of berths	Length	
-2.0	-	-	54	-	16	-	280	350
-4.0	30	2	60	1	30	-	64	154
-4.0	35	2	70	1	35	-	40	145
-4.5	45	1	45	1	45	-	12	102
Total		5	229	3	126		396	751

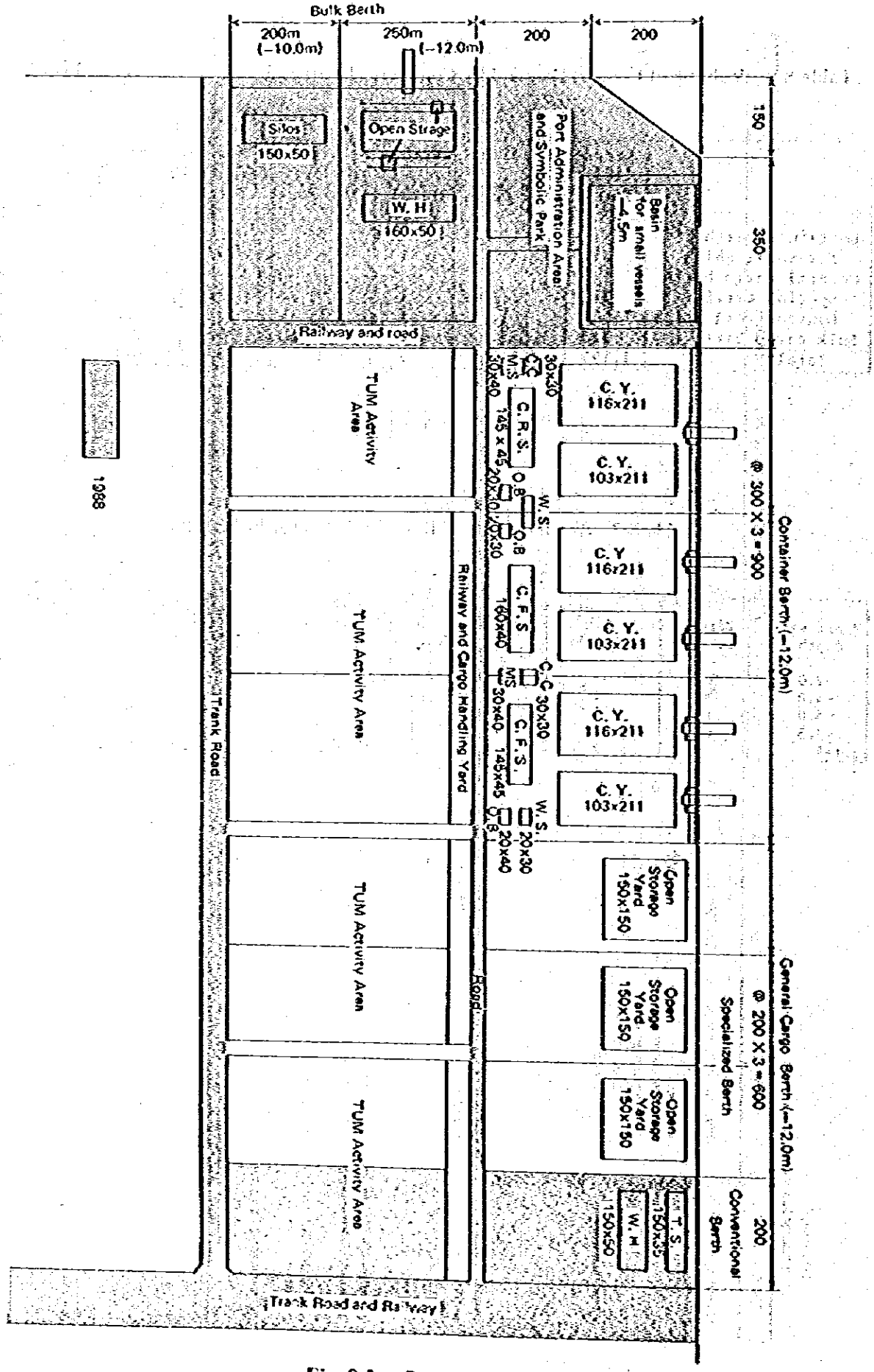
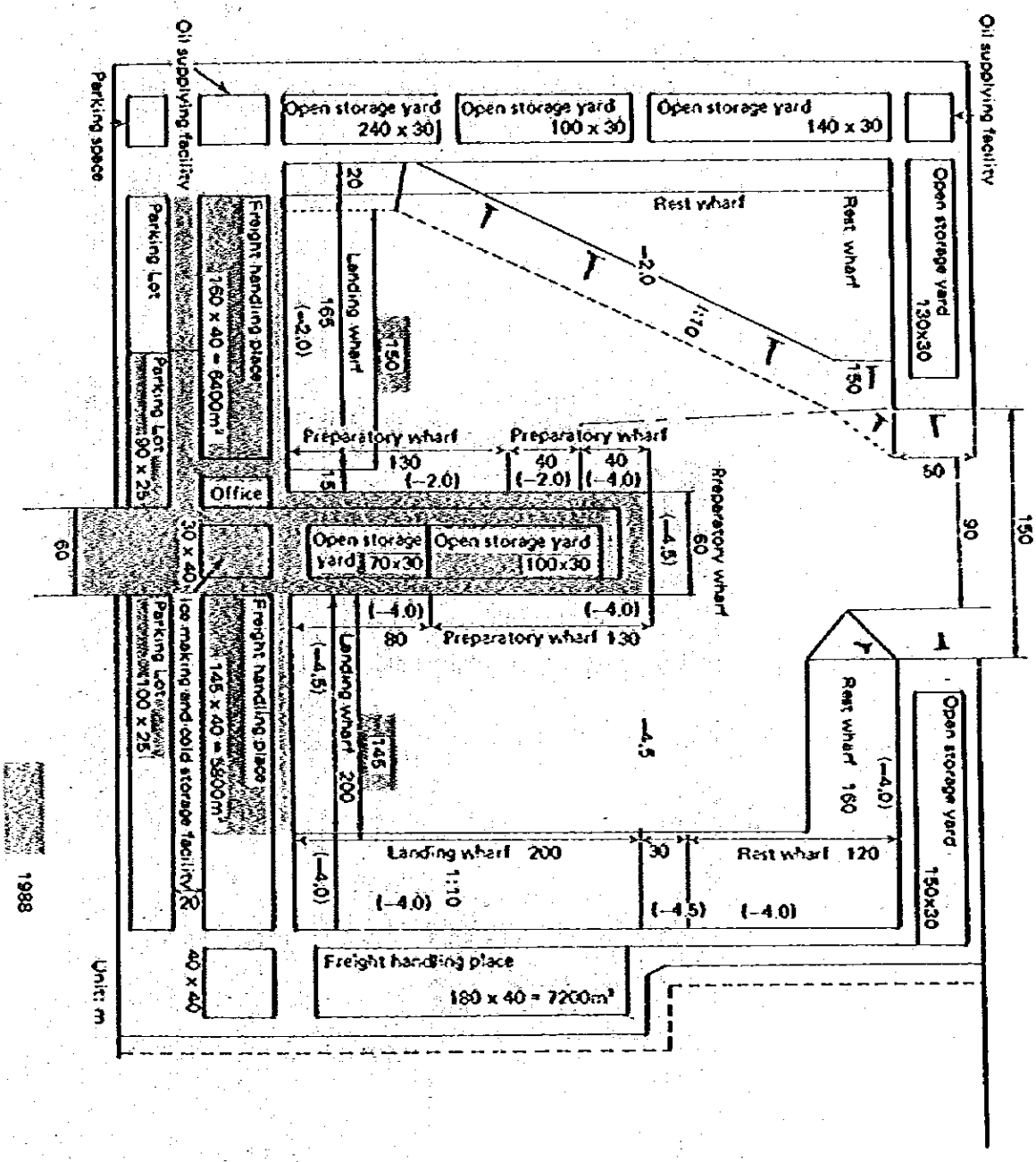


Fig. 8-2 Commercial Port Plan (1988)



Freight handling place	12,200m²
Open storage yard	5,100
Ice making and cold storage facility	1,200
Parking Lot	4,750
Office	800

	Water depth	Length
Quay	-2.0m	320m
	-4.0	250
	-4.5	205
	Total	775

Fig. 8-3 Fishery Port Plan (1988)

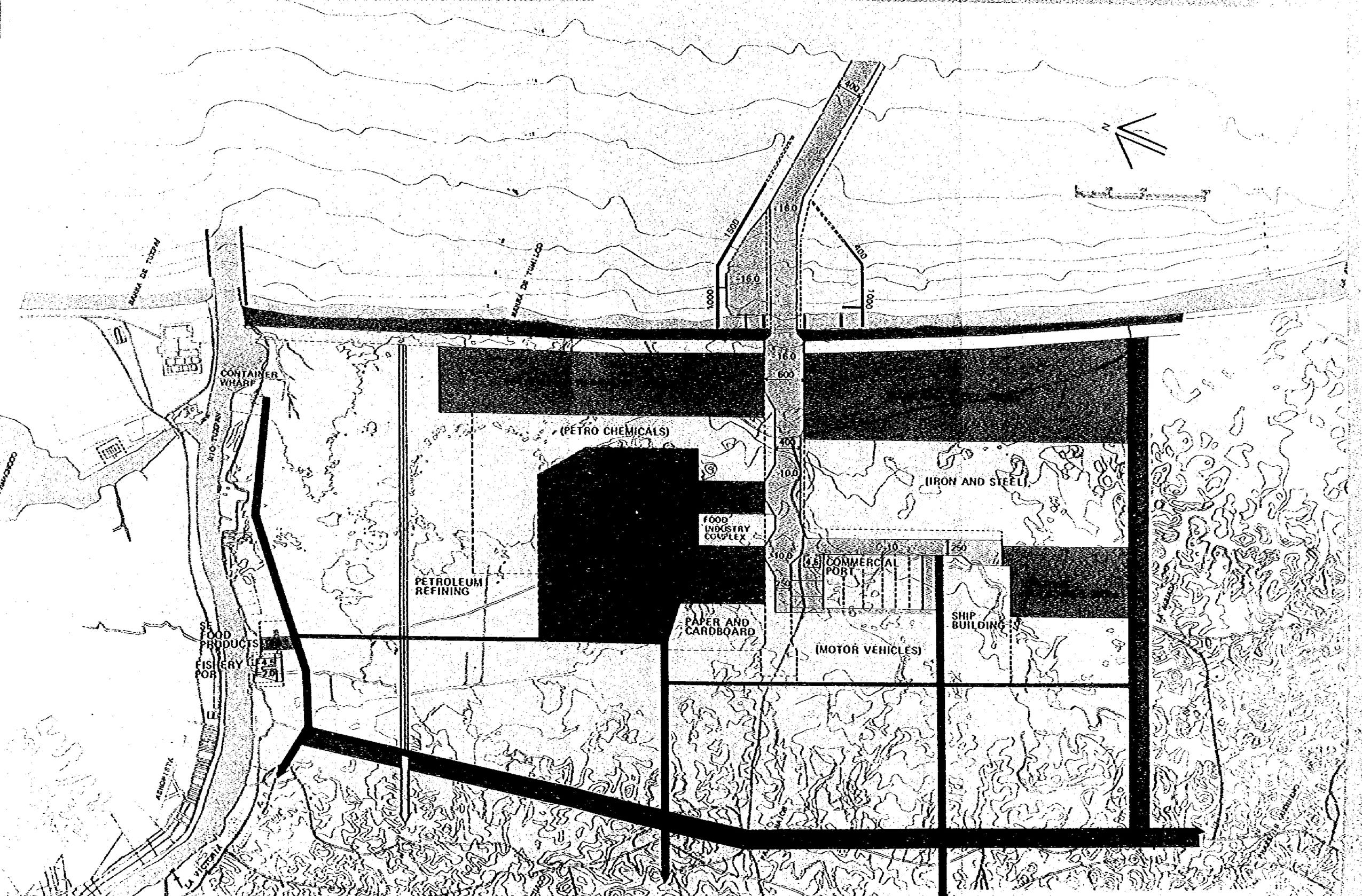


Fig. 8-4 Short Term Plan of Tuxpan Industrial Port (1988)

Chapter IX. Design, Construction and Cost Estimation

1. Design

(1) Breakwater

Based on the characteristics of rubble mound and composite caisson type breakwaters, the breakwater was considered in eight sections and the cross sections for each were decided according to water depth. Design wave height ranges from 3.5 m to 7.5 m. The northern breakwater has a larger section than the southern breakwater, because of the predominant wave direction.

(2) Mooring facilities

The open-type structure was adopted for the general cargo berth (water depth −12 m) out of various following structural types: gravitational, steel sheet pile and open.

The open type was also adopted for the bulk cargo berth (water depth −12 m, −10 m). The steel sheet pile structure was adopted for the small craft berth (water depth −4.5 m, −2.0 m).

2. Construction and Cost Estimation

A construction schedule for the short-term plan is presumed and the construction cost is determined accordingly.

(1) Construction schedule

The construction schedule is shown in Table 9-1.

(2) Cost estimation

Construction costs are estimated based on the following conditions:

(a) Estimate of construction costs is based on the prices of April 1982.

(b) Taxes such as import duties and enterprise taxes, land rents and compensations are not included.

(c) Cost estimation for the industrial port is concerned with berths only and does not cover such items as facilities.

(d) The exchange rates between Mexican currency, Japanese yen and U.S. dollars are assumed to be as follows:

US$1.0 = MN$50 = ¥250

Rough construction costs for the short-term plan are shown in Table 9-2.

Table 9-1 Construction Schedule

Classification of facilities	Quantities	First year												Second year												Third year												Remarks
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
Port facilities																																						
Breakwater	4,900m																																					
Wharf																																						
Commercial district																																						
−12m piled wharf	450m																																					
"																																						
−10m "	200m																																					
"																																						
−4.5m sheet pile	650m																																					
Quaywall Fishery district																																						
−4.5m "	455m																																					
"																																						
−2.0m "	320m																																					
Industrial district																																						
−2.2m ~ −7.5m wharf	3,550m																																					
Dredging of channel and basin	68,608,000m³																																					
Port related facilities																																						
Commercial facilities	1 set																																					
Fishery facilities	1 set																																					

Table 9-2 Rough Construction Cost (Mexican peso)

(Unit: thousand pesos)

	First year			Second year			Third year			Total		
	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total	Foreign Currency	Local Currency	Total
Port Facilities	3,898,400	1,907,600	5,806,000	7,824,200	3,004,600	10,828,800	8,130,400	3,215,800	11,346,200	19,853,000	8,128,000	27,981,000
Breakwater	350,000	1,263,800	1,613,800	466,400	1,684,800	2,151,200	466,400	1,684,800	2,151,200	1,282,800	4,633,400	5,916,200
Wharf												
Commercial District												
−12m piled wharf							298,000	158,400	456,400	298,000	158,400	456,400
〃 〃												
−10m 〃							114,000	69,600	183,600	114,000	69,600	183,600
〃 〃												
−4.5m sheet pile quaywall				84,200	93,400	177,600				84,200	93,400	177,600
〃												
Fishery District												
−4.5m 〃				59,000	70,800	129,800				59,000	70,800	129,800
〃 〃												
−2.0m 〃				25,000	28,400	53,400				25,000	28,400	53,400
〃												
Industrial District												
−22m~−7.5m wharf	393,800	343,400	737,200	640,600	503,200	1,143,800	703,000	678,800	1,381,800	1,737,400	1,525,400	3,262,800
Dredging of Channel and Basin	3,154,600	300,400	3,455,000	6,549,000	624,000	7,173,000	6,549,000	624,000	7,173,000	16,252,600	1,548,600	17,801,200
Port related Facilities	−	−	−	429,000	381,400	810,400	1,035,800	1,274,200	2,310,000	1,464,800	1,655,600	3,120,400
Commercial Facilities							1,035,800	1,274,200	2,310,000	1,035,800	1,274,200	2,310,000
Fishery Facilities				429,000	381,400	810,400				429,000	381,400	810,400
Total	3,898,400	1,907,600	5,806,000	8,253,200	3,386,000	11,639,200	9,166,200	4,490,000	13,656,200	21,317,800	9,783,600	31,101,400

Chapter X. Administration and Operation

1. Development and Authority of Administration and Operation

In the development of the new industrial port as a scheme of regional development, an integrated authority of administration and operation is desired for port construction as well as for operation. It is necessary to establish a public organization like the corporation in Lazaro Cardenas Port under the leadership of Mexican Government.

2. Administration and Operation System

The lower organization and task division of Tuxpan Port Authority were studied based upon the analysis of those of Kashima Port, because they basically stem from the same port functions and land uses.

Fig. 10-1 shows as proposed administrative chart of Tuxpan Port Authority.

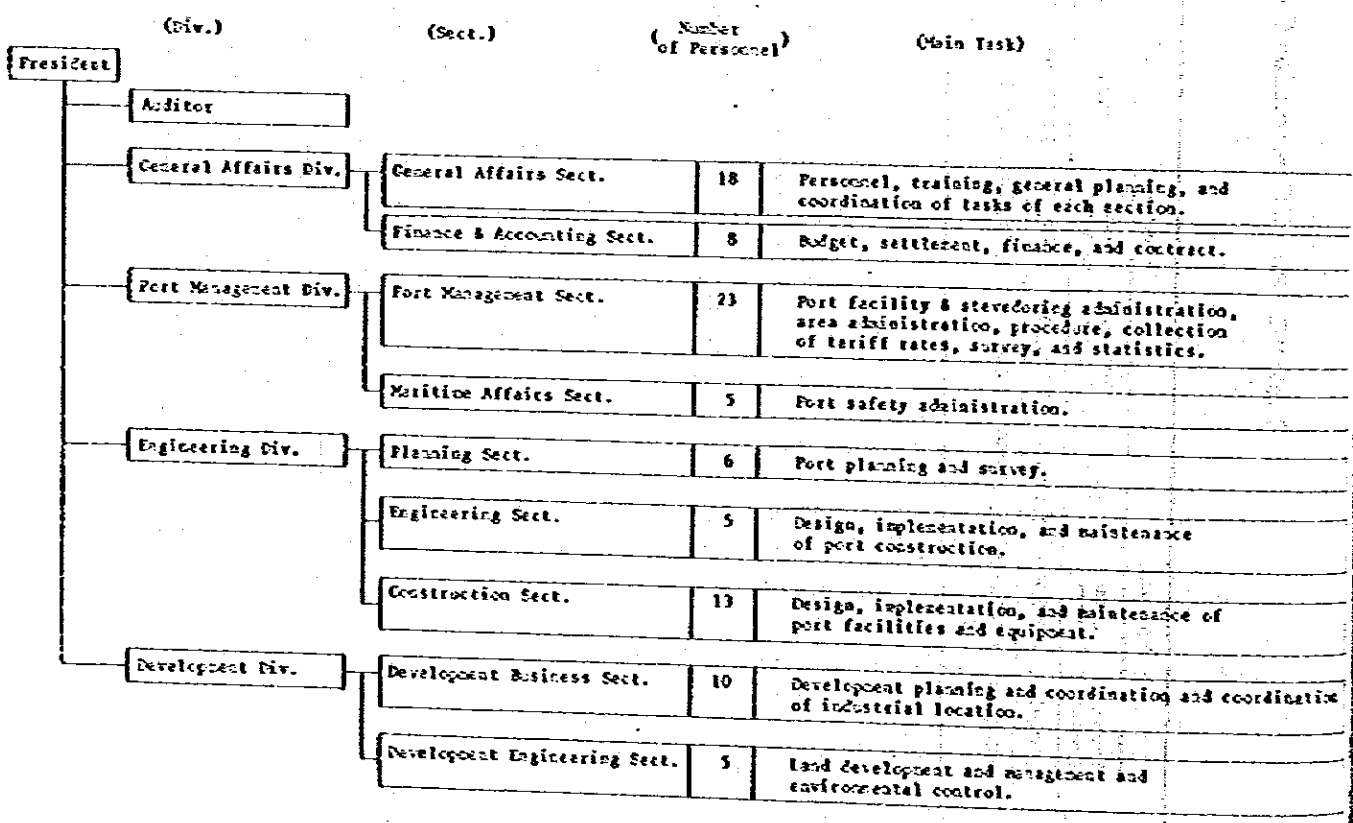


Fig. 10-1 Lower Organization and Task Division of Tuxpan Port Authority

Chapter XI. Economic Analysis

1. General

(1) Objective

The profitability of this project is studied from the standpoint of the national economy for the short-term development plan (target year 1988). The profitability of the Project will be judged from an Internal Rate of Return (IRR) of the Project.

(2) Premises

The followings are assumed in the analysis.

1) Costs of the construction of infrastructures such as railroad, road, industrial water works, power supply are excluded.
2) Port facilities are classified, according to function, into commercial port, industrial port and fishery port functions. For each function, IRR is calculated based on cost and benefit analysis. Finally, the IRR for the entire plan is obtained.
3) Among the commercial port facilities, the container berth planned on the right bank of the Tuxpan river is excluded from the analysis.
4) The analysis is made by the market price, the same as the prices used for cost estimation and the analysis is carried out by Mexican peso of the price of April 1982. The relationships with foreign currencies are as follows:
   1 US$ = 50 MN Peso = 250 Japanese Yen
5) The service life is fixed at 20 years.

2. Each Port Function

(1) Commercial port

1) Cost: Construction cost and operation and maintenance cost of port facility
2) Benefit: Reduction of land transportation cost and ship stay days in the port
3) Analysis: IRR = 1.3%

(2) Industrial port

1) Cost: Construction costs of plants. We assumed that the construction costs of port facilities are included in the construction costs of plants.
2) Benefit: Added values created by the located industries.
3) Analysis: IRR = 13.9%

(3) Fishery port

1) Cost
   i) Construction cost of the fishery port, sea-food processing plant and fishery boats.
   ii) Operation and maintenance cost of the fishery port facilities.
2) Benefit: Added value to the fish catches and to fish processing plant.
3) Analysis: IRR = 30.3%

3. Economic Feasibility of the Project

Table 11-1 shows an IRR calculation sheet for the Project. It is seen from the table that the IRR for the Project will reach 14%, nearly equal to the IRR value for the industrial port function.

If such effects as the benefits induced by port construction work are taken into consideration, the ratio of B/C for the commercial port function increases to 1.80 from 1.10.

Table 11-1 Result of Economic Analysis

(Unit: 10^5 $)

Year	n	Cost-Benefit			Total	13%	14%
		Commercial	Industrial	Fishery			
1984	0		18,750		18,750	18,750	18,750
1985	1	58	31,550	10	31,618	27,982	27,735
1986	2	480	37,220	1,454	39,154	30,661	30,129
1987	3	2,467	37,210	480	40,157	27,833	27,106
1988	4	−79	−22,217	−730	−23,026	−14,122	−13,634
1989	5	−88	"	"	−23,035	−12,503	−11,964
1990	6	−96	"	"	−23,043	−11,068	−10,498
1991	7	−104	"	"	−23,051	−9,799	−9,211
1992	8	−113	"	"	−23,060	−8,675	−8,085
1993	9	−122	"	"	−23,069	−7,680	−7,094
1994	10	−131	"	"	−23,078	−6,799	−6,847
1995	11	−140	"	"	−23,087	−6,019	−5,462
1996	12	−151	"	"	−23,098	−5,329	−4,795
1997	13	−161	"	"	−23,108	−4,719	−4,208
1998	14	−173	"	"	−23,120	−4,178	−3,692
1999	15	−184	"	"	−23,131	−3,699	−3,241
2000	16	−197	"	"	−23,144	−3,275	−2,844
2001	17	−210	"	"	−23,157	−2,899	−2,496
2002	18	−225	"	"	−23,172	−2,567	−2,192
2003	19	−239	"	"	−23,186	−2,275	−1,922
2004	20	−255	"	"	−23,202	−2,014	−1,689
2005	21	−271	"	"	−23,218	−1,783	−1,481
2006	22	−289	"	"	−23,236	−1,580	−1,301
2007	23	−307	"	"	−23,254	−1,398	−1,142
Total		−530	−319,655	−12,656	−332,796	−7,155	−78

IRR=14.0

Chapter XII. Financial Analysis

1. Purpose and Premises of Financial Analysis

The purpose of the analysis is to examine the revenue and expenditure, source and application of funds and financial state of the Short Term Development Plan of the Public Commercial Wharves and further to indentify problems and countermeasures.

The main premises of the financial analysis are as follows.

(1) Only the investment effects of the Public Commercial Wharves constructed in the industrial port of Tuxpan will be evaluated.

(2) The financial accounting will be started in 1988, the target year of the Short Term Development Plan of the Project.

(3) The revenue will be calculated based on the current port and stevedoring tariff rates authorized by the Mexican government.

(4) As to fund raising, the share of domestic currency shall be disbursed from Government funds, and the share of foreign currency shall be covered by overseas loans with the annual interest rate of 3 percent and repayment term of 30 years (with 10 years of grace period).

2. Result of Financial Analysis

The result of the examination of the financial statements is that the revenue at the current tariff rates shall be sufficient to cover the operating cost and the interest of loans, but not sufficient to meet the depreciation expense. This poses a problem in the financial accounting.

3. Contermeasures

In order to maintain the financial soundness and the profitability of this project, it will be necessary to consider the following measures:

(1) Re-study of the level of tariff rates

(2) Introduction of public funds

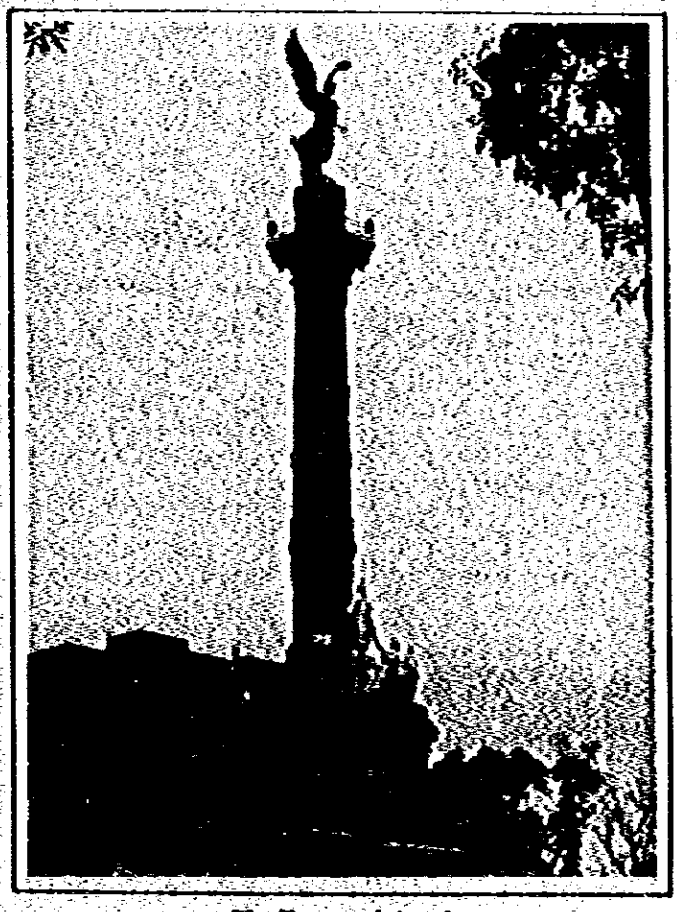
1) Government subsidy for operating funds

2) Additional government subsidy for investment funds

Through the introduction of public funds, it is highly recommended to secure financial self-support, since this project contributes greatly to the regional development and is expected to yield great benefit to the national economy.

If an additional financial analysis is made on the assumption with port dues from the ships transporting industrial cargoes and personnel cost of administrating the industrial port of Tuxpan, the soundness and the profitability of this project can be ensured.

CHAPTER I INTRODUCTION



The Tower of Angel

CHAPTER I. INTRODUCTION

1. Background of the Study

1-1 Socio-Economic Situation

At first, an outline of the socio-economic situation of the country is explained. However, the influence of an economic difficulty in Mexico occurring since the middle of 1981, it is treated in Chapter I-4.

Table I-1-(1) shows GDP and sectoral composition in Mexico during the years 1976 through 1980. From this table it is seen that

1) GDP annual growth rate reaches the range of 8 -- 9 percent.
2) This GDP rise is mainly supported by mining (petroleum in particular) and industry production increases.

Table I-1-(2) shows the total population and the share of urban habitation. The population marked a sharp increase of an annual rate of 3.3 – 3.4 percent, while undergoing great concentration in urban areas.

Table I-1-(3) shows how the population and industries are concentrated in the metropolitan and neighboring areas. As the table shows, an intense or excessive concentration is found in the metropolitan area which amounts to only 4.4 percent of the total land area but contains 34 percent of the national population and 57 percent of the national industrial production.

Table I-1-(1) GDP and Sectoral Composition

Index \ Year		1976	1977	1978	1979	1980
GDP (1970 billion peso)		635.8	657.7	712.0	777.2	841.9
Share (%)	Agriculture Forestry, Fishery	10.0	10.4	10.1	9.1	9.0
	Mining	2.5	2.6	2.7	2.9	3.3
	Industry	24.5	24.5	24.8	25.2	24.9
	Construction	5.4	4.9	5.1	5.3	5.5
	Electricity	1.4	1.5	1.5	1.5	1.5
	Transport, Communication	6.3	6.5	6.7	7.1	7.5
	Commerce, Hotel, Restaurant	25.6	25.2	25.1	25.7	25.7
	Other Service	24.3	24.4	24.0	23.2	22.6
	Total	100.0	100.0	100.0	100.0	100.0

(Source: Anuario Estadistico de los E.U.M. 1980, SPP)

Table I-1-(2) Population

(thousand person)

Item \ Year	1940	1950	1960	1970	1980
Total poplation	19,654	25,791	34,923	48,225	67,382
Urban	6,896	10,983	17,705	28,309	
Rural	12,757	14,807	17,218	19,916	
Share of urban (%)	35	42	51	59	

Note; Annual growth rate 1960 ~ 1970 : 3.3%
1970 ~ 1980 : 3.4%

(Source: Anuario Estadistico de los E.U.M. 1980, SPP)

Table I-1-(3) Concentration to the Metropolitan Area

Area \ Item		Population	Area	Industrial Production	Added value of commerce	Population density
		(10^3 person)	(10^3 km^2)	(10^9 $)	(10^9 $)	(person/km^2)
Country		67,383	1,967	473.1	89.92	34.4
Metropolitan Area	DF	9,373	1.5	140.2	34.67	6,336.0
	Hidalgo	1,517	21.0	9.7	0.57	72.8
	Puebra	3,280	32.9	18.4	2.15	97.0
	Tlaxcala	547	3.9	2.4	0.16	136.7
	Morelos	932	4.9	5.3	0.60	188.5
	Mexico	7,546	21.5	95.5	5.88	352.7
	Sub Total	23,195	86.7	271.5	44.03	
	Share (%)	34.4	4.4	57.4	49.0	
	Statistical Year	1980		1975	1975	

(Source; Anuario Estadistico de los E.U.M. 1980, SPP)
(Source; X Censo Industrial 1976, SPP)

1-2 Development Plan

The Government of Mexico has formulated a series of development plans for promoting social and economical development in the country. Major development plans related to this project are as follows:

(1) Global Development Plan (Plan Global de Desarrollo)

This plan (hereinafter referred to as PGD) was presented to the public in April, 1980 as an overall plan under which many subsequent plans such as National Industrial Development Plan

and National Urban Development Plan, described later, were organized. In this plan, many basic policies were established, among which the following four are primary objectives.

1) To construct a nation that is economically, politically and culturally independent.
2) To improve employment and welfare. (Increase employment by 20 million by the year 2000 and improve the quality of life)
3) To accelerate economic growth. (Average GDP growth rate: 8 percent; scale of economy in 2000 is to be five times as large as the level in 1980)
4) To improve income distribution (between individuals, production sectors, and regions)

(2) National Industrial Development Plan (Plan Nacional de Desarrollo Industrial)

This plan (hereinafter referred to as PNDI) was established in March, 1979. It includes the following six basic strategies.

1) To increase the production of basic consumer goods.
2) To strengthen export competitiveness.
3) To improve industrial structures and accelerate industrialization.
4) To disperse economic activities to rural districts
5) To protect and develop smaller enterprises
6) To strengthen cooperation between government and private circles.

The economic frame of the plan is devided into two phases, one for the period of 1979 to 1982; the other for the period of 1983 to 1990. The following guidelines (Table I-1-(4)) have been established. To achieve these objectives, development areas have been established to expand industrial production outside the Metropolitan area.

Table I-1-(4) Planning Frame of PNDI

(Unit: percent)

Item \ Year		1978	1979	1980	1981	1982	1982 ~85	1985 ~90
GDP (1975 billion peso)		1,603	1,713	1,853	2,027	2,248	3,037	5,015
Annual growth rate of GDP (%)		6.5	7.1	8.2	9.5	10.6	10.2	10.5
Sector (%)	Agriculture, Forestry,	0.8	2.5	2.7	2.9	3.5	3.5	2.9
	Mining	−2.4	6.1	9.1	8.6	10.5	8.3	7.7
	Petroleum, Petrochemical	36.5	38.3	24.6	22.0	8.9	6.7	8.3
	Manufacturing	6.4	6.6	8.2	9.7	12.4	12.1	10.8
	Construction	14.4	6.6	10.4	11.4	13.4	13.2	14.8
	Electricity	9.0	9.9	11.1	12.5	14.7	14.5	14.0
	Commerce, Service	4.6	5.4	6.8	8.4	10.6	10.1	10.5

(3) National Urban Development Plan

This was announced in May, 1978. It was decided to create ten development regions in the country so as to stop the further overconcentration of the population in the three major cities, namely, Mexico city, Guadalajara and Monterrey.

1-3 Industrial Port*

Under the development plan mentioned above, the Mexican Government has made it a policy to construct a number of coastal area industrial complexes since the coastal area is less developed than the central high land. In creating such coastal area industrial complexes, a deep sea industrial port is indispensable.

At present, there are nine locations to be developped as industrial ports, shown in Fig. I-1-(1). Among these, five ports, i.e. Altamira, Ostion, Dos Bocas, Salina Cruz and Lazaro Cardenas have first priority to be developed and now construction work is partly under way. Fig. I-1-(2) shows the location of existing commercial ports.

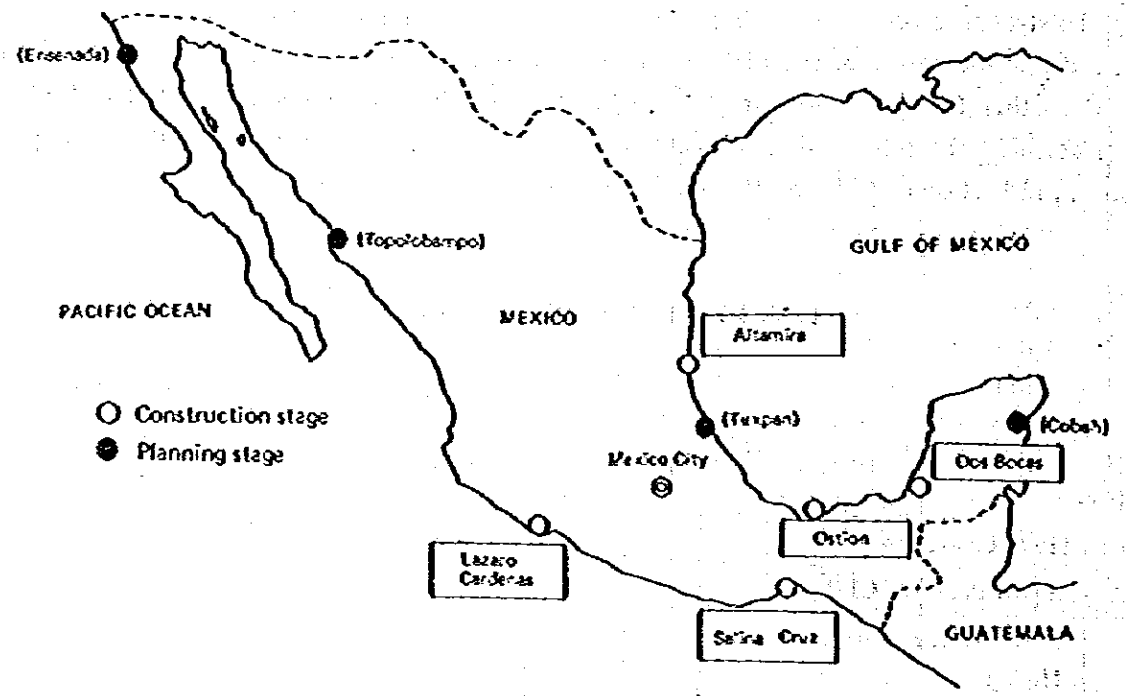


Fig. I-1-(1) Location of Industrial Port

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* As to the Industrial Port Construction Plan, the details are reported in the following reports.
1) Report of Study on the Development Plan of Industrial Ports in Mexico, March, 1981, JICA.
2) Ditto. (Second Phase) March, 1982, JICA.

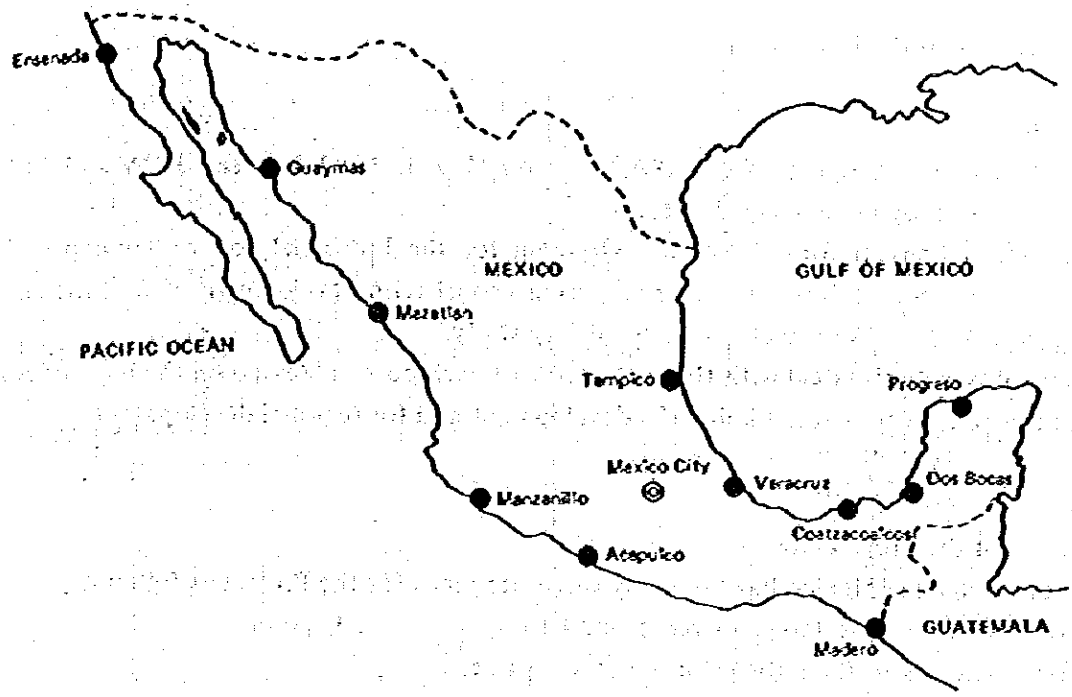


Fig. I-1-(2) Location of Commercial Port

2. Objective and Method of Survey

2-1 Objective

According to the Scope of Work concluded on May 4, 1982 between JICA and CPI, the objectives of the study are described as follows.

1) The study aims at formulating a masterplan for the Industrial Port of Tuxpan with the target year around 2000 as well as preparing a short term development plan of the Port for the period up to 1988, including a feasibility study.
2) The study will also deal with the proper role of each port in Mexico on the basis of reviewing the policies for overall industrial development and for regional development.

2-2 Method

(1) Selection of the project site

The government of Mexico has originally three site plans for the Project as follows;

Site I: North of the Tuxpan river, around Tampamachoco Lagoon

Site II: Estuary of the right bank of the Tuxpan river

Site III: South of the Tuxpan river, at the range of 5 ~ 15 km from the river

Among of them, we rejected the plan of Site I. The reasons for the rejection will be stated in detail in Chapter VII-1.

(2) Field investigation of natural conditions

Field investigation of natural conditions which will be described in Chapter V-2, was carried out by SCT, government of Mexico.

(3) Flow of survey

The flow charts for the survey is shown in Fig. I-2-(1).

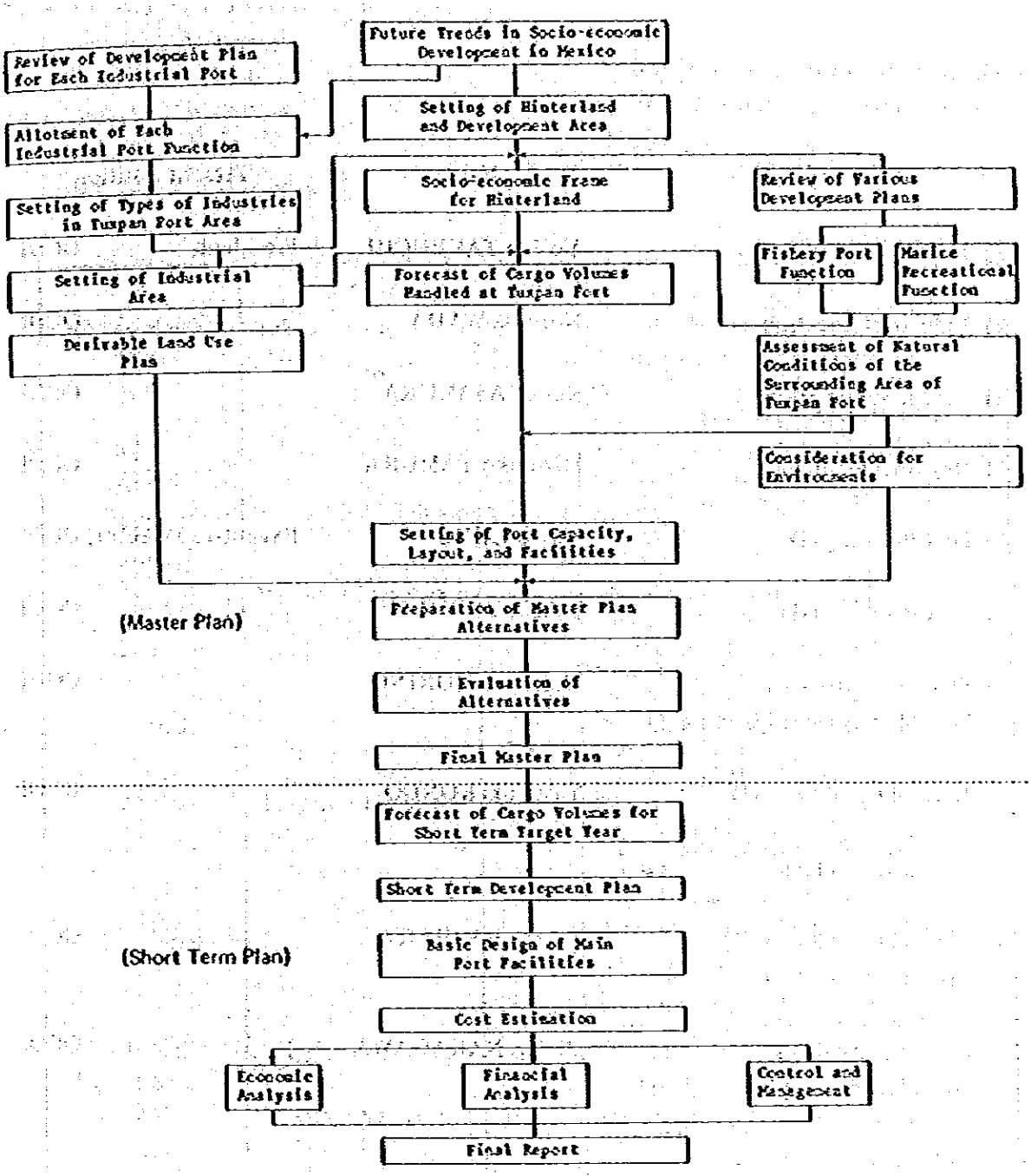


Fig. 1-2-(1) Flow Chart for the Study

3. Field Survey

3-1 Organization of the Survey Team

A survey team was organized as follows.

Duty	Name	Present Position
1) Leader, Overall Study	Yoshio TAKEUCHI	President, OCDI
2) Industrial Location	Norihisa WADA	OCDI
3) Port Demand Survey	Kengo ASAKURA	OCDI
4) Regional Planning	Mizuhiko TAMURA	OCDI
5) Port Planning (I)	Masao OHNO	Executive Director, OCDI
6) Port Planning (II)	Takahisa SOGABE	OCDI
7) Structural Design Port Management Planning (I)	Masaharu MORINO	OCDI
8) Natural Conditions (I) Cost Estimation Construction Plan	Yasuyuki KONDO	OCDI
9) Natural Conditions (II) Economic Analysis	Tsutomu KIHARA	OCDI
10) Financial Analysis Port Management Planning (II)	Michio NAKAGAWA	OCDI

3-2 Field Survey

Field survey was conducted as follows.

1) Preliminary Survey	July, 1982
2) Secondary Survey (Interim Report I)	October, 1983
3) Interim Report (II)	March, 1983
4) Draft Final Report	August, 1983

(1) Preliminary Survey (July, 1982)

Y. Takeuchi	M. Morino
N. Wada	Y. Kondo
K. Asakura	T. Kihara
M. Tamura	M. Nakagawa
M. Ohno	Hozumi KATSUTA (JICA, Coordinator)
T. Sogabe	

Date	Itinerary	Group	Activities
July 19 Mon.	Tokyo → Mexico		Arrived in Mexico city
20 Tue.			Courtesy call on SCT and CPI
21 Wed.			Courtesy call on Japanese Embassy & JICA Explanation of inception report in CPI
22 Thu.			The inception report was agreed by CPI
23 Fri.			Discussion with SCT Schedule arrangement of field survey
24 Sat.			Data collection
25 Sun.			Meeting
26 Mon.	Mexico → Poza Rica → Tuxpan		Observation of PEMEX Poza Rica oil refining factory
27 Tue.			Aerial observation of proposed site Visit of quarries Data collection in SCT Tuxpan
28 Wed.			Discussion with CFE, SARH, PESCA in Tuxpan office Inspection of Tuxpan port
29 Thu.	Tuxpan → Tampico		Call on and data collection in Tuxpan city hall, SCT, Chamber of Industry, TURISMO, CFE, PEMEX in Tuxpan office Inspection of proposed site
30 Fri.			Aerial inspection of Tampico and Altamira port Discussion with CPI Altamira officials Discussion with SCT Altamira officials Inspection of Tampico port by boat
31 Sat.	Tampico → Mexico		Group meeting
Aug. 1 Sun.			Data analysis
2 Mon.	Mexico → Veracruz	A	Discussion and data collection in SCT, PESCA, SARH Veracruz office Inspection of Veracruz port
		B	Data analysis in CPI office
3 Tue.			Data collection in SCT, PESCA, SARH Veracruz office Visit of a ship-building company
	Veracruz → Mexico	A	Return back to Mexico city
	Veracruz → Jalapa	C	Go to Jalapa, capital of Veracruz state
	Mexico ⇔ Cuernavaca	B	Inspection of Nissan automobile assembling factory
4 Wed.	Mexico → Acapulco	A	Inspection of Acapulco port, marina, sea leasure park
	Jalapa → Mexico	C	Data collection in Veracruz State office in Jalapa
		B	Data collection in the SUMITOMO METAL Mexico office

Date	Itineraty	Group	Activities
Aug. 5 Thu.	Acapulco → Mexico	A	Data collection in SCT and Secretary of Turism Acapulco office
		B	Data collection in the MITSUBISHI HEAVY INDUSTRY Mexico office
		C	Data analysis in CPI office
6 Fri.			Data analysis Team leader arrived in Mexico city
7 Sat.			Data collection
8 Sun.			Group meeting
9 Mon.		A	Courtesy call on Japanese Embassy JICA, SCT, CPI
		B	Data collection in SPP
10 Tue.		A	Courtesy call on PEMEX
		B	Data analysis
11 Wed.	Mexico → Tampico	A	Inspection of Tuxpan port
		B	Data analysis
12 Thu.	Tampico → Mexico	A	Inspection of Tampico and Altamira port
		B	Data analysis
13 Fri.	Mexico ↔ Lazaro Cardenas	A	Inspection of Lazaro Cardenas port Discussion with SCT Lazaro Cardenas officials
		B	Data analysis Discussion with SAHOP, SPP officials
14 Sat.			Data analysis
15 Sun.			Group meeting
16 Mon.	Mexico → Coatzacoalcos	A	Inspection of Coatzacoalcos port Discussion in SCT Coatzacoalcos office
		B	Preparation of provisional report
17 Tue.	Coatzacoalcos → Mexico	A	Discussion in SCT Coatzacoalcos office
		B	Discussion with SARH officials Preparation of provisional report
18 Wed.			Preparation of provisional report
19 Thu.	Mexico → Cancun	A	Inspection of Cobah port
		B	Preparation of provisional report
20 Fri.		A	Discussion with concerned officials
		B	Preparation of provisional report
21 Sat.	Cancun → Mexico	A	Return back to Mexico city
		B	Preparation of provisional report
22 Sun.			Group meeting
23 Mon.			Submit of the provisional report to CPI Signature of Minutes of Discussion
24 Tue.			Reporting to Japanese Embassy and JICA
25 Wed.	Mexico → Tokyo		Departure from Mexico city
26 Thu.			Arrival in Tokyo

(2) Secondary Survey (October, 1982)

Y. Takeuchi
T. Sogabe
T. Kihara
K. Asakura
M. Tamura
N. Wada

Date	Itinerary	Group	Activities
Oct. 27 Wed.	Tokyo → Mexico		Arrival in Mexico city
28 Thu.			Courtesy call on Japanese Embassy and JICA
			Submitting 30 copies of Interim (I) report to CPI
			Call on SCT
29 Fri.			Schedule arrangement in CPI
30 Sat.			Preparation of presentation
31 Sun.			Group meeting
1 Mon.			Preparation of presentation
2 Tue.			Preparation of presentation
3 Wed.			Presentation of the Interim Report (I)
			Team leader arrived in Mexico city
4 Thu.		A	Courtesy call on Japanese Embassy
		B	Data collection
5 Fri.	Mexico → Tuxpan	A	Discussion with CPI official
		B	Field trip to Tuxpan
6 Sat.		A	Group Discussion
		B	Field trip at Tumilco Lagoon, proposed site of the new city
7 Sun.		A	Data analysis
		B	Inspection around the proposed site of a new airport
			Data collection in SCT Tuxpan
8 Mon.		A	Call on Japanese Embassy and JICA
		B	Discussion with the mayor of Tuxpan
			Field trip in the development area
9 Tue.	Mexico ↔ Salina Cruz	A	Visit to Ostion, Salina Cruz port
		B	Field trip in the development area
		C	Data analysis in CRI
10 Wed.	Mexico → Manzanillo	A	Visit to Manzanillo port
	Tuxpan → Poza Rica	B	Meeting with the mayor of Poza Rica
		C	Data collection in Mexico city
11 Thu.	Manzanillo → Gudalajara	A	Discussion with SCT Manzanillo office
	Poza Rica → Mexico	B	Field inspection around Poza Rica
			Return back to Mexico city
		C	Discussion in CPI
12 Fri.	Guadalajara → Mazatlan	A	Inspection of La Paz port
		B	Exchange view with officials of SPP, SAHOP, CPI
13 Sat.	Mazatlan → Mexico	A	Inspection of Mazatlan port
			Return back to Mexico
		B	Meeting
14 Sun.			Meeting

Date	Itinerary	Group	Activities
Oct. 15 Mon.	Mexico → Houston	A	Discussion with CPI officials
		B	Leave for Houston
16 Tue.		A	Signature of Minutes of Discussion
		B	Data collection in Houston Port Authority
17 Wed.		A	Reporting to Japanese Embassy and JICA
		B	Inspection of Houston port
18 Thu.	Mexico → Tokyo	A	Departure from Mexico city
	Houston → Tokyo	B	Departure from Houston
19 Fri.	Tokyo		Arrival at Tokyo

(3) Interim Report (II) (March, 1983)

Y. Takeuchi
T. Sogabe
M. Nakagawa
T. Kihara
M. Morino
K. Asakura

Date	Itinerary	Group	Activities
Mar. 9 Wed.	Tokyo → Mexico		Arrival in Mexico city
10 Thu.		A	Courtesy call on Japanese Embassy and JICA office
			Schedule arrangement in CNCP
	Mexico → Coatzacoalcos	B	Inspection of Coatzacoalcos and Ostion port
			Discussion with concerned officials
11 Fri.		A	Brief explanation of Interim Report (II) in CNCP
	Coatzacoalcos → Mexico	B	Discussion with concerned officials
12 Sat.			Preparation of presentation of the Interim Report (II)
13 Sun.			Meeting
14 Mon.		A	Presentation of the Report in CNCP
	Mexico → Tuxpan	B	Field trip to Tuxpan area
15 Tue.		A	Call on Japanese Ambassador and Minister, FONDEPORT president
		B	Discussion with concerned officials in SCT Tuxpan
16 Wed.		A	Call on PEMEX
			Exchange view with the officials of SCT
	Tuxpan → Mexico	B	Data collection in SCT Tuxpan
17 Thu.			Exchange view with concerned officials of SARH, FONDEPORT, SDUE
18 Fri.			Discussion with SCT
			Signature of Minutes of Discussions
19 Sat.			Final discussion with the chairman of CNCP
20 Sun.	Mexico → Tokyo		Departure from Mexico city
21 Mon.	Tokyo		Arrival in Tokyo

(4) Draft Final Report

Y. Takeuchi
T. Sogabe
T. Kihara
M. Nakagawa
S. Naruse (JICA, Coordinator)

Date	Itinerary	Group	Activities
Aug. 29 Mon.	Tokyo → Mexico		Arrival in Mexico city
30 Tue.			Courtesy call on Japanese Embassy and JICA office Call on CNCP.
31 Wed.			Submitting of 30 copies of the Draft Final Report to CNCP Presentation in the CNCP office
Sep. 1 Thu.			Group meeting
2 Fri.			Discussion with CNCP
3 Sat.			Visit to Mr. Luna's house for exchanging views
4 Sun.			Data analysis
5 Mon.			Official meeting for exchanging views with concerned authorities in CNCP office
6 Tue.			Discussion with CNCP officials
7 Wed.			Reporting to Japanese Embassy and JICA office Signature of minutes of Discussion
8 Thu.	Mexico		Departure from Mexico city
9 Fri.	→ Tokyo		Arrival in Tokyo

4. Influence of the Current Economic Situation on the Project

4-1 General

Based on the data mainly from PNDI mentioned in Chapter I-1, prospective commercial cargo volume, kinds of located industries and their sizes will be determined and after that a development plan of the new industrial port will be formulated. Nevertheless, an economical crisis since the middle of 1981 has not only suppressed the national economy but has also compelled the Government to revise downward the economic growth rate projections in the future.

But as for the new medium and long-range economic plans which may replace the former plan, only the National Development Plan has been announced at present (as of November, 1983). This plan is insufficient for overall review of the present work because of the insufficiency of necessary data.

Consequently, in this section we will make a short study on how much the recent economic situation will affect the Project, using data so far collected.

4-2 Current Economic Situation

As mentioned in Chapter I-1, the Mexican economy registered quite a remarkable growth with annual rates of 8 to 9 percent during the years from 1977 to 1980. But since the middle of 1981, a financial crisis occurred, whose causes are stated as follows:

1) Drastic fall of crude oil price and other export commodity prices.
2) Heavy burden of interest repayments due to high international interest rates.
3) Funding difficulties from the international money markets.
4) Capital escape from Mexico.

Yet for 1981, GDP showed a steady increase of 8.1 percent from the year 1980. Meanwhile, prices increased by 29 percent. The economic crisis resulting from this financial difficulty emerged more strongly in 1982. The Government devalued the peso against the dollar (1 US dollar went from 27 peso to 45 peso) in February, 1982. At the same time the prices of basic consumer goods such as food and gasoline were hiked. Those measures could not settle down the economic confusion.

Therefore the Government took such measures as to further devalue the peso (1 US dollar went from 45 peso to 70 peso), to control more strongly the foreign exchange market and to nationalize the banks in order to avert the imminent flight of capital. The actual economic performance of 1982 recorded a recession of 0.2 percent, in the meantime prices increased by 98 percent. As of the end 1982 the foreign exchange rate is 1 US dollar = 150 pesos.

4-3 New Economic Plan (National Development Plan)

According to the National Development Plan announced in May, 1983, the main objective is to overcome the present economic crisis. In this Plan, the economic growth rates for 1983 to 1988 are projected as follows:

YEAR	GROWTH RATES (%)
1983	−2 to −4
1984	0 to 2.5
1985 – 88	5 to 6

Using above figures, GDP at the long-term target year (2000) and at the short-term target year (1988) will be forecast. For economic growth projection, the following premises are used.

1) For 1980 to 1982, the actual growth rates are used.
2) For 1983 to 1988, the mean value of the projected economic growth mentioned above is used.
3) For 1991 to 2000, the values projected in PNDI are used.
4) For 1989 and 1990, the growth rates are extrapolated from the 1988 and 1991 values.

Fig. I-4-(1) compares the new economic growth rates (used for GDP calculation here) with the older ones in PNDI.

Table I-4-(1) shows the projected values of GDP under the new and old plans and the ratio. GDP under the New Plan is about 61% and 58%, compared to Old Plan, for 1988 and 2000 respectively.

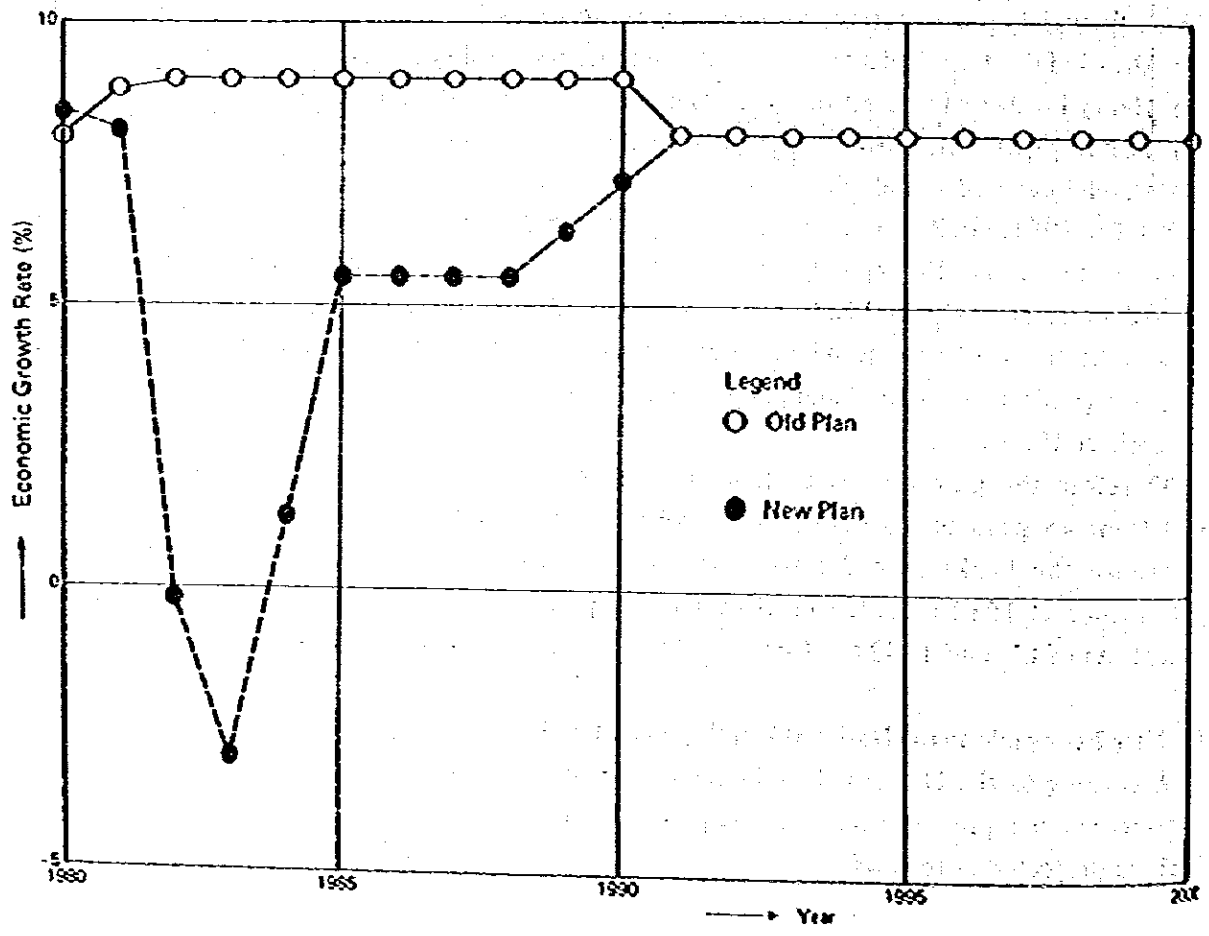


Fig. I-4-(1) Economic Growth Rate

Table I-4-(1) GDP Comparison

year	New Plan		Old Plan		GDP ratio New Plan/ Old Plan
	rate	GDP	rate	GDP	
	%	billion peso	%	billion peso	
1980		841.9		841.9	1.0
1981	8.1	910	8.8	916	0.95
1982	0.2	892	9.0	998	0.89
1983	-3.0	865	10.0	1,099	0.79
1984	1.25	876	"	1,208	0.73
1985	5.5	924	"	1,329	0.70
1986	"	975	"	1,461	0.67
1987	"	1,029	"	1,608	0.64
1988	"	1,085	"	1,769	0.61
1989	6.3	1,153	"	1,946	0.59
1990	7.2	1,236	"	2,140	0.58
1991	8.0	1,335	8.0	2,311	"
1992	"	1,442	"	2,496	"
1993	"	1,557	"	2,710	"
1994	"	1,682	"	2,912	"
1995	"	1,816	"	3,144	"
1996	"	1,962	"	3,397	"
1997	"	2,118	"	3,668	"
1998	"	2,288	"	3,961	"
1999	"	2,471	"	4,279	"
2000	"	2,669	"	4,621	"

4-4 The Influence of the Recent Economic Situation on the Project

It is very difficult to assess precisely the possible influences of the recent economic situation on this project. Therefore, we only forecast here the possible delay of the target years for the project.

Prospective volumes of commercial cargo to be handled at Tuxpan Port are estimated based on such figures as the population, GDP and industrial production in the hinterland.

Industrial cargo volumes are forecast based on the prospect of major industrial commodity production in the country and also on industrial plant location around the new port. Since it is impossible to review all these factors at present, it is assumed that the cargo volumes will slow down at the same pase as the GDP.

Fig. I-4-(2) shows the possible delay of GDP under the new plan as compared with the old plan.

From this we can say that there will be an approximately 6 to 7 year delay for each target year. Consequently, we may assess the target year of the plan in the report as follows. The year 1988 for short-term plan will be delayed to about 1995 while the year 2000 for long term plan will move to somewhere around 2007.

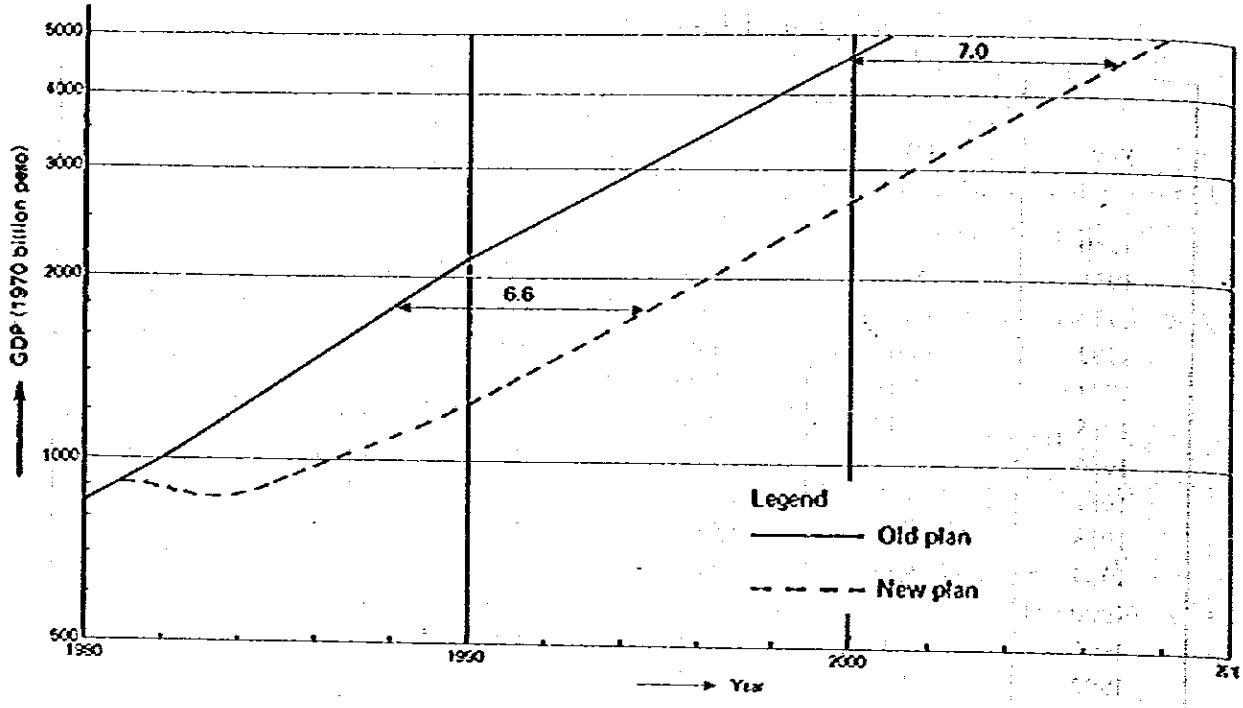
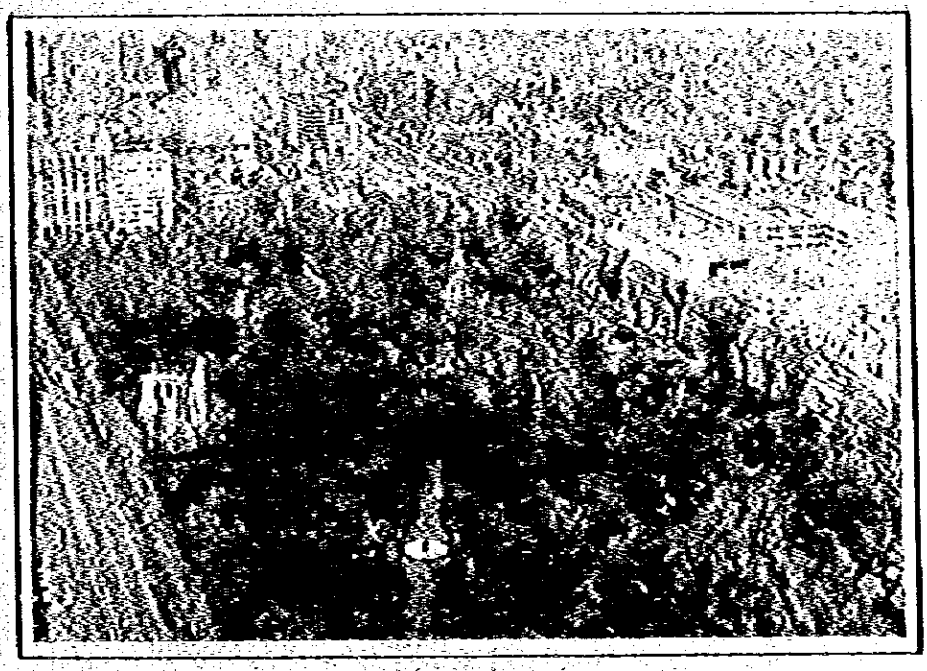


Fig. I-4-(2) Delay of the Project

CHAPTER II
BASIC POLICY ON THE DEVELOPMENT OF TUXPAN INDUSTRIAL PORT AND TUXPAN PORT CITY



Mexico City

CHAPTER II. BASIC POLICY ON THE DEVELOPMENT OF TUXPAN INDUSTRIAL PORT AND TUXPAN PORT CITY

1. Objectives of the Development

The main objective of Tuxpan industrial port development project (hereinafter referred to as the Project) is in a word to help achieve national targets prescribed in the national plans, such as GNP and PNDI. As already mentioned in Chap. I-1, the Government of Mexico has decided to construct five key industrial ports with first priority, that is: Altamira, Ostion, Dos Bocas, Salina Cruz and Lazaro Cardenas. This Project is expected to follow the five key port projects.

Industrial port construction makes it possible to locate big plants around the port such as iron and steel, crude oil refining and so on. Such trunk industries will induce many related industries such as machinery, petro-chemicals to locate around them. Therefore, an industrial complex which will promote the export and strengthen the domestic industry will be formed around the port. It is meant, of course, for the industrial complex to provide large scale job opportunities in the area. Generally, a new town is often constructed around the port for accommodating the large number of new employees needed at the newly located plants.

The effect of the industrial complex and new town development is not limited to the immediate port area but affects a broader area, bringing about the location of new related industries and encouraging the existing local industry.

Tuxpan port has the advantage of being the closest to the Metropolitan area, so it is expected to play an important role as a commercial port. These are other main objectives of the Project.

2. Targets of the Development

Tuxpan port should be developed with the following goals.

1) To be a part of the industrial zone along the Gulf of Mexico: Altamira, Tampico, Tuxpan, Veracruz, Ostion, Coatzacoalcos and Dos Bocas. This is a goal to be realized in the long-term.
2) To supplement Varacruz port as a commercial port, mainly by handling cargo to and from Metropolitan area. This is a goal to be realized in the short or medium-term.
3) To support and promote the "Chicontepec-Tuxpan project", which is mainly focused on crude oil development. (In detail see Chapter IV-2).

3. Setting of the Development Region

(1) Classification of areas influenced by the Tuxpan Industrial Port Development

As shown in Fig. II-3-(1), the area influenced by development of Tuxpan industrial port will be classified into the following three parts.

Area I:

The so-called "Project Site" in which a new port and a new city will be constructed and it will be developed in combination with the existing Tuxpan port and Tuxpan city.

Area II:
Area closely connected to Area I both economically and socially by such factors as people flow and located industries related to Tuxpan industrial complex. This is the development area of Tuxpan-Chicontepec.

Area III:
The so-called hinterland of the new industrial port, including the México City metoropolitan area, where cargo shipments passing through the new industrial port originate and terminate.

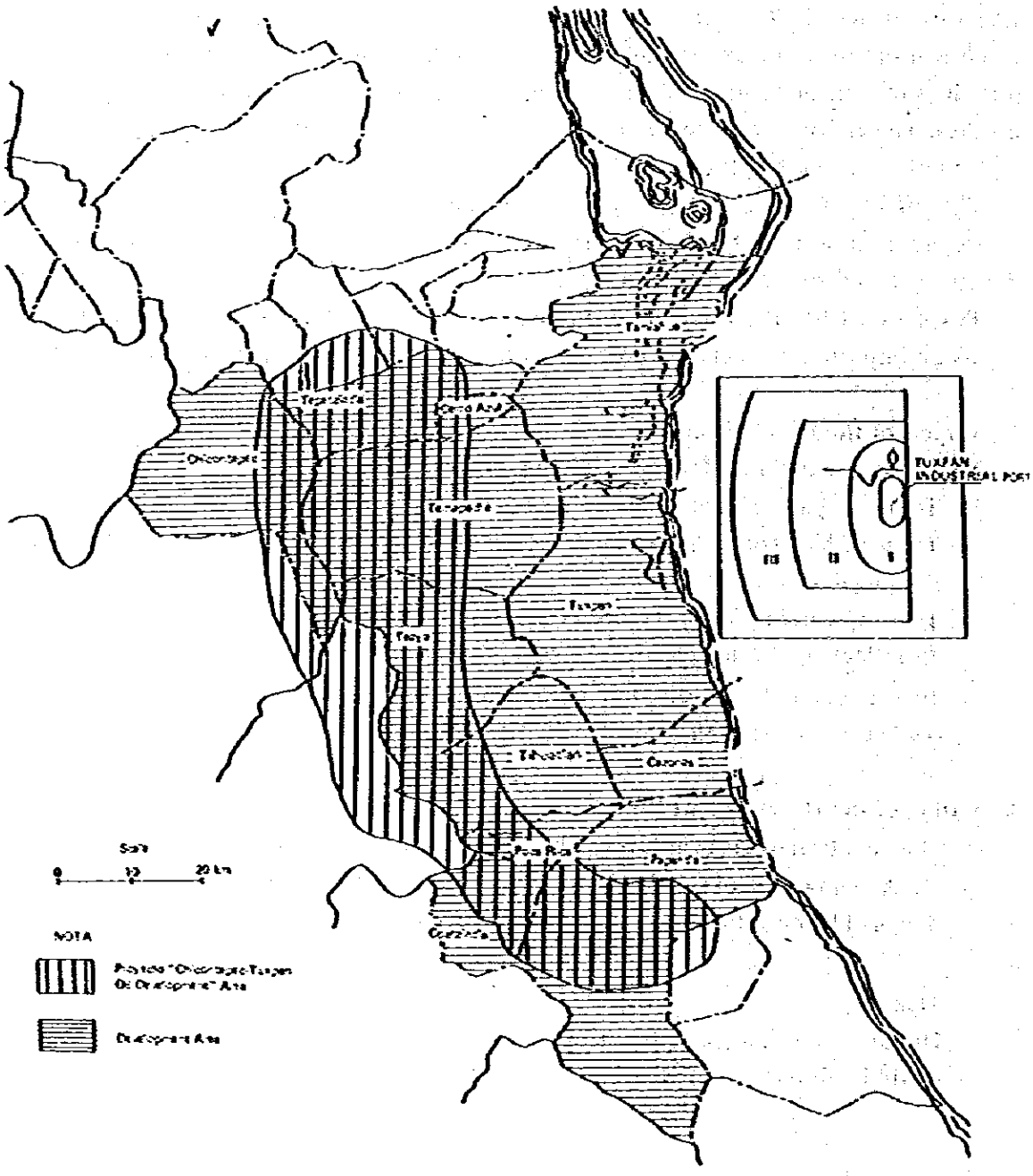


Fig. II-3-(1) DEVELOPMENT AREA

In this report, the overall plans such as the port plan, the land-use plan, and the new city plan are drafted for Area I. Area II is defined as the development area (hereinafter referred to as the Area) and such items as economic frame, urban function of each city, and the traffic network are studied. Area III is the area in which cargo volume is surveyed.

Needless to say Area I is wholly included in Area II, and Area II in Area III.

(2) Development area

The border of the development area (Area II) was decided after full consideration of the following items:

1) Administrative districts of the town and village (municipio)
2) Topographical divisions, such as mountains or rivers
3) Chicontepec crude oil development area
4) Travel time from Tuxpan
5) Allotment of urban functions
6) Allotment of industrial functions, and
7) Larger biosphere of inhabitants

The Development Area includes 12 municipios, as shown in Table II-3-(1).

Table II-3-(1) Development Area

Municipios	Space	Population (1980) (person)
Tuxpan	1,062 km²	88,573
Tamiahua	1,290	29,145
Tepetzintla	246	12,306
Cerro Azul	93	30,329
Chicontepec	978	57,784
Temapache	1,262	89,785
Cazones	265	20,956
Tecayo	447	16,664
Tihuatlan	652	67,490
Coatzintla	285	30,315
Papantla	1,665	124,552
Poza Rica	40	161,455
Total	8,285	729,354