

FINAL REPORT

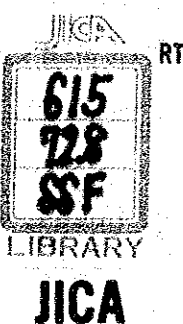
THE STUDY ON THE IMPROVEMENT PLAN OF THE PACIFIC COAST PORTS IN THE UNITED MEXICAN STATES

VOL.2 MAIN REPORT

JULY 1990



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JAPAN INTERNATIONAL COOPERATION AGENCY

FINAL REPORT

**THE STUDY ON
THE IMPROVEMENT PLAN OF
THE PACIFIC COAST PORTS IN
THE UNITED MEXICAN STATES**

VOL.2 MAIN REPORT

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PREFACE

In response to a request from the Government of the United Mexican States, the Japanese Government decided to conduct the study on the Improvement Plan of the Pacific Coast Ports in the United Mexican States and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to the United Mexican States a survey team headed by Mr. Terumi Iijima, and composed of members from the Overseas Coastal Area Development Institute of Japan (OCDI) and Nippon Koei Co., Ltd, three times from April, 1989 to March, 1990.

The team held discussions with concerned officials of the Government of the United Mexican States, and conducted field surveys. After the team returned to Japan, further studies were made and the present report was prepared.

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

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

July, 1990



kensuke Yanagiya, President
Japan International Cooperation Agency

LETTER OF TRANSMITTAL

Mr. Kensuke Yanagiya

President
Japan International Cooperation Agency

Dear Mr. Yanagiya

It is my great pleasure to submit herewith the Report for the Study on the Improvement Plan of the Pacific Coast Ports in the United Mexican States.

This report is the result of studies carried out by the Overseas Coastal Area Development Institute of Japan and Nippon Koei Co., Ltd at the contract of the Japan International Cooperation Agency. Regarding this study, our study team started the study in March, 1989 and conducted three series of field surveys. Based on the field surveys and their analysis in Japan, this report was prepared for the purpose of formulating a long-term development policy for the Pacific Coast ports focusing on the container network system for the target year 2005, examining urgent measures to make the fullest use of the existing facilities and equipment at each port and formulating short-term improvement plans in the two ports selected based on the above mentioned long-term development policy.

The report shows that the project is extremely important, so I hope the project is executed promptly.

On behalf of the study team, let me express my heartfelt thanks to Puertos Mexicanos Secretaria de Comunicaciones and to the other related agencies of the Mexican Government for the generous cooperation, assistance and warm hospitality which were extended to the study team during their stay in Mexico.

Our thanks are also due to the Japan International Cooperation Agency, the Ministry of Foreign Affairs, the Ministry of Transport and the Japanese Embassy in Mexico for their valuable advice and support during the field surveys and the preparation of this report.

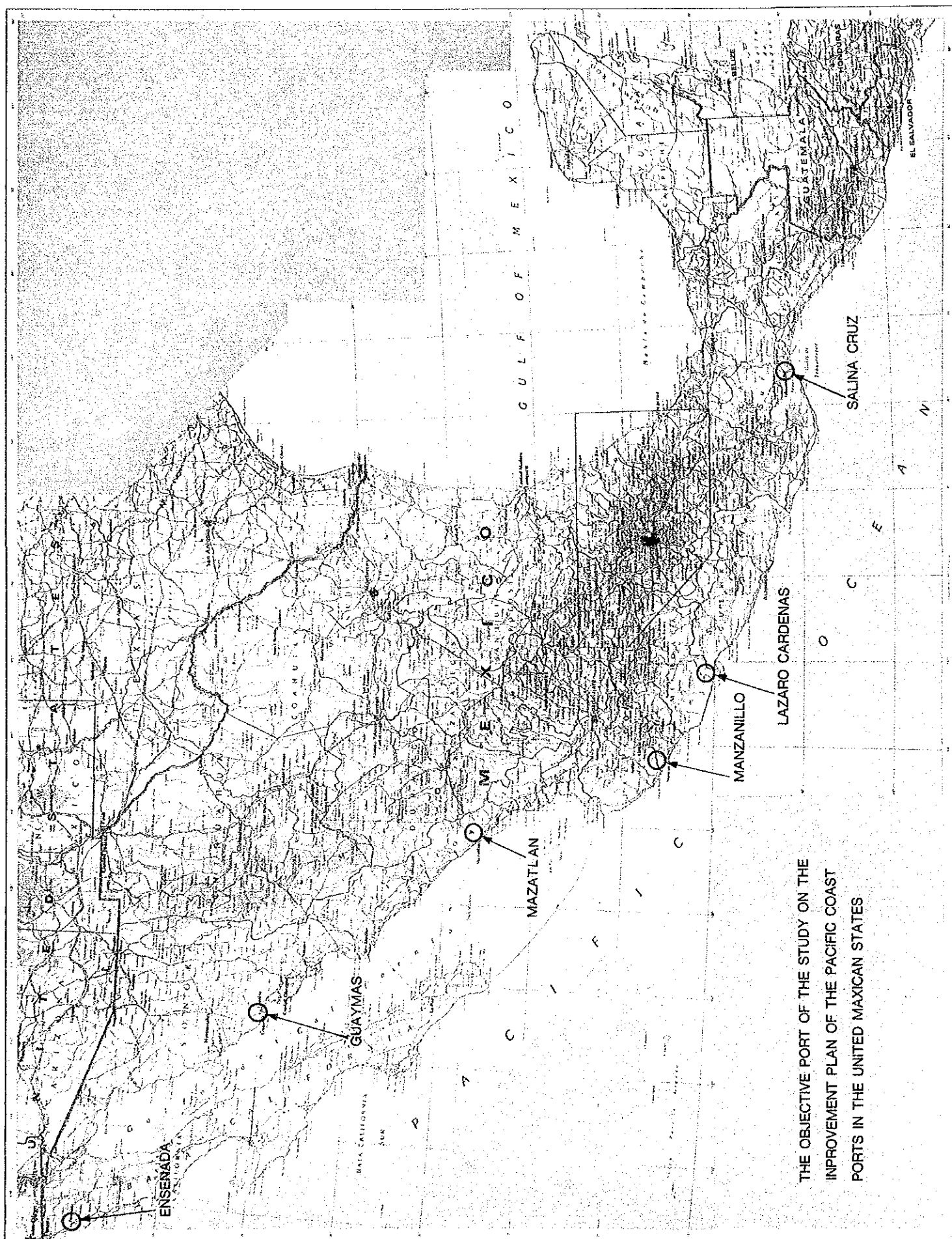
July 1990

Your faithfully,

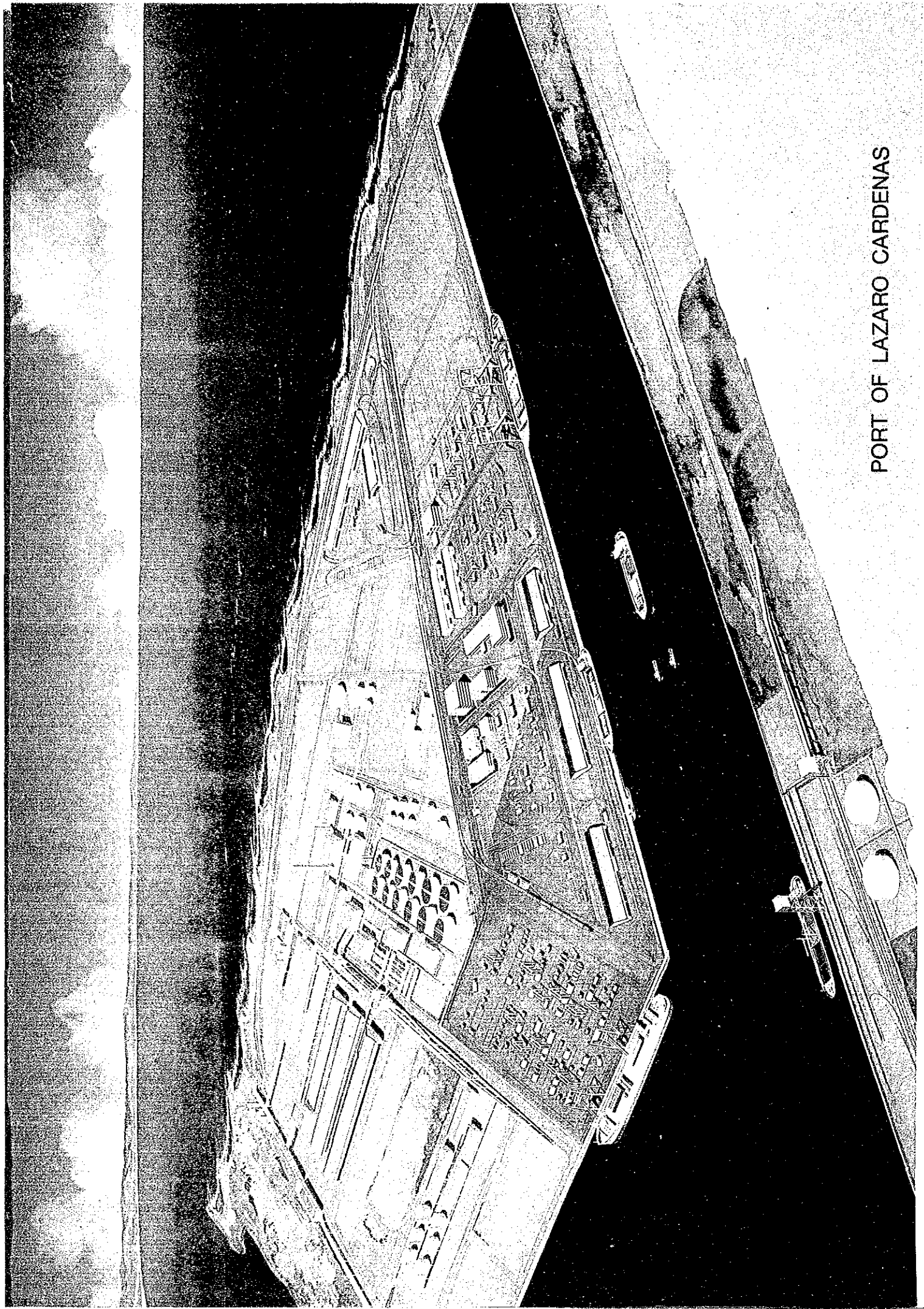


Terumi Iijima,

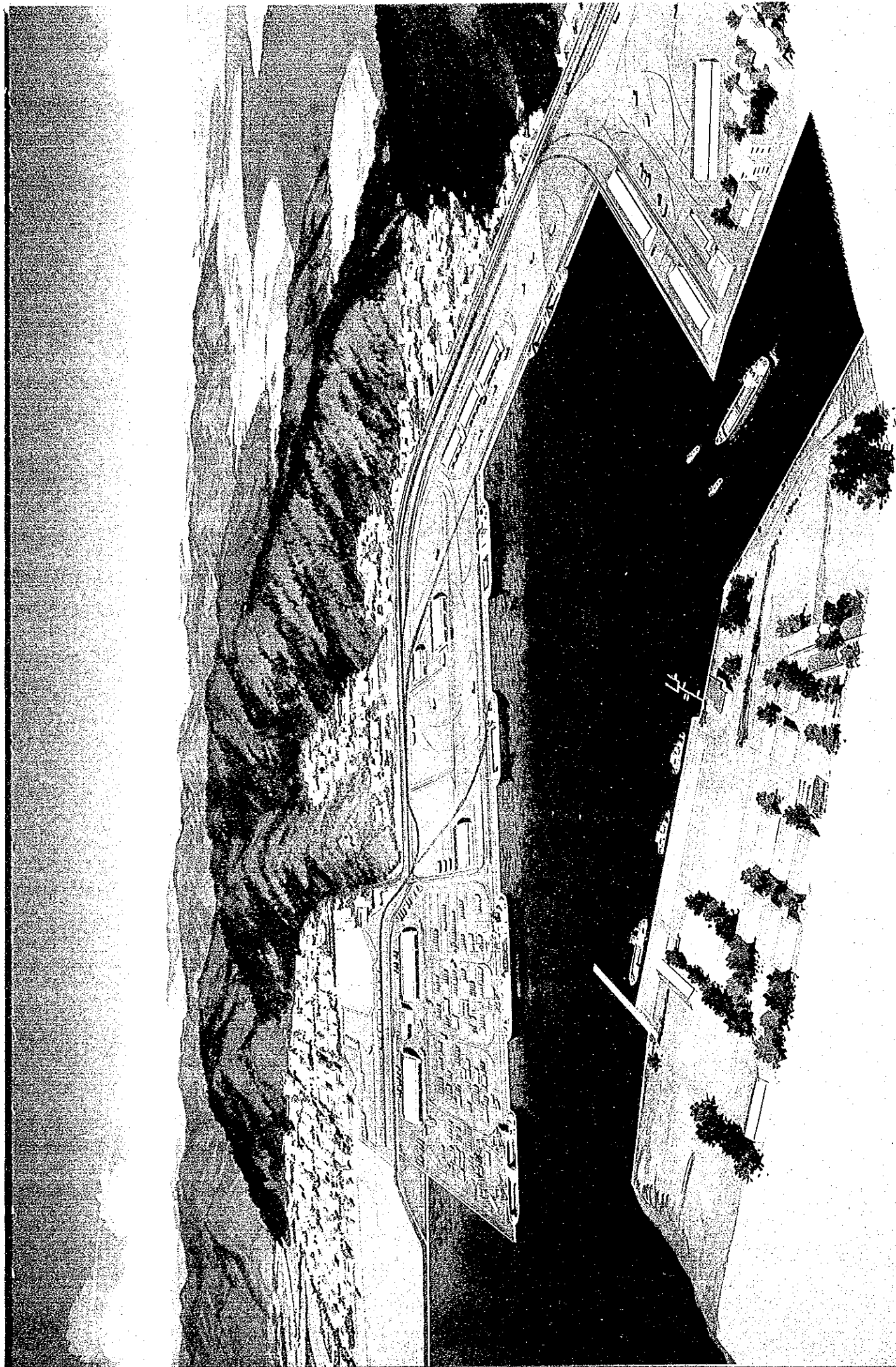
Head
Japanese Study Team for the Study on
the Improvement Plan of the Pacific
Coast Ports in the United Mexican
States
(Executive Director, the Overseas
Coastal Area Development Institute of
Japan)



THE OBJECTIVE PORT OF THE STUDY ON THE
IMPROVEMENT PLAN OF THE PACIFIC COAST
PORTS IN THE UNITED MEXICAN STATES



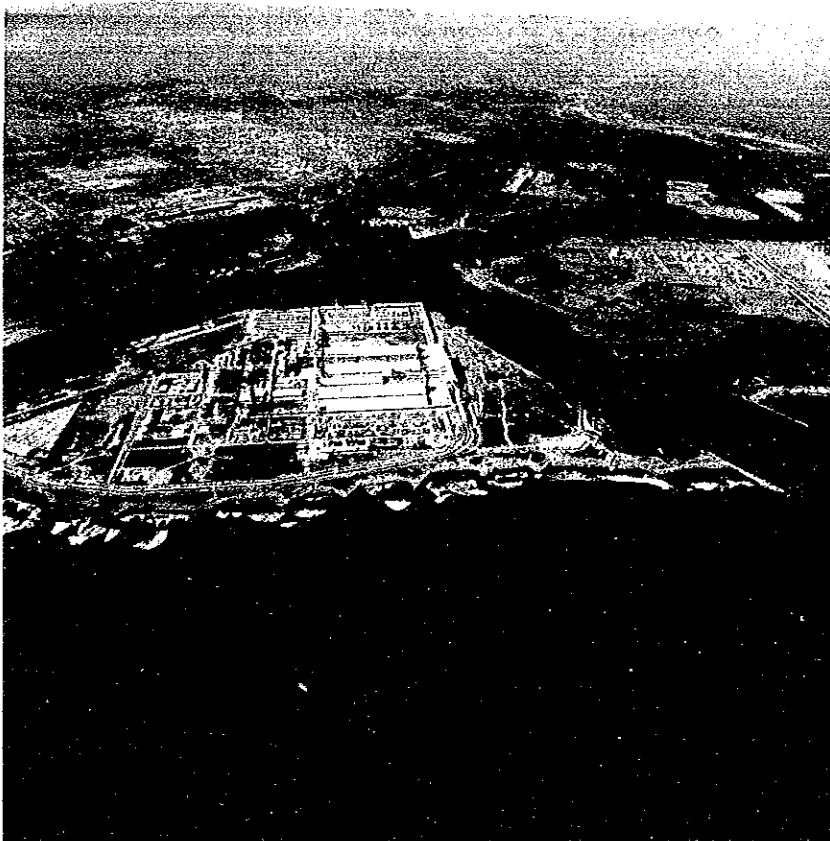
PORT OF LAZARO CARDENAS



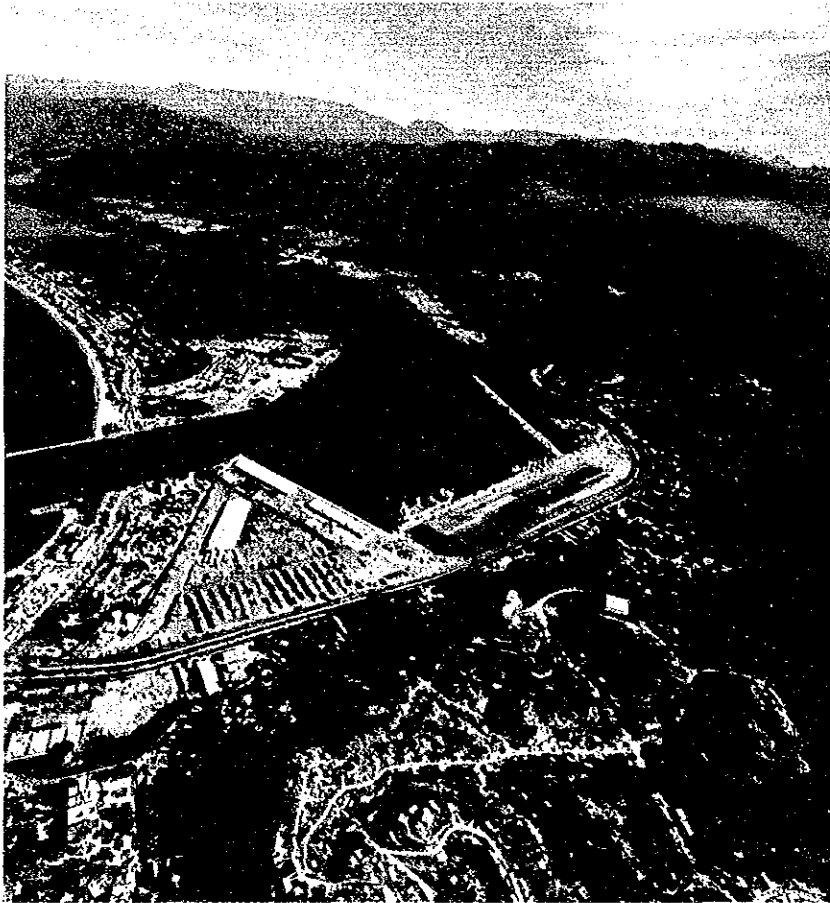
PORT OF MANZANILLO



PORT OF SALINA CRUZ



PORT OF LAZARO CARDENAS



PORT OF MANZANILLO



PORT OF MAZATLAN



PORT OF GUAYMAS



PORT OF ENSENADA

EXCHANGE RATE

US \$ 1 = \$ 2,600 PESOS

US \$ 1 = ¥ 143

(As of October 1989)

ABBREVIATIONS LIST

ANDSA	Almacenes Nacionales de Deposits, S.A.
ASA	Aeropuertos y Servicios Auxiliares
CDL	Construction Datum Level
CFS	Container Freight Station
CKD	Completely Knocked-Down (auto parts)
CLP	Container Load Plan
CNCP	Comision Nacional Coordinadora de Puertos
CONASUPO	Cia. Nacional de Subsistencias Populares
CPF	Caminos y Puentes Federales de Ingresos y Servicios Conexos
CROM	Confederacion Revolucionaria de Obreros Mexicanos
CTM	Confederacion de Trabajadores Mexicanos
CY	Container Yard
DST	Double Stack Train
D/R	Dock Receipt
DWT	Dead Weight Ton
EIR	Equipment Interchange Receipt
ESP	Empresa de Servicios Portuarios
ETA	Estimated Time of Arrival
FERTIMEX	Fertilizantes Mexicanos, S.A.
FDWS	a Fixed Day Weekly Service
FCL	Full Container Load
FIRR	Financial Rate of Return
FNM	Ferrocarriles Nacionales de Mexico (Ferroviales)
GDP	Gross Domestic Product
GRT	Gross Registered Tonnage
G.T	Gross Tonnage
LCL	Less Container Load
M.H.W	Mean Height Water
M.L.L.W	Mean Lowest Low Water
N.A.	Not Available

JICA	The Japan International Cooperation Agency
PEMEX	Petroleos Mexcicanos
ROK	The Republic of Korea
SCT	Secretaria de Comunicaciones y Transportes
SICARTSA	Siderurgica Lazaro Cardenas - Las Truchas, S.A.
SEDUE	Secretaria de Desarrollo Urbano y Ecologia
SPM	Servicio Postal Mexicano
SPP	Secretaria de Programacion y Presupuesto
TEU	Twenty-foot Equipment Unit
TM	Telecomunicaciones de Mexico
TMM	Transportation Maritima Mexicana S.A. de C.V.
TR	Telereservaciones
UNCTAD	United Nations Conference on Trade and Development
\$	U.S. Dollar
\$	Peso

CONTENTS (VOL.2 MAIN REPORT)

Conclusion.....	(1)
Recommendations.....	(10)
Chapter 1. Introduction.....	1
1.1 Background of the Study.....	1
1.2 Objectives of the Study.....	2
1.3 Scope of the Study.....	2
1.4 Study Schedule.....	3
1.5 Organization of the Study Team.....	4
1.6 List of the Counterparts.....	5
Chapter 2. Outline of the Hinterlands of Objective Ports.....	6
2.1 Natural Conditions.....	6
2.2 Socio-Economic Conditions.....	15
2.3 Transportation.....	22
Chapter 3. Present Situation of Each Port.....	33
3.1 General Outline of Port Administration in the United Mexican States.....	33
3.2 Summary of the Pacific Coast Ports in the United Mexican States.....	40
3.3 Port of Salina Cruz.....	42
3.4 Port of Lazaro Cardenas.....	58
3.5 Port of Manzanillo.....	73
3.6 Port of Mazatlan.....	88
3.7 Port of Guaymas.....	102
3.8 Port of Ensenada.....	116
Chapter 4. Principal problems of Each Port.....	129
4.1 Common Items.....	129
4.2 Principal Problems of the Port of Salina Cruz.....	141
4.3 Principal Problems of the Port of Lazaro Cardenas.....	146
4.4 Principal Problems of the Port of Manzanillo.....	151
4.5 Principal Problems of the Port of Mazatlan.....	154

4.6	Principal Problems of the Port of Guaymas.....	157
4.7	Principal Problems of the Port of Ensenada.....	161
Chapter 5.	Demand Forecast.....	166
5.1	Scope and Principal Policy for Demand Forecast.....	166
5.2	Forecast of Total Volume of Export and Import General Cargo....	167
5.3	Forecast of Total Volume of containerized Cargo.....	190
5.4	Origin and Destination Analysis.....	198
5.5	Forecast of General and Containerized Cargo Volume of Each Port.....	216
5.6	Forecast of Bulk Cargo Volume at the Selected ports.....	234
Chapter 6.	Container Network and Long Term Development Policy.....	252
6.1	Basic Conditions.....	252
6.2	Present Situation of International Container Trade.....	262
6.3	Examination of the Container Network.....	266
6.4	Formulation of the Container Network System.....	268
6.5	Long Term Development Policy of Each Port.....	284
Chapter 7.	Improvement Plan of Each Port by the Mexican Side.....	293
Chapter 8.	Recommendations on the Improvement Plans.....	295
8.1	Common Items.....	296
8.2	Recommendations on the Improvement Plan of the Port of Salina Cruz.....	346
8.3	Recommendations on the Improvement Plan of the Port of Lazaro Cardenas.....	352
8.4	Recommendations on the Improvement Plan of the Port of Manzanillo.....	357
8.5	Recommendations on the Improvement Plan of the Port of Mazatlan.....	361
8.6	Recommendations on the Improvement Plan of the Port of Guaymas.....	364
8.7	Recommendations on the Improvement Plan of the Port of Ensenada.....	367

Chapter 9. Long-Term Development Plans in the Selected Ports.....	370
9.1 Long-Term Development Plan for Containerized Cargoes in the Port of Lazaro Cardenas.....	370
9.2 Long-Term Development Plan for Containerized Cargoes in the Port of Manzanillo.....	411
Chapter10. Short-Term Improvement Plans in the Selected Ports.....	441
10.1 Short-Term Improvement Plan for Containerized Cargoes in the Port of Lazaro Cardenas.....	441
10.2 Short-Term Improvement Plan for Containerized Cargoes in the Port of Manzanillo.....	471
10.3 Short-Term Improvement Plans for Bulk Cargoes in the Port of Lazaro Cardenas.....	488
10.4 Short-Term Improvement Plan for Bulk Cargoes in the Port of Manzanillo.....	515
Chapter11. Preliminary Design and Cost Estimate.....	527
11.1 Preliminary Design of the Port of Lazaro Cardenas.....	527
11.2 Preliminary Design the Port of Manzanillo.....	537
11.3 Construction Planning of the Port of Lazaro Cardenas.....	550
11.4 Cost Estimate of the Port of Lazaro Cardenas.....	553
11.5 Construction Planning of the Port of Manzanillo.....	557
11.6 Cost Estimate of the Port of Manzanillo.....	567
Chapter12. Economic Analysis.....	576
12.1 General.....	576
12.2 Port of Lazaro Cardenas.....	584
12.3 Port of Manzanillo.....	601
Chapter13. Financial Analysis.....	617
13.1 Purpose and Methodology of the Financial Analysis.....	617
13.2 Port of Lazaro Cardenas.....	624
13.3 Port of Manzanillo.....	629

List of Table

Table 2. 1. 1	Number of Cyclones (1960-1980).....	12
Table 2. 2. 1	Movement of Population in Mexico.....	16
Table 2. 2. 2	Population Density (1985).....	16
Table 2. 2. 3	Gross Domestic Product by Sector in Constant Price of 1980.....	20
Table 2. 2. 4	Foreign Balance of Payment of Mexico.....	20
Table 2. 2. 5	Sectoral Composition of GDP (1980 price).....	21
Table 2. 3. 1	Annual Growth Rate of GDP.....	23
Table 2. 3. 2	Total Cargo Movement in Mexico.....	23
Table 2. 3. 3	Cargo Movement in Foreign Trade.....	24
Table 2. 3. 4	Share of Marine Transportation in Total Foreign Trade (percentage of national total).....	24
Table 2. 3. 5	Construction of the Road Network.....	26
Table 2. 3. 6	Number of Registered Vehicles.....	26
Table 2. 3. 7	Transportation Time by Road.....	27
Table 2. 3. 8	Total Length of Mexican Railways.....	28
Table 2. 3. 9	Transportation Time by Railways.....	28
Table 2. 3.10	Volume of Cargoes Handled at the Mexican Ports.....	31
Table 2. 3.11	Volume of Cargoes Export by Major Cargo Types.....	31
Table 2. 3.12	Volume of Cargoes Import by Major Cargo Types.....	31
Table 2. 3.13	Containerized Cargo Handled at the Mexican Ports.....	32
Table 2. 3.14	Containerized Ratio of General Cargo.....	32
Table 3. 1. 1	The Summary of Port Dues.....	39
Table 3. 2. 1	Cargo Handling Volume at the Objective Ports.....	41
Table 3. 3. 1(a)	Main Mooring Facilities.....	44
Table 3. 3. 1(b)	Main Breakwaters and Channels.....	44
Table 3. 3. 1(c)	Main Storage Facilities.....	44
Table 3. 3. 2	Number of Vessel Calls at the Port of Salina Cruz....	45
Table 3. 3. 3	Cargo Volume through the Port of Salina Cruz.....	46
Table 3. 3. 4	Containerized Cargo through the Port of Salina Cruz..	47
Table 3. 3. 5	Balance Sheet and Profit/Loss Statement at Salina Cruz.....	49
Table 3. 3. 6	List of Cargo Handling Equipment.....	55
Table 3. 3. 7	Average Age of the Existing Cargo Handling Equipment.	55

Table 3. 3. 8	Ratio of Operating Days of the Equipment to Available Days of the Equipment.....	56
Table 3. 3. 9	Ration of Available Days of the Equipment.....	56
Table 3. 4. 1(a)	Main Mooring Facilities.....	60
Table 3. 4. 1(b)	Main Breakwaters and Channels.....	60
Table 3. 4. 1(c)	Main Storage Facilities.....	60
Table 3. 4. 2	Number of Vessel Calls at the Port of Lazaro Cardenas	61
Table 3. 4. 3	Cargo Volume through the Port of Lazaro Cardenas.....	62
Table 3. 4. 4	Containerized Cargo through the Port of Lazaro Cardenas.....	63
Table 3. 4. 5	Balance Sheet and Profit/Loss Statement at Lazaro Cardenas.....	65
Table 3. 4. 6	List of Cargo Handling Facilities/Equipment.....	70
Table 3. 4. 7	Average Age of the Cargo Handling Facilities/Equipment.....	71
Table 3. 4. 8	Ratio of Operating Days of the Equipment to Available Days of the Equipment.....	71
Table 3. 4. 9	Ratio of Available Days of the Equipment.....	72
Table 3. 5. 1(a)	Main Mooring Facilities.....	75
Table 3. 5. 1(b)	Main Breakwaters and Channels.....	75
Table 3. 5. 1(c)	Main Storage Facilities.....	75
Table 3. 5. 2	Number of Vessel Calls at the Port of Manzanillo.....	76
Table 3. 5. 3	Cargo Volume through the Port of Manzanillo.....	78
Table 3. 5. 4	Containerized Cargo through the Port of Manzanillo...	79
Table 3. 5. 5	Balance Sheet and Profit/Loss Statement at Manzanillo	80
Table 3. 5. 6	List of Cargo Handling Equipment.....	85
Table 3. 5. 7	Ratio of Operating Days of the Equipment to Available Days of the Equipment.....	86
Table 3. 5. 8	Ratio of Available Days of the Equipment.....	86
Table 3. 6. 1(a)	Main Mooring Facilities.....	90
Table 3. 6. 1(b)	Main Breakwaters and Channels.....	90
Table 3. 6. 1(c)	Main Storage Facilities.....	90
Table 3. 6. 2	Number of Vessel Calls at the Port of Mazatlan.....	91
Table 3. 6. 3	Cargo Volume through the Port of Mazatlan.....	92
Table 3. 6. 4	Containerized Cargo through the Port of Mazatlan.....	93
Table 3. 6. 5	Balance Sheet and Profit/Loss Statement at Mazatlan...	94
Table 3. 6. 6	List of Cargo Handling Equipment.....	99

Table 3. 6. 7	Average Age of the Existing Cargo Handling Facilities /Equipment.....	100
Table 3. 6. 8	Total Working Hours in 1988.....	100
Table 3. 7. 1(a)	Main Mooring Facilities.....	104
Table 3. 7. 1(b)	Main Storage Facilities.....	104
Table 3. 7. 2	Number of Vessel Calls at the Port of Guaymas.....	105
Table 3. 7. 3	Cargo Volume through the Port of Guaymas.....	106
Table 3. 7. 4	Containerized Cargo through the Port of Guaymas.....	107
Table 3. 7. 5	Balance Sheet and Profit/Loss Statement at Guaymas...	108
Table 3. 7. 6	List of Cargo Handling Facilities/Equipment.....	113
Table 3. 7. 7	Average Age of the Cargo Handling Facilities/ Equipment.....	114
Table 3. 7. 8	Ratio of Operating Days of the Equipment to Available Days of the Equipment.....	114
Table 3. 7. 9	Ratio of Available Days of the Equipment.....	114
Table 3. 8. 1(a)	Main Mooring Facilities.....	118
Table 3. 8. 1(b)	Main Breakwaters and Channels.....	118
Table 3. 8. 1(c)	Main Storage Facilities.....	118
Table 3. 8. 2	Number of Vessel Calls at the Port of Ensenada.....	119
Table 3. 8. 3	Cargo Volume through the Port of Ensenada.....	120
Table 3. 8. 4	Containerized Cargo through the Port of Ensenada.....	121
Table 3. 8. 5	Balance Sheet and Profit/Loss Statement at Ensenada..	122
Table 3. 8. 6	List of Cargo Handling Facilities/Equipment.....	126
Table 3. 8. 7	Average Age of the Cargo Handling Facilities/ Equipment.....	127
Table 3. 8. 8	Ratio of Operating Days of the Equipment to Available Days of the Equipment.....	127
Table 3. 8. 9	Ratio of Available Days of the Equipment.....	127
Table 4. 3. 1	Operation Days of the Mobile Cranes.....	149
Table 5. 2. 1	Volume of General and Perishable Cargo by Commodity (1986).....	168
Table 5. 2. 2	Historical Trend of Export Cargo Volume in Mexico....	169
Table 5. 2. 3	Historical Trend of the Relation between Economic Indices and Export General Cargo Volume.....	172
Table 5. 2. 4	Export Volume of Sugar through Mexican Ports.....	174
Table 5. 2. 5	Value of Non-Oil Exports (1980 prices).....	176
Table 5. 2. 6	Historical Trend of Import General Cargo Volume in Mexico.....	182

Table 5. 2. 7	Volume of Imported Sugar Rice in General Cargo.....	184
Table 5. 2. 8	Summary of the Forecast Results of General Cargo (Total Volume of the Pacific Coast Ports).....	189
Table 5. 3. 1	Container Cargo Handling at the Mexican Ports by Commodity and Containerized Ratio (1986).....	191
Table 5. 3. 2	Historical Trend of Containerized Cargo in Mexico (Import).....	192
Table 5. 3. 3	Historical Trend of Containerized Cargo in Mexico (Export).....	192
Table 5. 3. 4	Estimated Containerized Ratio of General Cargo in the Pacific Coast Ports.....	195
Table 5. 3. 5	Result of Forecast of Containerized Cargo Volume.....	197
Table 5. 4. 1	Major Ports on which Each State Depends Import and Export 1986 (tons).....	200
Table 5. 4. 2	Domestic Loading Unloading for Each State by Port Year 1986.....	201
Table 5. 4. 3	Overlapping Hinterlands of Import Agricultural Bulk among the Ports.....	215
Table 5. 5. 1	Estimate of General Cargo and Containerized Cargo Import.....	221
Table 5. 5. 2	Estimate of General Cargo and Containerized Cargo Export.....	222
Table 5. 6. 1	Domestic Production and Imported Volume of Agricultural Product.....	237
Table 5. 6. 2	Imported Volume of Agricultural Bulk.....	238
Table 5. 6. 3	Historical Trend of Agricultural Bulk (Import).....	240
Table 5. 6. 4	Volume of Imported Agricultural Bulk Cargo Passing through Gulf Coast Ports and Transported to the Pacific Coast Areas.....	244
Table 5. 6. 5	Results of the Estimation for the Cargo Volume of Imported Agricultural Bulk in 1995.....	246
Table 5. 6. 6	Historical Trend of Agricultural Bulk (Port of Lazaro Cardenas).....	246
Table 5. 6. 7	Historical Trend of Mineral Bulk (Port of Lazaro Cardenas).....	248
Table 5. 6. 8	Historical Trend of Agricultural Bulk (Port of Manzanillo).....	248

Table 5. 6. 9	Historical Trend of Mineral Bulk (Port of Manzanillo)	250
Table 6. 4. 1	Containerized Cargo Tonnage by Trade Area in 2005....	269
Table 6. 4. 2	Top 10 Containerized Volume by Week in 2005.....	270
Table 6. 4. 3	Distance and Necessary Times.....	275
Table 6. 4. 4	Patterns of Feeder Network.....	275
Table 6. 4. 5	Cross Border Cargo Volume by State, 1987.....	282
Table 8. 1. 1	Container Handling Productivity.....	319
Table 8. 1. 2	Necessary Amount of Spare Parts for Corrective Maintenance.....	337
Table 9. 1. 1	Forecast Containerized Cargo Volume of Each Port.....	371
Table 9. 1. 2	Summary of Containerized Cargo by Container Vessel Type (Port of Lazaro Cardenas in 1988).....	373
Table 9. 1. 3	Containerized Cargoes by Container Vessel Type in the Year 2005 (Port of Lazaro Cardenas).....	374
Table 9. 1. 4	Physical Characteristics of Planned Container Vessel and Container Berth in 2005.....	376
Table 9. 1. 5	Berth Occupancy Ratio.....	377
Table 9. 1. 6	Calculation of Required Number of Berths.....	381
Table 9. 1. 7	Results of Required Storage Capacity in Container Yard (Port of Lazaro Cardenas in 2005).....	389
Table 9. 1. 8	Forecast Handling Volume of Break Bulk Cargoes.....	390
Table 9. 2. 1	Summary of Containerized Cargo by Container Vessel Type (Port of Manzanillo in 1988).....	412
Table 9. 2. 2	Containerized Cargoes by Container Vessel Type in the Year 2005 (Port of Manzanillo).....	413
Table 9. 2. 3	Calculation of Required Number of Berths.....	416
Table 9. 2. 4	Results of Required Storage Capacity in Container Yard (Port of Manzanillo in 2005).....	424
Table 10. 1. 1	Containerized Cargoes by Container Vessel Type in the Year 1995 (Port of Lazaro Cardenas).....	442
Table 10. 1. 2	Physical Characteristics of Planned Container Vessel and Container Berth in 1995.....	442
Table 10. 1. 3	Calculation of Required Number of Berths.....	444
Table 10. 1. 4	Required Storage Number of Container Calculated by Average Dwelling Days (Port of Lazaro Cargonas in 1995).....	446

Table 10. 1. 5	Required Storage Number of Container Calculated by Dwelling Curves (Port of Lazaro cardenas in 1995)....	449
Table 10. 1. 6	Results of Required Storage Capacity in Container Yard (Port of Lazaro Cardenas in 1995).....	449
Table 10. 2. 1	Containerized Cargoes by Container Vessel Type in the Year 1995 (Port of Manzanillo).....	471
Table 10. 2. 2	Physical Characteristics of Planned Container Vessel and Container Berth in 1995.....	473
Table 10. 2. 3	Calculation of Required Number of Berths.....	475
Table 10. 2. 4	Required Storage Number of Container Calculated by Dwelling Curves (Port of Manzanillo in 1995).....	476
Table 10. 2. 5	Results of Required Storage Capacity in Container Yard (Port of Manzanillo in 1995).....	477
Table 10. 3. 1	Cargo Volume, Berth Occupancy and Berth Waiting Time.	490
Table 10. 3. 2	Shortage (weight: M/T Percentage).....	492
Table 10. 3. 3	Evaluation of Management Bodies for Grain Silo Operation.....	497
Table 10. 3. 4	Cargo Volume.....	501
Table 10. 3. 5	Productivities of Pellet and Coal.....	502
Table 10. 3. 6	Productivity of Rod & Bar.....	503
Table 10. 3. 7	Productivity of Coil.....	503
Table 10. 3. 8	Productivity of Slab.....	504
Table 10. 3. 9	Programmed Cargo Volume on Sicartsa Berth.....	506
Table 10. 3.10	Handling Capacity per Berth.....	507
Table 10. 3.11	Annual Handling Capacity per Berth.....	509
Table 10. 3.12	Example of Lifting Numbers of Slabs.....	511
Table 10. 4. 1	Forecast Values of Break Bulk and Container Cargoes (Port of Manzanillo).....	516
Table 10. 4. 2	Forecast Values of Bulk Cargoes (Port of Manzanillo).	516
Table 10. 4. 3	Physical Characteristics of Average Size of Vessels and Scale of Berths.....	517
Table 10. 4. 4	Concessions and Facilities.....	522
Table 11. 1. 1	Design Ships and Crane.....	528
Table 11. 1. 2	Natural Conditions.....	529
Table 11. 2. 1	Design Ships and Crane.....	537
Table 11. 2. 2	Natural Conditions.....	538

Table 11. 3. 1	Summary of Project Components (excluding mechanical components).....	552
Table 11. 4. 1	Construction Cost (Direct).....	554
Table 11. 4. 2	Breakdown of Currency Component (Direct).....	555
Table 11. 4. 3	Project Cost of Lazaro Cardenas Port.....	556
Table 11. 5. 1	Typical Stratum Pattern at the Project Terminal Area.	558
Table 11. 5. 2	Summary of Civil Works.....	562
Table 11. 5. 3	Summary of Mechanical Works.....	562
Table 11. 5. 4	Summary of Building Works.....	563
Table 11. 5. 5	Summary of Utility Works.....	563
Table 11. 6. 1	Labour Rate for Cost Estimate.....	567
Table 11. 6. 2	Material Cost for Cost Estimate.....	569
Table 11. 6. 3	Equipment Cost for Cost Estimate.....	570
Table 11. 6. 4	Construction Cost (Direct).....	573
Table 11. 6. 5	Breakdown of Currency Component (Direct).....	574
Table 11. 6. 6	Project Cost of Manzanillo Port.....	575
Table 12. 1. 1	Standard Conversion Factors (SCF).....	582
Table 12. 1. 2	Foreign Trade by Type of Goods.....	582
Table 12. 2. 1	Yard Capacity Limited by the Slots Number (Without Case) (Lazaro Cardenas).....	585
Table 12. 2. 2	Allocation of the Cargo Volume.....	585
Table 12. 2. 3	Share of the Cargo Volume by Hinterlands (1995) (Lazaro Cardenas).....	587
Table 12. 2. 4	Transport Distance and Time between Ports and Hinterland (Lazaro Cardenas).....	587
Table 12. 2. 5	Reduction in Handling Time (1995) (Lazaro Cardenas)..	588
Table 12. 2. 6	Mexican Share in Dry Cargo by Commodity (Excluding Petroleum and its Related Products).....	589
Table 12. 2. 7	The Number of Calling Ship (Type I Vessel).....	591
Table 12. 2. 8	Benefit of the Saving of the Navigation Cost (Lazaro Cardenas).....	591
Table 12. 2. 9	Saving in Time Cost (Lazaro Cardenas).....	592
Table 12. 2.10	Integrated Conversion Factors.....	597
Table 12. 2.11	Calculation of EIRR (Lazaro Cardenas).....	599
Table 12. 2.12	The Result of Sensitivity Analysis.....	600
Table 12. 3. 1	Yard Capacity Limited by the Slots Number (Without Case) (Manzanillo).....	602

Table 12. 3. 2	Allocation of the Cargo Volume.....	602
Table 12. 3. 3	Share of the Cargo Volume by Hinterlands (1995) (Manzanillo).....	603
Table 12. 3. 4	Transport Distance and Time between Ports and Hinterland (Manzanillo).....	603
Table 12. 3. 5	Waiting Time of Bulk Ship (1995) (Manzanillo).....	604
Table 12. 3. 6	Reduction in Handling Time (1995) (Manzanillo).....	605
Table 12. 3. 7	Benefit of the Mexican Economy through Sarring in the Staying Cost (Manzanillo).....	606
Table 12. 3. 8	The Number of Calling Ships (TMM Type Ship).....	607
Table 12. 3. 9	Benefit of Saving of Navigation Cost.....	608
Table 12. 3.10	Saving in Time Cost (1995) (Manzanillo).....	609
Table 12. 3.11	Maintenance Cost (Market Price) (Manzanillo).....	610
Table 12. 3.12	Integrated Conversion Factors (Manzanillo).....	613
Table 12. 3.13	Flow of Construction Cost (Manzanillo).....	613
Table 12. 3.14	Calculation of EIRR (Manzanillo).....	614
Table 12. 3.15	Result of Sensitivity Analysis (Manzanillo).....	615
Table 13. 1. 1	Source of Fund.....	619
Table 13. 1. 2	Loan Condition.....	620
Table 13. 1. 3	Summary of Tariff or Due Rate.....	620
Table 13. 1. 4	Life Cycle and Depreciation Rate of Main Facilities/ Equipment.....	623
Table 13. 2. 1	The Objective Cargo Volumes and the Number of Ships..	624
Table 13. 2. 2	ESP Revenues.....	624
Table 13. 2. 3	Expenditures of ESP.....	625
Table 13. 2. 4	The Revenues of Puertos Mexicanos.....	626
Table 13. 2. 5	Expenditures of Puertos Mexicanos.....	627
Table 13. 2. 6	Calculated Value of FIRR.....	628
Table 13. 3. 1	The Objective Cargo Volumes and the Number of Ships..	629
Table 13. 3. 2	The Revenue of ESP.....	629
Table 13. 3. 3	Expenditures of ESP.....	630
Table 13. 3. 4	The Revenues of Puertos Mexicanos.....	631
Table 13. 3. 5	Expenditures of Puertos Mexicanos.....	632
Table 13. 3. 6	Calculated Value of FIRR.....	634

List of Figure

Fig. 2. 1. 1	Topography of the United Mexican States.....	7
Fig. 2. 1. 2	Geological Map of Manzanillo.....	9
Fig. 2. 1. 3	Geological Map of Lazaro Cardenas.....	10
Fig. 2. 1. 4	Rough Classification of Climate.....	11
Fig. 2. 1. 5	Wave Observation Block off the Pacific Coast of Mexico.....	13
Fig. 2. 2. 1	States and Districts of Mexico.....	17
Fig. 2. 2. 2	Density of Population.....	18
Fig. 2. 3. 1	Location of Main Ports in Mexico.....	30
Fig. 3. 1. 1	Outline of the Port Administration System in Mexico....	35
Fig. 3. 1. 2	Outline of Administrative Chart of the SCT.....	36
Fig. 3. 1. 3	The Organization of an ESP.....	37
Fig. 3. 1. 4	Flow of Port Funds and their Expenditure.....	38
Fig. 3. 3. 1	Port of Salina Cruz.....	43
Fig. 3. 4. 1	Port of Lazaro Cardenas.....	59
Fig. 3. 5. 1	Port of Manzanillo.....	74
Fig. 3. 6. 1	Port of Mazatlan.....	89
Fig. 3. 7. 1	Port of Guaymas.....	103
Fig. 3. 8. 1	Port of Ensenada.....	117
Fig. 5. 2. 1	Historical Trend of Export Cargo Volume in Mexico.....	170
Fig. 5. 2. 2	Correlation between Export General Cargo Volume and Export Value of Non-Petroleum Goods.....	176
Fig. 5. 2. 3	Results of Forecast by Each Method (Export Cargo in 1995).....	178
Fig. 5. 2. 4	Historical Trend of Export Cargo Volume by SICARTSA....	179
Fig. 5. 2. 5	Historical Trend of Import Cargo Volume in Mexico.....	183
Fig. 5. 2. 6	Results of Forecast by Each Method (Import Cargo in 1995).....	187
Fig. 5. 2. 7	Summary of the General Cargo Forecast Results (Total Volume of the Pacific Coast Ports).....	189
Fig. 5. 3. 1	Historical Trend of Containerized Cargo in Mexico.....	190
Fig. 5. 3. 2	Containerized Ratio for General Cargo.....	193
Fig. 5. 3. 3	Estimated Containerized Ratio of General Cargo in the Pacific Coast Ports.....	195

Fig. 5. 4. 1	Hinterland of Salina Cruz for Imported General Cargo...	205
Fig. 5. 4. 2	Hinterland of Salina Cruz for Exported General Cargo...	205
Fig. 5. 4. 3	Hinterland of Lazaro Cardenas for Imported General Cargo.....	206
Fig. 5. 4. 4	Hinterland of Lazaro Cardenas for Exported General Cargo.....	206
Fig. 5. 4. 5	Hinterland of Manzanillo for Imported General Cargo....	207
Fig. 5. 4. 6	Hinterland of Manzanillo for Exported General Cargo....	207
Fig. 5. 4. 7	Hinterland of Mazatlan for Imported General Cargo.....	208
Fig. 5. 4. 8	Hinterland of Mazatlan for Exported General Cargo.....	208
Fig. 5. 4. 9	Hinterland of Guaymas for Imported General Cargo.....	209
Fig. 5. 4.10	Hinterland of Guaymas for Exported General Cargo.....	209
Fig. 5. 4.11	Hinterland of Ensenada for Imported General Cargo.....	210
Fig. 5. 4.12	Hinterland of Ensenada for Exported General Cargo.....	210
Fig. 5. 4.13	Hinterland for Import Agricultural Bulk (Eusenada).....	212
Fig. 5. 4.14	Hinterland for Export Agricultural Bulk (Guaymas).....	212
Fig. 5. 4.15	Hinterland for Export Agricultural Bulk (Mazatlan).....	213
Fig. 5. 4.16	Hinterland for Import Agricultural Bulk (Manzanillo)...	213
Fig. 5. 4.17	Hinterland for Import Agricultural Bulk (Lazaro Cardenas).....	214
Fig. 5. 5. 1	Historical Trend of Share of the General Cargo Volume of Acapulco and Other Pacific Coast Ports.....	219
Fig. 5. 5. 2	Historical Trend and Forecast of General Cargo (Port of Salina Cruz).....	223
Fig. 5. 5. 3	Historical Trend and Forecast of General Cargo (Port of Lazaro Cardenas).....	226
Fig. 5. 5. 4	Historical Trend and Forecast of General Cargo (Port of Manzanillo).....	228
Fig. 5. 5. 5	Historical Trend and Forecast of General Cargo (Port of Mazatlan).....	230
Fig. 5. 5. 6	Historical Trend and Forecast of General Cargo (Port of Guaymas).....	232
Fig. 5. 5. 7	Historical Trend and Forecast of General Cargo (Port of Eusenada).....	233
Fig. 5. 6. 1	Trend of Domestic Production and Import of Agricultural Products.....	235
Fig. 5. 6. 2	Trend and Estimated Value of the Share of Imported	

	Agricultural Bulk (Manzanillo and Lazaro Cardenas).....	241
Fig. 5. 6. 3	Trend and Estimated Value of the Share of Imported Agricultural Bulk (Guaymas, Mazatlan and Ensenada).....	241
Fig. 5. 6. 4	Forecast of Volume of Mineral Bulk at Manzanillo.....	250
Fig. 6. 4. 1	Feeder Vessel Rotations, Case I.....	276
Fig. 6. 4. 2	Feeder Vessel Rotations, Case II.....	277
Fig. 6. 4. 3	Feeder Vessel Rotations, Case III.....	278
Fig. 8. 1. 1	Economical Service Life.....	327
Fig. 8. 1. 2	Optimum Preventive Maintenance Cost.....	330
Fig. 9. 1. 1	Forecast Containerized Cargo Volume (Port of Lazaro Cardenas).....	372
Fig. 9. 1. 2	Alternative Site for Container Terminal (Port of Lazaro Cardenas).....	382
Fig. 9. 1. 3	Quayside Container Crane (40').....	395
Fig. 9. 1. 4	General Layout Plan for Containerized Cargo (Port of Lazaro Cardenas : 2005).....	399
Fig. 9. 1. 5	Layout Plan of Existing Container Terminal and the Area behind the General Cargo Berths (Port of Lazaro Cardenas : 2005).....	401
Fig. 9. 1. 6	Layout Plan of New Container Terminal - Rail-mounted Transfer Crane System : Adopted Plan - (Port of Lazaro Cardenas : 2005).....	402
Fig. 9. 1. 7	Layout Plan of New Container Terminal - Rubber Tyred Transfer Crane System : (Port of Lazaro Cardenas : 2005).....	403
Fig. 9. 1. 8	Example of New Organization for the Container Terminal (Port of Lazaro Cardenas).....	407
Fig. 9. 2. 1	Forecast Containerized Cargo Volume (Port of Manzanillo).....	412
Fig. 9. 2. 2	Alternative Site for Container Terminal (Port of Manzanillo).....	420
Fig. 9. 2. 3	Quayside Container Crane (40').....	428
Fig. 9. 2. 4	General Layout Plan for Containerized Cargo (Port of Manzanillo : 2005).....	432
Fig. 9. 2. 5	Layout Plan of Container Terminal (Port of Manzanillo : 2005).....	433
Fig. 9. 2. 6	Example of New Organization for the Container Terminal	

	(Port of Manzanillo).....	435
Fig. 10. 1. 1	Model of Dwelling Containers at Container Yard.....	448
Fig. 10. 1. 2	Movement of Dwelling Container by Arrival of Type I Container Vessel (Port of Lazaro Cardenas).....	448
Fig. 10. 1. 3	Layout Plan of Existing Container Terminal and the Area behind the General Cargo Berths (Port of Lazaro Cardenas).....	457
Fig. 10. 1. 4	Ground Slot Allotment of Container Yard (Port of Lazaro Cardenas : 1995).....	458
Fig. 10. 1. 5	Layout Plan of CFS Area (Port of Lazaro Cardenas:1995).	459
Fig. 10. 2. 1	Movement of Dwelling Container by Arrival of Type I Container Vessel (Port of Manzanillo).....	476
Fig. 10. 2. 2	Layout Plan of Existing Container Terminal (Port of Manzanillo : 1995).....	484
Fig. 10. 2. 3	Ground Slot Allotment of Container Yard (Port of Manzanillo: 1995).....	485
Fig. 10. 3. 1	80,000T Grain Silo Complex, Lazaro Cardenas.....	490
Fig. 10. 3. 2	Existing General Plan, Sicartsa Berth, Lazaro Cardenas.	502
Fig. 10. 3. 3	General Plan for Expansion, Sicartsa Berth, Lazaro Cardenas.....	505
Fig. 10. 3. 4	Example (1) of Multi-purpose Crane for Final Products, Lazaro Cardenas.....	513
Fig. 10. 3. 5	Example (2) of Multi-purpose Crane for Final Products, Lazaro Cardenas.....	514
Fig. 10. 4. 1	Berth Allocation Plan of Inner Port Area (Port of Manzanillo : 1995).....	519
Fig. 10. 4. 2	Wharf Use Plan of Inner Port Area (Port of Manzanillo : 1995).....	521
Fig. 10. 4. 3	General Arrangement Plan, for A, B, C and D, Manzanillo.....	523
Fig. 10. 4. 4	Examples of Shiftable Conveyor.....	525
Fig. 10. 4. 5	Planning (1) of Wagon Loader.....	526
Fig. 10. 4. 6	Planning (2) of Wagon Loader.....	526
Fig. 11. 1. 1	Plan of Soil Investigation.....	529
Fig. 11. 1. 2	Soil Profile at the Port of Lazaro Cardenas.....	530
Fig. 11. 1. 3	Container Berth (Long-term Plan 2005 L = 10030m = 300m).....	533

Fig. 11. 1. 4	Pavement Structure.....	535
Fig. 11. 1. 5	Plane of Pavement Zone.....	536
Fig. 11. 2. 1	Plan of Soil Investigation.....	539
Fig. 11. 2. 2	Soil Profile, Section 1-1.....	540
Fig. 11. 2. 3	Container Berth (Short-term Plan 1995 L = 10@25m = 250m).....	544
Fig. 11. 2. 4	Container Berth (Short-term Plan 1995 L = 1@50m = 50m).....	545
Fig. 11. 2. 5	Pavement Structure.....	548
Fig. 11. 2. 6	Plane of Pavement Zone.....	549
Fig. 11. 5. 1	Location of Quarry Sites, Manzanillo Port Zone.....	560
Fig. 11. 5. 2	Mother Port of Construction Crafts.....	561
Fig. 11. 5. 3	Preliminary Construction Schedule (Manzanillo Port)....	566
Fig. 12. 1. 1	Process of Economic Analysis.....	577
Fig. 13. 1. 1	Flow Chart of Financial Analysis.....	619

CONCLUSION

1. Need for Urgent Measures and Development of the ports

(1) Need for the Urgent Measures at the Ports

The development of infrastructures in the transport sector is one of the most significant issues in the United Mexican State in line with the government's policy of stabilizing and developing the national economy. However, because of the limited funds available for the development of infrastructures in the short term, there is an urgent need for measures to be taken which would allow the most efficient and fullest utilization of infrastructures without a large amount of investment.

The main ports on the Pacific coast of the United Mexican States, namely the Ports of Salina Cruz, Lazaro Cardenas, Manzanillo, Mazatlan, Guaymas and Ensenada, now suffer from many problems, such as superannuated facilities/equipment, low cargo handling productivity and shortage of cargo handling facilities/equipment.

Therefore there is an urgent need to examine and implement measures that will effectively cope with the present problems at the port, thus contributing to their fullest and most effective use.

(2) Need to Develop Selected Ports

Container traffic through the objective ports has been showing remarkable progress. But the facilities/equipment and productivity of container handling are not sufficient, having lead to problems in dealing with this increased traffic. It is thus necessary to develop and improve the port facilities/equipment and operations regarding container handling.

Taking into consideration an optimum cost/benefit conception for investment as well as the sailing costs of large container vessels, it is important to examine the rational container network among the ports on a long-term basis and select the pivotal base ports for container vessels' calling. These selected ports need to be developed and the operational ability of container handling at them must be improved.

On the other hand, another crucial issue at the ports is improving the facilities/equipment and operation for handling bulk cargoes, which are one of the main types of cargoes passing through the ports. Improvement in handing these cargoes along the lines mentioned above is urgently required.

2. Demand Forecast and Container Network

(1) Demand Forecast

The general and containerized cargo volume through the ports on the Pacific coast are forecast in the years 1995 and 2005 as follows:

(Unit:1000tons)

	1988	1995	2005
General Cargoes	1,247	2,630	4,600
Containerized Cargoes	647	1,841	3,758
Containerized Ratio	52%	70%	82%

(Note:Excluding general cargoes by SICARTSA)

The handling volume of containerized cargoes is forecast to grow significantly due to greater amounts of general cargoes and the promotion of containerization.

The container traffic demands through each port are estimated as follows:

(Unit:1000tons)

	1988	1995	2005
Salina Cruz	161	301	501
Lazaro Cardenas	154	522	1,119
Manzanillo	164	636	1,284
Mazatlan	21	95	202
Guaymas	134	194	315
Ensenada	-	42	103

(2) Container Network

The container network among the ports on the Pacific coast is examined taking into account the forecast results of container traffic through the ports and geographical conditions of the ports.

The Ports of Lazaro Cardenas and Manzanillo are selected as pivotal base ports which container mother vessels are assumed to call at on a fixed day weekly service basis.

Other ports except Ensenada are to act as feeder ports connected to

the base ports by domestic feeder routes. As for the Port of Salina Cruz, the direct calls of some container mother vessels are also assumed.

Two feeder service routes, one connecting Manzanillo with Mazatlan and Guaymas and another connecting Lazaro Cardenas with Salina Cruz, are proposed as comprising the most feasible network.

3. Recommendations on the Urgent Improvement Plans

The recommendations regarding the urgent improvement plans of the ports are proposed covering a series of comprehensive items with respect to urgent measures as follows:

1) Utilization of the ports

- . Establishment of a system for promoting utilization of the port
- . Promotion of containerization at the ports
- . Formulation of the master plans of the ports and make them available to the public
- . Investigation of the possibility of promoting domestic maritime transportation

2) General port administration

- . Strengthening of the management constitution of the ESP
- . Improvement of the coordination and communication system among the ESPs and other local governmental organizations

3) Tariff system

- . Simplification of the tariff system
- . Carrying out cost accounting for individual tariffs
- . Taking full account of the need to improve cargo handling efficiency in the tariff system

4) Cargo handling unions

- . Taking the necessary measures regarding the existence of more than one union
- . Taking integrated measures to improve productivity

5) Statistics

- . Allocation of more responsibility for preparing port statistics to

Puertos Mexicanos

- . Strengthening the statistics sections in the ESPs
 - . Improvement of port statistics regarding vessels, cargoes, containers and others
- 6) Procedures of ship entry/exit and customs formalities
- . Promotion of further coordination among related bodies
 - . Requesting the simplification and unification of customs formalities
 - . Requesting reform of the fumigation system
- 7) Land transportation and storage system in the port area
- . Requesting repair and construction of the roads and railways connecting the ports with their hinterlands
 - . Requesting the required number of trucks and freight cars from the port side
 - . Promotion of coordination to secure necessary number of trucks and freight cars
 - . Promotion of installation of adequate storage facilities in the port area
 - . Taking necessary and effective measures to reduce the dwelling time of cargoes at the port area
 - . Investigation of the installation of inland depots for container transportation
- 8) Cargo handling operation
- . Formulation of cargo handling plans and supervision of cargo handling activities by ESP
 - . Preparation of a manual describing the standard activities of ship cargo supervisors
 - . Preparation of a container operation manual at the container terminals
 - . Taking comprehensive measures to improve container handling productivity
 - . Taking necessary measures to prevent large handling/storage losses and contamination during bulk cargo handling
 - . Improvement of the training system for workers

9) Cargo handling facilities/equipment and maintenance system

- . Examination of the optimum possession level of cargo handling facilities/equipment and spare parts at each port
- . Preparation of a replacement or disposal plan for cargo handling facilities/equipment at each port
- . Establishment of an effective maintenance policy and system
- . Promotion of the disposal of superannuated equipment
- . Management and utilization of the records and data effectively
- . Making clear the role of Puertos Mexicanos

10) Port facilities (except cargo handling facilities/equipment)

- . Promotion of the rehabilitation of superannuated facilities at the ports
- . Carrying out construction works based on the long-term master plans of the ports

4. Long-term Development Plans in the Selected Ports

(1) Port of Lazaro Cardenas

The long-term development plan (master plan) in the Port of Lazaro Cardenas is formulated with regard to the amount of containerized cargoes expected in the target year 2005.

The handling volume of containerized cargoes in the target year is estimated to be around 2,360 thousand tons, including domestic feeder cargoes.

Two container berths are planned to meet the anticipated container traffic demand. One is the existing berth with a length of 286m and water depth of 14m. The other is a newly planned berth with a length of 300m and water depth of 14m, which it is proposed be located in the area adjacent to the general cargo berths.

An area use plan for the area behind the general cargo berths is proposed. This area is to be used for an empty container yard, office area, open storage yards and other purpose.

A rubber-tyred transfer crane system is adopted as the operation system at the existing container terminal, while a rail-mounted transfer crane system is proposed for the newly planned terminal, considering the relatively narrow width of the terminal.

(2) Port of Manzanillo

The long-term development plan (master plan) for the Port of Manzanillo is formulated with respect to containerized cargoes for the target year of 2005.

The handling volume of containerized cargoes in 2005 is estimates to be around 2,480 thousand tons, including domestic feeder cargoes.

Two container berths are required to accommodate the anticipated container traffic demand in the target year. Two continuous berths with lengths of 300m and water depths of 14m each are proposed at the C band area of the port.

A rubber-tyred transfer crane system is adopted as the operation system at the proposed container terminal.

5. Short-term Improvement Plans in the Selected Ports

(1) Port of Lazaro Cardenas

1) Improvement plan for containerized cargoes

The short-term improvement plan for containerized cargo is formulated with a target year of 1995, based on the master plan of this port.

The estimated handling volume of containerized cargo in 1995 is 522 thousand tons. One container berth is required to accommodate the container traffic in the target year.

Therefore, the existing berth is where the reformed utilization of the container yard along with the installation of the required cargo handling equipment are proposed.

The use plan for the area behind the general cargo berths is proposed in line with the master plan. This area will be used mainly as an empty container yard in 1995.

The operation system at the terminal is the same as in the master plan : a rubber tyred transfer crane system.

The construction cost component of the project is limited to modernization of container handling facilities/equipment, pavement of yards and roads and other items. The project cost is estimated at 48.4 billion pesos (prices as of october 1989). Around 59% of the project cost comprises the foreign price portion.

2) Improvement plans for bulk cargoes

The improvement of the grain silo operation is examined. The recommendations in this connection concern the coordination needed to ensure sufficient land transportation means, the significance of maintenance of the overall silo system and others.

As for the management/operation body of the silo complex, a private or third sector is recommended as preferable to the ESP, given the vitality and adaptability required for management/operation of the silo complex.

In the next place, the improvement of cargo handling operations at the SICARTSA berth is examined focussing on the handling productivity. Assuming operations improve, it will be possible to handle projected volume of cargoes arriving at the port annually from 1990 to 1995 on the existing berths.

3) Economic and financial analyses

The short-term improvement plan for containerized cargoes is evaluated on an economic basis using the EIRR (Economic Internal Rate of Return), which is calculated based on a cost-benefit analysis from the viewpoint of the national economy. Benefits considered are the reduction in land transportation cost, ships' staying cost and cargo handling costs, while costs are construction and maintenance costs. The calculated EIRR, using 30 years as the period of calculation, is 29.05%. This shows that the project is sufficiently advantageous from the viewpoint of the national economy.

The port finances, regarding the above project are analyzed using the financial statement from the viewpoint of each management body of the ESP and the local office of Puertos Mexicanos. The profitability of the project itself is analyzed based on the FIRR (Financial Internal Rate of Return) using the Discount Cash Flow Method. The analyzed results show that, given the relatively low portion of loans in the total fund, each management body will maintain its financial viability throughout the entire project life and will be able to pay all expenditures and repay long-term loans. As to the profitability of the project itself, the FIRR is expected to be 10.06. This result shows that the project is feasible from the financial point of view.

Judging from the above, it is concluded that the short-term improvement plan for containerized cargoes with a target year of 1995 is

feasible both economically and financially.

On the other hand, the short-term improvement plans for bulk cargoes, which are dealt with in this report, do not require much investment. Therefore, judging from the expected benefits, the projects are considered feasible, both economically and Financially.

(2) Port of Manzanillo

1) Improvement plan for containerized cargoes

The improvement plan for containerized cargoes with the target year of 1995 is formulated based on the master plan.

The projected handling volume of containerized cargoes in 1995 is 636 thousand tons. One berth is required to meet the container traffic in the target year. The required scale of the berth is 300m in length and 13m in water depth.

The operation system at the terminal is the same as that in the master plan: a rubber tyred transfer crane system.

The construction cost of the project is estimated at 136.4 billion pesos (prices as of october, 1989). Around 44% of the project cost belongs to the foreign price portion.

2) Improvement plans for bulk cargoes

The berth and land use plans of the inner port area are examined and proposed based on the demand forecast and assuming the concessions for bulk cargo handling.

Improvement of cargo handling operation at the band B berths is examined. The recommendations are proposed regarding ensuring enough number of freight cars and trucks and other items.

3) Economic and financial analyses

The short-term improvement plan for containerized cargoes is evaluated economically according to the same concept and methods used for the Port of Lazaro Cardenas. The calculated EIRR is 13.75% showing that the project is advantageous from the viewpoint of the national economy.

The above project is evaluated financially using the same concept and methods as the Port of Lazaro Cardenas. The analyzed results shows that given the low ratio of loans to the total fund, each management body will

be viable and will be able to pay all expenditures and repay long-term loans. The FIRR of this project is expected to be 6.22% showing that the project is regarded feasible from financial point of view.

Judging from the above, it is concluded that the short-term improvement plan for containerized cargoes with target year 1995 will be feasible both economically and financially.

The short-term improvement plan for bulk cargoes is regarded as feasible both economically and financially for the same reasons given before.

RECOMMENDATIONS

The urgent measures at the ports and the implementation of the projects at the selected ports shall be conducted in accordance with the plans and recommendations presented in this report. The recommendations below concern the main matters which the study team noticed while carrying out the study.

1. In view of the urgency of the projects, the urgent improvement plans at the objective ports and the short term improvement plans at the Ports of Lazaro Cardenas and Manzanillo should be carried out as soon as possible, considering the priority and effects of the projects.

2. Socio-economic factors are in constant flux and the demands of maritime cargo traffic at the ports are greatly affected by changes in the domestic and world economies. Therefore, before implementation, the master plans as well as the long-term cargo demand at the ports should be reviewed taking into consideration the regional and national economic development and the change in port environments.

3. Taking into consideration the long distance between the ports and their hinterlands, the inland transportation of maritime cargoes is a crucial factor. It is strongly recommended to improve the road and railway links connecting the ports with main cities and to coordinate to ensure sufficient land traffic means. Also, installation of storage facilities required at the ports should be encouraged.

4. The countermeasures to meet the increasing volume of containerized cargoes through the ports should be further examined and implemented in an integrated manner taking into account the following points:

- . Promotion to realize the container network among the Pacific coast ports presented in this report.
- . Improvement of land transportation of containers, including bonded transportation.
- . Investigation of the installation of inland depots in the main hinterland cities.

- . Installation of modernized facilities/equipment and improvement in the management and operation of container terminals at the ports.

5. A port management system should be simple and integrated so that the port can be developed and managed effectively according to a consistent policy. In view of the rather complicated port management system at the ports at present, an investigation should be carried out with the aim of simplifying and unifying the management system under the strong control of Puertos Mexicanos.

6. The countermeasures to strengthen the financial constitution of the ESPs should be comprehensively examined aiming at obtaining financial self-dependence based on their own incomes as soon as possible.

In this connection, upgrading the tariff level should be examined based on cost-accounting of individual tariffs and taking into consideration other factors such as the tariff levels at rival ports and a reasonable level of cost bearing by port users.

7. Cargo handling operations should be improved in accordance with the recommendations presented in the report. The key points of the recommendations are as follows:

- . More involvement of ESPs in formulation of cargo handling plans and supervision of cargo handling activities.
- . Upgrading cargo handling productivity, especially with respect to container handling.
- . Improvement of the system regarding cargo handling unions and adequate training of union workers.
- . Preparation of manuals for cargo handling supervision and container terminal operation.

8. Cargo handling facilities/equipment and the maintenance system should be improved in accordance with the recommendations presented in this report. The key points are as follows:

- . Examination of the optimum possession level of cargo handling facilities/equipment at each port.
- . Establishment of the policy and method of preventive maintenance of cargo handling facilities/equipment at each port.

. Examination of the optimum scale of workshops and possession level of spare parts at each port.

9. In the implementation of the project of the container wharf at the Port of Manzanillo, further investigation on the settlement due to the consolidation of the clayey layer should be carried out.

Chapter 1. Introduction

1.1 Background of the Study

- i. The development of the infrastructures and management systems in the transport section is one of the most significant issues in the United Mexican States (hereinafter referred to as Mexico) with the governmental policy aiming at the stabilization and development of the economy. Under this situation, the ports are expected to play a further important and strategic role in Mexico.
- ii. Mexico has around 100 ports, the total cargo of which amounts to 142 million tons in 1986. The total throughput has remained almost constant over the last several years. The ports along the Pacific coast register about one-third of the total cargo volume of Mexico, including 6 main ports which are the objective ports for the study.
- iii. Although the Pacific coast ports in Mexico have been developed continuously, there still exist significant problems in the current port facilities and port operations. Hence the development of the port facilities and operation systems is needed on an urgent basis to contribute to the economic development of Mexico. Taking into consideration the limited funds for investment under the existing financial situation, the urgent measures for the port development should begin with the rehabilitation of the present port facilities and the improvement of administrative and operational systems.
- iv. The formulation of a long-term development policy for the Pacific coast ports, the establishment of a long-term container network system in particular, is also required to cope with the increasing future demand for container cargo. Along with this long-term policy, the efficiency of the ports must be improved in the short term, to be focusing on the ports for container and bulk cargo handling.
- v. Based on this situation, the Government of Mexico requested the Japanese Government to conduct a study on the improvement plan of the Pacific coast ports in Mexico (hereinafter referred to as the study). In response to the request, the Japanese Government decided to conduct the study and entrusted it to the Japan International Cooperation Agency (hereinafter referred to as the

JICA). The JICA sent a preliminary study team headed by Mr. M. Kihara and agreed to carry out the study.

In accordance with the agreement, the JICA organized the study team for the study headed by Mr. T. Iijima (hereinafter referred to as the study team, the managing director of the Overseas coastal Area Development Institute of JAPAN (OCDI).

1.2 Objectives of the Study

The main objectives of the study are to formulate a long-term development policy for the Pacific coast ports focusing on the container network system, to examine urgent measures for the fullest use of the existing facilities and equipment of each port and to formulate short-term efficiency improvement plans for certain ports (hereinafter referred to as the selected ports). The objective ports for the study are Ensenada, Guaymas, Mazatlan, Manzanillo, Lazaro Cardenas and Salina Cruz.

1.3 Scope of the Study

In order to achieve the objectives, the study shall include the follows:

(1) Review/analysis and Diagnosis of the Present Situation of each Port

- i. Review and analysis of the present conditions of the infrastructure, function and environment of each port.
- ii. Analysis of the present situation and recent trend of maritime transportation.
- iii. Identification and classification of the problems and constraints of each port.

(2) Formulation of the Long Term Development Policy and Plan

- i. Demand forecast of general cargo and containerized cargo.
- ii. Analysis of origin-destination structure of general cargo and containerized cargo.
- iii. Establishment of the container network system.
- iv. Development plan of port facilities/equipment and management and operation systems for containerized cargo in the Selected Ports.

**(3) Examination of Urgent Improvement Plan and Recommendation
of Urgent Measures**

- i. Examination of improvement plans of the management and operation systems and cargo handling facilities.
- ii. Recommendation of the urgent measures to be taken on functional and engineering aspects.

**(4) Formulation of Short Term Efficiency Improvement Plans in
the Selected Ports**

- i. Formulation of improvement plan for containerized cargo
- ii. Formulation of improvement plan for bulk cargo
- iii. Preliminary structural design and cost estimation
- iv. Economic and financial evaluation

1.4 Study Schedule

The study was conducted as follows:

(First Site Survey)

- 1) Presentation of the Inception Report : April 1989
- 2) Minutes of Meeting on the Inception Report : April 21th 1989
- 3) Field Surveys : April to July 1989
- 4) Presentation of the Progress Report : July 1989
- 5) Minutes of Meeting on the Progress Report : July 12th 1989

(Second Site Survey)

- 6) Preparation of the Interim Report : August to November 1989
- 7) Presentation of the Interim Report : November 1989
- 8) Minutes of Meeting on the Interim Report: November 16th 1989
- 9) Field Surveys : November to December 1989

(Third Site Survey)

- 10) Presentation of the Draft Final Report : March 1990
- 11) Minutes of Meeting on the Draft Final Report : March 1990

(Final Report)

12) Submission of the Final Report : July 1990

1.5 Organization of the Study Team

The study team was made up of Fourteen (14) experts, Their names, titles and responsibilities are listed below. The JICA coordinators and experts are listed below as well.

(Name)	(Titles)	(Responsibility)
Mr. T. Iijima	Team Leader	Overall Management, Traffic Condition in Hinterlands
Mr. T. Katayama	Expert (Sub Leader)	Port Planning, Demand Forecast
Mr. K. Inoue	Expert (Sub Leader)	Port Planning, Demand Forecast
Mr. Y. Sunohara	Expert	Demand Forecast
Mr. Y. Kida	Expert	Shipping
Mr. H. Kanzawa	Expert	Economic Analysis
Mr. T. Inoue	Expert	Port Management, Financial Analysis
Mr. S. Tanami	Expert	Port Operation (1)
Dr. I. Yamashita	Expert	Port Operation (2)
Mr. T. Shibao	Expert	Cargo Handling Equipment (1)
Mr. M. Nagatomo	Expert	Cargo Handling Equipment (2)
Mr. I. Hirayama	Expert	Cargo Handling Equipment (2)
Mr. N. Murai	Expert	Engineering Design (1)
Mr. Y. Ando	Expert	Engineering Design (2)
Mr. K. Ookubo	Expert	Cost Estimation, Natural Conditions
Mr. K. Otani	JICA Coordinater	
Mr. Y. Sasaoka	JICA Coordinater	
Dr. S. Sato	JICA Expert in Mexico	
Mr. H. Shimada	JICA Expert in Mexico	
Mr. M. Morita	JICA Expert in Mexico	

1.6 List of Counterparts

The counterparts of the study are listed below.

(Name)	(Position)
Lic. Roberto Rios Ferrer	Vocal Ejectivo
Ing. Francisco Martínez Narvaez	Vocal de Planeacion
Ing. Enrique Cárdenas Trigos	Vocal de Operacion
Ing. Hector López Gutiérrez	Gerente de Servicios Portuarios
Ing. Marcial Guzmán Díaz	Subgerente de Control de Operaciones
Ing. Jose A Areán Martínez	Subgerente de Evaluacion de Proyectos
Ing. Roberto Vera Strathman	Subgerente de Estudios Basicos y Investigacions
Ing. Luis Domínguez Martínez	Subgerente de Evaluacion de Proyectos
Ing. Julio Pinter Vega	Subgerente de Estudios
Ing. Profirio León Ruiz	Coordinador de Proyectos
Arq. Tere Leon Palominos	Coordinador de Proyectos
Ing. J. Luis Chavez T.	Jefe de Evaluacion
Arq. Felix Tena R.	Jefe de Evaluacion y Arquitectura Portuaria
Arq. Rodrigo Sanchez Villagomez	Coordinador
Arq. Alvaro Osorio Garcia	Coordinador
Lic. Salvador Barroñ Belmontes	Delegado de Puertos Mexicanos en Salina Cruz
Lic. Carlos Cabanillas Tirado	Delegado de Puertos Mexicanos en Lazaro Cardenas
Ing. Cargos Cao Romero	Delegado de Puertos Mexicanos en Manzanillo
Lic. Cesar Madrazo Lozano	Delegado de Puertos Mexicanos en Mazatlan
Ing. J. Roberto Hernandez Camalich	Delegado de Puertos Mexicanos en Guaymas
Ing. Fernando Castillo Menendez	Delegado de Puertos Mexicanos en Ensenada

Chapter 2. Outline of the Hinterlands of Objective Ports

2.1 Natural Conditions

2.1.1 Geography and Topography

The United Mexican States, the third largest country in Latin America, after Brazil and Argentina, is bordered on the north by U.S.A. Its northern border runs about 2,100km from the Pacific Ocean to the gulf of Mexico, covering the Gulf of Mexico and the Caribbean Sea to the east, Belize and Guatemala to the southeast, and the Pacific Ocean to the south and west. The western coastline including both sides of the Baja California Peninsula and the entire Pacific coast is 7,360km long.

Mexico is a mountainous country and more than 50% of the total area is a highland with the altitude of 1,500m to 2,000m. The average altitude is more than 1,000m, and almost 71% of the total land area lies at above 400m above sea level. The Sierra Madre Occidental and the Sierra Madre del Sur along the western coastline, and the Sierra Madre Oriental along the eastern coastline extend from northwest to southeast. In the isolated areas between these ranges lie several plateaus where the main portion of Mexico's administration, economy, culture and industry are located. The main cities of Mexico are located in these highlands. The basin of Mexico City is at 2,300m altitude; Guadalajara is at 1,500m altitude; and Toluca is at 2,600m altitude.

Furthermore, the belt of high volcanic activity which surrounds the Pacific Ocean includes Mexico's mountain ranges. Mexico has many famous volcanoes: Mt. Orizaba (5,700m), the nation's highest peak, Mt. Popocatepetl (5,452m), and Mt. Colima (4,339m) near Manzanillo. Also, about 480km to the south of the Baja California Peninsula and about 720km west of Manzanillo lie the Revilla Gigedo Islands, a group of volcanic islands.

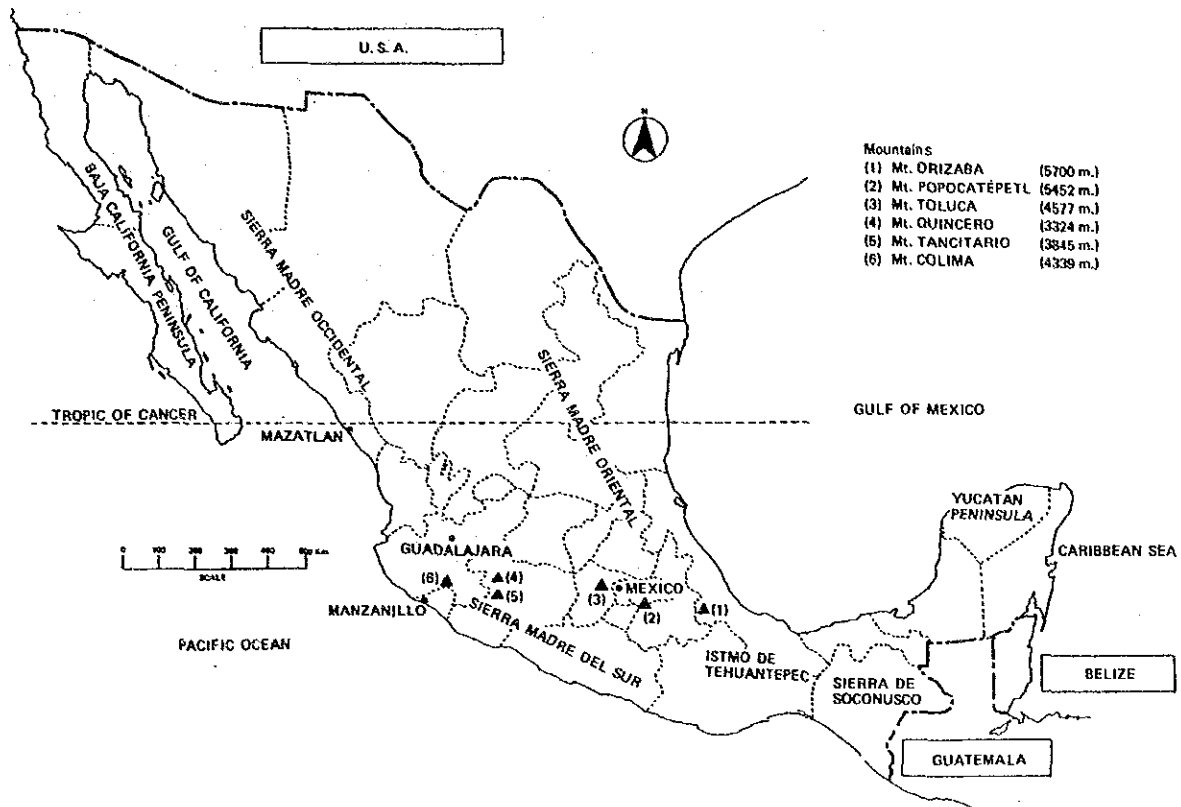


Fig. 2.1.1 Topography of the United Mexican States

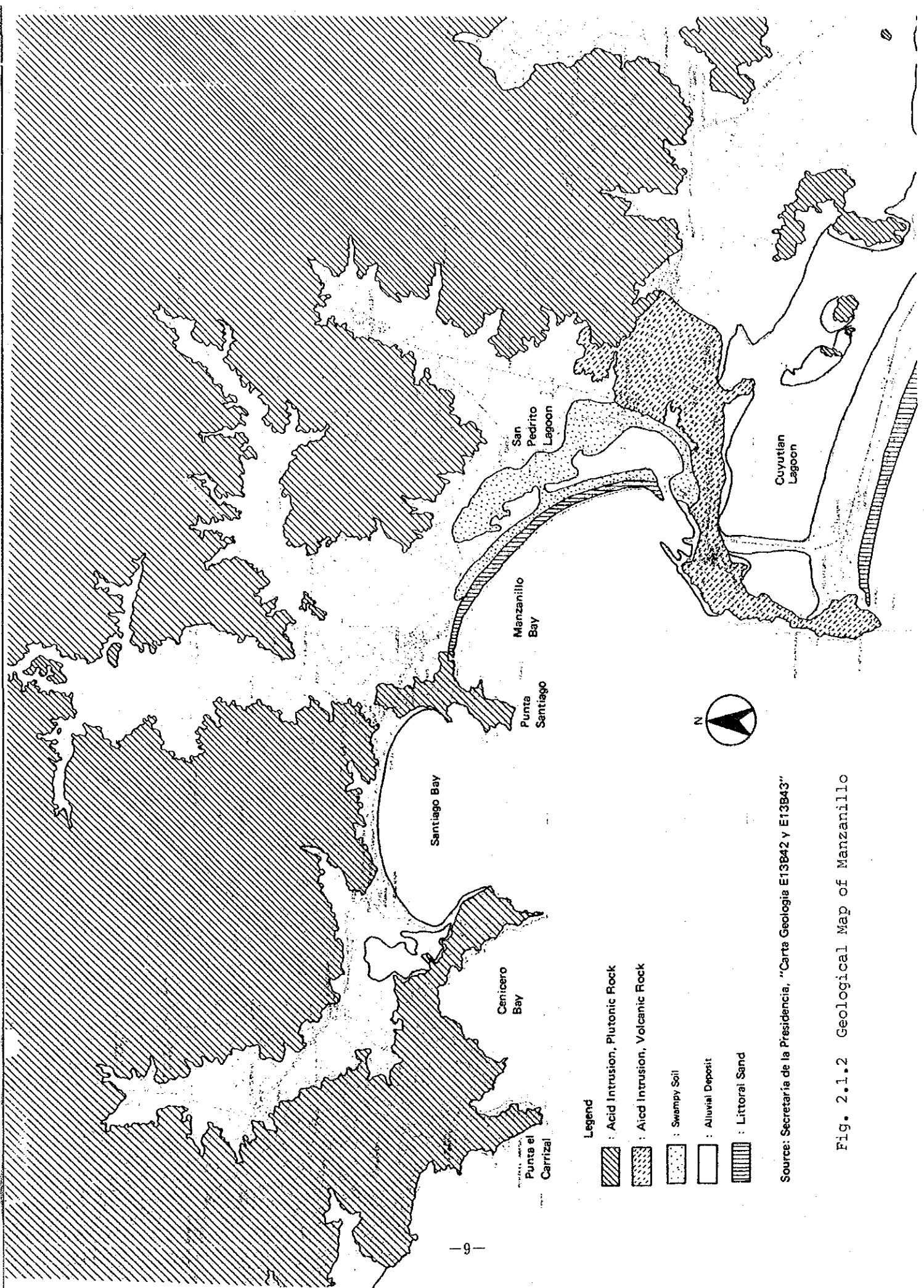
With the exception of the Yucatan Peninsula, Mexico's mountains are bounded by narrow plains along the coast. The western coast may be divided into the following two portions with the exception of the Baja California Peninsula.

The first is the narrow coastal plain located between the Sierra madre del Sur and the pacific Ocean. It forms a narrow alluvial strip, extending about 1,750km, Colima, Michoacan, Guerrero, Oaxaca, and Chiapas. The second is the coastal plain located between the Sierra Madre Occidental and the gulf of California and the Pacific Ocean. This plain is widest in the north where it includes low hills and mountains, and numerous bays and lagoons.

In the meantime, the target ports of the project - Lazaro Cardenas Port and Manzanillo Port - are located in harmony with the natural geographical features of the Mexican coast outlined above.

Manzanillo Port development has been initiated making full use of the geographical potential of natural shape of the lagoon named San Pedrito,

which provides the natural haven for the inner port area. The hilly range extends close to the shoreline of the San Pedrito Lagoon. Geographically, the Manzanillo Port area extends over the swampy soil stratum as shown in Fig. 2.1.2. The Lazaro Cardenas Port is an artificially excavated port developed at the estuary of Rio Balgas. The geological surface condition surrounding the vicinity of Lazaro Cardenas is as outlined in the schematized geological map of Fig. 2.1.3. The port area is characterized as an alluvial one.



Source: Secretaría de la Presidencia, "Carta Geología E13B42 y E13B43"

Fig. 2.1.2 Geological Map of Manzanillo

2.1.2 Climate

The climate of Mexico is diversified. The climate regions can be roughly classified as shown in Fig. 2.1.4. This wide variety of climates is due not only to the latitudinal difference but also to differences in altitude. The gale called 'Nortes', from the north, caused by northern anticyclones, and tropical cyclones called 'Hurricanes' further vary this diverse climate.

Accordingly, there is also a wide variety of vegetation: grass and cactus in the dry zone; oak, walnut, pine and firs on the mountain slopes and plateaus; rubber trees, cacao, mahogany, etc. in the tropical selva; pineapple, banana, coconut plum, potato and cereals in the tropical savanna; and mangroves in the tropical lowlands. Climatic differences influence human activity, and as a result, population is concentrated on the plateaus.

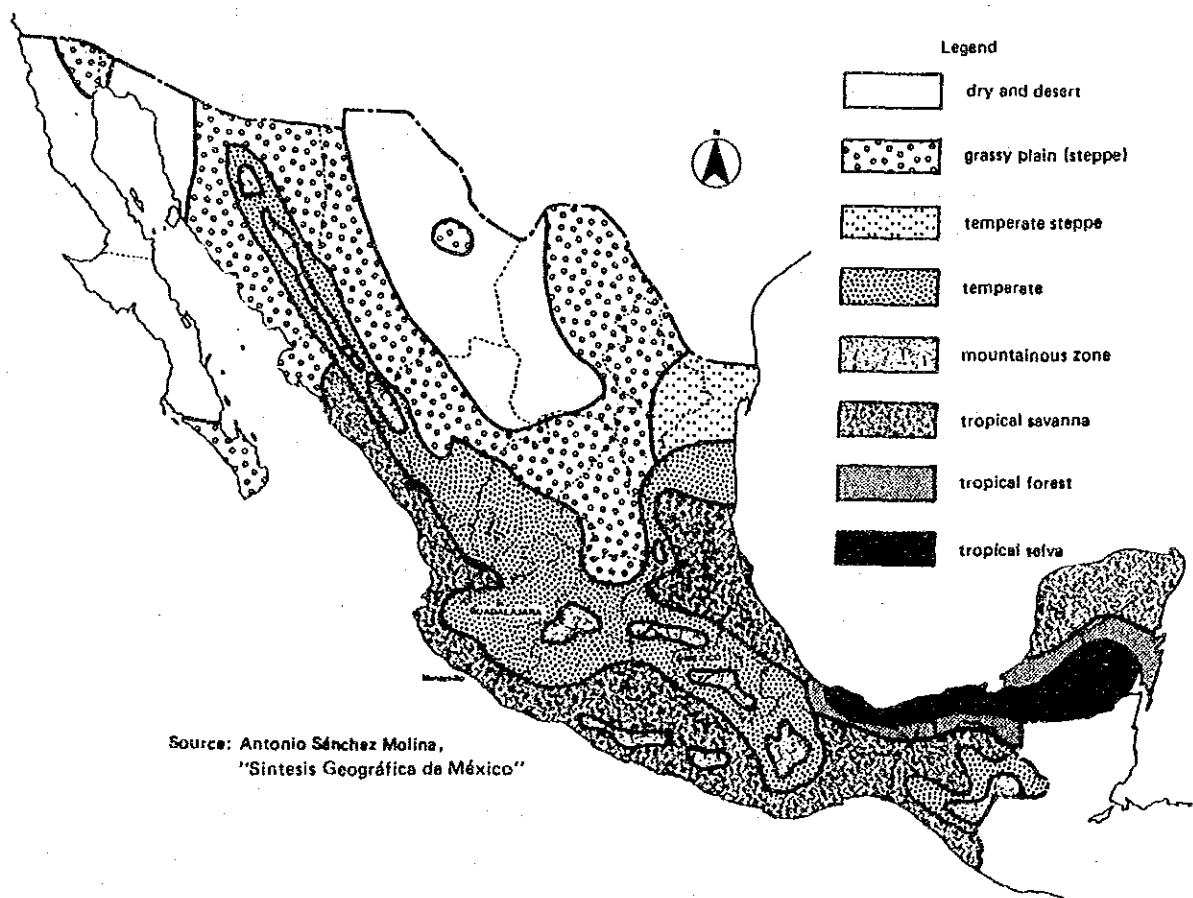


Fig. 2.1.4 Rough Classification of Climate

The coastal area from Manzanillo and Lazaro Cardenas to the southern border of the west coast which is classified as tropical savanna, has a dry season from December to May, and a rainy season from June to November. The mean temperature is about 28°C in the winter season. It is hot and the temperature differential between summer and winter is small.

This zone is influenced by both the northeast tradewinds of the northern hemisphere and the southeast tradewinds of the southern hemisphere. The confluence is called the Inter-Tropical Convergence Zone (ITCZ) where gentle winds are usual. The ITCZ moves south in the winter season and north in the summer season. Thus, northwest winds predominate in winter. The gale called "Nortes" from the north caused by the anticyclone in the northern part of Mexico sometimes blows in this season. On the other hand, southwest and southeast winds prevail in summer.

The seasonal movement of the ITCZ is closely related to the ocean current in the east Pacific and migratory tropical cyclones. When the ITCZ moves northwards bringing warm humid air in late spring and summer, cyclones appear, and when the ITCZ moves southwards in late autumn and early spring, the cyclones stop. The number of cyclones is shown in Table 2.1.1. These data show that the cyclones occur most frequently in July, August and September.

Table 2.1.1 Number of Cyclones (1960-1980)

	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.
Number	11	56	68	77	62	36	6

Note : The figures in this table show the number of cyclones in the Pacific Ocean from 1960 to 1980.

Source: SPP, "Atlas de Huracanes"

Cyclones in this area are called 'hurricanes' when they become powerful. They are usually born off the south Pacific coast and they move north along the Pacific coast. Gales caused by the cyclones bring humid air from the ocean to the land areas. This causes heavy rainfall on the mountain slopes and coastal areas, because the high Sierra Madre Occidental Range stops the humid air.

The mean annual precipitation around Manzanillo and Lazaro Cardenas is about 900mm and most of the rain falls from June to October. It usually falls in the afternoon with cloudbursts. The most rainy month of the year is September because of the frequent cyclones during that month. The precipitation in September reaches 220mm. The visibility of this area is usually good. There are less than 5 foggy days per year.

The vegetation of this area includes tropical plants such as coconut palms, pineapples, bananas, mangoes and sorghum. Mangroves grow in the tropical lowlands. The more inland areas have fields of maize, sugar cane, lemons, tomatoes and cattle ranches.

As for the wave climate along the Pacific coast of Mexico, the statistical wave data reveals the general characteristics of offshore waves off the Project Ports area.

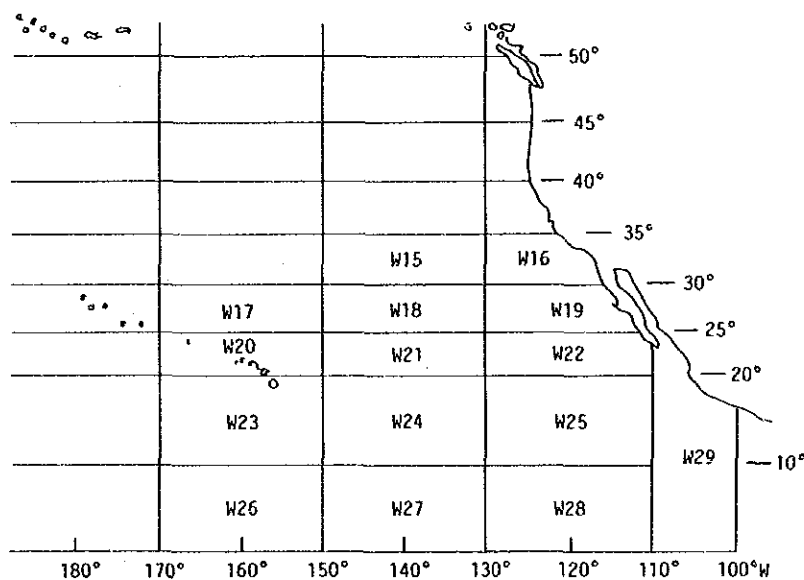


Fig. 2.1.5 Wave Observation Block off the Pacific Coast of Mexico

Source: "Marine Climatic Atlas"

From among the above wave observation blocks, the wave data from W16 and W19 blocks are representative of the overall wave characteristics offshore the project ports. According to the wave records, there seem no distinct, significant wave periods, most of them being distributed over a wide range from 5-11 seconds and concentrated around 7m in wave height. The maximum offshore wave ever recorded was 11.5m in the block W-16.

For designing the breakwater, careful consideration of these offshore

wave statistics will be necessary in addition to a study of the tracks of the cyclones mentioned earlier.

As for littoral drift, there was very limited information available during the period of the study, so, it cannot be addressed in detail, but it seems that shorelines which extend in an orientation close to the predominant wave directions near the coastal zone suffer considerable erosion or accretion in the beach line. Lazaro Cardenas is a typical case.

2.2 Socio-economic Condition

2.2.1 Population

As shown in Table 2.2.1, the population of Mexico increased at an annual rate of about 3% from 1960 to 1985 and reached 78 million in 1985. This is primarily due to a rapid decrease in the death rate, from 16.1 per thousand persons in 1950 to 6.9 per thousand persons in 1985. Such a decrease was brought about by social development and economic progress, which reduced such social and economic problems as insufficient housing and poor supply of food.

To limit the excessive population growth, a decrease in the birth rate was encouraged by the government, resulting in the decrease of the population growth rate from 3.4% in 1970 to 3.0% in 1985. The succeeding censuses indicated a steady decrease in the growth rate; 2.1% in 1986 and 2.0% in 1987.

The population in 1995 and 2005 is estimated to be 93 and 108 million persons, respectively, by "Proyecciones de la Población de México y de las Entidades Federativas, 1980-2010: 1985 of Instituto Nacional de Estadística Geografía e Informática". By this estimation the death rate and the birth rate will get to lower and lower. The working population, which covers the group between the ages of 12 and 64, will account for an estimated 70% at least, of the total population in 1995 and 2005.

In addition, due to the topographic and climate conditions of Mexico, population is concentrated in the central regions. The population density of Federal District is remarkably high: 6,715 persons per km² in 1985. That of Mexico State is 477 persons per km²; far larger than the national average of 40 persons per km², as shown in Table 2.2.1. This unbalanced concentration of population has resulted by migration into urban areas, and a rapid population increase caused by the increased birth rate.

Table 2.2.1 Movement of Population in Mexico

Item	Unit	1950	1960	1970	1980	*1985
Total Population	(Thousand Persons)	25,791	34,923	48,225	69,655	77,938
Annual Increase Rate	(%)	2.7	3.1	3.4	3.8	2.3
Birth Rate	(per thousand)	45.6	46.1	44.2	34.4	33.0
Death Rate	(per thousand)	16.1	11.5	10.1	7.5	6.9

Note: *is estimated

Source: Programación y Presupuesto SPP "Anuario Estadística de los Estados Unidos Mexicanos 1980
INEGI "Proyecciones de la Población de México y de las Entidades Federativas 1980-2010, 1980"

Table 2.2.2 Population Density (1985)

District	Population ('000 persons)	Area ('000 km ²)	Population Density (persons/km ²)
National Total	77,938.3	1,958	39.8
North-West*	6,336.2	411	15.4
North*	5,323.6	518	10.3
North-East*	5,146.1	144	35.7
Central-North	3,772.7	142	26.6
Zacatecas	1,226.9	73	16.7
San Luis Potosí	1,916.2	63	30.4
Aguascalientes	629.6	6	104.9
Central-West	15,299.7	252	60.7
Jalisco	4,972.4	81	61.5
Colima	398.3	5	76.7
Guanajuato	3,389.6	31	111.2
Querétaro	882.7	11	77.1
Michoacan	3,233.0	60	53.9
Guerrero	2,423.7	64	37.7
Center	27,497.5	87	316.0
Distrito Federal	9,931.4	2	6,714.9
México	10,176.5	21	476.5
Tlaxcala	633.1	4	157.6
Morelos	1,160.6	5	234.5
Puebla	3,850.5	34	113.6
Hidalgo	1,745.4	21	83.9
South*	12,468.3	265	47.1
Peninsula*	2,094.2	139	15.1

Note: * - Each district is shown in Fig. 1.2.1

Source: "Proyecciones de la Población de México y de las Entidades Federativas 1980-2010, México 1985" INEGI.

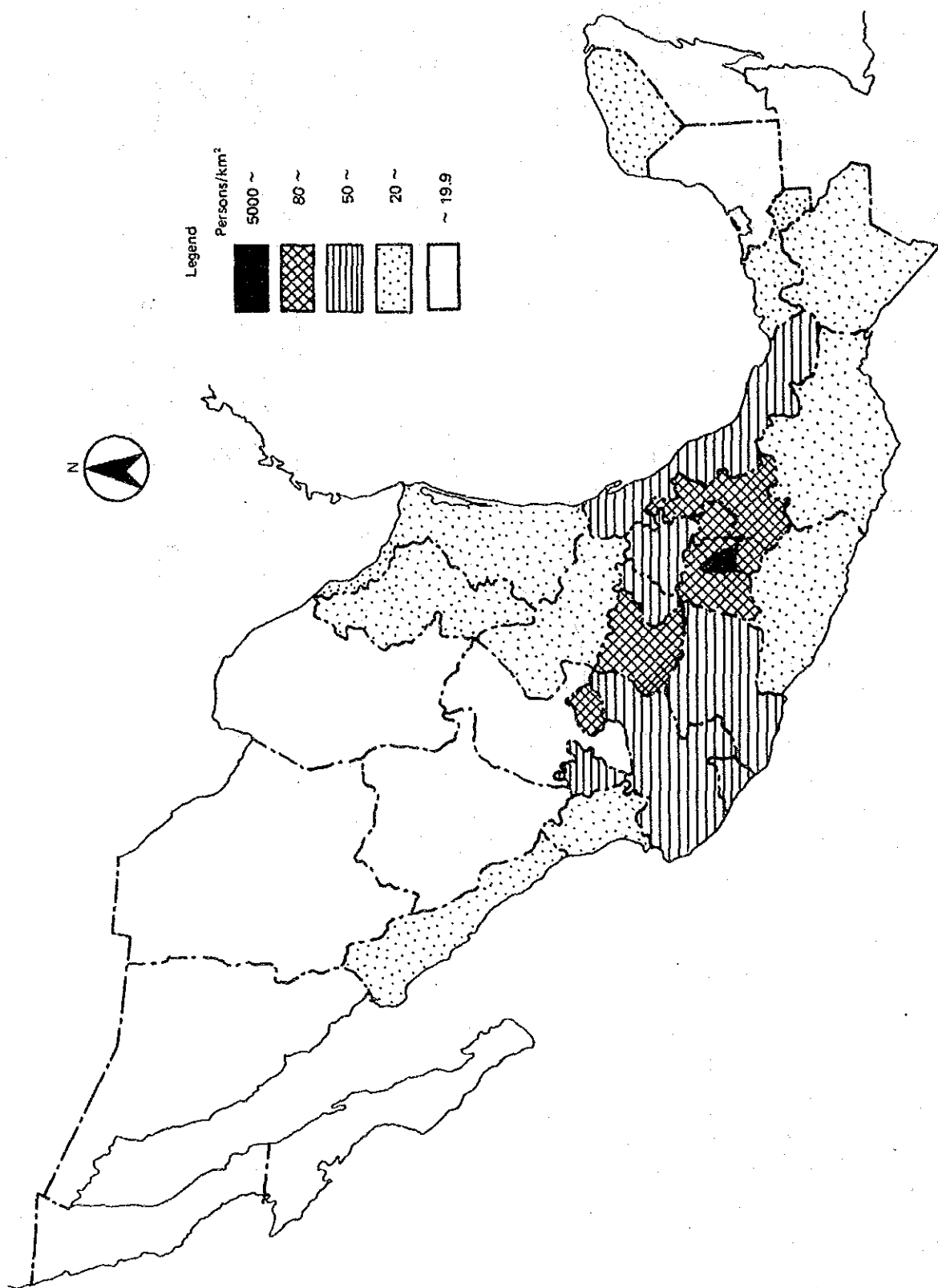


Fig. 2.2.2.2 Density of Population

2.2.2 Economic Activities

Due to abundant oil resources, Mexico was, economically, the most stable country in Latin America until the early 1980's. It maintained an average economic growth rate of 7.4% (at 1970 price) from 1976 to 1981.

During this period, with increasing oil export revenue, modernization and industrialization led to large amount of external loans.

At the beginning of the 1980's, with the world-wide decline in oil demand, the overvalued peso and demand related inflation caused by the nation's rapid-growth-oriented policy impeded the economic growth of Mexico and worsened its international balance of payments. The growth rate was negative in 1982 and 1983.

Due to effective administration of the national economy and finance and foreign trade, the growth rate was positive for a while in 1984 and 1985. But it became negative in 1986 again due to the sharp fall in exported oil prices. On the other hand, the inflation rate spiraled, with the consumer price index recording rises of 102% in 1983, 65.5% in 1984, 57.8% in 1985, 86.2% in 1986 and 134.3% in 1987. (based on 1980 prices; reported in "Boletín de Información Económica No. 4, Volumen 1" of INEGI).

Mexico's international balance of payments, as mentioned above, represented a deficit in 1980 and 1981 due to the reduction and stagnation of oil exports and the sharp increase in imports caused by the peso's being by overvalued against the dollar. Because of the government's restrictive imports policy, the trade balance recovered to record a 6,793 million dollar surplus in 1982. But both the value of exports and imports grew negligibly with the sharp fall in oil export prices and the devaluation of the peso from 1983 to 1987.

In addition, a large amount of loans with high rates of interest from developed countries and their private banks burdened Mexico with the interest payments. These amounted to 8,097 million dollars in 1987 and 8,991 million dollars in 1988 (reported in "Informe Anual 1988", Banco de México). Due to the decrease in oil export revenues, Mexico could not cover the trade deficits caused by imports of raw materials and capital goods, which were necessary for industrial production. Several times, the devaluation of the peso has gradually promoted the export of non-oil products and has improved the balance of trade. This has also contributed to the growth of the Mexican economy.

Table 2.2.3 Gross Domestic Product by Sector in constant prices of 1980

(Unit: 000,000 pesos)

Sector	1980	1981	1982	1983	1984	1985	1986	1987
Total	4,470,077	4,862,219	4,831,689	4,628,937	4,796,050	4,919,905	4,725,277	4,792,936
(Annual Growth Rate)	+ 8.3	+ 8.8	- 0.6	- 4.2	+ 3.6	+ 2.6	- 4.0	+ 1.4
Agriculture, Forestry Fishery	368,049	390,559	382,872	390,605	401,120	416,163	404,841	411,440
Mining	144,044	165,140	179,478	177,917	181,769	182,040	174,250	181,525
Manufacturing	988,900	1,052,660	1,023,811	943,549	990,856	1,050,187	990,468	1,010,086
Construction	287,164	328,555	305,354	246,762	260,003	266,013	238,953	242,896
Electricity	44,275	49,416	54,191	54,806	57,548	62,393	64,215	66,624
Transport, Communication	285,601	314,393	290,928	283,419	297,922	306,474	295,762	302,539
Commerce, Hotel Restaurant	1,249,572	1,382,116	1,369,598	1,266,538	1,298,133	1,313,213	1,223,321	1,223,804
Other Service	1,102,472	1,179,380	1,225,457	1,265,341	1,308,699	1,323,422	1,333,467	1,354,022

Source: INEGI, Sistema de Cuentas Nacionales de México Cuentas Consolidadas de la Nación, 1987

Table 2.2.4 Foreign Balance of Payment of Mexico

(Unit: 1,000,000 dollars)

Item	1980	1981	1982	1983	1984	1985	1986	1987
Current Balance Account	- 7,223	-12,544	- 4,879	5,324	4,239	1,237	- 1,673	3,881
Trade Balance	- 3,785	- 3,846	6,793	13,761	12,942	8,452	4,599	8,430
Export (F.O.B.) (Oil Export)	15,112 (9,430)	20,102 (13,305)	21,230 (15,623)	22,312 (14,793)	24,196 (14,968)	21,664 (13,309)	16,031 (5,580)	20,650 (7,877)
Import (F.O.B.)	18,897	23,948	14,437	8,551	11,254	13,212	11,432	12,220
Invisible Trade Balance	- 3,438	- 8,698	-11,672	- 8,437	- 8,703	- 7,215	- 6,272	- 4,549
External Debt	N.D.	N.D.	N.D.	71,186	74,039	76,685	80,066	82,202

Source: Banco de México "Indicadores Económicos" with other data referring.

Note: () represents the amount of oil export

N.D. means "no data"

2.2.3 Industrial Composition

Amid the modernization and industrialization of the economy in 1970's, primary industries such as the agriculture, forestry and fishery sectors decreased relatively in terms of overall contribution to GDP, while the mining and communication sectors increased up until 1981. But, as mentioned above, the growth of the economy stagnated due to the increase of oil exports and inflation. Additionally, the competitiveness of manufacturing industries suffered because of the import restrictions on raw materials and capital goods imposed by the government. Thus the sectoral composition of the GDP has not changed much since 1981, as shown in Table 2.2.5. During this period, the electricity sector has grown relative to the rest of the economy, while the construction sector declined in the stagnant economy.

Table 2.2.5 Sectoral Composition of GDP (1980 price)

(Unit: %)

Sector	1980	1981	1982	1983	1984	1985	1986	1987
Total	100	100	100	100	100	100	100	100
Agriculture, Forestry Fishery	8.2	8.0	7.9	8.4	8.4	8.5	8.6	8.6
Mining	3.2	3.4	3.7	3.8	3.8	3.7	3.7	3.8
Manufacturing	22.1	21.6	21.2	20.4	20.7	21.3	20.9	21.1
Construction	6.4	6.8	6.3	5.3	5.4	5.4	5.1	5.1
Electricity	1.0	1.0	1.1	1.2	1.2	1.3	1.3	1.4
Transport, Communication	6.4	6.5	6.0	6.1	6.2	6.2	6.3	6.3
Commerce, Hotel Restaurant	28.0	28.4	28.4	27.4	27.1	26.7	25.9	25.5
Other Services	24.7	24.3	25.4	27.4	27.3	26.9	28.2	28.2

Source: Same as Table 2.2.3

2.3 Transportation

(1) General View of Cargo Movement

In accordance with the progress of economic development, the total freight volume in Mexico increased rapidly at an average annual growth rate of 7.6% from 1970 to 1980 and reached 432 million tons of freight, more than twice the 1970 volume of 207 million tons. But in the early 1980's, freight volume did not show much increase, with an average annual growth rate of 1.6% from 1980 to 1986, due to the stagnation of the economy. In 1986, growth was negative, because of the recession caused by a sudden drop in oil prices on the world market.

On the other hand, marine transportation grew through the 1970's at an average rate of 13.0% per annum, about twice as fast as other modes of transportation, and continued to increase, reaching 126 million tons in 1983, which accounted for 26.8% of the total freight volume. But it also recorded little growth from 1983 to 1985 and showed negative growth in 1986.

Marine transportation in Mexico developed rapidly through the 1970's owing to increased foreign trade cargo. The total volume of foreign trade cargo grew from 23 million tons in 1970 to 115 million tons in 1984. Of this volume, marine cargo increased from 13 million tons to 107 million tons, or eight times as much as in 1970. Specially, the exported cargo volume increased from 10 million tons to 96 million tons, while the imported cargo volume increased from 3 million tons to 11 million tons.

The total foreign trade cargo volume in Mexico also grew through the first half of the 1980's at a rate of about 3 - 4% per annum, but recorded negative growth in 1985 and 1986.

During the same period, the marine cargo volume rose to 107 million tons, but decreased in 1985 and 1986. In Particular, imported cargo was restricted from 1982 by the government due to the economic crisis, decreasing year by year to 10 million tons in 1986. Exported cargo remained at the same level due to the sharp fall in oil prices on the world market.

With the beginning in 1983 of the import restriction policy by the government aiming at recover from the economy crisis, in the growth in the share of marine transportation of Mexico's foreign trade slowed, but the

share of marine transportation of exports increased year by year in spite of economic stagnation and recession. It accounted for 97% of total exports, and 92% of total foreign trade. These high percentages indicate the large share of oil exports in Mexico's foreign trade volume.

Table 2.3.1 Annual Growth Rate of GDP

(unit: %)

	1980	1981	1982	1983	1984	1985	1986	1987
Total	+ 8.3	+ 8.8	- 0.6	- 4.2	+ 3.6	+ 2.6	4.0	1.4
Agriculture, Forestry Fishery	+10.7	+ 6.1	- 2.0	+ 2.0	+ 2.7	+ 3.8	- 2.7	+ 1.6
Mining	+22.3	+14.6	+ 8.7	+ 0.9	+ 2.2	+ 0.1	- 4.3	+ 4.2
Manufacturing	+ 7.2	+ 6.4	- 2.7	- 7.8	+ 5.0	+ 6.0	- 5.7	+ 2.0
Construction	+12.3	+14.4	- 7.1	-19.2	+ 5.4	+ 2.3	-10.2	+ 1.7
Electricity	+ 6.5	+11.6	+ 9.7	+ 1.1	+ 5.0	+ 8.4	+ 2.9	+ 3.8
Transport, Communication	+14.1	+10.1	- 7.5	- 2.6	+ 5.1	- 2.0	- 3.5	+ 2.3
Commerce, Hotel Restaurant	+ 8.1	+10.6	- 0.9	- 7.5	+ 2.5	+ 1.2	- 6.8	+ 0.0
Other Services	+ 6.0	+ 7.0	+ 3.9	+ 3.3	+ 3.4	+ 1.1	+ 0.8	+ 1.5

Source: Same as Table 2.2.3

Table 2.3.2 Total Cargo Movement in Mexico

(unit: 1,000 tons)

Year	Volume of Cargo		
	Total	Marine	Other
1970	207,024	28,155	178,869
1980	432,121	95,256	336,865
1983	467,287	125,511	341,776
1985	492,000	126,161	365,839
1986	474,760	119,153	355,607

Source: Manual Estadístico del Sector Transporte 1989,
Instituto Mexicano del Transporte
Movimiento de Cargo y Buques 1987 Sistema
Portuario Nacional

Table 2.3.3 Cargo Movement in Foreign Trade

(unit: 1,000 tons)

Year	Total Cargo Volume			Marine Cargo Volume		
		Export	Import		Export	Import
1970	23,048	14,183	8,865	13,021	9,705	3,316
1980	80,221	56,817	23,404	66,056	52,536	13,520
1981	83,130	59,680	23,450	70,781	55,799	14,982
1982	108,881	92,633	16,248	100,822	88,555	12,267
1983	113,287	96,339	16,948	103,011	91,710	11,301
1984	115,930	98,790	17,140	107,080	95,899	11,181
1985	108,800	93,680	15,120	100,061	89,158	10,903
1986	103,860	88,970	14,890	95,953	86,377	9,576

Note: Total cargo volume is estimated and does not include the exported volume of Natural Gas

Source: DGODP "Estadísticas del Movimiento Portuario de Cargo y Buques 1987"

Table 2.3.4 Share of Marine Transportation in Total Foreign Trade
(percentage to national total)

(Unit: %)

Year	Total		
		Exports	Imports
1970	56.5	68.4	37.4
1980	82.3	92.5	57.8
1981	85.1	93.5	63.5
1982	92.6	95.6	75.5
1983	90.9	95.2	66.7
1984	92.4	97.1	65.0
1985	92.0	95.2	72.1
1986	92.4	97.1	64.3

(2) Roads and Railways

The road and railway network has been developed around the Mexican Plateau and connects the principal cities of the central region of the country with each other and with the U.S.A.

Due to geographical conditions, particularly the mountain ranges running from north to south, the road network linking the principal cities in the central region and the highways running longitudinally from the border of the U.S.A. to the central region are well developed. However, the roads running horizontally across Mexico are relatively poor. Thus, the Mexican government has been making efforts to construct transversal road leading to the longitudinal highways in order to promote the decentralization of social and economic activities.

The construction of roads was carried out at a remarkable pace during the 1970's. The total length of the road network in 1980 was three times the total length in 1970. This rapid construction of roads contributed to the basis of the present road network. In 1986, the total length reached 225,516 km, of which paved roads amounted to 74,854 km, 33.2% of the national total. The main arteries are wide and well-paved, but due to Mexico's complicated topography, it takes a long time to travel, given the distances involved.

The number of registered vehicles has been increasing at an average growth rate of 9.5% per annum, and reached 8,317 thousand in 1986, is 3.3 times the 1970 figure. The number of registered cars grew rapidly through the 1970's. Following the period of economic stagnation, it surpassed 5,451 thousand in 1986.

Table 2.3.7 shows the distance and average transportation time by roads from the major ports of the Pacific coast to Mexico's principal cities.

As for the average time to Mexico city, the time from Acapulco is the shortest, about 7.8 hours. It takes about 14.4 hours from Lazaro Cardenas and about 15.6 hours from Manzanillo to the capital.

The existing railway network has been developed, but does not still cover the entire country and is less comprehensive than the road network. Some of the state capitals do not have railway connections. The main part of the railway network was completed in the 1910s.

Since 1970s, the progress of construction has advanced somewhat, and the total length of railways reached 26,183 km in 1986, which is only 1,700

km or 7% more than in 1970. But feeder lines of railway and wide sized railway (1,435 mm) have been lengthened to 1,350 km and to 2,454 km, respectively.

Table 2.3.9 shows the distance and average transportation time by railways from the major ports of the Pacific coast and the Gulf coast to the main cities.

According to this table, the average time from Manzanillo is the shortest to Guadalajara. As for traveling to Mexico City from both Manzanillo and Lazaro Cardenas, it takes 19.1 and 13.3 hours, respectively.

Table 2.3.5 Construction of the Road Network

(unit: km.)

Year	Improved	Flat	Coated	Paved		Total	
				2 Lanes	4 Lanes	Length	Indication
1970	1,520	6,579	21,462	41,358	601	71,520	100.0
1980	33,409	24,735	87,562	65,920	1,000	212,625	297.3
1981	N.A	N.A	N.A	N.A	N.A	N.A	N.A
1982	30,250	20,725	92,493	69,111	1,123	213,702	298.8
1983	N.A	N.A	N.A	N.A	N.A	N.A	N.A
1984	N.A	N.A	N.A	N.A	N.A	N.A	N.A
1985	N.A	N.A	N.A	N.A	N.A	N.A	N.A
1986	29,800	3,740	117,122	72,339	2,515	225,516	315.3

Source: Instituto Mexicano del Transporte "Manual Estadístico del Sector Transporte 1989"

Table 2.3.6 Number of Registered Vehicles

(Unit: Thousands)

Year	Cars	Buses	Trucks and Trailers	Total	
				Number	Indication
1970	1,224	33	525	1,792	100.
1980	4,254	84	1,489	5,827	3,252
1981	4,747	79	1,719	6,545	3,652
1982	N/A	N/A	N/A	N/A	N/A
1983	4,624	75	1,819	6,518	3,637
1984	N/A	N/A	N/A	N/A	N/A
1985	N/A	N/A	N/A	N/A	N/A
1986	5,451	73	2,793	8,317	4,641

Source: Dirección General de Estadística SPP

1970 "La Industria Automotriz en México"

1980 "Instituto Nacional de Estadística Gráfica e Informática"

1983, 1986 Manual Estadístico del Sector Transporte

Table 2.3.7 Transportation Time by Road

From	To	Distance (km)	Time (Hours)	Via
Ensenada	Tijuana	108	1.7	
	Mexicali	297	4.5	Tijuana
	S.L. Rio Colorado	368	5.5	Tijuana, Mexicali
Guaymas	Hermosillo	143	2.5	
	Santa Ana	311	5.1	Hermosillo
	Juarey	795	13.8	Hermosillo, Santa Ana
	S.L. Rio Colorado	761	13.5	" "
	Los Mochis	351	6.5	
Mazatlán	Culiacán	223	4.2	
	Durango	319	9.1	
	Torreón	576	14.9	Durango
	Los Mochis	430	8.0	Culiacán
	Tepic	293	7.1	
	Guadajarara	519	12.4	Tepic
	Leon	763	16.7	Tepic Guadajarara
	Navojoa	587	10.8	Los Mochis
	Mexico City	1,146	22.8	Guadajarara, Queretaro
Manzanillo	Guadalajara	357	6.4	Colima
	Aguascalientes	626	10.4	Guadalajara
	Zacatecas	755	13.2	Guadalajara
	León	601	10.7	Guadalajara
	Mexico City	984	16.7	Guadalajara, Querétaro
	Mexico City	810	15.6	Zamora, Toluca
	Monterrey	1,090	22.0	Zacatecas
		1,210	22.5	San Luis Potosí
Lázaro Cárdenas				
	Guadalajara	556	12.4	Manzanillo, Colima
	León	661	13.2	Zamora, Irapuato
	Aguascalientes	788	15.5	León
	Acapulco	353	6.7	
	Cuernavaca	679	11.3	
	Mexico City	687	15.6	Uruapan, Morelia, Toluca
	Mexico City	764	14.4	Acapulco, Cuernavaca
Acapulco	Mexico City	411	7.8	
Salina Cruz				
	Oaxaca	269	7.0	
	Puebla	730	14.7	
	Mexico City	855	16.6	Acayucan, Puebla
	Coatzacoalcos	302	6.5	Acayucan
	Tapachula	439	8.7	
Tampico	Monterrey	530	11.2	CD. Victoria
	San Luis Potosí	510	10.4	
	Guadalajara	931	18.5	San Luis Potosí
	Aguascalientes	680	14.0	San Luis Potosí
	Mexico City	930	17.4	San Luis Potosí
Tuxpan	Mexico City	353	9.6	
	Guadalajara	980	20.0	
	Veracruz	326	6.2	
	Mérida	1,450	29.5	Veracruz
Veracruz	Puebla	307	5.6	
	Mexico City	432	7.5	Puebla
	Mérida	1,124	23.3	
Coatzacoalcos				
	Veracruz	311	6.9	
	Mérida	813	16.4	
	Mexico City	656	13.0	

Source: Made from the data of SCT: "Mapa de Tiempo de Recorrido"

Table 2.3.8 Total Length of Mexican Railways

(Unit: km.)

	Total Length				
Year		Main Line	Feeder Line	Wide Rail	Narrow Rail
1970	24,468	19,845	4,623	23,429	1,039
1980	25,510	20,011	5,499	24,778	732
1983	25,799	19,907	5,892	25,408	341
1986	26,183	20,209	5,974	25,883	300

Source: Instituto Mexicano del Transporte

"Manual Estadístico del Sector Transporte 1989"

Table 2.3.9 Transportation Time by Railway

From	To	Distance (km)	Approximate (Hours) Time	Via
Guaymas	Hermosillo	149	3.4	
	Nogales	425	10.2	
	Sufragio	333	7.2	
Mazatlán	Culiacán	219	6.3	
	Sufragio	433	13.6	
	Tepic	317	5.0	
	Guadalajara	588	9.3	
Manzanillo	Guadalajara	357	6.3	Guadalajara
	México City	1,030	19.1	
Lázaro Cárdenas	Morelia	423	8.1	Morelia
	México City	797	13.3	
Salina Cruz	Puebla	758	14.5	Puebla
	Coatzacoalcos	301	3.8	
	México City	999	19.5	
Tampico	Monterrey	524	8.1	
	San Luis Potosí	449	9.2	
	Querétaro	683	13.4	
	México City	947	19.5	
Veracruz	Puebla	445	8.4	
	Mexico City	686	13.3	
Coatzacoalcos	Puebla	646	12.1	
	Mexico City	887	17.5	
	Campeche	721	13.2	

Note: As actual running time data were not available, the above distance and time figures were calculated using railway company timetables.

Source: Calculated from the materials of SCT by a local consultant in Mexico.

(3) Ports and Shipping

In the United Mexican States, there are 41 principal ports, and eleven (11) major ports are considered to be essential for foreign trade.

The total length of quaywall amounts to approximately 59 km; 33 km on the Mexican Gulf coast and 26 km on the Pacific coast.

The volume of cargoes handled at all Mexican ports increased gradually at an average annual rate of 3% in the period from 1980 to 1987, and reached 153,644 thousand tons. This increase was mainly supported by the growth in exported volume of cargo, particularly in crude oil and its derivatives, from 41,409 thousand tons to 73,368 thousand tons. A restrictive import policy was introduced by the government in 1982, and the volume of import cargo declined from 13,250 thousand tons in 1980 to 9,576 thousand tons in 1987. In terms exports, a sharp fall in the export prices of crude oil hit and cut the export cargo volume in 1986. On the other hand, exports of other cargo increased in this year. In 1987, both the export and import cargo volume recovered, due to the improvement in oil prices and the remarkable progress in exports of non-oil goods.

As for domestic trade, about 70% of the cargo volume is petroleum and its derivatives and about 20% is mineral bulk cargo, which thus account for about 90% of the total domestic tonnage.

Referring to the historical trends of cargo movement by commodity type, imports of general cargo have been decreasing since 1981. On the other hand, exports of general cargo have been increasing since the same year. This is due to the governmental policy of promoting the export of non-oil industrial products in order to improve the balance of international payments.

Exports of agricultural bulk products is very small. However, imports of agricultural bulk products shows great fluctuation from year to year.

Exports of mineral bulk products have been increasing from year to year due to Mexico's abundant natural resources. Imports of mineral bulk products have remained at almost the same level of volume of about 2,000 thousand - 3,000 thousand tons since 1982.

The volume of containerized cargoes handled at all Mexican ports increased from 853 thousand tons in 1983 to 1,534 thousand tons in 1987 at an average rate of 15.8% per annum. Export cargo volume grew rapidly from 361 thousand tons in 1983 to 980 thousand tons in 1987 at 28.4% rate per annum.

On the other hand, the imported cargo volume increased rather gradually, from 492 thousand tons in 1983 to 554 thousand tons in 1987.

The containerized ratio of the general cargo also progressed from 24.6% in 1983 to 36.6% in 1987 of total foreign trade, from 23.2% to 33.9% in exports and from 25.7% to 42.6% in imports. Accordingly, the number of container units increased from 65 thousand units to 120 thousand units in the same period.

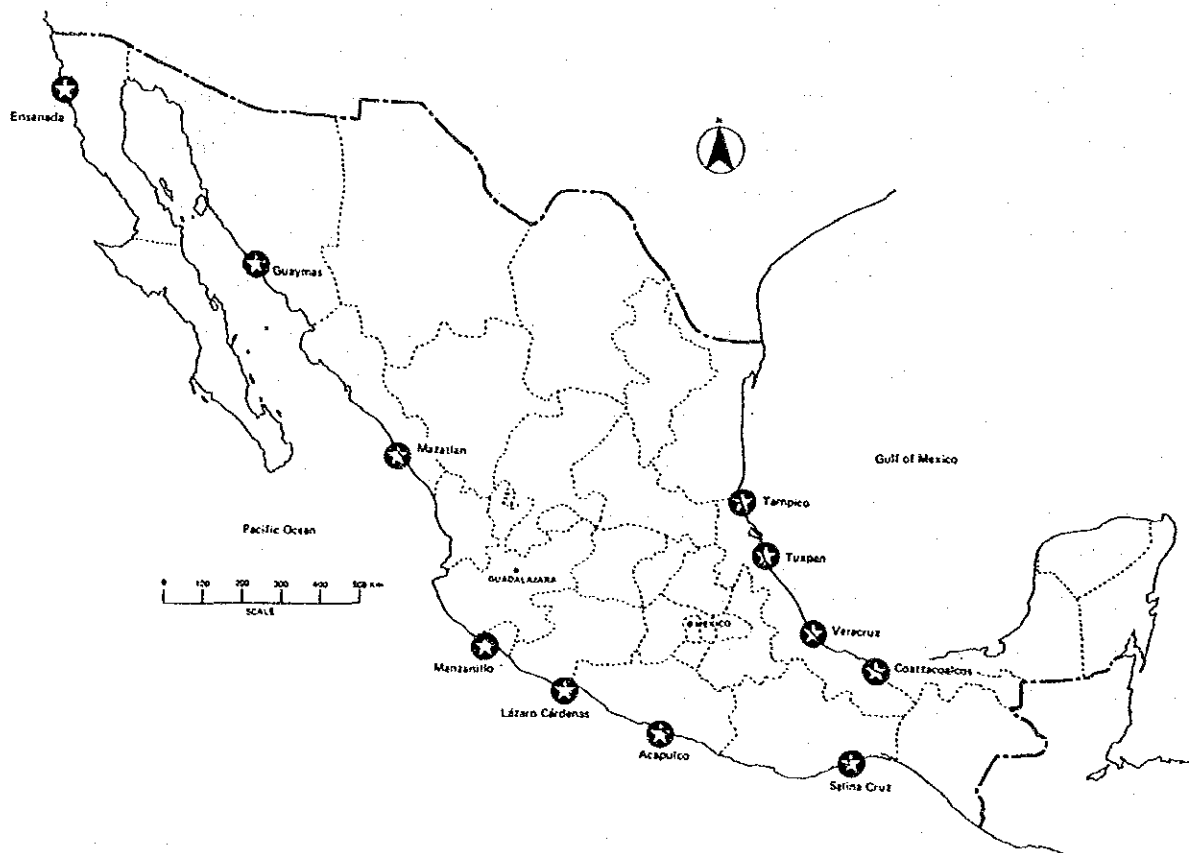


Fig. 2.3.1 Location of Main Ports in Mexico

Table 2.3.10 Volume of Cargoes Handled at the Mexican Ports

(Unit: Thousand tons)

Year	Grand Total	Foreign Trade			Domestic Trade		
		Export	Import	Total	Out	In	Total
1980	124,576	52,536	13,520	66,056	25,215	33,305	58,520
1981	131,038	55,799	14,982	70,781	25,996	34,261	60,257
1982	150,444	88,555	12,267	100,822	21,228	28,394	49,622
1983	147,913	91,710	11,301	103,011	20,481	24,421	44,902
1984	153,082	95,899	11,182	107,081	21,222	24,779	46,001
1985	152,228	89,158	10,903	100,061	24,383	27,784	52,167
1986	142,313	86,378	9,576	95,954	20,245	26,114	46,359
1987	153,644	90,644	11,746	102,390	25,381	25,873	51,254

Source: DGODP "Estadísticas del Movimiento Portuario Nacional de Carga y Buques"

SCT "Movimiento de Carga y Buques, Sistema Portuario Nacional 1985, 1986, 1987"

Table 2.3.11 Volume of Export by Major Cargo Types

(Unit: 1,000 Tons, %)

Year	General Cargo	Agricultural Bulk	Mineral Bulk	Petroleum and its Derivatives	Other Liquids	Perishables
1982	1,231 1.4	14 --	6,965 7.9	79,180 89.4	1,151 1.3	14 --
1983	1,553 1.7	28 0.1	7,920 8.6	81,259 88.6	950 1.0	18 --
1984	1,653 1.7	56 0.1	9,398 9.8	83,746 87.3	1,037 1.1	9 --
1985	1,424 1.6	102 0.1	9,445 10.6	77,114 86.5	1,058 1.2	15 --
1986	2,031 2.4	184 0.2	11,136 12.9	71,817 83.1	1,172 1.4	38 --
1987	2,837 3.1	459 3.5	12,065 13.3	73,868 81.5	1,359 1.5	56 0.1

Source: 1982 - GDOP "Estadísticas del Movimiento Portuario Nacional de Carga y Buques"

1984 - SCT "Movimiento de Carga y Buques, Sistema Portuario Nacional 1984-1987"

Table 2.3.12 Volume of Import by Major Cargo Types

(Unit: 1,000 Tons, %)

Year	General Cargo	Agricultural Bulk	Mineral Bulk	Petroleum and its Derivatives	Other Liquids	Perishables
1982	2,584 21.2	3,227 26.3	2,855 23.3	3,041 24.8	559 4.5	1 0.1
1983	1,916 17.0	6,523 17.7	2,035 18.0	650 5.8	177 1.5	-- --
1984	2,107 18.8	5,181 46.3	2,422 21.7	1,231 11.0	241 2.2	-- --
1985	2,026 18.6	4,243 38.9	2,630 24.1	1,725 15.8	263 2.4	16 0.1
1986	1,570 16.4	2,583 27.0	2,654 27.7	2,484 25.9	273 2.9	12 0.1
1987	1,288 11.0	3,932 33.5	2,845 24.2	3,446 29.3	222 1.9	13 0.1

Source: Same as Table 2.3.11

Table 2.3.13 Containerized Cargo Handled at the Mexican Ports

(Unit: 1,000 Tons, Units)

Year	Cargo Volume			Number of Units		
	Export	Import	Total	Export	Import	Total
1983	361	492	853	30,854 (20,820)	34,401 (21,761)	65,255 (42,851)
1984	528	382	910	35,217 (29,011)	40,010 (23,675)	75,227 (52,686)
1985	538	487	1,025	35,995 (29,345)	46,952 (32,282)	82,947 (61,627)
1986	709	444	1,153	43,074 (37,016)	48,929 (30,432)	92,003 (67,448)
1987	980	554	1,534	58,687 (51,578)	60,813 (39,389)	119,500 (90,967)

Note: Number of containers includes empty units, and figures in parentheses show number of loading units.

Source: 1983 DGODP, "Estadísticas del Movimiento Portuario Nacional de Carga y Buques"
1984-1987 SCT. "Movimiento de Carga y Buques, Sistema Portuario Nacional 1984-1987"

Table 2.3.14 Containerized Ratio of General Cargo

(Unit: %)

Year	Percent of Container Cargo		
	Export	Import	Total
1983	23.2	25.7	24.6
1984	31.8	18.1	24.1
1985	37.4	23.8	29.4
1986	34.3	28.1	31.6
1987	33.9	42.6	36.6

Note: Containerized ratio means the ratio of containerized cargo to general cargo and perishables.

Source: Same as Table 2.3.13

Chapter 3. Present Situation of Each Port

3.1 General Outline of Port Administration in the United Mexican States

3.1.1 Historical View of Port Administration

Before 1970, the ports in Mexico were managed by the Harbor Master and Customs and port districts were as under the jurisdiction of the Navy.

The cargo handling services were supplied by cargo handling labor unions at each port, with which users had to make contracts directly. This situation, involving different cargo handling operation by different unions led to inefficiency in cargo handling at each port.

In 1970, the ports in Mexico came under the control of the Ministry of Public Works. At the same time, the ESP, an organization for supplying port services, was established at the Port of Manzanillo to make improvements in this situation. Similar organizations were then established at the ports of Veracruz, Coatzacoalcos/Salina Cruz, Ensenada, Guaymas, Mazatlan, Lazaro Cardenas and Acapulco. The ESPs control the unions and users could then arrange for the provision of all necessary services from the ESP.

In 1982, the SCT was established to unify the administration of communication and transportation. Under the minister were three vice-ministers, in charge of operation, infrastructure and development of technology, respectively. In the organization of the SCT, three port-related bureaus were established as follows:

DGOM: Dirección General de Obras Marítimas

DGP : Dirección General de Puertos

DGMM: Dirección General de Marina Mercante

In addition to the above, the CNCP was set under the direct control of the minister to coordinate the various port administrations.

Following the inauguration of the new president, the new organization of Puertos Mexicanos was established in May 1989, aiming at the improvement of port administration and finance. Puertos Mexicanos is a unified executive organization which is in charge of port planning, construction, management and operation.

3.1.2 Present situation of Port Administration in Mexico

(1) Port Administration Type

In Mexico, there are two types of port administration: ports directly controlled by the Federal Government and decentralized ports. Almost all the main ports in Mexico belong to the former category.

(2) Port Areas and their Control

In Mexico, land areas within 20m from the shoreline as well as the sea and other water basins belong to the Federal Government, under the jurisdiction of SEDUE, which is the ministry in charge of environment and development. Generally, when constructing a port, the SCT has to get permission from SEDUE regarding the port area and to make public the port area, according to a presidential ordinance. Within this area, the port facilities are constructed and the port administration is executed by the SCT.

(3) Port Administration and Other Related Organizations

Figs. 3.1.1 and 3.1.2 show the present outline of the administrative system concerning ports in Mexico. SCT legally supervises Puertos Mexicanos, which mainly carries out planning, construction and dredging work at ports as well as supervising the ESP.

Puertos Mexicanos has local construction and dredging division offices at most main ports in order to supervise construction work.

An ESP is a joint-stock-company and is basically independent from Puertos Mexicanos in financial matters. But the share of stock held by the Federal Government amounts to more than 92% at the all objective ports. The ESP provides users and shipping companies with various port services using the cargo handling unions.

The relation between the ESP and the unions is based on collective private contracts.

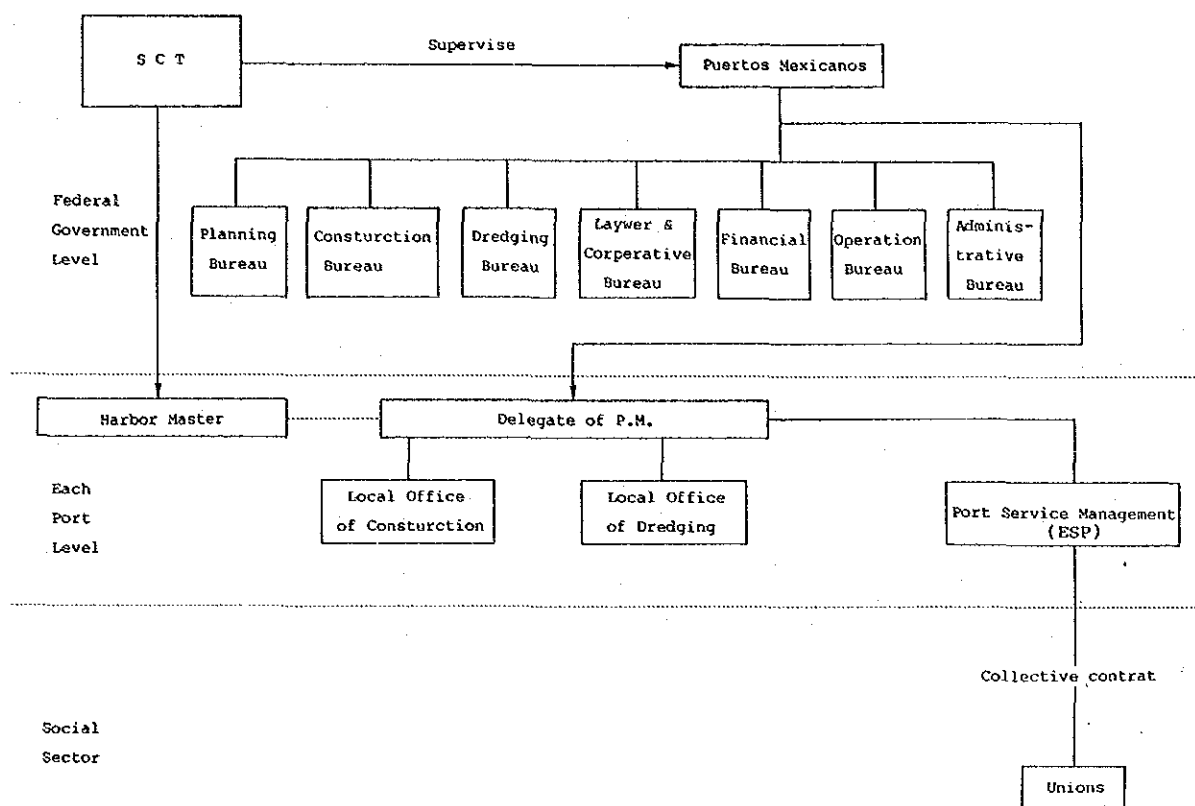


Fig. 3.1.1 Outline of the Port Administration System in Mexico

Another port organization related to the SCT is that of the Harbour Master, which is in charge of the supervision of the ESP as well as navigation security and related matters.

Other governmental organizations, such as immigration and the customs, exist at each port independently.

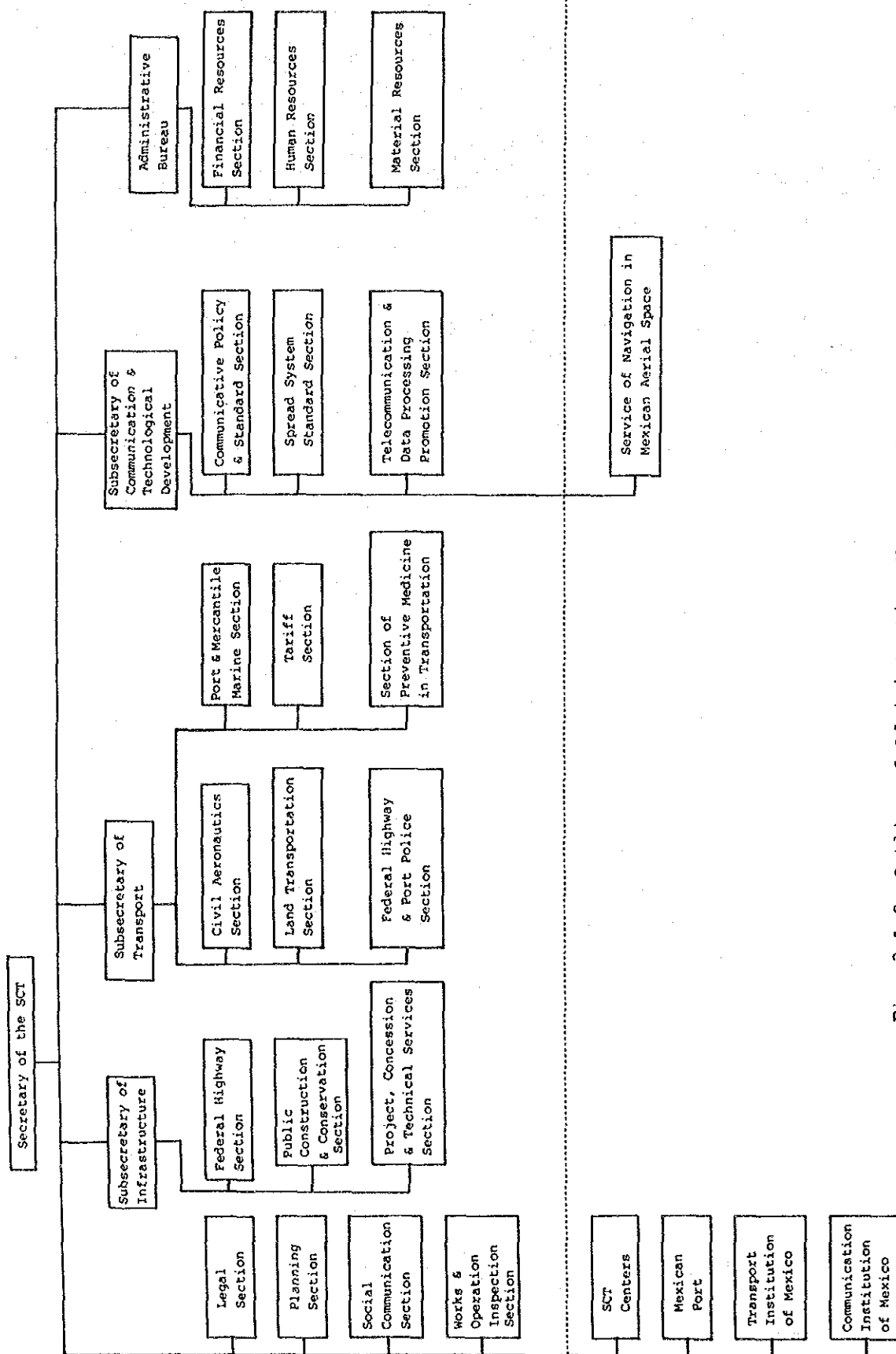


Fig. 3.1.2 Outline of Administrative Chart of the SCT

(4) Management Method and Organization of the ESP

The ESP is an organization that supplies port service on an exclusive basis. The management of the ESP is based on a joint-stock-company. The organization of an ESP is roughly shown in Fig. 3.1.3.

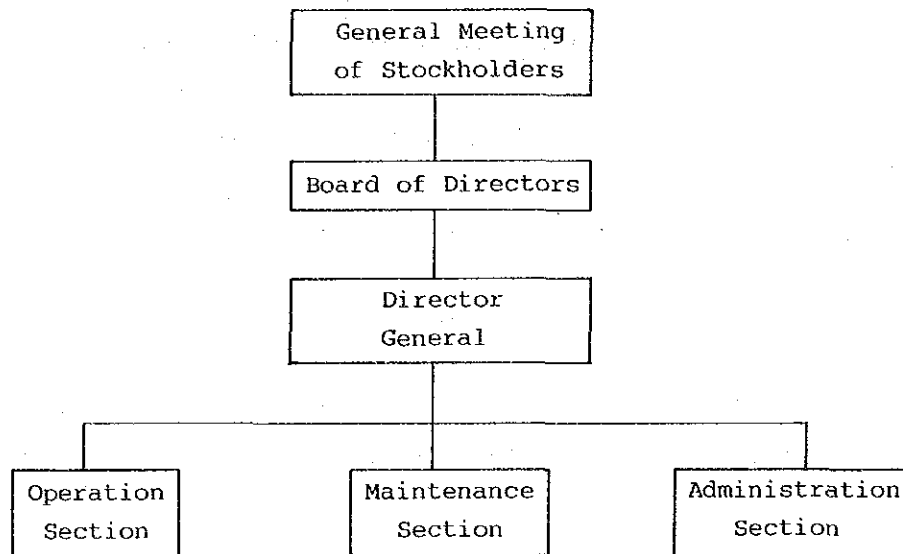


Fig. 3.1.3 The Organization of an ESP

More than 92% of the stock is held by the Federal Government, Other stock-holders are unions and other related companies.

(5) Income and the Flow of Port Fund and its Expenditures

1) Income of the Port

The income of ports in Mexico consists of port dues and tariff. Port dues are paid to the Federal Government in accordance with the ship's entry and exit to and from ports and the storage of cargoes in ports. All the port dues are used for the port construction and administration according to Federal law. The summary of port dues are shown in Table 3.1.1.

Tariffs are paid by port users in compensation for port services and the tariff rates of each ESP are decided with the permission of the SCT.

Tariffs provide the main revenue of an ESP. The ESP expends this revenue on administration and operational costs, personnel cost and the cost paid to union.

2) The flow of port funds and their expenditure

As explained above, port funds consist of two parts, port dues and tariffs. The flow of port funds and their expenditures are summarized in Fig. 3.1.4.

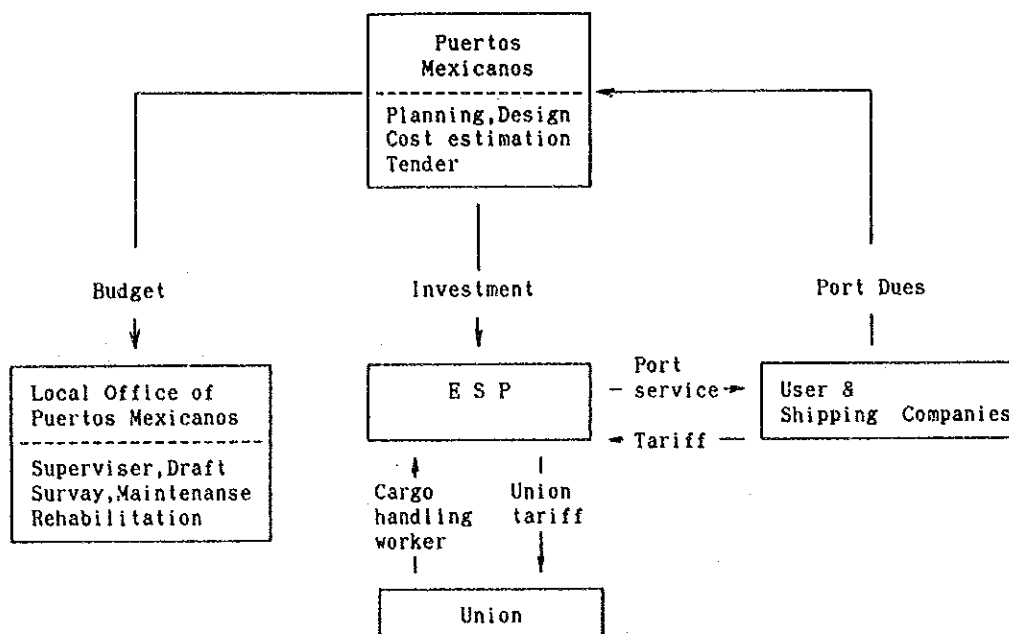


Fig. 3.1.4 Flow of Port Funds and their Expenditure

Table 3.1.1.1 The Summary of Port Dues

		Rate	Object of Due	Remark
Due for Using Warehouse	Import	0-15 days 250 peso/500kg·day 16-45 days 490 " 46- days 750 " - 380 peso/100kg·days	For Cargo	Extra charge for Over 5m ³ Cargo Precious Cargo Dangerous Cargo
	Export	- 100 peso/500kg·day Grain 65 " Cotton 100 peso/package + 290 peso/500kg·30 day.	For Cargo	
	Foreign Ship Domestic Ship	850 peso/t x Total Cargo Weight 765 "	For User of Port	Paid only at first port
Due for Berthing	Commercial Yatch	120 peso/m·124h 85 "	For Ship	
Due for Using Wharf	Cargo	Export 420 peso/t x Total Cargo Weight Import 900 "	For User	Excluding domestic companies and empty containers.
	Tourist	Non exclusive berth 600 peso/person Exclusive berth 900 "		