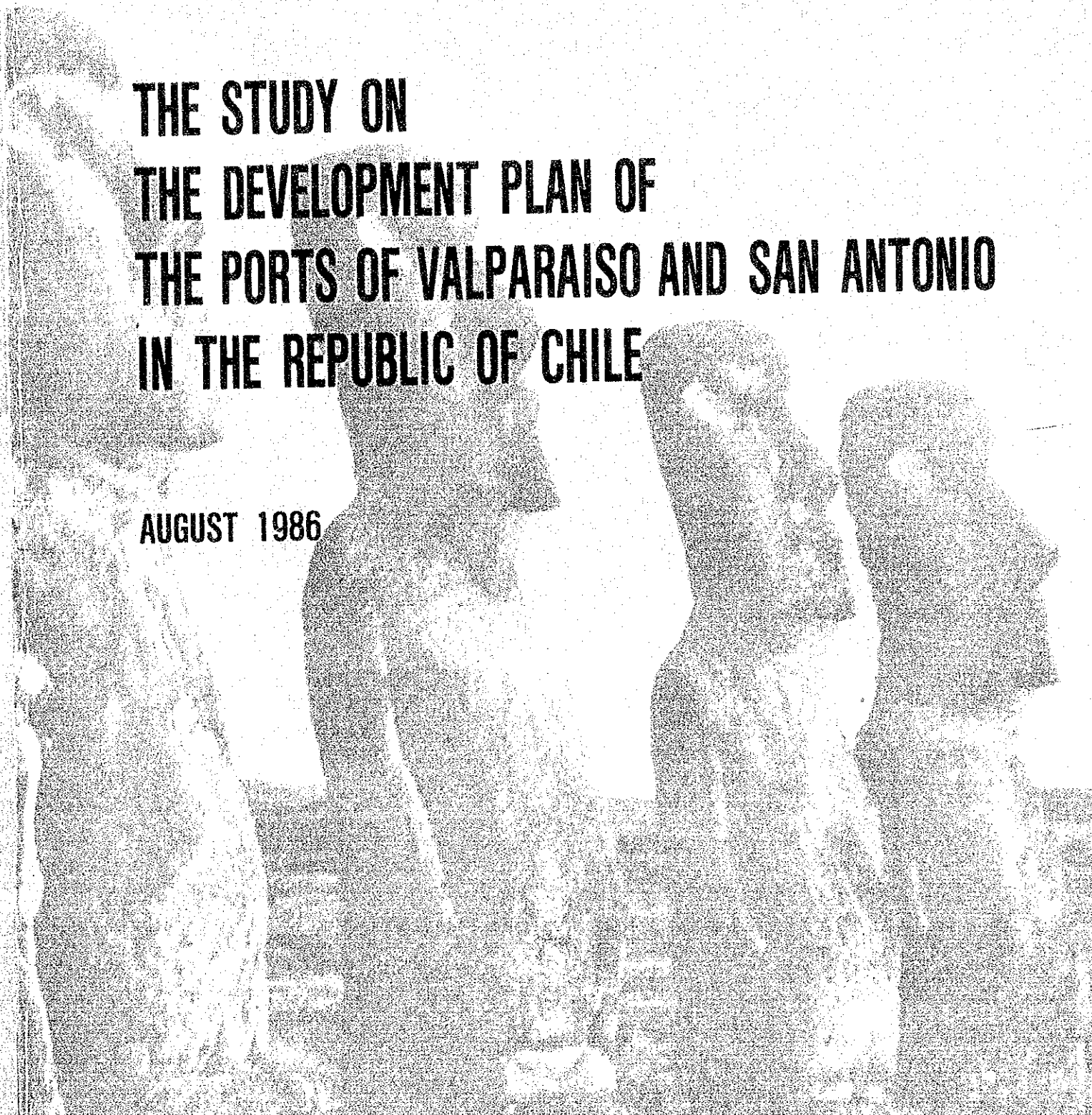
社会開発協力部報告書

No. 7

FINAL REPORT

THE STUDY ON THE DEVELOPMENT PLAN OF THE PORTS OF VALPARAISO AND SAN ANTONIO IN THE REPUBLIC OF CHILE

AUGUST 1986



JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

In response to the request of the Government of the Republic of Chile, the Japanese Government decided to conduct a study on the Project for Development of the Ports of Valparaiso and San Antonio and entrusted the study to the Japan International Cooperation Agency (J.I.C.A). J.I.C.A sent to Chile a study team headed by Mr. Katsuhiro Suzunai, Senior Adviser, The Overseas Coastal Area Development Institute of Japan (O.C.D.I), and comprising experts of O.C.D.I and Pacific Consultants International from September to December, 1985.

The team had discussions on the project with the officials concerned of the Government of Chile and conducted a field survey. After the team returned to Japan, further studies were made and the present report has been prepared.

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

I wish to express my deep appreciation to the officials concerned of the Government of the Republic of Chile for their close cooperation extended to the team.

August, 1986

Keisuke Arita

Keisuke Arita
President
Japan International Cooperation Agency

Letter of Transmittal

August, 1986

Mr. Keisuke Arita
President, Japan International Cooperation Agency

Dear sir,

It is my great pleasure to submit herewith to you the Study Report on the Development Plan of the Ports of Valparaiso and San Antonio.

This report incorporates the results of studies which The Overseas Coastal Area Development Institute of Japan and Pacific Consultants International have jointly carried out at the request of the Japan International Cooperation Agency.

Regarding this project, our study team conducted three series of field surveys, one of which took place from September 24 to December 13, 1985, to collect a variety of data including data concerning natural conditions. Based on the findings of these surveys as well as on the data and information collected and analyses in Japan, we have formulated Development Plans and Immediate Restoration Plans for the Port of Valparaiso and San Antonio, and a Restoration and Improvement Plan for the Port of Valparaiso.

We believe that the Development Project of the ports as proposed in this report will provide an effective means to promote the economic development of the Metropolitan Region and of the entire nation, and the provision of aseismic facilities as proposed in this report is an urgent matter to ensure the national security considering the seismic risk.

It is my great pleasure to hear that the Chilean Government intends to commission a feasibility study and a detailed design study for this project using funding which will be provided by the World Bank. I hope that these studies will begin very soon so that the Project can be implemented as soon as possible.

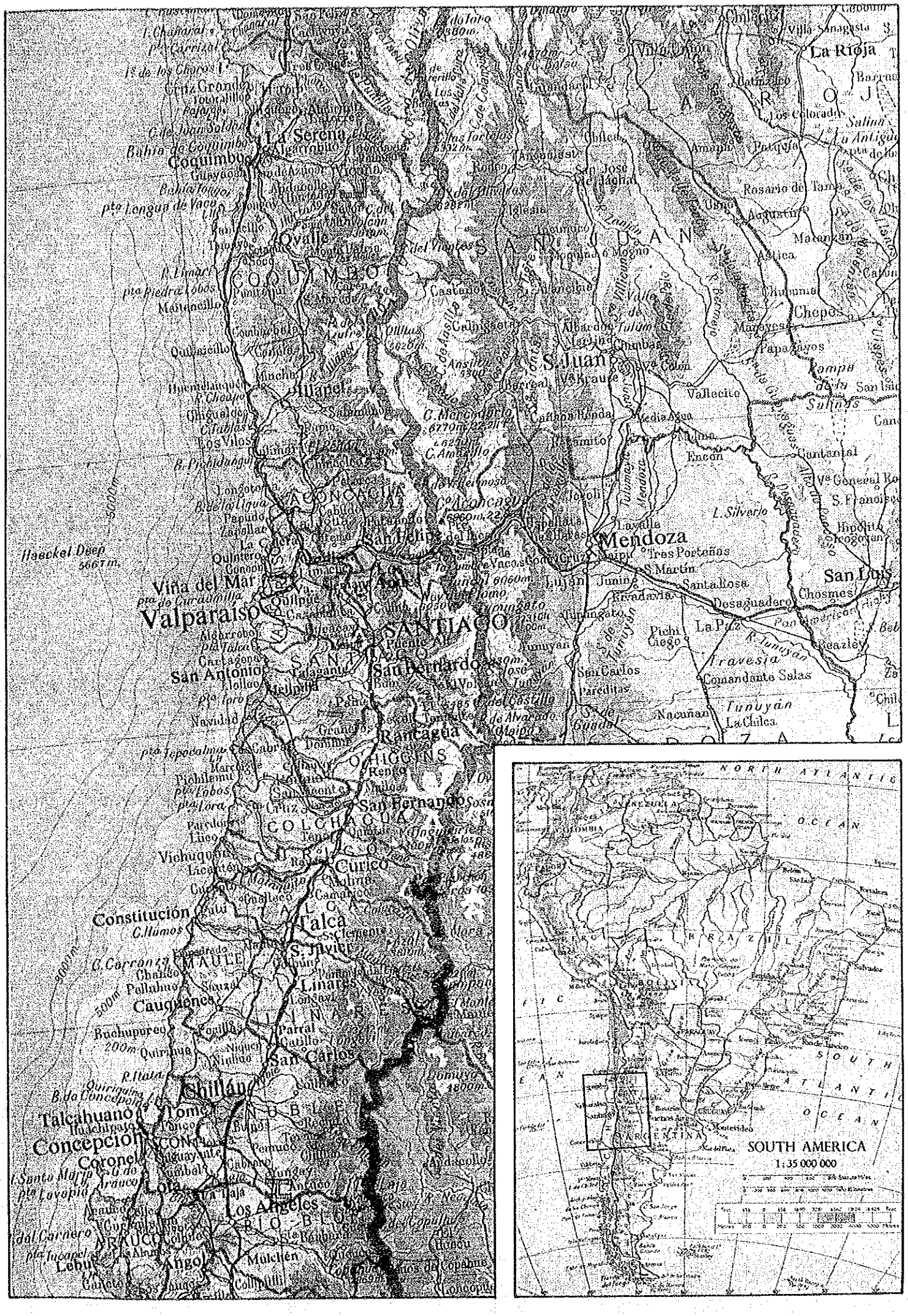
On behalf of the study team, let me express my heartfelt thanks to the various agencies of the Chilean Government for the generous cooperation, assistance and warm hospitality which were extended to the study team during our stay in Chile.

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

Yours faithfully,

Suzunai

Katsuhiro Suzunai
Head, Japanese Study Team
for the Development Project
of the Ports of Valparaiso and
San Antonio
(Senior Adviser, The Overseas Coastal
Area Development Institute of Japan)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Los Colorados
La Serena
Coquimbo
Ovalle
Rosario de Tama
Chepes
S. Juan
Vallecito
Media Agua
Encon
Cantantal
Mendoza
Tres Porteñas
S. Martín
Lujan
Junin
Santa Rosa
San Luis
Chosmes
Desaguadero
Viña del Mar
Valparaiso
SANTIAGO
San Bernardo
San Antonio
Rancagua
La Paz
Pichi Ciego
Travesia
Comandante Salas
San Carlos
Nacuñan
La Chilca
San Fernando
Curico
Constitución
Talca
Linares
Cauquenes
San Carlos
Chillán
Talcahuano
Tomé
Concepción
Coronel
Lota
Los Angeles
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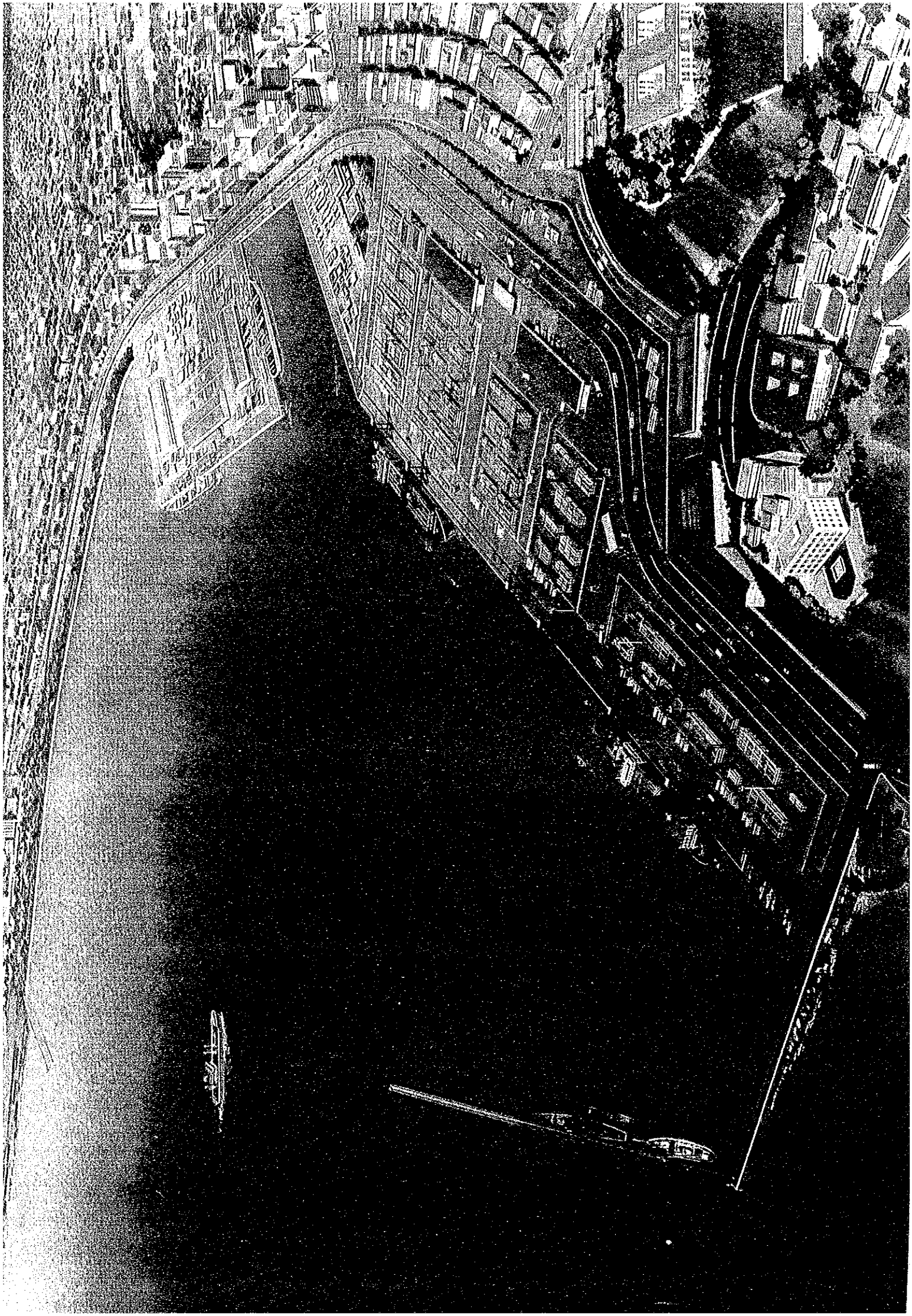

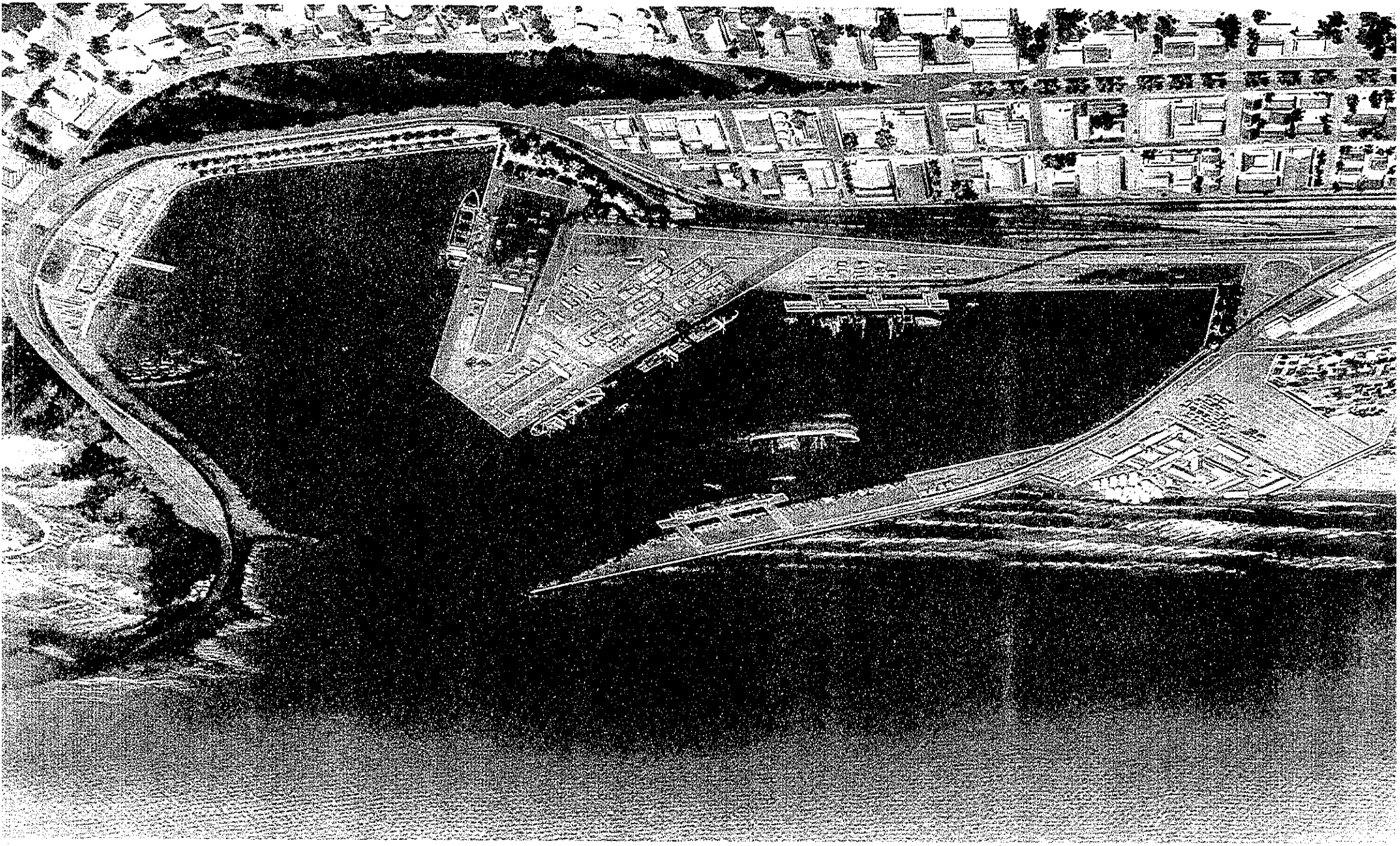

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RECOMMENDATION

RECOMMENDATIONS

1. The Port Plans may have to be altered in the Future based on Future Economic Changes

Our proposed port plans for both ports have been prepared by studying the past development in the hinterland, and by assuming future socioeconomic conditions and so on. However, the economic activities in the hinterland are constantly changing, and the entire Chilean economy, including the activities at the ports, is deeply influenced by the world economy.

It is, therefore, important to keep track of future economic changes and to revise the port plan or take other steps, as necessary.

2. Necessity of Early Implementation

It is expected that containerization in both ports will grow rapidly in the future, and the risk of large earthquakes will continue.

Therefore, port facilities which are severely deteriorated and out-dated, and which have lower aseismicity as identified from the field investigation, should be reconstructed or replaced early in the development project in an effort to provide more modernized facilities with greater aseimicity as soon as reasonably possible.

3. Coordination between Port Operation and Construction Works

The short-term development plans (Restoration and Improvement Plans) for both ports include construction works within the present boundaries of the ports.

Thus construction works and ongoing port operations must be carefully coordinated so that the construction works do not interfere with the regular daily activities at the ports.

4. Review of the Structual Types of the Main Facilities

The purpose of the preliminary structural designs presented in this study is to determine the basic structural types of the main facilities to make a rough estimate of the construction costs for economic and financial analyses.

Preliminary designs are carried out based on the soil investigation

which the Study Team conducted in 1985 and on available data from past investigations. However, as the scope of the soil investigations conducted to date is limited, the structural types of the main facilities should e reviewed based on more detailed soil investigations prior to the actual construction works.

5. Project Financing

The proposed long-term project is a large-scale undertaking which is crucial to the future development of the national economy of Chile. Both the private and the public sectors will be involved with various aspects of the development project.

As the development plan, particularly the construction of the aseismic facilities, is a matter of national security and well being, it may be appropriate to subsidize the project to some extent using funds from the national budget.

6. Possible revision of the Port Plans Based on Additional Date

The proposed port plans have been formulated based on data collected during the site surveys and on other available data. Especially, long-term observation data concerning natural conditions such as winds and waves have been used in designing both the immediate and the long-term plans.

However, the available data, particularly for the Port of San Antonio, is not really sufficient. Thus, it is of the utmost importance to continue regular site observations at both ports, and the port plans may have to be revised somewhat based on additional data.

OUTLINE OF THE STUDY

OUTLINE OF THE STUDY

1. The background of the Study

Chile is known as a country of scenic beauty with veried coastal natural features. It is also known as an earthquake-prone country, part of the circum-pan-Pacific earthquake belt. The earthquake which occurred near Conception in central Chile in May 1960 and brought unprecedented "tsunami" damage to Japan, 18,000 Km away, is still fresh in our memories.

More recently, on March 3, 1985, at about 19:50 hours, an earthquake of magnitude (M) 7.7 occurred in the area near the capital, Santiago, and Valparaiso in Central Chile, and caused severe damage to the port of Valparaiso and to the port of San Antonio, both nationally important.

The ports of Valparaiso and San Antonio suffered considerable damage; port facilities including wharf embankments were affected, producing cracks and tilting forward quays and cranes. These ports, together with Quintero (which was not damaged by the earthquake), are the main terminals handling maritime commerce for the principal centers of production and consumption in Region Five, the Metropolitan area of Santiago, and important parts of Regions Four, Six and Seven. Because of their importance to the national economy, it is imperative that these ports be provided with the capacity to fulfill demand for maritime commerce as soon as possible. To meet these short-term needs, it has been decided to seek quick solutions that will impose minimal constraints on the various options to be considered in selecting the best long-term development plans for these ports.

The Government of the Republic of Chile requested the Government of Japan to provide technical cooperation in the rehabilitation of the damaged port facilities and in planning the future development of the ports. The Government of Japan dispatched a preliminary study team to comply with the request. The preliminary team decided that the study team would conduct an investigation of the damaged facilities and perform a survey to gather data for the formulation of a rehabilitation plan for the damaged facilities as well as a Master Plan for the comprehensive long-term development of the ports.

2. Purpose and Study Method

The purpose of the Study is to formulate a development project for the ports of Valparaiso and San Antonio.

The plans involved in the development project are summarized below.

Plans to be formulated	Port of Valparaiso	Port of San Antonio
Immediate restoration Plan	○	○
Master plan	○	○
Restoration and improvement plan	○	

A natural conditions survey, data collection and analysis were conducted and hearings and discussions were held. In addition, the team was fully able to exchange opinions and views with Chilean counterparts throughout the course of the Study.

3. Participants in the Study

1) Study Team

Team Leader	Katsuhiro Suzunai	The Overseas Coastal Area Development Institute of Japan (OCDI)
	Yasuyuki Nakayama	OCDI
	Yasunori Shibahara	OCDI
	Eiji Yasuda	OCDI
	Takashi Yanase	OCDI
	Yoshiharu Sadamatsu	OCDI
	Shinichi Inoue	OCDI
	Shigezumi Onogawa	Pacific Consultants International (PCI)
	Nobuo Ide	PCI
	Toshio Yamada	PCI
	Akira Ichihara	PCI
	Yuichi Kaji	PCI
	Yoshiaki Terashima	PCI
	Hiroshi Inoue	PCI

Coordinator	Eiji Tomida	Japan International Cooperation Agency (JICA)
	Tetsuo Omomi	JICA
	Koichi Miyoshi	JICA

(2) Counterparts

Plan Director Subcommission (Ports of V Region Reconstruction Commission)

President	Marcos Maraboli B.	Ministry of Transport and Telecommunications (MTT)
	Hugo de la Fuente R.	Ministry of Public Works (MOP)
	Fernando Garcia B.	The National Planning Office (ODEPLAN)
	Jorge Asecio F.	Ministry of Economy
	Marcela Quezada V.	The Chilean Port Enterprise (EMPORCHI)
	Jaime Herrera F.	MTT
	Enrique Pereira O.	The Maritime Territory Direction and Merchant Marine (DIRECTEMAR)
	Alejandro Pattillo	Adviser to the Commission

Emergency Subcommission

President	Jorge Baeza C.	EMPORCHI
	Luis Mesias G.	DIRECTEMAR
	Jorge Hadermann	EMPORCHI
	Miguel Valenzuela	MOP
	Jaime Opazo F.	MTT
	Miguel Espinoza	MOP

MOP

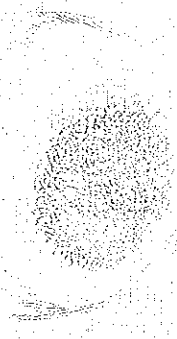
Hernan Rubio
Arturo Prat
Jaime Pena
Jose Allendes
Eduardo Tschorne
Jose Navarro

EMPORCHI

Ivan Leiva G.	Manager, Port of Valparaiso
Patricio Toro F.	Manager, Port of San Antonio
Jaime Sanchez	
Julio Fernandez	
Enrique Koplow	

JICA Experts

Setsuo Noda	Ministry of Transport (MOT)
Yasuo Takagaki	MOT
Nobuaki Ohtsuki	MOT



CHAPTER I BACKGROUND OF THE COUNTRY

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I-1 General

Chile is located in the southwest extremity of South America. It is situated between latitude 17°30' S. and 56°32'S., and longitude 66°30' W. and 75°40'W. The total length of the country from its northernmost part to its southernmost part is 4,270 km, and the average breadth from east to west is 262 km. With a total area of 756 thousand km^2, Chile has 11.275 million inhabitants, according to a population census taken in 1982.

Chile is bordered by Peru to the north, and by Bolivia and Argentina (the Andes Mountains) to the east. It faces the Pacific Ocean to the west (refer to the map on the inside cover).

Chile's climatic characteristics serve to divide the country into 3 separate areas. One of those regions extends from the northernmost part to 30° S.L. and is comprised mainly of desert areas with virtually no annual rainfall. In the lower latitudes, the heat in this area is relieved by the cold Humbolt ocean current on the coast. This region is rich in mineral resources such as copper, iron and rock salt.

The central region, including the metropolis of Santiago, has a temperate climate. With some rainfall in the winter, the climate resembles that of the Mediterranean area. The central region plays a major role in the Chilean economy with thriving agriculture and cattle breeding. Mineral resources such as copper and coal are also located in this area.

The area south of 35° S.L. is characterized by prevailing westerly winds with a great deal of rainfall throughout the year. The area south of 40° S.L. has a recorded rainfall of 2,000 mm per year. In addition to agriculture and cattle breeding, the southern region is noted for its flourishing forestry industry. It is also favoured with marine resources. Although the temperature often drops below zero degrees centigrade, the climate of this region is rather mild for its latitude due to the influence of the Humbolt current.

Chile experiences a large number of earthquakes since it is situated in the pan-Pacific earthquake belt. (Refer to Fig. II-1-1). Extensive movement in the earth's crust occurs in this area since the Continental Plate is gradually slipping below the Pacific Plate. Japan and the western coastal area of North America are also susceptible to earthquakes since they are located in areas with similar frequent movement of the crust of the earth.

Table I-1-1 Temperatures and Rainfall of Some Chilean Cities: Summary of the Country's Climate

CITY	LATITUDE	MEAN TEMPERATURES (EXPRESSED IN °C)				AVERAGE RAINFALL (EXPRESSED IN MM)		
		MEAN ANNUAL TEMPERATURE	WARMEST MONTH	COLDEST MONTH	ANNUAL OSCIL-LATION	AVERAGE ANNUAL RAINFALL	DRIEST MONTH	WETTEST MONTH
Iquique	20°13'S.	17.9	20.9 Jan	15.4 Jul.-Aug.	5.5	2.1	0.0 Nov.-Dec.	0.7 Jul.-Aug.
Antofagasta	23°39'S.	16.6	20.4 Jan.-Feb.	13.4 Jul.	7.0	7.7	0.0 Dec.-Jan.	2.4 Jul.
La Serena	29°54'S.	14.7	18.4 Feb.	11.7 Jul.	6.7	133.3	0.1 Jan.	43.7
Valparaiso	33°02'S.	14.7	18.0 Jan.	11.8 Jul.	6.2	458.9	2.0 Feb.	128.0 Jun..
Santiago	33°27'S.	14.0	20.0 Jan.	8.1 Jul.	11.9	356.3	1.6 Jan.	84.6 Jun.
San Fernando	34°35'S.	13.4	20.1 Jan.	7.5 Jul.	12.6	773.1	6.5 Feb.	195.5 Jun.
Talca	35°26'S.	14.8	22.1 Jan.	8.5 Jul.	13.6	716.3	6.1 Jan.	172.8 Jun.
Concepción	36°50'S.	13.8	18.0 Jan.	9.6 Jul.	8.4	1,292.8	14.8 Jan.	252.2 Jul.
Temuco	38°44'S.	12.0	17.0 Jan.	7.9 Jul.	9.1	1,345.0	24.3 Jan.	219.4 May
Valdivia	39°48'S.	11.9	17.0 Jan.	7.7 Jul.	9.3	2,488.7	65.4 Jan.	414.1 Jun.
Puerto Aisén	45°24'S.	8.9	13.4 Jan.	4.8 Jul.	8.3	2,820.3	190.4	312.7 Jun.
Punta Arenas	53°09'S.	6.7	11.7 Feb.	2.5 Jul.	9.2	437.1	24.3 Oct.	50.4 May

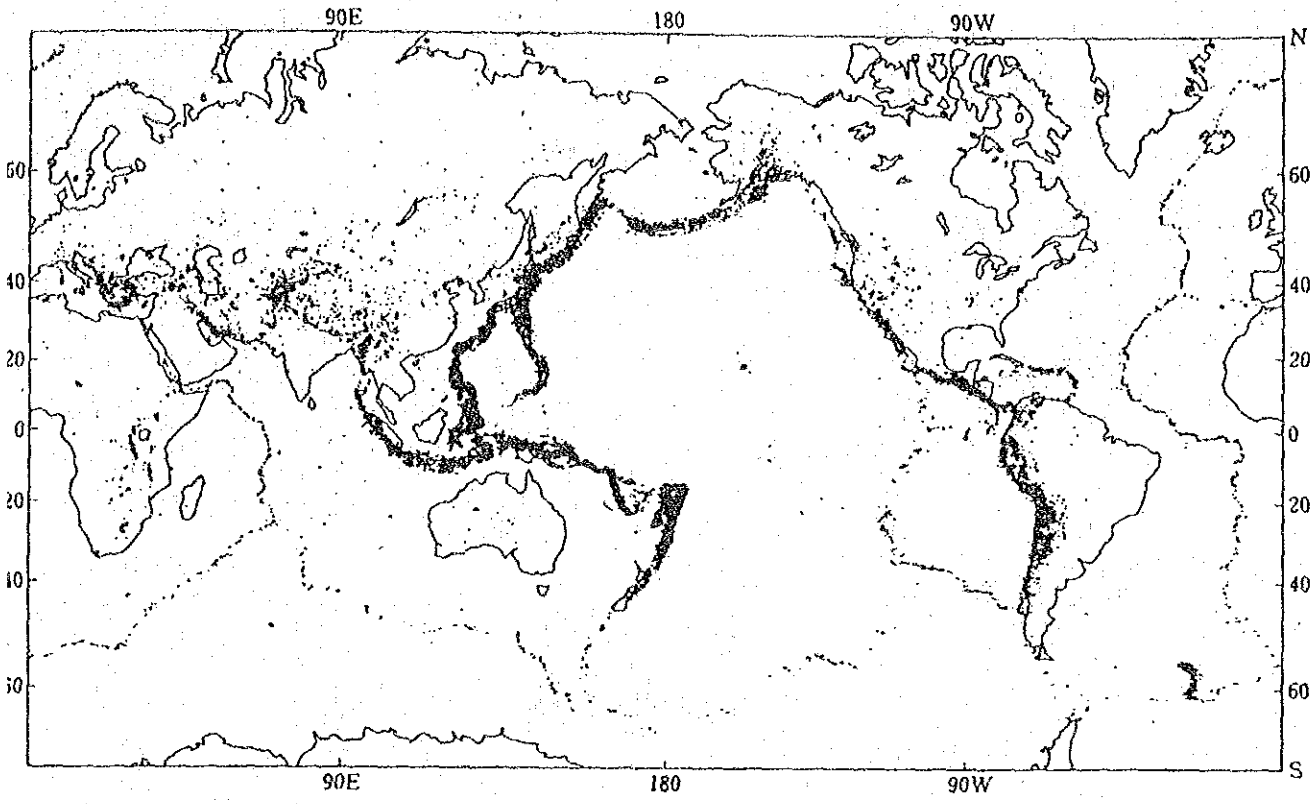


Fig. I-1-1 Earthquake Map

Chile experienced a severe earthquake near Concepcion in May 1960. In March 1985, another strong earthquake occurred near Valparaiso, followed closely by the earthquake in Mexico in July 1985. Earthquakes of the magnitude experienced on these occasions are a recent phenomena. Damage caused to the Ports of Valparaiso and San Antonio during the March 1985 earthquake are the impetus for this study.

I-2 Social Conditions

(1) Organization

For administrative and internal government purposes, the country is divided into regions, and these, into provinces. For the purpose of local administration, the provinces are subdivided into communes. (Fig. I-2-1, Table I-2-1).

The regional, provincial and communal government systems are hierarchically structured. At the head of each region's administration is the Intendant, who is in charge of directing and administrating the Region, and is advised by a Regional Council of Development and a Regional Secretariat of Planning and Coordination.(Fig. I-2-2)

The government and administration of each province are entrusted to a Governor, who is subordinate to the Regional Intendent whom he represents. He is assisted by an Advisory Technical Committee and by a Provincial Council.

In charge of communal government is the Mayor, assisted by a Communal Council of Development and by a Communal Secretariat of Planning and Coordination.

The basis of the system is the commune, since it is there that organized participation of the community takes place. Within the system, the Ministries act in a decentralized way by means of Regional Ministerial Secretariats.

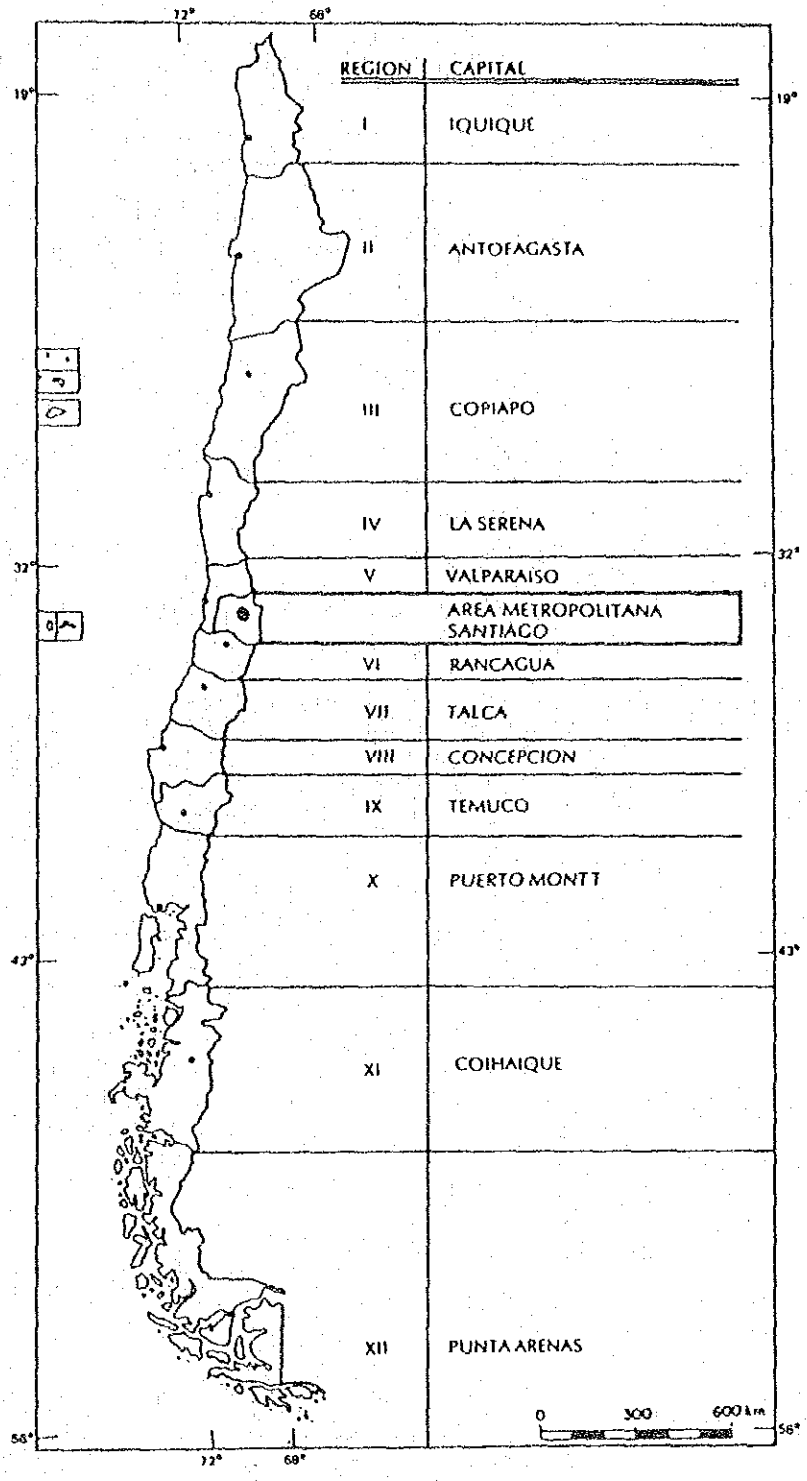


Fig. I-2-1 Regions

Table I-2-1 Political-Administrative Division of Chile

REGION	CAPITAL	PROVINCES	CAPITALS
Region I Tarapaca	Iquique	Arica Iquique Parinacota	Arica Iquique Putre
Region II Antofagasta	Antofagasta	Tacopilla Antofagasta El Loa	Tacopilla Antofagasta Calama
Region III Atacama	Copiapó	Chanaral Copiapó Huasco	Chanaral Copiapó Vallenar
Region IV Coquimbo	La Serena	Elqui Limari Choapa	Coquimbo Ovalle Illapel
Region V Valparaiso	Valparaiso	Valparaiso Quillota San Antonio San Felipe de Aconcagua Los Andes Petorca Isla de Pascua	Valparaiso Quillora San Antonio Sam Felipe Los Andes La Ligua Hanga Roa
Region VI Libertador Gral. Bdo. O'Higgins	Rancagua	Cachapoal Colchagua Cardenal Caro	Rancagua San Fernando Pichilemu
Region VII Maule	Talca	Curicó Talca Linares Cauquenes	Curicó Talca Linares Cauquenes
Region VIII Bíobío	Concepción	Nuble Concepción Arauco Biobio	Chillán Concepción Lebu Los Angeles
Region IX Araucanía	Temuco	Malleco Cautin	Angol Temuco
Region X Los Lagos	Puerto Montt	Valdivia Osorno Llanquihue Chiloé Palena	Valdivia Osorno Puerto Montt Castro Chaitén
Region XI Aisén del Gral. C. Ibanez del Campo	Coihaique	Aisén Gral. Carrera Capitán Prat Coihaique	Puerto Aisén Chile Chico Cochrane Coihaique
Region XII Magallanes and Chilean Antarctic	Punta Arenas	Ultima Esperanza Magallanes Tierra del Fuego Antártica Chilena	Pto. Natales Punta Arenas Porvenir Pto. Williams
Metropolitan Region of Santiago	Santiago	A.M. de Santiago Chacabuco Cordillera Maipo Talagante Melipilla	Santiago Colina Puente Alto San Bernardo Talagante Melipilla

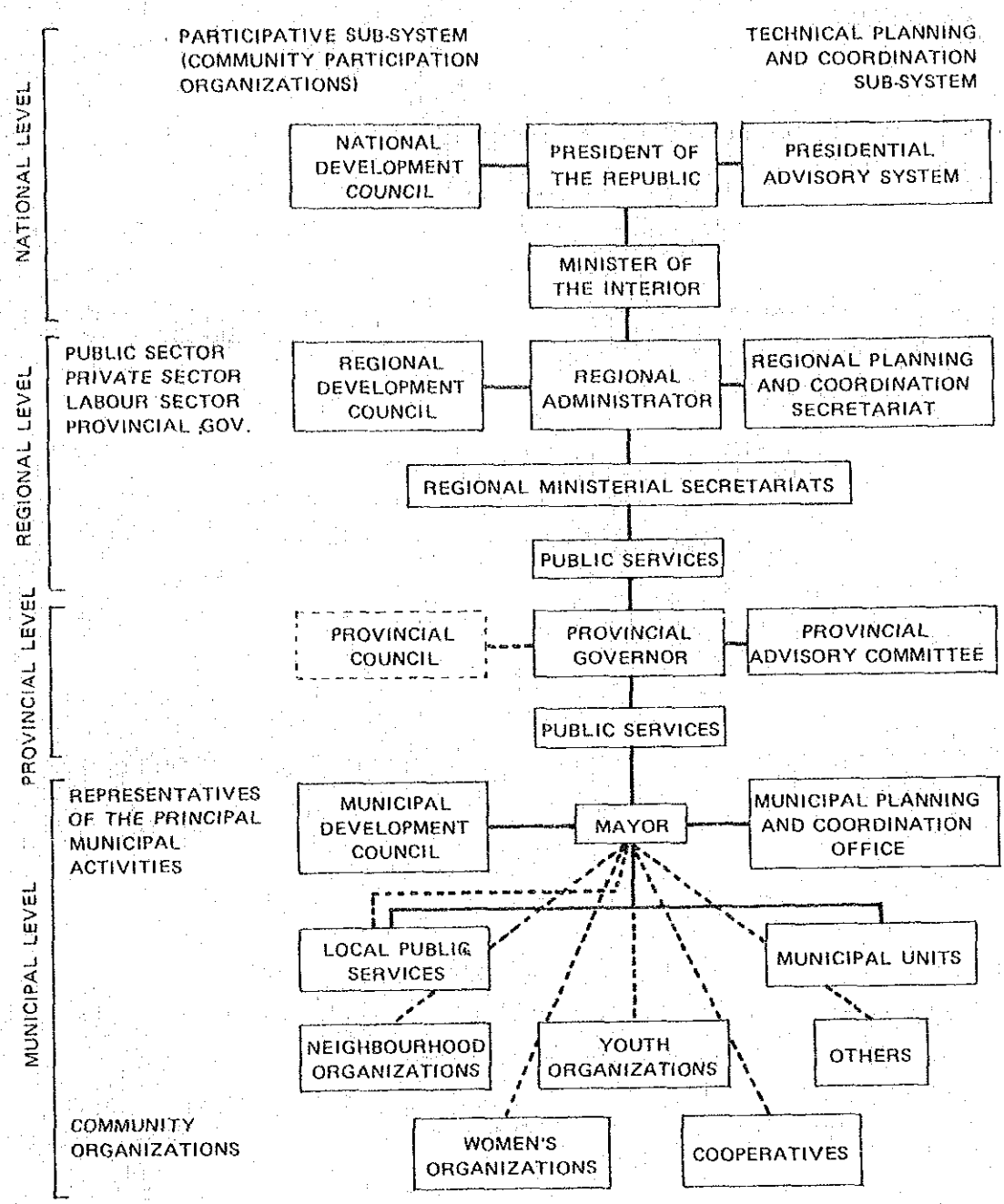


Fig. I-2-2 Government Structure and National, Regional, Provincial and Municipal Administration

(2) Land Use

Close to 69.6%, or 526 thousand km^2 of Chile's total land area of 756 thousand km^2 is comprised of desert and mountainous areas. Of the remaining land space, 17 thousand km^2 (2.2%) is used for agriculture, 129 thousand km^2 (17.1%) for cattle breeding and 84 thousand km^2 (11.1%) is utilized for forestry.

287.6 thousand km^2 of the total land area is used for agriculture, forestry and ranching. This figure also includes the land to be used for potential development in these areas. Of the total land area, land used for ranches holds the largest percentage at 42.3%, in second place is forestry with 20.5% and land under cultivation is 11.5% . (Refer to Table I-2-2).

Looking at the distribution of arable and irrigated land by different regions, the area south of the 7th region has a great deal of land suitable for land cultivation totaling 75.6% of the total cultivated land area.

Table I-2-2 Land Breakdown

SPECIFICATION	Km^2	%
Land under cultivation	33,178	11.5
Natural pastures	108,540	37.8
Improved pastures	11,154	4.5
Forestry plantations, forests & scrub under exploitation	15,231	5.2
Natural forests & scrub under exploitation	44,273	15.3
Sterile land (arid, stony or sandy ground, sand dunes, etc.)	69,478	24.3
Land under indirect use (buildings, canals, etc.)	3,738	1.4
TOTAL	287,592	100.0

Source: National Agricultural & Livestock Census 1975-76.

The central regional area between the Santiago metropolitan area and the 8th region comprises 80.4% of the total irrigated land. (Refer to Table I-2-3).

Table I-2-3 Arable and Irrigated Area by Region
('000 hectares)

REGION	ARABLE		IRRIGATED		PERCENTAGE IRRIGATED (%)
	AREA	(%)	AREA	(%)	
I to III	36.3	1.1	23.4	2.2	64.4
IV	125.1	3.8	71.8	6.8	57.3
V	155.3	4.7	77.8	7.3	50.1
Metropolitan Region	171.1	5.1	155.9	14.8	91.1
VI	321.8	9.7	205.8	19.5	64.0
VII	522.8	15.8	301.8	28.6	57.7
VIII	731.1	22.0	184.6	17.5	25.2
IX	722.9	21.8	28.3	2.7	3.9
X to XII	531.4	16.0	5.9	0.6	1.1
TOTAL	3,317.8	100.0	1,055.3	100.0	31.8

Source: National Agricultural & Livestock Census

(3) Population

Chile's total population at the end of June 1985 is estimated as 11,858 thousand, with an average annual increase of 1.71% over the last 10 years.

The current urban population comprises roughly 83.1% of the total population. The concentration of the population in urban areas is phenomenal. The concentration has been consistently growing since the 1952 census. Migration of the rural population is predominantly to the Santiago Metropolitan Region and to the provinces of Concepcion and Valparaiso.

The population flow into the Santiago metropolitan region is particularly notable. The average growth rate of the population in this region during the last 10 years is 2.34%, which is much higher than that of the national total. Santiago's current population is 39.3% of the total population of the country. Refer to Table I-2-4 for Chile's population by region for the past 5 years.

Table I-2-4 Population by Region

(Unit: Thousand people)

	1980	1981	1982	1983	1984
I Region	239.2	245.5	273.4	257.4	263.4
II Region	313.1	319.6	341.2	329.1	333.9
III Region	198.7	301.7	184.1	309.1	313.9
IV Region	416.5	420.7	419.2	431.8	437.2
V Region	1,231.0	1,251.9	1,204.7	1,294.8	1,316.2
Metropolitan Region	4,264.5	4,372.7	4,294.9	4,572.3	4,672.7
VI Region	567.5	566.3	585.0	579.3	586.0
VII Region	706.9	712.2	723.2	727.5	735.4
VIII Region	1,473.9	1,496.1	1,516.6	1,537.5	1,558.7
IX Region	657.4	662.5	592.9	671.3	675.7
X Region	863.4	868.2	843.4	888.7	899.3
XI Region	63.4	66.2	65.5	69.1	70.6
XII Region	108.7	110.5	132.3	114.4	116.4
Total	11,104.3	11,294.1	11,275.4(c)	11,682.3	11,878.4

The current population density is 15.7 inhabitants per square kilometer, one of the lowest in Latin America. Reasons for this are geographical, in that more than 70% of the land is comprised of uninhabitable areas such as deserts and high mountains.

The ranking of the 10 most populated cities in Chile as of June 30, 1982 is as follows.

City	Population
1. Santiago (Metropolitan area)	4,039,287
2. Vina del Mar	290,014
3. Valparaiso	266,577
4. Talcahuano	208,941
5. Concepcion	206,107
6. Antofagasta	166,964
7. Temuco	162,058
8. Rancagua	137,773
9. Talca	134,721
10. Arica	120,846

Valparaiso, where the Port of Valparaiso is located, is the 3rd most populated city in Chile, after Santiago and Vina del Mar. The cities of Valparaiso and Vina del Mar are situated adjacent to each other, and together they constitute the 2nd largest metropolitan area.

The population of San Antonio is estimated to be 95,971 as of 1984.

I-3 Economic Development

(1) Overview

Despite a number of incidents of political unrest after the present Chilean government was formed in September 1973, the present government's strict economic retrenchment policy ensured that Chile enjoyed smooth economic growth until 1980.

Considerably high GDP growth rates were recorded between 1977 and 1980. During this period, for the most part, equilibrium of fiscal expenses was maintained and inflation was eased. Private investment in capital goods rose, but domestic accumulation of deposits was unsatisfactory. A large part of Chile's required funds were financed by overseas borrowing.

After the second oil-shock, which created a worldwide economic slump and a sudden increase in worldwide interest rates, Chile's industrial activities started to decline. Furthermore, from 1981 on the market for copper slackened. In the same year, exports dropped quite drastically from the year before and business conditions became radically worse.

In light of the fact that in political circles this deterioration was regarded as a temporary situation, financial policies were not stiffened, and overseas borrowing was increased.

After 1983, however, due to the perceived need for decisive action, economic policies were made stricter, and in addition to a policy promoting a balance of imports and exports, middle- and long-term economic development and expansion of domestic investment in capital equipment was emphasized.

(2) Gross Domestic Product and the Industrial Structure

The average annual growth rate of Chile's GDP during the last 10 years is 3.6%. According to the 1985 World Development Report of the World Bank, the average growth rate of GDP from 1973 to 1983 was 2.9%. This figure exceeds those of Argentina (0.4%) and of Uruguay and Venezuela (both 2.5%), but is below those of Brazil (4.8%) and of Mexico (5.6%).

The annual GDP growth rate in Chile between 1977 and 1981 was high (5.7% - 9.0%). However, compared with the previous year's figures, the GDP for 1982 shows a 14.1% decrease. With the worldwide economic recession and a sudden increases in interest rates, Chile's economy deteriorated rapidly. (Refer to Table I-3-1).

Table I-3-1 Overall Economic Indicators: 1973 - 1984

SPECIFICATIONS	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984*
Growth of GDP (%)	-5.6	1.0	-12.9	3.5	9.0	8.2	8.3	7.8	5.7	-14.3	-0.7	6.3
Inflation (%)	508.1	375.9	340.7	174.3	63.5	30.3	38.9	31.2	9.5	20.7	23.1	23.0
Fiscal deficit/GDP (%)	24.7	10.5	2.6	2.3	1.8	0.8	-1.7	-3.1	-1.7	2.3	3.8	4.0
Exports f.o.b.(million US$)	1,309	2,151	1,590	2,116	2,185	2,460	3,835	4,705	3,836	3,706	3,827.0	3,650.3
Import f.o.b. (million US$)	1,288	1,794	1,520	1,473	2,151	2,886	4,190	5,469	6,513	3,643	2,818.0	3,357.3
Trade Balance (million US$)	21	357	70	643	34	-426	-355	-764	-2,677	63	1,009.0	293.0
Balance of Payments (million US$)	-21	-55	-344	414	113	712	1,047	1,244	67	-1,165	-541.0	17.3
Medium & long-term foreign debt (million US$)	3,261	4,026	4,267	4,274	4,510	5,923	7,507	9,413	12,553	13,815	14,831.0	17,032.0

* Estimated
Source: Banco Central de Chile

A breakdown of GDP share by sector and its average annual growth rate for the past 10 year period is presented in Table I-3-2.

Table I-3-2 GDP by Sector

	Share (%) in 1984	Average Annual Growth from 1975-1985 (%)
Agriculture & Livestock	8.3	1.6
Fisheries	1.0	14.9
Mining	8.7	4.7
Manufacturing	20.7	3.1
Construction	5.1	2.5
Electricity Gas, & Water	2.5	4.8
Transport & Communications	5.4	4.0
Commerce	16.9	5.9
Services & Other	31.4	2.9
Total	100.0	3.6

Source: Banco Central de Chile

As can be seen, the tertiary industries enjoyed relatively smooth economic growth and the growth in the manufacturing and construction industries was below that of all industries, showing a gradual change in industrial structure.

The total amount of capital equipment investment as a ratio of GDP for 1984 is 13.2%. The average for the last 10-year period is 15.0%. Compared to the figures for other Central and South American countries, those for Chile are at a somewhat low level.

Table I-3-3 Breakdown of Gross Capital Formation

(Million 1977 pesos)

YEAR	GROSS FIXED CAPITAL FORMATION					Gross Fixed Capital Formation GDP (%)
	Total	Construction & Other Works	MACHINERY & EQUIPMENT			
			Total	Imported Machinery	Domestic Machinery	
1975	38,992	25,118	13,874	11,465	2,410	15.4
1976	32,215	20,683	12,532	10,471	2,061	12.7
1977	38,346	21,251	17,095	14,593	2,503	13.3
1978	45,009	24,111	20,898	17,454	3,444	14.5
1979	52,593	28,633	23,960	21,101	2,860	15.6
1980	64,105	35,005	29,101	25,785	3,315	17.6
1981	74,848	40,877	33,970	30,597	3,373	19.5
1982	49,448	30,847	18,601	16,640	1,961	15.0
1983	42,091	29,363	12,728	11,042	1,685	12.9
1984	45,870	31,209	14,661	12,809	1,852	13.2

Source: Banco Central de Chile

(3) Foreign Trade

Referring to Table I-3-4, the total exports and imports in 1984 were US$7,007 million. This is roughly 2.25 times the total export and import figure 10 years before. The average annual rate of growth during the interim period was 9.4%.

Table I-3-4 Chile's Exports and Imports

	Exports		Imports		Total	
	Value (US$1 mil)	Growth rate(%) over previous year	Value (US$1 mil)	Growth rate(%) over previous year	Value (US$1 mil)	Growth rate(%) over previous year
1975	1,590	- 26.1	1,520	-15.3	3,110	- 21.2
1976	2,116	33.1	1,473	- 3.1	3,589	15.4
1977	2,185	3.3	2,151	46.0	4,336	20.8
1978	2,460	12.6	2,886	34.2	5,346	23.3
1979	3,835	55.9	4,190	45.2	8,025	50.1
1980	4,705	22.7	5,469	30.5	10,174	26.8
1981	3,836	-18.5	6,513	19.1	10,349	1.7
1982	3,706	- 3.4	3,643	- 44.1	7,349	-29.0
1983	3,827	3.3	2,818	- 22.7	6,645	- 9.6
1984	3,650	- 4.6	3,357	19.1	7,007	5.4
Average growth rate	-	9.7	-	9.2	-	9.4

Source: Banco Central de Chile

During the 10-year period, the largest volume of exports was achieved in 1980, with a value of US$4,705 million. This is roughly 3 times the US$1,590 million export volume in 1975. With the slackening in the rate of economic growth throughout the world after the first oilshock, Chile's exports in 1975 were 26.1% lower than those of the previous year. The domestic and worldwide recovery in economic growth after that ensured continued smooth increases in exports up to 1980.

When the world economy once again faced a slump after the second

oilshock, for the 2 consecutive years after 1980 there was a decrease in exports: -18.5% in 1981 and -3.4% in 1982.

In 1983 exports were up 3.3% from the previous year, and in 1984 they once again dropped by 4.6%. This change was caused mainly by a slackening in the price of principal export commodities.

Chile's export trends by commodity are shown in Table I-3-5. It can be seen that the ratio of total copper exports is gradually declining; however, the ratio is still high.

Taking a close look at the price and volume of copper exports, (Tables I-3-6, and I-3-7), despite the fact that export volume increased at an average rate of 4.7% per year, export prices declined at an average rate of 11% per year to 62.8% of the 1980 level. This decline in copper export prices is the major reason for copper's declining share in total exports.

Reference to Table I-3-4 shows that, under a policy of trade liberalization, there was a vigorous increase in imports between 1976 and 1981. The average growth rate of the volume of imports during this period was 34.6%. In 1982, however, in congruence with the economic recession, consumption waned and investment in equipment was kept under a tight rein. Consequently, imports decreased by 44.1% compared to the previous year. This trend continued into 1983, which showed a decline of 22.7%. With economic recovery in Chile in 1984, imports increased 19.1% over the 1983 figures. Table I-3-8 shows the trends in Chile's imports by commodity. In 1982, the values of imports in all groups diminished dramatically compared to 1981 figures. If a line is drawn between 1981 and 1982 for import trends during the last 10-year period, it can be seen that prior to and including 1981 there was an extremely high growth rate in non-food consumer goods and capital goods. After 1982, however, imports in these same areas decreased to record lows. It is also clear that trade movement in these areas is sensitive to domestic business conditions.

Table I-3-5 Exports of Goods 1975 - 1984
(Million US$)

SPECIFICATION	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
MINING	1,074.6	1,417.6	1,348.8	1,425.9	2,155.0	2,614.6	2,177.5	2,123.7	2,331.5	1,961.7
Copper	868.2	1,233.2	1,161.4	1,218.7	1,887.9	2,124.7	1,737.8	1,684.6	1,871.0	1,603.8
- Large-scale mining	(707.2)	(1,041.1)	(969.4)	(1,024.0	(1,602.5)	(1,771.0)	(1,403.4)	(1,350.8)	(1,505.9)	(1,279.5)
- Small - & medium-scale mining	(161.0)	(192.1)	(192.0)	(194.7)	(285.4)	(353.7)	(334.4)	(333.8)	(365.1)	(324.3)
Iron	89.9	86.3	81.5	103.1	116.7	157.6	161.9	158.2	112.0	110.6
Nitrate & Iodine	49.9	37.3	44.2	47.7	58.4	89.2	82.9	74.6	83.6	74.3
Silver Metal	23.2	4.8	3.9	27.1	48.6	120.0	82.0	81.5	114.5	87.4
Other Minerals	43.4	56.0	57.8	29.3	43.4	123.1	112.9	124.8	150.4	85.6
AGRICULTURAL, LIVESTOCK & MARINE Goods	84.3	111.2	159.5	203.5	264.5	339.9	365.4	374.9	327.5	428.3
Agricultural	58.4	83.9	126.6	157.7	183.8	244.3	268.0	278.1	253.7	345.7
Livestock	16.0	20.0	23.2	27.8	37.5	36.9	29.1	33.5	26.4	28.9
Forestry	4.0	1.5	1.2	2.4	3.3	1.6	2.1	2.2	2.3	1.8
Fisheries	5.9	5.8	8.5	15.6	39.9	57.1	66.2	61.1	45.1	51.9
INDUSTRIAL	395.0	579.8	668.2	833.6	1,399.4	1,704.8	1,238.9	1,125.3	1,081.9	1,175.5
Food	102.1	119.4	169.1	188.6	272.8	375.6	326.0	365.8	423.9	406.8
(Fishmeal)	(25.3)	(63.4)	(86.5)	(108.4)	(152.6)	(233.7)	(202.0)	(256.0)	(307.0)	(275.7)
Beverages	4.5	7.9	7.9	9.8	27.8	21.4	16.8	13.1	10.8	13.7
Lumber	24.9	37.3	70.4	94.4	164.7	286.2	121.0	122.3	116.4	116.3
Pulp, paper, cardboard & derivatives, printing materials	99.5	137.5	134.4	159.1	238.8	297.2	254.3	219.6	208.0	259.3
Chemical & Petroleum derivatives, non-metal ores	45.9	67.1	77.9	106.2	128.2	163.2	86.0	87.5	58.6	79.7
Metal Basic Industries	85.8	120.7	143.8,	192.4	460.9	425.0	293.8	243.8	206.2	217.2
(Oxide and ferromolybdenum)	(36.1)	(44.5)	(76.6)	(119.4)	(342.6)	(336.9)	(223.2)	(177.6)	(148.6)	(165.0)
Metal products, electrical machinery & appliances, transport & other	32.3	89.9	64.7	83.1	106.2	136.2	141.0	73.2	58.0	82.5
NON-MONETARY GOLD	35.6	7.0	9.0	-3.0	16.5	46.0	54.7	81.8	85.7	84.8
TOTAL	1,589.5	2,115.6	2,185.5	2,460.0	3,835.4	4,705.3	3,836.5	3,705.7	3,826.6	3,650.3
Share of Copper (%)	54.6	58.3	53.1	49.5	49.2	45.2	45.3	45.5	48.9	43.9

Source: Banco Central de Chile

Table I-3-6 Trends in Export Prices

(Base: 1977 = 100)

SPECIFICATION	PRICES					Average annual variation (%)
	1980	1981	1982	1983	1984	
Mining	183	151	129	137	119	-10.2
- Copper	(183)	(146)	(122)	(132)	(115)	(-11.0)
- Non-Copper	(185)	(169)	(162)	(162)	(140)	(6.7)
Agricultural, Livestock and Marine	139	142	128	109	122	-3.2
Industrial	145	131	99	94	94	-10.3
TOTAL	164	142	117	118	109	- 9.7
% annual variation		-13.4	-17.6	0.9	-7.6	

Source: Banco Central de Chile

Table I-3-7 Trends in Export Volumes

(Base: 1977 = 100)

SPECIFICATION	VOLUME					Average annual variation (%)
	1980	1981	1982	1983	1984	
Mining	106	107	123	126	122	3.6
- Copper	(100)	(102)	(119)	(122)	(120)	4.7
- Non-Copper	(142)	(139)	(145)	(152)	(137)	-0.8
Agricultural, Livestock and Marine	154	161	183	189	220	9.3
Industrial	168	147	182	184	199	4.3
TOTAL	129	124	145	149	153	4.4
% annual variation		-3.9	16.9	2.8	2.7	

Source: Banco Central de Chile

Table I-3-8 Import of Goods (C.I.F)
(Million US$)

	GOODS	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	Average Annual Variations(%) '75-'81	'81-'84	'75-'84
I.	Non-food consumer goods	117.7	101.0	440.2	601.5	805.8	1,271.5	1,904.0	894.4	494.1	552.3	40.2	-33.8	18.7
II.	Food	361.0	342.0	348.9	476.9	521.4	799.9	823.0	589.8	525.3	492.1	14.7	-15.8	3.5
III.	Intermediate goods	903.7	845.5	1,109.2	1,430.5	2,435.2	2,800.5	3,144.0	1,912.8	1,747.1	2,097.0	23.1	-12.6	9.8
	- Raw materials	268.0	214.4	325.8	386.6	565.0	632.2	757.0	449.8	505.4	607.7	18.9	-7.1	9.5
	- Spare parts & intermediate products	271.0	215.4	365.5	605.0	898.0	1,205.5	1,431.0	831.2	661.1	895.1	32.0	-14.5	14.2
	Fuel & Lubricants	251.6	350.7	417.9	438.9	981.2	962.8	956.0	631.8	580.6	594.2	25.0	-14.7	10.0
	(Petroleum)	(242.6)	(308.4)	(377.9)	(389.5)	(883.7)	(822.4)	(672.0)	(281.7)	(398.1)	(405.9)	18.5	-15.5	5.9
	- Large-scale copper mining	113.1	65.0	1/	1/	1/	1/	1/	1/	1/				
IV.	Total goods	1,382.4	1,288.5	1,898.3	2,508.9	3,762.4	4,871.0	5,871.0	3,397.0	2,766.5	3,144.4	27.3	-18.8	9.6
V.	Capital goods	325.4	366.5	519.0	733.7	946.0	1,273.7	1,447.0	696.9	393.4	597.4	28.2	-25.5	7.0
VI.	Total c.i.f.	1,707.8	1,655.0	2,417.3	3,242.6	4,708.4	6,144.7	7,318.0	4,093.9	3,159.9	3,738.8	27.4	-20.1	9.1
VII.	Total f.o.b.	1,520.0	1,473.0	2,151.4	2,885.9	4,190.5	5,468.8	6,513.0	3,643.3	2,817.8	3,357.3	27.4	-19.8	9.2

1/ Included in other import figures

Source: Banco Central de Chile

The average rates of increase of imports over the past 10 years show that the increase in non-food consumer goods is the highest, followed by that of intermediate goods such as raw materials, spare parts and intermediate products.

The growth rate of Chile's imports in capital goods, however, is substantially lower than the overall growth rate. The share of all imports of capital goods imported from 1975 to 1982 was 20%. In 1984, although above the previous year's level, imports in this area had fallen to 16%. This indicates that domestic investment in equipment is not robust.

Chile maintains a free trade policy. Import and export transactions include dealings with a large number of countries. For a list of trade partners see Table I-3-9.

Stated in order of the value of exports, the principal countries Chile exported to in 1984 are: the USA, Japan, West Germany, Brazil, UK, France and Italy. The overall value of exports to these countries comprised 2/3 of total exports for Chile.

Imports into Chile in 1984, starting from the highest value, are from the USA, Japan, Brazil, Venezuela, West Germany and Argentina.

Table I-3-9 Trade by Country in 1984
(Million US$)

COUNTRY	EXPORT SHIPMENTS		IMPORT STATEMENTS	
	AMOUNT F.O.B.	%SHARE	AMOUNT C.I.F.	%SHARE
LATIN AMERICA	550.0	15.0	902.7	25.9
ALADI Area	536.9	14.6	900.0	25.8
Argentina	116.7	3.2	160.9	4.6
Bolivia	14.7	0.4	6.6	0.2
Brazil	227.5	6.2	296.4	8.5
Colombia	43.0	1.2	21.5	0.6
Ecuador	27.8	0.8	46.0	1.3
Mexico	8.9	0.2	21.8	0.6
Paraguay	4.5	0.1	36.5	1.0
Peru	44.9	1.2	49.2	1.4
Uruguay	8.7	0.2	9.3	0.3
Venezuela	40.2	1.1	251.8	7.3
Others	13.1	0.4	2.7	0.1
NORTH AMERICA	982.3	26.9	814.3	23.4
United States	951.2	26.0	747.8	21.5
Canada	31.1	0.9	66.5	1.9
REST OF AMERICA	0.0	0.0	75.3	2.2
WESTERN EUROPE	1,217.7	33.3	728.5	21.0
EUROPEAN ECONOMIC COMMUNITY	1,060.7	29.0	545.6	15.7
Greece	14.8	0.4	0.1	0.0
Belgium	67.1	1.8	44.6	1.3
Denmark	1.0	0.0	10.9	0.3
France	163.4	4.5	97.6	2.8
Netherlands	92.2	2.5	28.2	0.8
Italy	160.9	4.4	66.1	1.9
United Kingdom	196.1	5.4	79.6	2.3
Fed. Rep. Germany	364.8	10.0	215.7	6.2
Ireland	0.4	0.0	2.8	0.1
Others	157.0	4.3	182.9	5.3
EASTERN EUROPE	40.0	1.1	6.6	0.2
ASIA	698.3	19.0	441.8	12.7
South Korea	64.9	1.8	40.7	1.1
Hong Kong	8.5	0.2	19.8	0.6
Japan	407.7	11.1	312.7	9.0
People's Rep. China	125.3	3.4	12.4	0.4
Taiwan	44.7	1.2	37.3	1.1
Others	47.2	1.3	18.9	0.5
MIDDLE EAST	75.5	2.1	29.3	0.8
AFRICA	40.4	1.1	164.7	4.7
OCEANIA	2.9	0.1	21.6	0.6
OTHERS NOT INCLUDED IN ECONOMIC ZONES	50.1	1.4	5.8	0.2
FREE ZONES	-	-	289.9	8.3
GRAND TOTAL	3,657.2	100.0	3,480.5	100.0

I-4 The Transport Sector

(1) Transport Administrative Organization

For historical reason, the administration of transport in Chile is carried out through the cooperative efforts of three different ministries. The principal roles of each of the ministries concerned are as follows:

- Ministry of Transportation and Telecommunication: Make transportation policy & plans
- Ministry of Public Works: Construct transportation infrastructures and equipment
- Ministry of National Defence (DIRECTEMAR): Control maritime transportation and sea areas.

The detailed organization is illustrated in Fig. I-4-1.

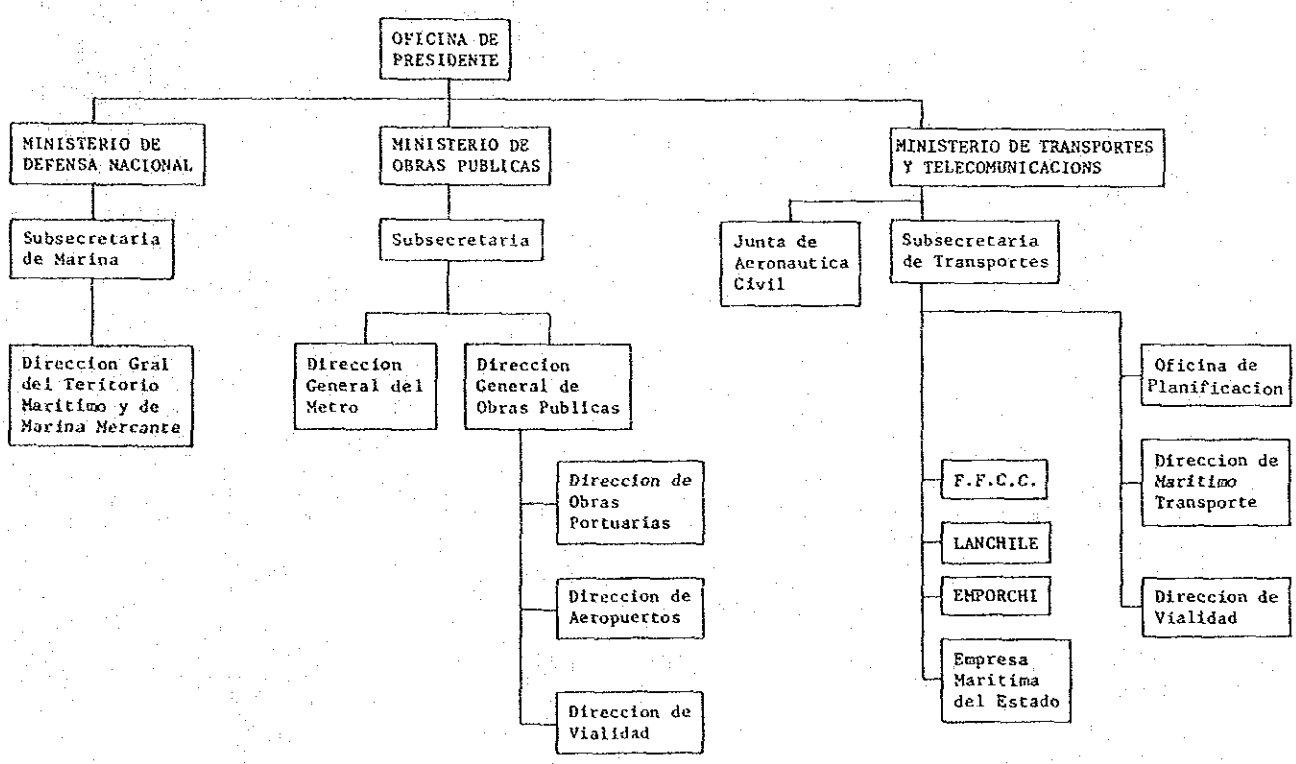


Fig. I-4-1 Transport Administration in Chile

(2) Overview of Facilities and Demand

The general conditions of basic facilities and the demands of the transport sector in Chile are as follows.

1) Roads

As shown in Fig I-4-2, the total length of roads in Chile is 78,588 Km, and the share of paved road is 12.2% and that of principal roads (national roads and regional roads) is 78.1%. Table I-4-1 shows that the density of roads is 0.105 Km/Km^2. As noted in Table I-4-2, the number of registered vehicles in 1984 is 930,353 and automobiles occupy a high share of 69.3%. Concerning the regional aspect, 42.8% of all vehicles are concentrated in the Metropolitan Region as shown Table I-4-3.

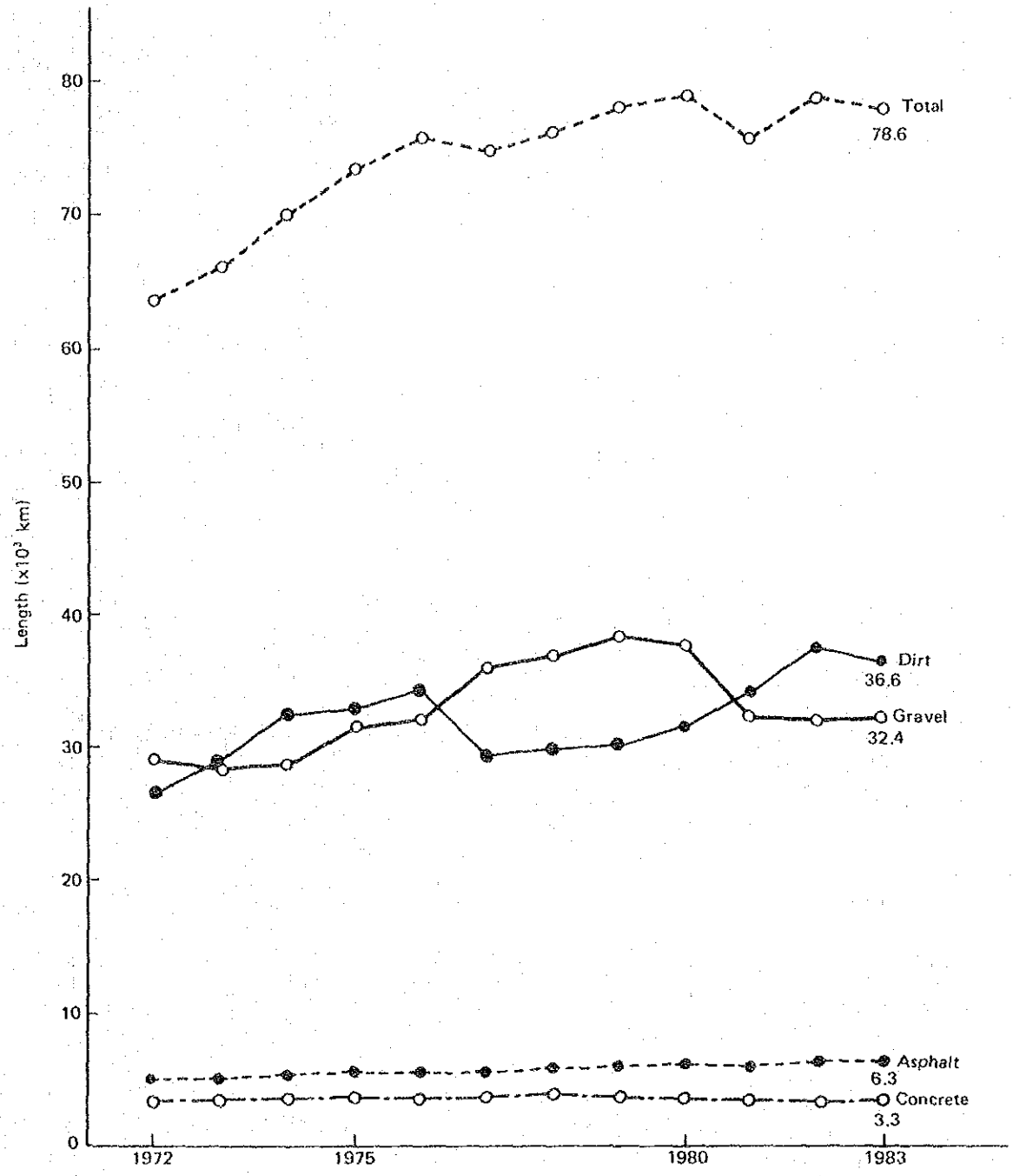


Fig. I-4-2 Road Length by Pavement Type

Source) – *MOP Direction de Vialidad, Memoria 1982*
– Anuario de Transporte y Comunicacions 1983

Table I-4-1 Roads by Region (1982)

Region	Total	(share)	Class A	Class B	Class C	Class D	Ratio of Paved Roads	Density of All Roads
	km	%	km	km	km	km	%	km/km
I	4,357	5.5	700	273	767	2,617	17.7	0.074
II	5,030	6.3	638	857	531	3,004	27.3	0.040
III	6,074	7.6	484	335	794	4,461	15.1	0.081
IV	5,025	6.3	368	629	454	3,574	19.8	0.124
V	8,510	10.7	346	430	380	2,329	11.9	0.519
M.R.	2,580	3.2	407	307	346	1,520	32.1	0.166
VI	4,484	5.6	182	465	403	3,434	11.0	0.272
VII	7,472	9.4	174	651	970	5,677	7.2	0.244
VIII	12,074	15.2	360	790	1,034	9,890	10.0	0.327
IX	12,182	15.3	206	758	829	10,389	4.9	0.381
X	11,458	14.4	843	546	1,816	8,253	8.6	0.359
XI	2,160	2.7	448	595	256	861	0.0	0.020
XII	3,208	4.0	258	780	1,073	1,097	4.2	0.024
Total	79,582	100.0	5,408	7,416	9,653	57,106	12.0	0.105

(Notice) Class A: National Roads
Class B: Principal Regional Roads
Class C: Secondary Regional Roads
Class D: Other Roads

(Source) MOP Direccion de Vialidad, Memoria 1982

Table I-4-2 Number of Registered Vehicles in Chile

(Unit: vehicles)

Year \ Kind of Vehicle	Automobiles	Taxis	Buses	Trucks	Others	Total
1982	611,847	57,517	21,851	188,138	33,396	912,749
1983	636,948	53,920	21,468	174,329	19,695	906,360
1984	644,446	49,732	14,487	196,637	18,762	930,353
1984 - 1982	32,599	Δ7,785	Δ7,364	8,499	Δ14,634	17,604
1984/1982	1.053	0.865	0.663	1.045	0.562	1.019

(Source) MTT UNIDAD DE INFORMATICA

Table I-4-3 Number of Registered Vehicles by Region in 1984

Region \ Item	Number	Share	Vehicles/1,000 habitants
1	32,869	3.5	111
2	31,421	3.4	88
3	15,161	1.6	81
4	27,352	2.9	63
5	116,504	12.5	94
MR	397,947	42.8	85
6	56,401	6.1	93
7	55,006	5.9	74
8	83,863	9.0	54
9	32,683	3.5	46
10	50,749	5.5	59
11	5,305	0.6	76
12	25,092	2.7	180
Total	930,353	100.0	78

(Source) MTT Unidad de Informatica

2) Railways

Chilean national railways are administrated by three departments: North, South and Arica. The total lengths of the national railway and of private railways in 1984 are 7,889 km and 1,342.5 km, respectively, as shown in Table I-4-4 and I-4-5. Table I-4-6 shows that the ratio of electrification of national railways is 21.0%.

The volume of cargo transported by the national railway has remained constant at about 12,000 tons/year over the last 10 years as shown in Fig. I-4-4. Table I-4-7 shows that the main cargoes carried by the national railway are:

- South Line: Forestry Products (42.1%)
  Mining Products (28.5%)
  Agricultural Products (17.5%)
- North Line: Mining Products (96.8%)

On the other hand, the number of passengers decreased from 1973 to 1984 at an average rate of -10.2% per year as shown in Fig. I-4-3.

Table I-4-4 Length of the National Railway (Dec. 31, 1984)

Sector	Gauge	Enterprise Lines		Subtotal	Particular Lines	Total
		Circulation Lines	Branch Lines			
	m	km	km	km	km	km
South Line	1,000 - 1,676	3,077	855	3,932	218	4,150
North Line	1,000 - 1,435	2,624	284	2,908	14	2,923
Alameda Port & Ramales Line	1,000 - 1,676	342	115	457	30	487
Argentina Line	1,000 - 1,676	71	16	87	-	87
Arica Line	0.750 - 1,000	206	22	228	15	243
Total	0.750 - 1,676	6,140	1,292	7,612	277	7,889

(Notice) The above figures include 431 km of double track

(Source) Anuario Estadistico 1984, Ferrocarriles del Estado de Chile

Table I-4-5 Length of Private Railways

Sector	Gauge	Distance			Total
		Principal Lines	Secondary Lines	Branch Lines	
	m	km	km	km	km
Antfagasta - Bolivia	1,000	667	-	286	953
Tocopilla - Toco	1,067	207	-	7	214
Romeral - Guavacon	1,000	18	-	-	18
Algarrobo - Maitencilic	1,000	50	16.5	-	66.5
de Almogro - Ro - Trevillos	1,000	91	-	-	91
Total		1,033	16.5	293	1,342.5

(Source) MTT

Table I-4-6 Length of Electrified Lines of the National Railway

(Dec. 31, 1984)

Section	Gauge	Distance			
		Circulation Lines	Double track Lines	Side track Lines	Total
	m	km			
North Line		306	57	109	472
Alameda-Puerto	1,676	187	57	68	312
Yungay-Mapocho	1,676	3	-	21	24
LlayLlay-Los Andes	1,676	46	-	7	53
LosAndes-Frontera	1,000-1,676	71	-	13	83
South Line		652	158	372	1,182
Alameda-State	1,676	527	135	294	957
Alameda-Talagante	1,676	33	-	6	39
Alameda-Nunoa	1,676	8	-	5	13
Sn. Rosendo-Thno	1,676	83	23	67	173
Total		958	215	481	1,654

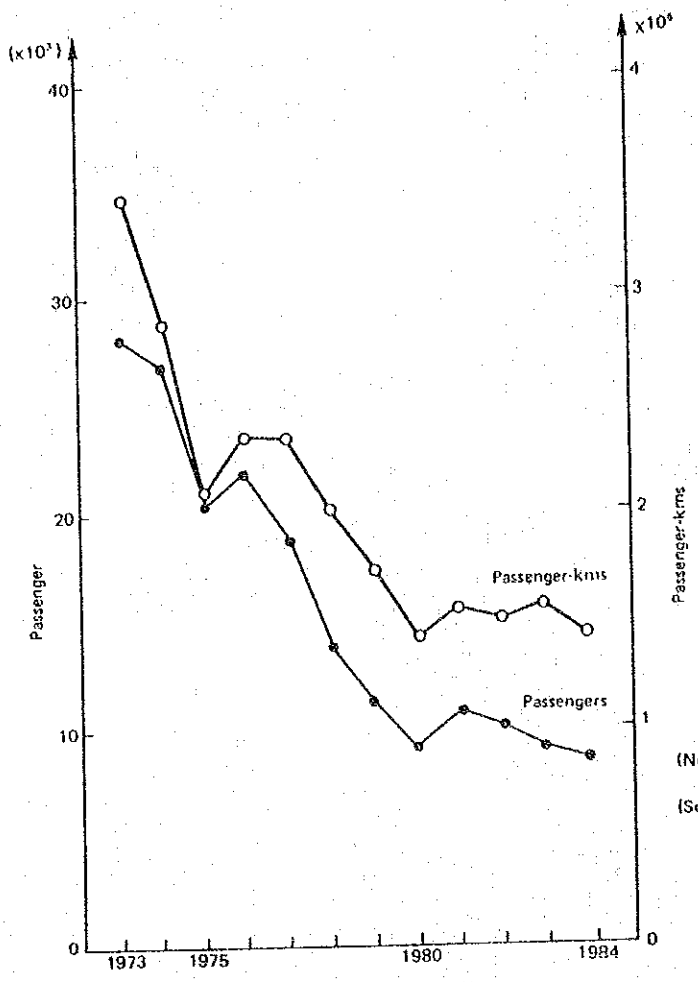
(Source) Anuario Estadistico 1984
Ferrocarriles del Estado de Chile

Table 1-4-7 Cargoes Transported by the National Railway

(1984)

Product	South Line	North Line	Arica Line
Agricultural Products	17.5	0.3	39.9
Forestry Products	42.1	0.1	1.1
Livestock Products	1.5	0.0	-
Marine Products	1.0	0.2	-
Foodstuff Products	4.4	0.3	-
Industrial Products	5.0	2.3	35.4
Mining Products	28.5	96.8	23.6
Total	100.0	100.0	100.0
Transport Volume(tons)	4,409	8,382	97

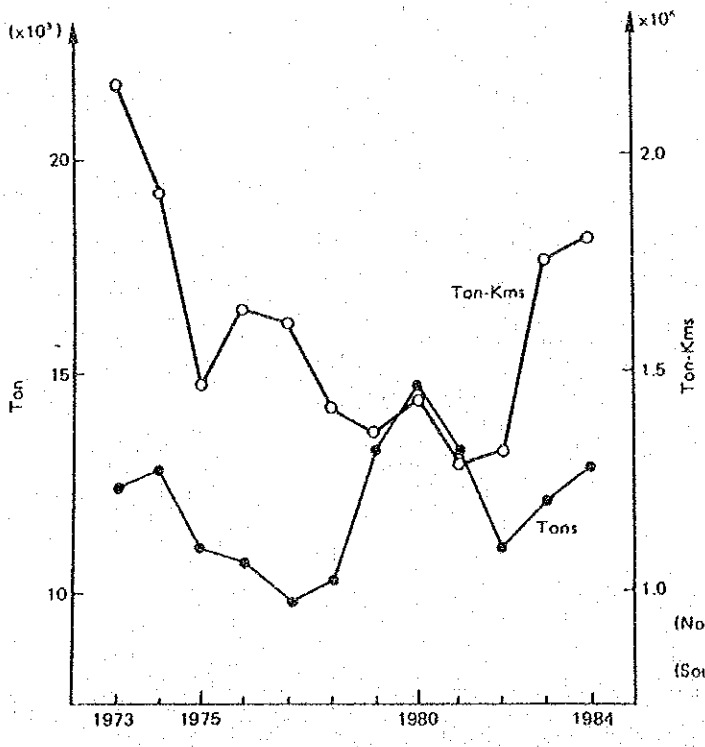
(Source) Anuavio Estadistico 1984, Forrocarriles del Estado de Chile



(Note) Line over Andes is shifted from South Line to North Line in 1982

(Source) Anuario Estadistico 1982, 1983, 1984, Ferrocarriles del Estad de Chile

Fig. I-4-3 Passenger Transport by the National Railway



(Note) Line over Andes is shifted from South Line to North Line in 1982

(Source) Anuario Estadistico 1982, 1983, 1984, Ferrocarriles del Estad de Chile

Fig. I-4-4 Freight Transport by the National Railway

3) Ports

The total number of ports in Chile is 68 port with 10 ports administered by EMPORCHI and 58 private ports.

The total number of berths of EMPORCHI's ports is 52 berths, with covered warehouses totaling 231 x 10^3 m^2 and open warehouses totaling 741 x 10^3 m^2 as shown in Table I-4-8.

There has only been a slight increase in the cargo volume handled at all the ports over the last 15 years as shown in Table I-4-9. However, the container cargo volume handled by EMPORCHI has increased at an average rate of 39.2% per year since 1976 as shown in Fig. I-4-5.

The cargo volume ratio of import: export: domestic is 1:2:1. The share of cargo volume handled by EMPORCHI is approximately 30%.

Table I-4-8 Facilities of the Ports of EMPORCHI (1983)

Name of Port / Item	ARICA	IQUIQUE	ANTOFAGASTA	COQUIMBO	VALPARAISO	SAN ANTONIO	THNO/SN VICENTE	PUERTO MONTT	CHACABUCO	PUNTA ARENAS	TOTAL
SITIOS	6	7	7	2	10	7	4	2	1	6	52
ALMACEN CUBIERTO. (m2)	12.800	9.680	18.100	5.000	120.411	15.949	30.021	10.150	4.440	4.410	230.961
ALMACEN DESCUBIERTO (m2)	115.936	82.341	63.801	59.200	69.578	133.276	139.688	26.500	17.910	32.500	740.730
GRUAS DE MUELLE ELECTRICAS	6	-	15	6	26	12	4	-	-	1	70
GRUAS MOVILES DE PATIO	3	-	2	2	7	-	1	1	2	1	19
ELEVADORES DE HORQUILIAS FORESTALES	8	5	-	4	57	2	1	1	2	4	84
TRACTORES INDUSTRIALES DE ARRASTRE	1	-	6	2	17	-	1	-	2	1	30
CABALLETE GRUA	1	-	-	-	-	-	-	-	-	-	1
VAGONETAS	7	-	12	9	178	-	2	2	8	2	220
TABLEROS PALETAS	1.200	-	2.000	-	-	-	1.000	50	-	580	4.830
GRUAS HORQUILLAS	-	-	11	-	-	-	-	-	-	-	11
LOCOMOTORA DE PATIO	-	-	2	-	-	3	-	-	-	-	5
TRACTOR-LOCOMOTORA	-	-	3	-	-	1	-	1	-	-	5
CINTAS TRANSPORTADAS	-	-	2jgs	-	-	-	-	-	-	-	2
CARGADORES FRONTALES	-	-	2	-	-	-	1	-	-	-	3
CARROS FERROVIARIOS	-	-	-	13	-	-	-	-	-	-	13
LOCOMOTORA	-	-	-	1	-	-	-	-	-	-	1
PALAS GRANELERAS	-	-	-	3	18	-	7	4	-	-	32
PORTA CONTENEDORES	-	-	-	-	2	-	-	-	-	-	2
GRUAS MURALES	-	-	-	-	4	-	-	-	-	-	4
CARGADORES DE PALA FRONTAL	-	-	-	-	2	-	-	-	-	-	2
ASCENSORES	-	-	-	-	14	-	-	-	-	-	14
CHUTE GRANELERO	-	-	-	-	-	1	-	2	-	-	3
SHUTTLE-WAGON	-	-	-	-	-	1	-	-	-	-	1
TRACK MOVILES	-	-	-	-	-	-	1	-	-	-	1
PLANTA MECANIZADA (de particulares)	-	-	-	-	-	1	-	-	-	-	1
GRUAS DE MUELLE	-	-	-	-	4	-	-	4	-	-	8

(Source) MANUAL DE LOS PUERTOS OPERADOS POR EMPORCHI: 1984

Table I-4-9 Port Cargo Volume in Chile

(Unit: 1000 tons, %)

Year	Total	Import	Export	Domestic
1970				4,633 (29.2)
1971				4,561 (32.1)
1972				4,795 (26.6)
1973				5,195 (24.0)
1974				6,234 (25.1)
1975	22,496 (18.3)	4,854 (31.0)	12,746 (10.3)	4,901 (26.2)
1976	23,746 (20.9)	5,508 (31.6)	13,183 (15.0)	5,054 (24.6)
1977	22,286 (24.8)	5,479 (30.1)	11,944 (21.5)	4,863 (27.1)
1978	21,574 (31.7)	6,180 (37.0)	10,475 (29.6)	4,919 (29.4)
1979	20,668 (36.6)	4,902 (51.4)	10,814 (33.2)	4,952 (29.4)
1980	24,409 (36.4)	6,666 (48.0)	12,425 (31.4)	5,318 (33.7)
1981	24,936 (33.5)	7,386 (47.4)	11,735 (29.1)	5,816 (24.8)
1982	22,139 (38.4)	5,186 (52.6)	11,940 (37.5)	5,613 (23.1)
1983	21,980 (37.8)	5,276 (44.8)	10,700 (40.6)	6,004 (26.4)
1984	29,628 (31.0)			

(Note) The figures in parentheses are the share handled by EMPORCHI

(Source) - EMPORCHI

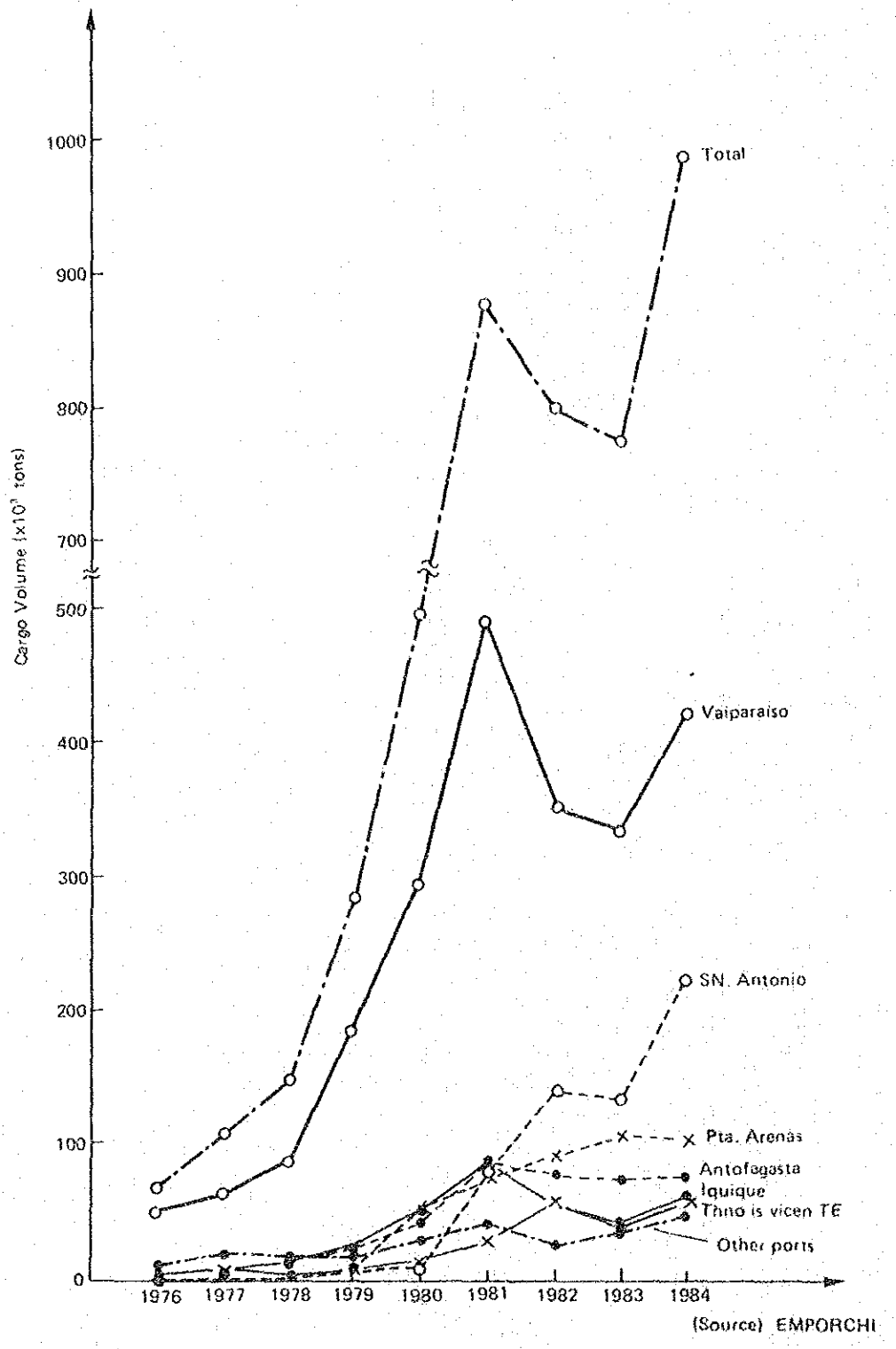


Fig. I-4-5 Container Cargo Volume Handled by EMPORCHI

4) Airports

There are 22 airports in Chile including 9 international airports and the number of airplanes owned by Chilean carriers is 25 planes. Table I-4-10 is a summary of the main airports in Chile.

The demands and capacities for national and international traffic on Chilean carriers in 1984 are as follows:

Passenger-Kms (Demand)	$1,594 \times 10^3$
Seat-Km (Capacity)	$2,860 \times 10^3$
Load factor	55.7%

Ton-Km transported (Demand)	270×10^3
Ton-Km available (capacity)	486×10^3
Load factor	55.6%

The details are presented in Table I-4-11 and I-4-12 and Fig I-4-6 ~ I-4-8.

Table I-4-10 Main Airports in Chile

AEROPUERTO (Airport)	
⊖ Arica	Chacelluta
- Iquique	Chucumata
⊖ Antofagasta	Cerro Moreno
- El Salvador	El Salvador Bajo
⊖ Isla de Pascua	Mataveri
⊖ Santiago	Comodoro Arturo Merino Benitez
⊖ Santiago	Cerrillos
⊖ Concepcion	Carriel Sur
⊖ Puerto Mont	El Tepual
- Balmaceda	Balmaceda
⊖ Punta Arenas	Presidente Ibanez

(Note) ⊖ marks international airports

Table I-4-11 Airplane Holdings of Chilean Companies (1984)

Airline	LANCHILE	LADECO	AERONORTE	FAST AIR	T.A.C.	AERO GUAYACAN
Type of Airplane	2DC-10 2B-737 3B-707 1B-707C	3B-727 2B-737	2F-27A 1 Piper PA-31	1B-707C	1F-27A 1 Cessna 402C 1 Cessna 402 2 Cessna U-206-G	1 Beech A100 1 Beech 65-A-9 1 Beech A200
Total	8	5	3	1	5	3

(Source) J.A.C.

Table I-4-12 Total of National and International Traffic by Chilean Carriers

Year	1976	1977	1978	1979	1980	1981	1982	1983	1984
Passengers	508	595	596	587	703	51	852	694	777
Passenger-Kilometers	1,265	1,434	1,498	1,608	1,890	2,264	1,335	1,504	1,594
Seat-Kilometers	2,266	2,201	2,466	2,643	2,984	3,597	3,208	2,681	2,860
Utilization ratio	56	65	61	61	63	63	57	56	56
Freight	22	34	34	36	40	44	37	31	28
Ton-Kilometers available (National)	77	107	119	130	149	159	142	120	116
Ton-Km transported (International)	195	242	262	282	330	377	315	268	270
Ton-Km available (International)	305	377	431	525	581	668	584	489	486

Source: MTT, Junta de Aeronautica Civil Chile 1981. Aviacion Comercial, May 1983, 1984.

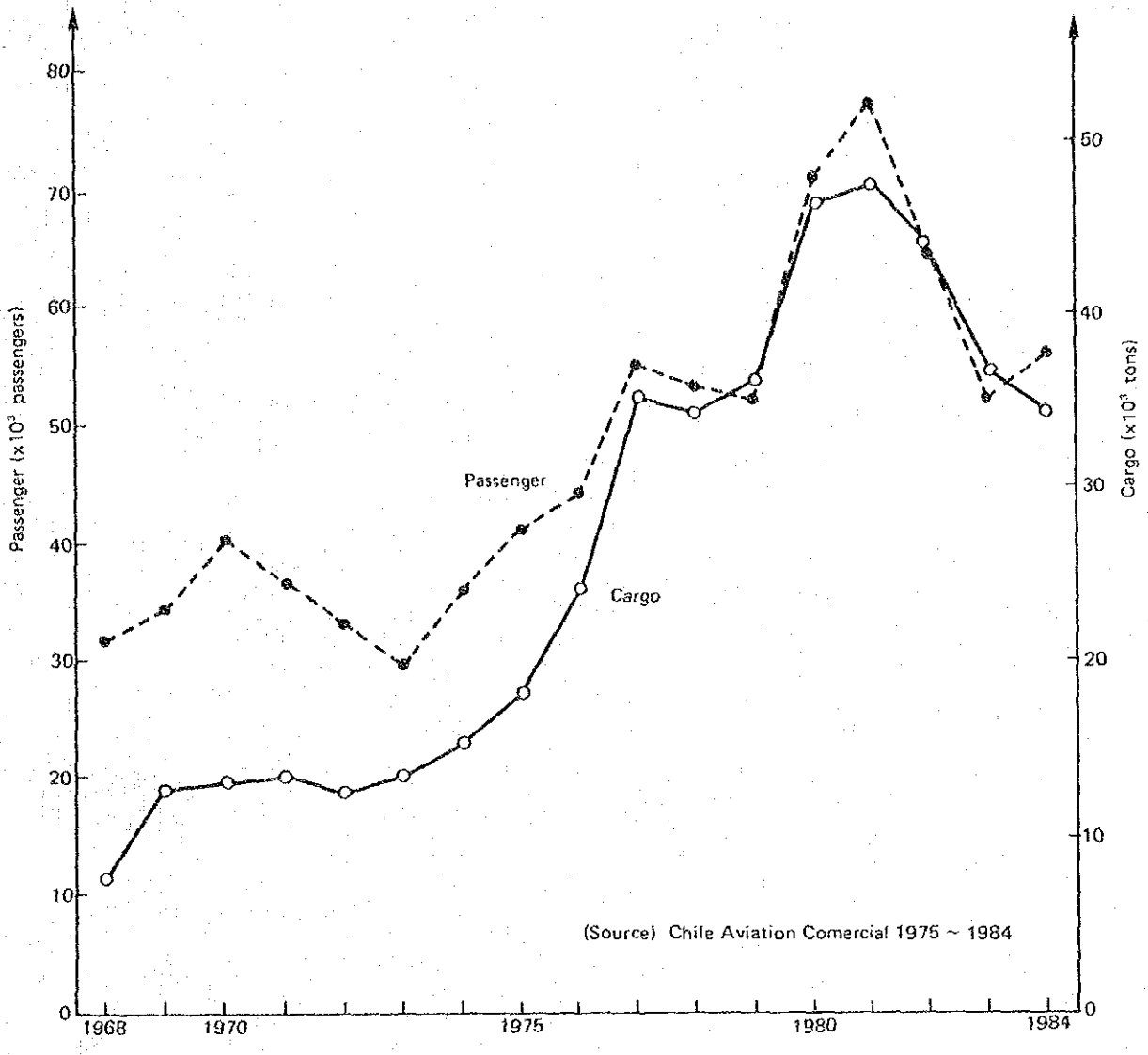


Fig. I-4-6 International Traffic by Chilean Air Carriers

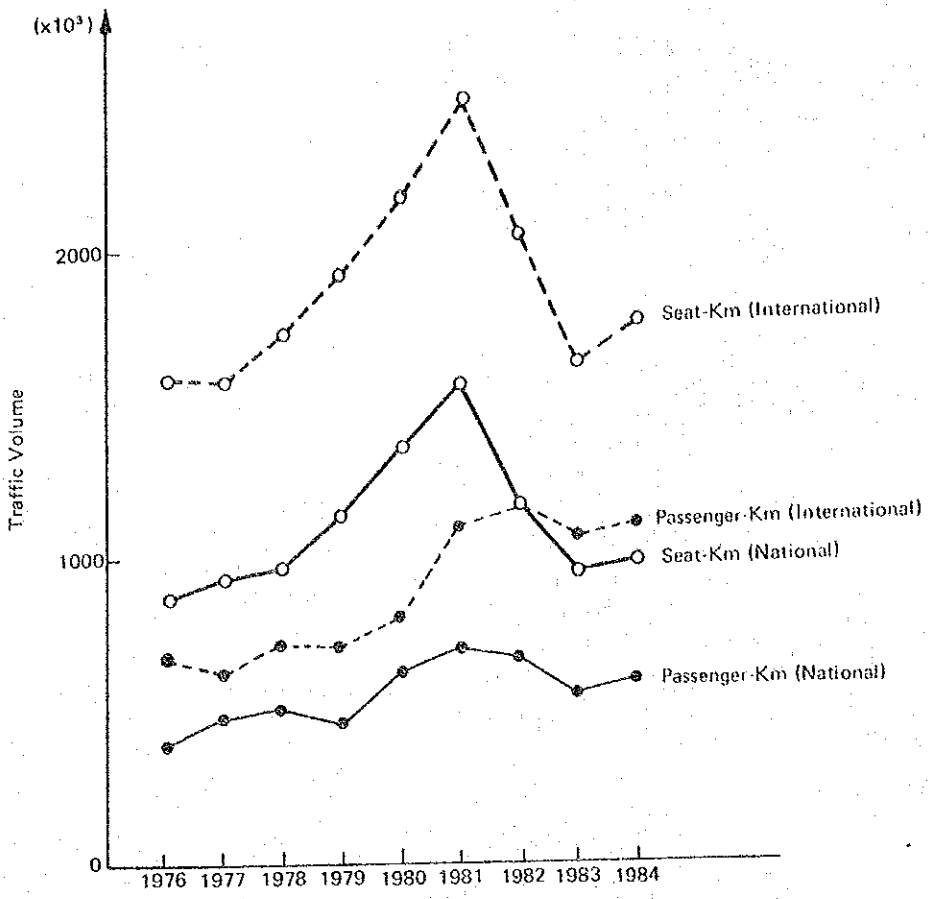


Fig. I-4-7 Passenger Traffic by Chilean Air Carriers

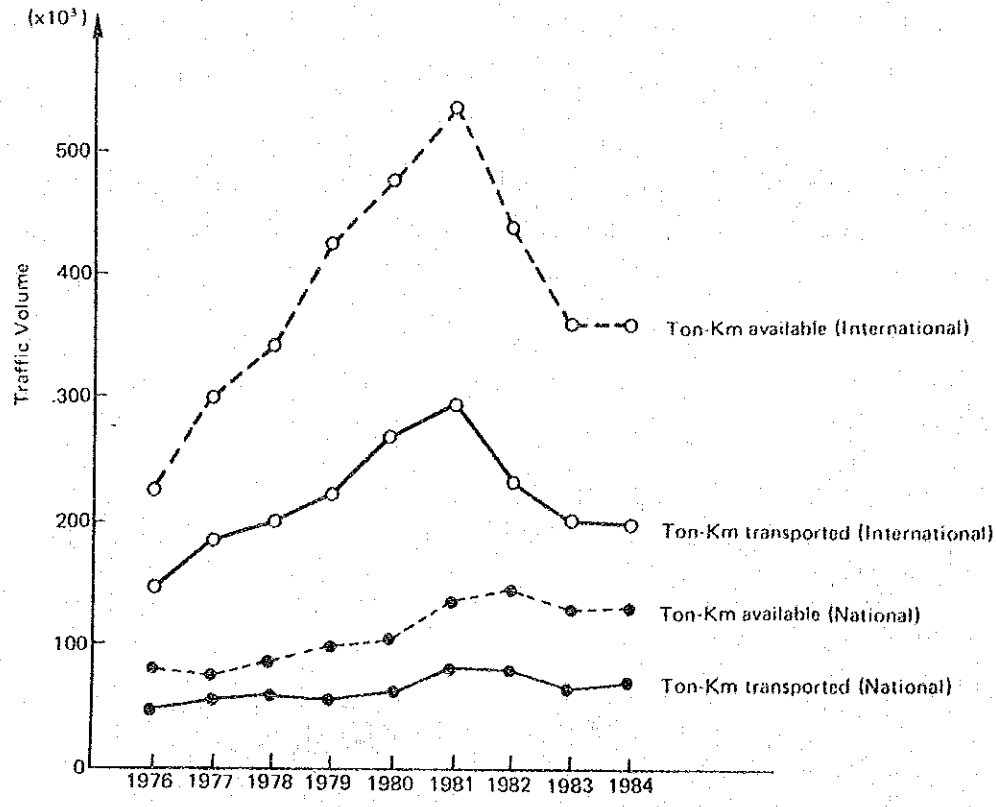


Fig. I-4-8 Freight Traffic by Chilean Air Carriers

5) Pipelines

The total length of oil pipelines in Chile as shown in Table I-4-13 is 622 km, which is concentrated in Regions V - VIII and the Metropolitan region.

Table I-4-14 shows that, the volume of oil transported through the pipelines remained stable at approx. 2,000 thousand m^3 over the last 5 years.

The main pipeline is the Concon-Maipu line with a length of 118 km and a transport volume 833 thousand m^3.

Table I-4-13 Oil Pipeline Equipment

Tract	Length (km)	Diameter (inches)	Capacity (m^3/hr)
Con - Con Salinas (Fuel Oil)	10.300	8. 5/8	110
Con - Con Salinas (Prod. limpio)	10.800	8. 5/8	233
Con - Con Maipu	117.758	10. 3/4	295
Maipu - San Fdo.	133.127	6. 5/8	89
San Fdo. - Linares	158.712	8. 5/8	107
Linares - Chillan	94.940	8. 5/8	120
Chillan - Concepcion	96.600	8. 5/8 - 10. 3/4	123
Total	622.237		

(Source) M.T.T. Estadisticas de Transporte Terrestre Octubre-Noviembre-Diciembre 1983.

Table I-4-14 Oil Volume Transported through Chilean Pipelines

(Unit: 1000 m^3)

Tract \ Year	1980	1981	1982	1983	1984
Con-Con Salinas	825.9	474.9	363.6	470.4	446.2
Salinas - Maipu	-	46.2	116.3	21.0	28.9
Con-con - Maipu	701.0	1,142.0	889.5	854.7	832.9
San Fdo. - Maipu	16.3	14.2	13.2	7.5	13.8
Concep. - Maipu	358.3	283.4	375.7	423.0	416.3
Concep. - San Fdo.	170.0	240.7	172.9	187.7	173.9
Concep. - Linares	72.5	95.3	77.0	84.1	92.4
Concep. - Chillan	66.1	81.9	82.1	67.2	71.6
Total	2,210.1	2,378.6	2,090.3	2,125.7	2,077.2

(Source) MTT Unidad de Informatica

6) Transport of the Port Related Cargoes.

The passenger-kms transported by railways shows a downward trend, while the Ton-Kms transported by rail is stable over the long term. The reason is that the railways have stable demand for transport of a few kinds of cargo in large volumes such as forestry, mining and agriculture products. Further, oil is transported mainly by oil pipelines between the ports and the main demand areas.

Meanwhile, the number of registered trucks is increasing and the hinterland of the 5th port, which comprises IV ~ VIII and Metropolitan regions, has a share 79.2% of total registered vehicles.

Consequently, it is considered that trucks will continue to be the main transport mode for the port-related cargoes, especially for container cargoes which are increasing.

Railways will continue to be used for the transport of certain forestry, mining and agricultural products as at present.