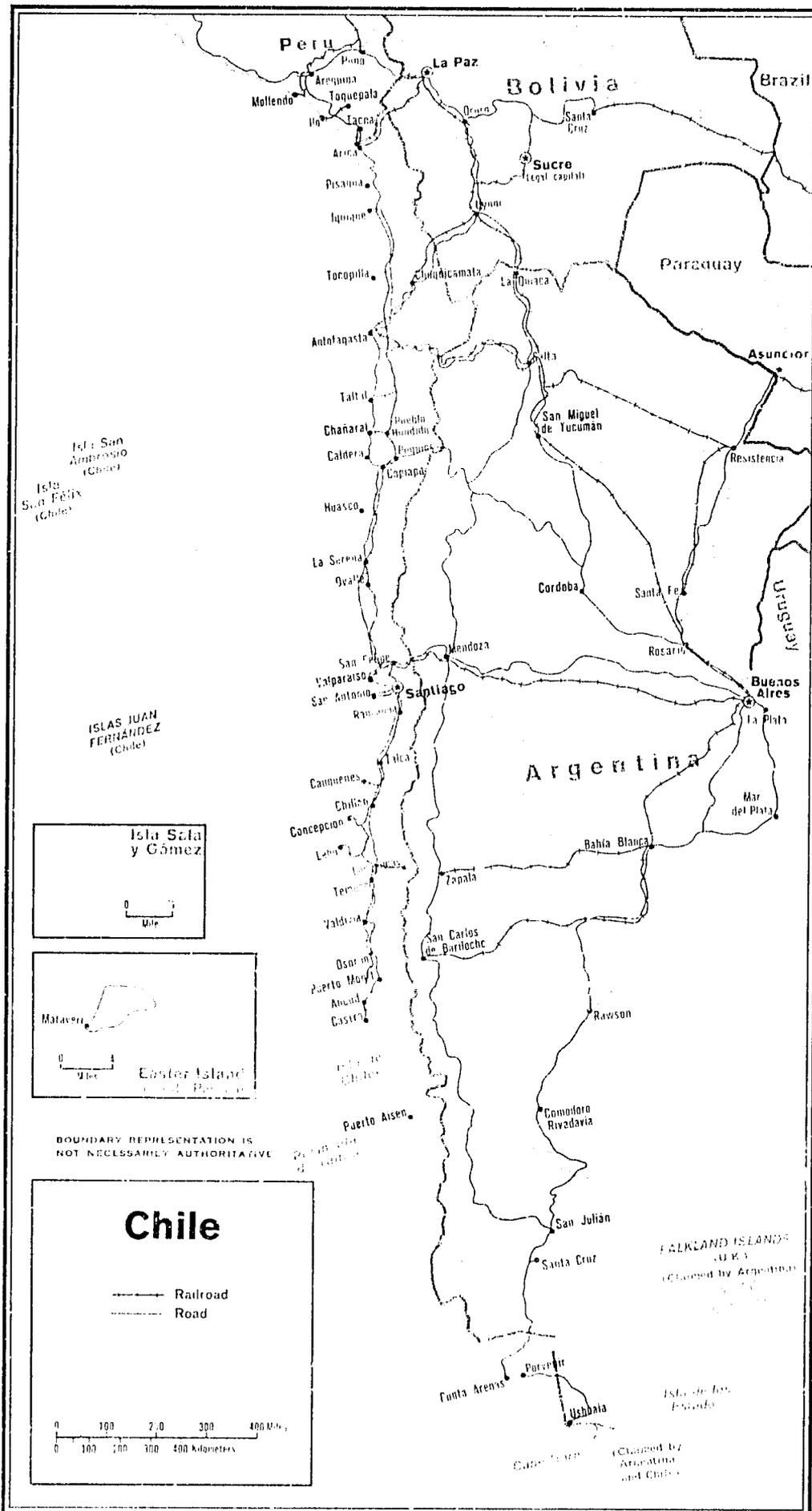




Chile

A Country Profile

Office of Foreign Disaster Assistance
Agency for International Development
Washington, D.C. 20523



CHILE: A COUNTRY PROFILE

prepared for

The Office of U.S. Foreign Disaster Assistance
Agency for International Development
Department of State
Washington, D.C. 20523

by

Holly Brooks

Evaluation Technologies, Inc.
Arlington, Virginia
under contract AID/SOD/PDC-C-3345

Production by: Waverly Jackson, Jr. and Wesley Mossburg

The country profile of Chile is part of a series designed to provide baseline country data in support of the planning and relief operations of the Office of U.S. Foreign Disaster Assistance (OFDA). Content, scope, and sources have evolved over the course of the last several years and the relatively narrow focus is intentional.

We hope that the information provided will also be useful to others in the disaster assistance and development communities. Every effort is made to obtain current, reliable data; unfortunately it is not possible to issue updates as fast as changes would warrant.

We invite your comments and corrections. Address these and other queries to OFDA, A.I.D., as given above.

August 1987

OFDA COUNTRY PROFILES: AUGUST 1987

AFRICA

Burkina Faso (1982)
Cape Verde (1984)
Chad (1982)
East Africa Regional Profile
Djibouti (1981)
Ethiopia
Kenya
Somalia
Sudan
Tanzania
Uganda
Gambia-Senegal (1983)
Ghana (1985)
Mali (1980)
Mauritania (1984)
Mozambique (1987)
Niger (1985)
Zaire (1986)
Zambia (1982)

ASIA

Bangladesh (1983)
Burma (1980)
India (1983)
Indonesia (1983)
Nepal (1983)
Pakistan (1983)
Philippines (1982)
Sri Lanka (1983)

NEAR EAST

Turkey (1982)

SOUTH PACIFIC

Fiji (1986)
Papua New Guinea (1985)
Tonga (1986)
Western Samoa (1987)

CARIBBEAN

CARICOM Regional Profile (1983)
Antigua
Barbados
Belize
Dominica
Grenada
Guyana
Montserrat
St. Kitts-Nevis-Anguilla
St. Lucia
St. Vincent
Trinidad and Tobago
Dominican Republic (1984)
Haiti (1984)
Jamaica (1986)

CENTRAL/SOUTH AMERICA

Bolivia (1984)
Chile (1987)
Costa Rica (1987)
Ecuador (1983)
El Salvador (1984)
Guatemala (1982)
Honduras (1981)
Nicaragua (1981)
Peru (1983)

INDIAN OCEAN

Island Countries of the
Indian Ocean (1984)
The Comoros
Madagascar
Maldives
Mauritius
Reunion
Seychelles

Acknowledgments

Special thanks for their invaluable assistance in the preparation of this report are expressed to the staff of the U.S. Embassy in Santiago, Chile. In particular, Wendell L. Belew and Renato Hidalgo have my deepest appreciation for their support and assistance. Additionally, many thanks are extended to ONEMI's former director, General (Ret.) Víctor Aquiles López Barrenechea, and his staff for their warm reception and useful contributions to this profile.

Preface.....	1
OFDA Country Profile List.....	ii
Acknowledgments.....	iii
1. General Information.....	1-20
1.1 Geographic Codes.....	1
1.2 Host Mission to the U.S.....	1
1.3 U.S. Mission in Chile.....	1
1.4 Time Zones.....	1
1.5 Currency.....	1
1.6 Travel and Visa Requirements.....	2
1.7 Holidays and Calendar.....	2
1.8 Treaties and Agreements.....	2
1.9 International Organization Memberships.....	3
1.10 Geography.....	3
1.11 Ethnic and Sociocultural Groups.....	5
1.12 Language.....	6
1.13 Religion.....	6
1.14 History.....	7
1.15 Government.....	11
1.16 Population.....	13
1.17 Health.....	14
1.18 Economy.....	15
1.19 Power Supply.....	19
1.20 Communications.....	19
2. Disaster Vulnerability.....	21-34
2.1 Geographic Regions.....	21
2.2 Climate.....	24
2.3 Seismicity.....	27
2.4 Tsunamis.....	28
2.5 Volcanoes.....	28
2.6 Floods.....	29
2.7 Drought.....	30
2.8 Forest Fires.....	30
2.9 Selected Major Disasters.....	33
3. Disaster Preparedness and Assistance.....	35-70
3.1 Host Country Disaster Organization.....	35
3.2 Non-Governmental Organizations.....	44
3.3 Warning Systems.....	48
3.4 Health Resources.....	52
3.5 Agriculture.....	53
3.6 Forestry.....	55
3.7 Housing.....	57
3.8 Water Supply.....	59
3.9 Energy.....	60
3.10 Communications.....	61

3. Disaster Preparedness and Assistance (continued)	
3.11 Ground Transport.....	63
3.12 Seaports.....	64
3.13 Air Transport.....	65
3.14 U.S. Government Assistance.....	67
3.15 International Organizations.....	68
Appendix A: <u>Case Report Chile Earthquake 1985</u>	71-80
Appendix B: <u>Case Report Chile Floods 1986</u>	81-83
Appendix C: <u>Situation Report Chile Floods 1987</u>	84-89
Appendix D: OFDA-Sponsored Training, Chilean Participants.....	90-91
Appendix E: U.S. Disaster Assistance to Chile 1964-1987.....	92-94
Figure 1: Chilean Regions & Provinces and Their Capitals.....	12
Figure 2: Chilean Geographic Divisions.....	23
Figure 3: Average Temperatures.....	25
Figure 4: Average Precipitation.....	26
Figure 5: Forest Fires: Incidence and Damage.....	31
Figure 6: Incidence of Forest Fires in Chile.....	32
Figure 7: National Disaster Organization.....	36
Figure 8: ONEMI Organizational Chart.....	38
Figure 9: Emergency Plan Schema.....	42
Figure 10: Airports of Entry.....	66
Interviews.....	95
Bibliography.....	96-99

1. General Information1.1 Geographic Codes

AID Standard	513
AID Region	LAC/SA
State Region	ARA/SC

1.2 Host Mission to the U.S.

Chancery
1732 Massachusetts Avenue, NW
Washington, D.C. 20008
Tel: (202) 785-1746

For current information on the Chilean
Embassy staff, refer to the U.S. Department
of State Diplomatic List.

1.3 U.S. Mission to Chile

Embassy of the United States
Codina Building
Agustinas 1343
Santiago, Chile
Telephone: 71-0133 and 71-0326
Direct dial service: country code 56
Santiago city code 2
Embassy public hours: 8:30-17:00

There is no USAID Mission in Chile.

1.4 Time Zones

GMT-4; EST+1

1.5 Currency

U.S. \$1.00 = 212.77 pesos (July 1987)

1.6 Travel and Visa Requirements

A valid passport is required of all visitors. No entry visa is necessary for tourists for a visit of three months or less. Both official and diplomatic travelers must obtain a visa. An official letter requesting a visa must accompany the traveler's passport to the Chilean Consulate.

Upon leaving Chile via the Comodoro Arturo Merino Benítez Airport, travelers must pay a (U.S.) \$12.50 departure fee (payable in dollars or their peso equivalent.)

1.7 Holidays and Calendar

New Year's Day.....	January 1
Good Friday.....	*
Easter Sunday.....	*
Labor Day.....	May 1
Battle of Iquique.....	May 21
Assumption Day.....	August 15
Independence Day.....	September 18
Day of the Army.....	September 19
Columbus Day.....	October 12
All Saint's Day.....	November 1
Immaculate Conception.....	December 8
Christmas.....	December 25

* Dates vary annually
Fiscal year = calendar year

Seasons:

Spring.....	September 21-December 20
Summer.....	December 21-March 20
Autumn.....	March 21-June 20
Winter.....	June 21-September 20

1.8 Treaties and Agreements

Agricultural Commodities
Atomic Energy
Aviation
Defense
Economic and Technical Cooperation

Treaties and Agreements
(continued)

Education
Extradition
Investment Guaranties
Maritime Matters
Pacific Settlement of Disputes
Postal Matters
Relief Supplies and Packages
Scientific Cooperation
Smuggling
Taxation
Telecommunications
Tracking Stations
Trade and Commerce
Weather Stations

1.9 International Organization Memberships

Intergovernmental Council of Copper Exporting Countries (CIPEC), ECOSOC, FAO, G-77, GATT, Inter-American Defense Board (IADB), IAEA, ICAO, Inter-American Development Bank (IDB), IFAD, IHO, ILO, IMO, INTELSAT, INTERPOL, IPU, ITU, LAIA, OAS, PAHO, SELA, UN, UNESCO, UPU, WHO, WIPO, WMO, World Bank (IBRD, IDA, IFC, IMF), WSG, WTO.

1.10 Geography

Like a sword hanging from the waist of South America, Chile occupies the extreme southwestern coast of the continent, lying between 17°25'S and 56°S latitude and 69°W and 75°W longitude. It has a land area of 756,945 sq. km and is bordered on the north by Peru, on the far northeast by Bolivia, and flanked by Argentina on the east and the Pacific Ocean on the west. The coastline extends for 4,267 km along the Pacific. At its widest, Chile spans slightly less than 400 km, while the average width measures about 161 km.

Chilean territories include Easter Island and the Juan Fernandez Archipelago in the Pacific. In addition, Chile claims 1,250,000 sq. km of Antarctic territory.

Chile's topography is rich and diverse. Three longitudinal divisions - the Chilean Andes, the coastal range, and the fertile central valley between the two - split the country from north to south. A series of latitudinal divisions further section the country. The Norte Grande (Big North), comprising the rugged, arid terrain of the Atacama desert, gives way to the Norte Chico (Little North), a transitional region characterized by transverse valleys. The fertile heartland, referred to as Central Chile, stretches about 1,100 km from San Felipe to Puerto Montt. The geographical relief of South-Central Chile is marked by volcanoes and rich in forests and lakes. Farther south, a network of fjords, inlets, channels, peninsulas, and islands forms the region known as Archipelagic Chile (also referred to as the Far South). The archipelago is actually a continuation of the coastal mountain range which rises again after plunging into the sea at Puerto Montt.

Due to its latitudinal range, all types of climatic conditions may be encountered in Chile (except tropical weather), yet a temperate climate generally prevails. Climatic differentiation, based on annual rainfall statistics, depends on both latitude and altitude.

North of 30°S latitude, drought conditions generally hold sway; in the central region, yearly rainfall averages 361 mm in Santiago, while farther south, in Valdivia, rainfall reaches 2601 mm a year. Still farther south, rainfall can register up to 3300 mm (on islands of western Patagonia, around 47°S latitude) -- levels unrivaled in any other nontropical region of the world.

Rivers:

In general, Chile's rivers are short and inappropriate for navigation. However, rivers are important in terms of settlement

and are vital sources of water in the desert and central regions. Moreover, Chile's rivers are sources of tremendous hydroelectrical potential. Most rivers in Chile flow from east to west. The majority of Chilean rivers originate in the Andes, then cross the intermediate depression and the coastal range. The coastal range also serves as a watershed and is the source of some small rivers.

River characteristics vary from region to region, with the volume of flow increasing progressively from north to south. In the northern desert, with the exception of the Río Loa, most rivers never reach the sea. Their sources are uncertain and the rivers run spasmodically. The rivers of the central region are fed by rain and thawing snow; their volumes of flow are more regular. The river systems south of the Río Bio-Bio originate from rains. Rivers in Patagonia are supplied by a combination of snowstorms and rain, and flow westward to the Pacific.

Principal rivers: Loa, Aconcagua, Maipo, Maule, Bio-Bio, Toltén, Imperial, Valdivia, Palena, and Baker.

1.11 Ethnic and Sociocultural Groups

Chile's ethnic configuration is relatively uncomplicated:

Mestizo	92%	(a mixture of Spanish and Indian)
Indian	6%	
Others	2%	

The slow but consistent amalgamation of various European groups with the indigenous population has yielded a highly uniform culture. Though never great in number, the majority of Indians were quickly assimilated, through intermarriage, into the mainstream European population. The Basques were the earliest immigrants, followed by English, Irish, and Scottish settlers. In 1845 an

official colonization agency was established in Europe to recruit settlers for the region south of the Río Bío Bío. Liberal incentives drew Germans, Italians, French, and Yugoslavs as well as Lebanese to Chile.

The Mapuche form the largest Indian group; their numbers are estimated at 250,000. Although sometimes referred to by ethnographers as Araucanians, the preferred term among members of the group is Mapuche, meaning "people of the land." The Mapuche fiercely resisted attempts by both the Incas and the Spanish to conquer them. It was not until 1883, after more than three hundred years of armed resistance, that the Mapuche were settled in over 2,000 reservations. The Mapuche are said to number 500,000 and are concentrated in rural areas to the south of Río Bío Bío. Smaller Indian groups include the Quechua, Aymará, and Chango. The Ona, Alachaluf, and Yahgan tribal groups of Tierra del Fuego reportedly are near extinction.

1.12 Language

Spanish is the official language.

1.13 Religion

Roman Catholicism is the dominant religion with 85 percent to 90 percent of Chileans nominally Catholic. An estimated 10 percent to 15 percent of the population is Protestant (this constitutes the highest rate in predominantly Roman Catholic Latin America). The Constitution provides for separation of Church and State. As a result of papal social encyclicals and progressive European Catholic social thought, the Chilean Catholic Church has played a major role in social, economic, and religious reform programs. Representatives of the Church have taken surprisingly progressive positions on controversial issues with a view toward remedying social problems. In 1970,

the Chilean Catholic Church divested itself of its securities and income-producing land and properties as an act of official rejection of capitalism. Since the proscription of political parties following the 1973 military takeover, the Church has been the strongest institutional bridge to social progress in Chile.

1.14 History

Conquest and Colonization, 1535-1800

In 1535 Diego de Almagro, spurred by Inca reports of vast wealth to the south, led a contingent of Spaniards from Peru into Chile. The arid Atacama Desert taxed Almagro's forces, but the ferocity of attacks by local tribal groups was probably the overriding factor in the Spaniards' retreat. Several years later, Pedro de Valdivia led a second, smaller group of conquistadors into Chile. Relying on Almagro's reconnaissance, Valdivia reached the central valley and founded Santiago in 1541.

The customs of Spanish conquest provided for the establishment of a cabildo (council) made up of conquistadors. The cabildo was the focus of local politics, and gave land-owner/warriors an element of control in the distribution of land, food, and justice. A conqueror used the distribution of encomiendas (trusteeships) as a system of rewarding and controlling his underlings, who in turn, prevailed over the Indians. The encomenderos subscribed to extended military service in exchange for the right to collect tribute from the Indians. An obligation to Christianize the conquered Indians usually went hand in hand with the encomenderos' privileges. The system did not wash well in Chile for two reasons: first, there were not enough Indians to operate an encomienda system to support the large numbers of Spanish who began to arrive in Chile; and secondly, the relative dearth of gold and silver curtailed any possibility of extravagant tribute on the

scale of Mexico or Peru from the indigenous population. Agricultural and livestock production became the only source of income for the Spanish.

Spain exerted less influence on Chile than on its other colonies in the Americas. Neither the Crown nor the Viceroyalty of Peru (under whose authority Chile's governor operated) could summon much interest in a backward warring province which proved insignificant in the imperial economic scheme, except perhaps as a drain on the Crown's resources. Chile's geographical isolation contributed to its status as a provincial outpost, also making the transfer of important business to Peru unrealistic. Though generally considered the bottom rung in Spanish-American government hierarchy, the cabildo became the focus of local politics in Chile due to the lack of a complex government structure.

Land ownership was a mark of social prestige. Originally, the warrior/landowners formed the highest stratum of society. During the 17th and 18th centuries, civilian landowners (descendants of the conquerors) and wealthy merchants amassed large land holdings (haciendas) and formed the elite. Chilean society could be broken into the upper class - landowners, Spanish bureaucrats, and merchants - and the class of laborers, composed of Indians and, gradually, mestizos. The lack of a middle class accounts for the landed oligarchy's monopoly on political power after independence.

Independent Chile:

The liberalism generated by contemporary European intellectual developments, the new ideas inspired by the American Revolution, and Spain's involvement in the Napoleonic wars precipitated colonial Spanish America's hankering for independence. Chile declared its independence from Spain on September 18, 1810, but it was not until 1818 that Chile achieved de facto independence.

The colonial social structure prevailed throughout the 19th century. Two political parties emerged, the Conservatives and the

Liberals, with the notion of partisanship becoming increasingly significant in the political sphere. The Conservatives, hewing to the idea of a strong, centralized administration, sought to perpetuate the status quo. The Liberal Party, influenced by French liberalism, was more interested in reform than authority.

The Conservatives held the reins of government from 1830-60, the Liberals during the 1860s through the 1890s. The system of government evolved from one of presidential absolutism to one with a legislative predominance. The landed oligarchy's hegemony gradually weakened.

Chile's victory over Bolivia and Peru in the War of the Pacific (1879-83) permitted a northward expansion into territories rich in copper, nitrates, and guano. Exploitation of these natural resources gave the Chilean economy a much-needed boost. As a result, Chile became one of the primary powers in South America. The outcome of this war is still a thorny issue among Bolivians and Peruvians.

The political atmosphere of the 20th century has been marked by instability, characterized by the struggle for power between left and right-wing forces. The system of parliamentary domination was upset in the early part of this century when efforts were made to protect the interests of the ruling oligarchy. The middle and working classes emerged in the 1920s as political forces to be reckoned with. The Radical Party came into being in 1932, establishing a base for coalition governments for the next two decades.

From the mid-30s to the mid-60s the state assumed an increased role in the economy with state-directed industrial development, extension of the social welfare program, and expansion of education. The Christian Democratic government of Eduardo Frei Montalva initiated far-reaching social and economic programs, yet met with opposition from conservatives who found the reforms

extreme, and from leftists who thought them inadequate.

In 1970 Dr. Salvador Allende Gossens, the Marxist candidate of the Unidad Popular (a coalition of left-wing parties), succeeded Frei as president of Chile. President Allende embarked on a program of economic and social change which featured an acceleration of agrarian reform and an aggressive nationalization policy. The next three years saw a deterioration of the economy and the gradual polarization of Chilean society. The government's fiscal policies caused a decline in most of the domestic productive sectors, creating severe shortages of food, consumer goods, and manufactured products, spiraling inflation, and enormous deficits.

On September 11, 1973, the military staged a violent coup d'etat in which President Allende was killed. Congress was dissolved, political parties were recessed indefinitely, and civil freedoms were severely restricted. A state of emergency is periodically renewed and serves to curb civil and political freedoms.

The Chilean people have increased pressure on the regime for restoration of democracy. In 1985 the leaders of the main Chilean political parties (except for the Communist and a segment of the Socialist parties) signed the National Accord for the Full Transition to Democracy. The Accord called for a speedy return to civilian rule and the restoration of civil and political freedoms.

Mounting opposition to General Pinochet's regime has been met with stern measures and the staunch avowal by Pinochet that elections will not be held before the end of the transitional period (1989) provided for in the Constitution of 1980 (in force in March 1981).

1.15 Government

The military has ruled Chile since 1973. In 1974 General Pinochet became President of the Republic, separating him from the junta and in effect consolidating his power. The junta is made up of the commanders of the air force, navy, carabineros (national police), and an army representative. Pinochet exercises executive authority, while legislative authority rests with the junta. Cabinet ministers, regional administrators, provincial governors, and mayors are all appointed by the president.

The 1980 Constitution provides for a nine year transition period to the restoration of democracy. According to this timetable, Pinochet's term as president will end in 1989 when the next president will be named by the junta and approved in a plebiscite. Pinochet may well be that candidate. Under the terms of the Constitution, if the junta's candidate is rejected, presidential and congressional elections would be convoked by President Pinochet within one year.

Following the 1973 coup the electoral rolls were ordered destroyed. In advance of the 1989 plebiscite, 500 voter registration stations were opened in late February of 1987 to inscribe voters nationwide. Of an estimated seven to eight million eligible voters, 200,000 registered during the first month.

In addition, a law legalizing political parties came into force in March. The law provides for centrist and right-wing parties to legally organize, although most have been operating openly for some time. Some parties view the law with skepticism because of the many restrictions, such as strict guidelines for internal party organization and the exclusion of certain groups of people from party leadership as well as rules on the amount of support a party must demonstrate to qualify for inscription.

Chilean Regions and Provinces and Their Capitals

<u>Region</u>	<u>Regional Capital</u>	<u>Provinces</u>	<u>Provincial Capitals</u>
I TARAPACÁ	IQUIQUE	ARICA PARINACOTA IQUIQUE	ARICA PUTRE IQUIQUE
II ANTOFAGASTA	ANTOFAGASTA	TOCOPILLA EL LOA ANTOFAGASTA	TOCOPILLA CALAMA ANTOFAGASTA
III ATACAMA	COPIAPÓ	CHAÑARAL COPIAPÓ HUASCO	CHAÑARAL COPIAPÓ VALLENAR
IV COQUIMBO	LA SERENA	ELQUI LIMARÍ CHOAPA	COQUIMBO OVALLE ILLAPEL
V VALPARAÍSO	VALPARAÍSO	PETORCA LOS ANDES SAN FELIPE DE ACONCAGUA QUILLOTA VALPARAÍSO SAN ANTONIO ISLA DE PASCUA	LA LIGUA LOS ANDES SAN FELIPE QUILLOTA VALPARAÍSO SAN ANTONIO HANGA ROA
REGIÓN METROPOLITANA DE SANTIAGO	SANTIAGO	CHACABUCO CORDILLERA MAIPO TALAGANTE MELIPILLA ÁREA METROPOLITANA DE SANTIAGO	COLINA PUENTE ALTO SAN BERNARDO TALAGANTE MELIPILLA SANTIAGO
VI DEL LIBERTADOR GENERAL BERNARDO O'HIGGINS	RANCAGUA	CACHAPOAL COLCHAGUA CARDENAL CARO	RANCAGUA SAN FERNANDO PICHILEMU
VII DEL MAULE	TALCA	CURICÓ TALCA LINARES CAUQUENES	CURICÓ TALCA LINARES CAUQUENES
VIII DEL BÍO-BÍO	CONCEPCIÓN	ÑUBLE BÍO-BÍO CONCEPCIÓN ARAUCO	CHILLÁN LOS ÁNGELES CONCEPCIÓN LEBU
IX DE LA ARAUCANÍA	TEMUCO	MALLECO CAUTÍN	ANGOL TEMUCO
X DE LOS LAGOS	PUERTO MONTT	VALDIVIA OSORNO LLANQUIHUE CHILOÉ PALENA	VALDIVIA OSORNO PUERTO MONTT CASTRO CHAITÉN
XI AISÉN DEL GENERAL CARLOS IBÁÑEZ DEL CÁMPO	COIHAIQUE	AISÉN COIHAIQUE GENERAL CARRERA CAPITÁN PRAT	PUERTO AISÉN COIHAIQUE CHILE CHICO COCHRANE

Administrative
Structure:

For administrative purposes, Chile is divided into twelve regions plus the Metropolitan Region of Santiago. Local government ultimately falls under the Ministry of the Interior. Each region is subdivided into provinces and each province into districts (comunas). Regional administration is handled by intendentes, assisted by regional development councils. Provincial level administration is performed by governors with the support of provincial advisory committees. Alcaldes (mayors) head up the comunas.

1.16 Population

Indicators:

Total population	12,074,500
Annual growth rate	1.7%
Urban population	83.6%
Rural population	16.4%
* Age structure	
0-14 years	31.2%
15-64 years	63.1%
65 +	5.7%

Sources: Sintesis Estadistica de Chile
1981-1985

*Compendio Estadístico, Chile '85

Chile is one of the most urbanized nations in Latin America, with more than 83 percent of the population living in urban areas. Of the urban population, 47.2 percent (4,772,900) resides in Santiago. The urban growth rate, recorded at 2.4 percent from 1973-83, cannot be entirely attributed to migration from rural areas - at least one-third of Santiago's inhabitants come from other cities and towns. It is estimated that 25 percent of Chile's urban population lives in slums and squatter settlements.

The northern and southern extremities of Chile have low population densities. Ninety percent of the population lives in Central Chile. The South-Central region contains a proportionally large Indian population. The

land south of Puerto Montt is virtually uninhabited. At the tip of the continent, Punta Arenas is the world's southernmost human settlement.

Chile's average population density is 16 people per sq. km. Agricultural areas register 116 people per sq. km.

While immigrants have influenced Chile's economic, social, and political development, they do not account for a high numerical proportion of the population. Despite liberal immigration laws, immigration has declined; current estimates place the inflow of migrants at under 1,000 a year.

Emigration siphons a disproportionate number of skilled professionals from the population. During the 1970s, political events prompted two waves of emigrants: in 1970, those fleeing Allende's rule, and again in 1973, those escaping Pinochet's regime.

1.17 Health

Indicators (1985)	Birth rate/1,000 population	22
	Death rate/1,000 live births	6
	Infant mortality/1,000 live births	19.5
	Child mortality/1,000 children 1-4 yrs	0.9
	Life expectancy, years*	
	Females	72
Males	68	

Sources: PAHO, July 1987.

*World Bank, World Development Report 1985.

Health Overview:

Chronic diseases and accidents are the leading causes of death. In 1984 circulatory diseases accounted for 28.3 percent of all deaths; tumors for 16.1 percent; injury and poisoning for 12.2 percent; and diseases of the respiratory system were responsible for 10.5 percent. The mortality rate of infants under one year of age due to diarrheal

diseases has dropped from 10.8/1,000 live births in 1972 to one death per 1,000 live births in 1981.

Caloric deficiency, iron deficiency, anemia, and hypovitaminosis A constitute the prevalent nutritional problems. Serious malnutrition has virtually disappeared from the school age population, while moderate malnutrition exists in 0.8 percent of this same group. National immunization programs reach between 75 percent and 90 percent of the susceptible population. Of diseases preventable by immunization, measles and tuberculosis present a public health problem although both diseases have been reduced in the last few years. Smallpox and poliomyelitis have been virtually eliminated.

Typhoid fever is one of the communicable diseases with a high incidence. Beginning in 1977, occurrence of the disease surged with morbidity rates registering around 120 per 100,000. In 1978 cases numbered 13,114; in 1984, 9,124 cases were reported (mostly in the Metropolitan Region) -- representing a 30 percent decrease.

1.18 Economy

General Situation:

Since the 1930s, successive administrations have sought to reduce Chile's vulnerability to world market fluctuations, increase economic development, and attain a more equitable distribution of wealth. These aims led to the active intervention in the economy by the government - expanding public ownership, controlling prices, wages, and credit allocation, offering tax and other incentives to investment, establishing subsidies, multiple exchange rates, and import quotas. Chile underwent periods of slow growth, rapid inflation, and balance of payment problems, at the same time, its foreign debt grew, its agricultural and industrial sectors became inefficient, and copper accounted for an inordinately large portion (80 percent) of exports. Allende's government launched an aggressive

expropriation policy in the private industrial and mining sectors, as well as a major reform program. Chile's economic situation in 1973 was not optimal: inflation, at an annualized rate above 1,000 percent, was the highest in the world; the deficit of the central government alone exceeded 20 percent of the GDP; and a black exchange rate beat out the official rate more than ten times.

The military government, in a break with traditional economic trends, opted for an emphasis on private sector initiatives and free market forces. Major changes to the economic structure were implemented, such as the freeing of prices and interest rates, encouragement to foreign investment, the virtual elimination of trade barriers, and the reduction of the state's role in the economic field. Also, many of the companies nationalized during the previous administration were returned to the private sector.

The economy initially responded well to these reforms as evidenced by the 8.5 percent annual real growth rate between 1976-80, the reduction of inflation to 30 percent by 1980, and the sevenfold increase in agricultural and manufactured export value between 1973 and 1978.

The Chilean economy, however, entered a recession in late 1981 due in part to the world recession, and in part to a shift in macroeconomic policy. Where previously resolute, the GOC adopted ad hoc economic measures resulting in a loss of confidence on the part of domestic and foreign investors. In 1982 the GDP plummeted 14 percent and unemployment soared to 19 percent, and Chile entered into a depression. In 1983 a financial crisis precipitated by banking insolvency and capital outflow further damaged the economy. The GOC intervened in the country's financial system and also adopted strict austerity measures to stabilize the economy; these steps would have long-term

effects on the economic situation. The depression bottomed out in 1984 and Chile gained a tenuous hold on economic recovery.

In recent years, GOC economic policies based on export promotion, import substitution, and reduction of the state's role appear to be having their intended effect in redirecting the economy. In 1986 the Chilean economy registered a 5.7 percent growth rate, contrasted with 2.4 in 1985.

Exports grew more than ten percent to \$4.2 billion in 1986. Agricultural exports were nearly one-third higher than the previous year, with fruits excelling. Grape and apple sales increased by 15 percent and 70 percent, respectively. Forestry exports grew by more than 20 percent. While copper output reached record levels, the value of copper and other mining exports fell due to low world prices. As a result, copper production levels did not translate into higher export earnings.

Imports grew by five percent to \$3.1 billion. A sharp decline in food imports -- 40 percent lower than 1985 levels -- seems to signal the success of import substitution.

In early 1986 unemployment had fallen to 8.4 percent. This figure, however, does not include those employed in special employment programs. Counting those in the Minimum Employment Plan (Plan de Empleo Mnimo, PEM) and the Occupational Program for Heads of Households (Programa Ocupacional para Jefes de Hogar, POJH) the unemployment rate for the end of 1986 is just over 13 percent, compared with 19 percent the year before. Statistics point to broad regional differences in unemployment rates, suggesting that unemployment is a primarily urban problem. Unemployment levels range from 2.7 percent in Region II to 10.7 percent and 12.2 percent in Santiago and Valparaso, respectively.

Chile's foreign debt of \$19.3 billion constitutes a heavy burden and servicing the country's debt is a major issue. It must be

noted that international financial institutions consider Chile's debt management responsible and innovative (e.g. debt/equity swaps). The strategy appears to be paying off in terms of reduced payments and fostering goodwill among Chile's creditors.

Macroeconomic Indicators (1986)

GDP	\$15,800 million
GDP per capita	\$1,300
Foreign debt	\$19,300 million

GDP by Sector (1986, provisional figures)

	<u>Percent of Total</u>
Agriculture and forestry	8.8
Fishing	1.0
Mining	6.5
Industry	20.8
Electricity, gas, and water	2.6
Construction	5.5
Trade	16.7
Transport	5.7
Total	100.0

Balance of Payments: In 1986 the balance of payments was \$1.2 million. Imports amounted to \$3,099 million and exports to \$4,199 million.

Main Exports, 1986

(\$ million)

Mining	2,096.1
of which, copper:	1,757.1
Agriculture and fish products	683.0
Industrial products	1,419.7
Total	4,198.8

Source: EIU Country Profile Chile, 1986

- Imports:** Principal imports include petroleum, sugar, wheat, capital goods, and vehicles.
- Main sources of supply are U.S. (21.8 percent), Venezuela (8.9 percent), Brazil (8.3 percent), FRG (6.9 percent), and Japan (6.3 percent). 1985 figures.
- Exports:** Major exports are copper, molybdenum, iron ore, paper products, fishmeal, fruits, and wood products. Producing 17 percent of the world supply, Chile is the world's largest producer and exporter of copper. Chile is also the world's largest exporter of fishmeal.
- Main export markets are U.S. (22.8 percent), Japan (10.3 percent), FRG (9.7 percent), U.K. (6.7 percent), and Brazil (5.5 percent). 1985 figures.

1.19 Power Supply

The current in Chile is 220v, 50-cycle, single-phase, 2-wire, AC.

1.20 Communications

- Radio:** Radio is Chile's most influential mass communications medium. In 1982, there were 3,450,000 radio receivers in use, or 300 radios per 1,000 population. There are a total of 155 AM and 118 FM radio stations in Chile.
- Most of the 220 transmitters are privately owned, but the government operates 11 medium-wave, four short-wave, and three FM transmitters.
- Television:** Television is operated by both private and government networks. The government network, Televisión Nacional de Chile, has 12 stations and covers 97 percent of Chile's territory. The private stations are operated by four universities: Universidad Católica de Chile, Universidad Católica de

Valparaíso, Universidad de Chile, and Universidad del Norte. There are an estimated 3,500,000 televisions sets in the country. Color television transmission using the U.S. (NTSC) system is available.

Telephones: In 1982, Chile had 595,000 telephones. Sixty-one percent of the total telephones were in Santiago, 4.75 percent in Viña del Mar, and 3.6 percent in Valparaíso.

Press: Sixty-six daily newspapers are published in Chile. El Mercurio (360,000) and La Tercera de la Hora (410,000) both conservative independent papers, are the most widely-read dailies. El Cronista (45,000) is the official government newspaper. (Note: circulation figures vary according to source.) In March 1987 La Epoca, the first opposition daily newspaper since the 1973 military coup, appeared on Chile's newsstands.



2. Disaster Vulnerability

2.1 Geographic Regions

Chile can be divided into geographical regions both longitudinally and latitudinally. The Chilean Andes, the central valley, and the coastal range define the country's three longitudinal sections. Five latitudinal divisions include the northern desert regions of Norte Grande (Big North) and Norte Chico (Little North), Central Chile, South-Central Chile, and Archipelagic Chile, or the Far South.

Chilean Andes - Rising abruptly from the central depression in sharp gradients, the Andes extend down the length of Chile -- the mountains' spine describing the eastern perimeter. Altitudes decrease as the system wends its way south, consequently the highest crests are found in the north. On this single, compact mountain range stand the volcanoes Tupungato (6,550 m), Maipo (5,290 m), and Llullaillaco (6,739 m), while to the northeast of Copiapó, Chile's highest peak, Ojos del Salado, towers at 6,880 m.

Permanent snow blankets the summits over 4,500 m in the north (at latitude 20°S), and above 3,500 m in the latitude of Concepción (latitude 36°S). South of Talca active volcanoes lie west of the main range. The section between Concepción and Puerto Montt, with an average elevation of 3,000 m, contains spectacular mountain peaks, glacial valleys, lakes, and waterfalls. At the latitude of Valdivia, permanent snow whitens the crests at 1,500 m, and farther south many snow and ice-capped peaks can be found as low as 700 m, with some icebergs floating in coastal fjords. The Andean system disappears in the lowlands of the Chilean Patagonia, on both sides of the Strait of Magellan, but reappears at Cape Horn, the crest of a submerged mountain.

Coastal Mountain Range - The coastal mountain range consists of a series of rounded hills serrated by rivers and gorges. Many small rivers originating along the eastern flank have carved steep valleys in the coastal plateaus, while many Andean rivers, such as the Bio-Bio and the Maule, have wide alluvial valleys reaching to the Pacific. Elevations reach 2,150 m in the north; the coastal system deteriorates south of Valparaiso, disappears beneath the sea just after Puerto Montt, and re-emerges as the hundreds of little islands of Archipelagic Chile. In the north, steep cliffs jut from the sea forming a formidable coastal wall, with few natural harbors. As the mountain range loses altitude, the coast becomes irregular and more natural harbors are found.

Central Valley - The structural depression between the Andes and the coastal zone is poorly defined in the north, manifesting itself as rainless, barren plateau basins. In the middle section of the country, the central valley is the well-defined agricultural and industrial heartland of Chile. South of the Rio Bio-Bio, dense forests characterize the land. At Puerto Montt the central depression slides under the sea.

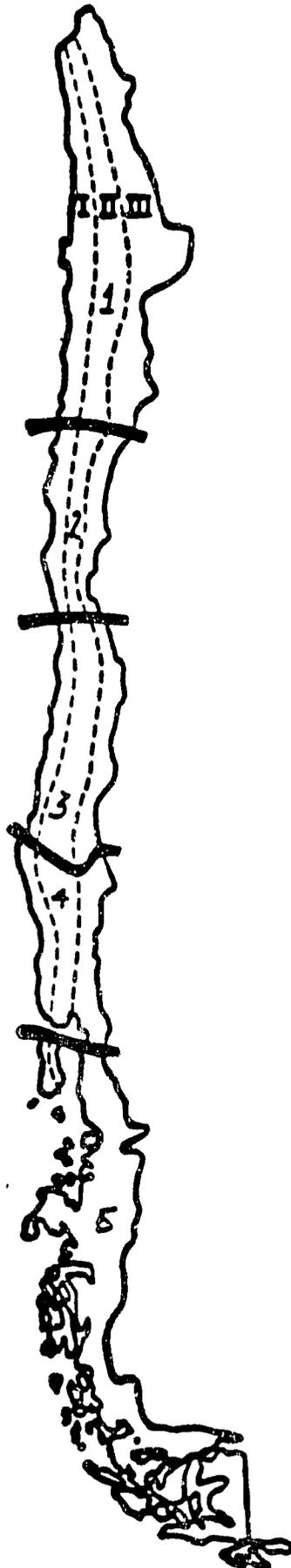
Norte Grande - This region includes the mineral-rich Puna de Atacama, the 1,300-km Chilean section of the desert extending along the coast of South America from latitudes 4°S-27°S. The land is a desolate succession of plateau basins, alluvial fans, and salt beds relieved occasionally by small oases. Although many streams thread westward, almost all are sucked into the arid desert after supplying limited amounts of water to oasis farm villages. The Lluta, Camarones, and Loa rivers are the exceptions. Much of the region's wealth comes from the mining of copper ore and sand, salt, and clay deposits. Recently, fishing, electronics, and automobile assembly industries have gained predominance as the area's economic activities.

Norte Chico - The Norte Chico is a transitional zone of transverse valleys notched between spurs of the Andes. Chief among the Andean rivers nourishing these basin oases are the Elqui, Limarí, Huasco, and Coquimbo. Thus, in addition to mining and industry, farming is a viable occupation in this region (although irrigation is essential). The fishing port of Coquimbo also contributes to the area's economy. Important national and international observatories and space research centers are located in the interior, due to the excellent visibility of the southern skies.

Central Chile - An Andean spur separates the extraordinarily lush Valle de Chile from Santiago. From the southern edge of the Valle, the lowlands of the central valley stretch uninterrupted for over 500 km to the Río Bio-Bio. Chile's central depression is a natural receptacle for the sediment from the region's major rivers - the Mapocho, Maipo, and Maule. The resulting alluvial plains slope westward and are remarkably fertile. The primary economic occupations are industry and agriculture, featuring the cultivation of wheat, fruit, cereals, and vegetables.

South-Central Chile - The geographical relief remains essentially the same for another 400 km - rolling hills, large rivers, and green forests. The southern portion of the zone contains many lakes and rivers that cut through the residual coastal range. Agriculture and cattle raising contribute to the local industry.

Far South - As the central valley disappears and the coastal range dips below sea level, the terrain becomes a complicated mosaic of forests, rivers, lakes, mountains, islands, fjords, channels, and glaciers. The area has limited arable land and a small population. Stock raising, primarily sheep, along with oil and gas production are the region's main economic occupations. Near Punta Arenas, one of the world's southernmost cities, is the Strait of Magellan, a natural passage between the Pacific and Atlantic oceans.



Longitudinal Divisions:

- I. Coastal Range
- II. Central Valley
- III. Andean Cordillera

Latitudinal Divisions:

- 1. Norte Grande
- 2. Norte Chico
- 3. Central Chile
- 4. South-Central Chile
- 5. Archipelagic Chile

2.2 Climate

Chile's climatic conditions are necessarily varied by virtue of its great length and diverse topography. Three general climatic zones can be distinguished: the north, one of the driest regions in the world; the middle, characterized by mild wet winters and long dry summers; and the south, with heavy rains and strong winds.

Several factors influence the weather, the most significant being the proximity of the Andes and the Antarctic waters of the Humboldt Current. The current meets the shoreline of southern Chile and follows the coast northward, thereby exerting its climatological hold over the entire length of the country. In addition, streams of cold air accompanying the current and warm air from the southwest also affect the climate. These air masses interact, producing cyclonic weather south of the Río Bio-Bio during all seasons and, during the winter, bringing moisture to the rest of the central valley. Overall, temperatures are moderate and decrease only slightly from north to south. Rainfall, on the other hand, increases from almost none in the north to over 4,500 mm annually on some of the southern islands. In the south, the prevailing westerlies drive air masses from the Pacific over the Andes, resulting in heavy precipitation on the western slopes. Most of the rainfall occurs during the winter months, except in the Far South where precipitation is evenly distributed throughout the year.

The North - The northern desert is distinguished not only by its lack of rain, significant drainage systems, and permanent vegetation, but also by its moderate average temperatures which vary from 13°C to 15°C in July and 20°C to 21°C in January. The aridity of this area is primarily due to the frigid Humboldt Current and a high pressure belt over the Pacific which inhibits precipitation and favors stable climatic conditions. Humidity is higher along the coast (81 percent relative average humidity), resulting in lower temperatures than in the interior. The camanchaca, a heavy coastal fog, is a weather phenomenon indigenous to the northern coast. In the transverse valleys, rainfall increases with the elevation, as much as 200-300 mm may fall in the higher parts of the Andes. In a few areas of the desert rainfall has never been recorded; in Arica the mean annual rainfall is 0.7 mm. Rainfall remains scanty in the Norte Chico with the little that does fall coming in the winter.

The Middle - This section of the country enjoys a mild winter and warm, dry summer climate. There are distinct seasonal changes in the climate, which varies from a Mediterranean type with a marked dry season between the Aconcagua and Bio-Bio rivers, to a moderate, humid climate on the coast and western slopes between the Bio-Bio and the island of Chiloé. Temperatures are moderate and the differences are slight. Average winter temperatures are 11°C at Valparaíso, 8°C at Santiago, and 12°C at Coquimbo; average summer temperatures are 18°C, 21°C, and 17°C, respectively. Yearly rainfall registers around 360 mm at Santiago and 100 mm at Coquimbo, falling mostly in the winter; descending air from the Pacific high pressure center inhibits precipitation during the summer.

TEMPERATURE (°Celsius)

	<u>LATITUDE</u>	<u>LONGITUDE</u>	<u>Elevation</u> (meters)	<u>Length of</u> <u>record</u> (years)	<u>Jan</u>		<u>Average Daily</u>				<u>Extreme</u>			
					<u>Max</u>	<u>Min</u>	<u>Apr</u>	<u>Jul</u>	<u>Oct</u>	<u>Max</u>	<u>Min</u>			
Arica	18°28'S	70°20'W	29	15	25	17	23	16	19	12	21	14	34	4
Antofagasta	23°42'S	70°24'W	94	22	24	17	21	14	17	10	19	13	30	3
Potreriillos	26°30'S	69°27'W	2850	7	18	9	17	8	14	4	16	7	24	-7
Valparaíso	33°01'S	71°38'W	41	30	22	13	19	11	16	8	18	10	34	0
Santiago	33°27'S	70°42'W	520	14	29	12	23	7	15	3	22	7	37	-4
Valdivia	39°48'S	73°14'W	5	29	23	11	17	8	11	5	17	7	36	-7
Ancud	41°47'S	73°52'W	56	30	17	11	14	8	10	6	13	7	28	-1
Puerto Aisén	42°24'S	72°42'W	10	8	17	10	13	6	7	3	13	6	34	-8
Cabo Raper	46°50'S	75°38'W	40	8	14	8	12	7	8	3	11	4	22	-2
Los Evangelistas	52°23'S	75°07'W	58	16	10	7	9	5	6	2	7	4	19	-7
Punta Arenas	53°10'S	70°54'W	8	15	14	7	10	4	4	-1	11	3	30	-12

Adapted from The Weather Almanac, 1984

AVERAGE PRECIPITATION
(in mm.)

	Length of Record (years)	<u>AVERAGE PRECIPITATION</u> (in mm.)												<u>YEAR</u>
		<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>	
Arica	25	*	0	0	0	0	0	0	*	0	0	0	*	*
Antofagasta	32	0	0	0	*	*	3	5	3	*	3	*	0	13
Potreriillos	7	*	*	8	*	18	*	13	8	5	5	0	*	56
Valparaíso	41	3	*	8	15	104	150	99	74	33	10	5	5	506
Santiago	58	3	3	5	13	64	84	76	56	31	15	8	5	361
Valdivia	60	66	74	132	234	361	450	394	328	208	127	125	104	2601
Ancud	46	79	94	135	188	252	279	262	239	165	107	119	117	2035
Puerto Aisén	11	198	198	211	191	373	264	282	282	155	198	178	201	2741
Cabo Raper	10	198	147	180	196	191	201	241	191	142	178	170	178	2212
Los Evangelistas	27	297	254	287	290	244	239	239	218	234	224	252	257	3033
Punta Arenas	15	38	23	33	36	33	41	28	31	23	28	18	36	368

* Less than 1 mm

Note: Figures have been rounded off to nearest whole number
Adapted from The Weather Almanac, 1984

The South - This zone is exposed to continual westerly winds, frequent storms, and heavy rainfall. Winter temperatures average 8°C at Valdivia and Puerto Montt and 2°C at Punta Arenas; summer temperatures average, respectively, 17°C, 16°C, and 11°C. In Tierra del Fuego, the Pacific and Atlantic oceans have a moderating effect on the temperature, which rarely falls below -6°C, although strong winds are common. South of Puerto Montt precipitation increases -- snow and sleet are common -- and Archipelagic Chile is one of the wettest, stormiest regions in the world. The sun shines an average of 51 days a year, winds of gale intensity blow year-round, and about 5,100 mm of rain falls in some areas. Annual rainfall is 2,600 mm at Valdivia, 2,200 mm at Puerto Montt, and drops to 480 mm in Punta Arenas.

2.3 Seismicity

Situated in one of the most active seismic areas of the world, Chile has suffered devastating earthquakes and will continue to experience damaging shocks in the future. Chile's location relative to the movement of tectonic plates accounts for this concentrated seismic activity. Chile is attached to the South American Plate; to the west, following the contour of the continent, lies the Nazca Plate, converging on the South American Plate at a rate of ten centimeters per year. The meeting point of these two plates is known as a subduction zone, where the Nazca Plate plunges beneath the continental plate. The consequent deformation of the Nazca Plate builds up energy which, when released, is manifested as an earthquake.

Seismic activity decreases significantly south of the island of Chiloé, with earthquakes registering only sporadically in the southern area of the country. The Nazca Plate's southern boundary gives way to the Antarctic Plate at around 45°S latitude. Like the Nazca, the Antarctic Plate also moves eastward in relation to the South American Plate, but at a rate of only two to three centimeters per year, thus accounting for reduced earthquake activity.

A study of the geographic distribution of major earthquakes in Chile reveals that the occurrence of shocks with Richter magnitudes larger than seven preponderates along the coast. Only in the north is there a significant incidence of major quakes in the interior of the country.

Earthquake-associated casualties and damages outstrip those resulting from any other disaster agent to which Chile is vulnerable. The calamitous May 1960 earthquake, occurring near Valdivia, had an estimated 9.2 Richter magnitude -- one of the strongest known shocks in the world -- and claimed 6,000 lives. Fatalities in a 1939 tremor totaled 30,000. The March 1985 shock, registering 7.8 on the Richter scale, took only 180 lives but inflicted tremendous damage to the country's infrastructure (see CHILE - 1985 Earthquake case report,

Appendix A). A major earthquake of Richter magnitude 7.3 struck northern Chile in March of 1987. The tremor's epicenter was located in the ocean, northeast of Antofagasta. The affected area is sparsely populated and somewhat remote; only moderate damages were reported and no fatalities occurred.

Chilean and Peruvian seismologists recently forecast a powerful earthquake in southern Peru, close to the Chilean border. While earthquake prediction techniques still are imprecise, the scientists base their prognostication on historical recurrence probabilities which indicate that the area is due for a large tremor. The increased frequency of earthquakes in Chile's northern region may be cause for concern.

2.4 Tsunamis

Seismic sea waves, or tsunamis, are another natural hazard to which Chile is prone. Submarine or coastal earthquakes, deep ocean avalanches, or volcanism can trigger these killer waves, which have been known to travel at speeds greater than 960 km per hour. The shoals of a coastline have a braking effect on the waves. As a wave loses speed, however, the top of the wave column bunches, gathering height, and strikes the shore with enormous force. A tsunami always poses a threat to the shore areas close to the epicenter of the earthquake originating the wave. Major tsunamis can also threaten coastal areas thousands of kilometers from their source.

Since 1562, 112 recorded tsunamis have slammed into Chile's coast; of these, 24 have caused extensive loss of life and property. Examination of geographical origin reveals an increasing level of tsunami activity north of 45°S.

A tsunami generated by the May 1960 earthquake struck Hawaii, the Philippines, and Japan, destroying property and killing hundreds of people. Waves measuring four to six meters reportedly hit the Japanese coast. The tsunami also wiped out or seriously damaged coastal towns in southern Chile, close to the source of the shock. Waves of 10-20 m were recorded. A tsunami generated by the March 1985 earthquake reached a height of 1.3 m but had no adverse effect on the Chilean coast. (See also Section 3.3 Warning Systems, Tsunami Warning.)

2.5 Volcanoes

Part of the notorious Ring of Fire, Chile has a volcanic chain coincident with the subduction zone of the Peru-Chile Trench. Chile's National Emergency Office currently classifies 17 active volcanoes as high risk, meaning that populations reside on the slopes or within the volcano's range.

Chile's volcanoes offer some of the most breathtaking landscapes in the world. Accompanying this scenic beauty, however, is a potential for extinguishing life and causing economic losses to the nation. In 1964, southern Chile's Villarica volcano erupted and generated lahars (volcanic mudflows) which killed 25 people. Seven years later, in 1971, Villarica again blew. Fifteen people lost their lives to the consequent lahars which also damaged bridges and highways in the surrounding area.

2.6 Floods

Flooding generally occurs during April to September, with the majority of activity concentrated in May, June, and July. While floods usually originate in the autumn and winter rains, the effects of thawing Andean snows may also contribute to inundation of low-lying land. Andean meltwaters, in the form of flash floods, deposit walls of silt and debris-laden water on farming villages and line the course of streams, endangering crops, property, and sometimes life.

In the northern third of the country, rainfall is extremely variable, oscillating between aridity and sudden violent deluges. People tend to settle in the fertile low lands of the transverse valleys, on dry river beds and coastal terraces. Fluctuating precipitation is deceptive: flashfloods can destroy bridges, roads, and even settlements.

Between Santiago and Concepción, rivers fed by overabundant rains may rush down the steep Andean inclines, enter the valley in ill-defined flows, and flood areas of important economic activity. From Region X southward the abrupt topography and heavy rains combine to cause river overflows and landslides.

In June 1986 flooding severely affected Chile's central region, especially communities which, coincidentally, were the most affected by the 1985 earthquake -- including Rengo, San Vicente, San Francisco, and Curicó. In Rengo (Region VI), for example, the earthquake caused substantial housing damage. Many buildings which were not leveled sustained structural damage. When the floods swept through Rengo in June, adobe structures previously affected absorbed the waters and, in some instances, walls collapsed in muddy masses. In Santiago, the irregular flow of the Mapocho River often affects the city and, on this occasion, demonstrated its baneful potential. (See CHILE - 1986 Floods case report, Appendix B.)

Beginning on July 10, 1987, heavy rains again spawned powerful floods bringing renewed destruction to central Chile, principally in regions III - IX. Forty-nine people were killed and the "damnificados" (people affected by a disaster) numbered 116,364. Preliminary statistics indicate that damages exceeded those caused by the 1986 floods. (See also CHILE - 1987 Floods situation report, Appendix C.)

2.7 Drought

Drought is another kind of disaster which affects Chile from time to time. Aridity occurs naturally in many areas of Chile, particularly in the north. In sections of the country with a Mediterranean-type climate (the central zone), the length of rainy and dry seasons is critical to agriculture. Significant variations can be disastrous.

In 1968-69 arid conditions prevalent in the northern desert encroached on the rich central valley where most of the nation's food is grown. The drought had its origin in unusual climatic conditions. Rainfall levels registered 81 percent below normal in the Santiago area in 1967. The consequent water shortage created a drop in electricity generation, producing a raft of associated problems. Electric power rationing was instituted in homes and industries. As a result, copper production dropped considerably, begetting a loss of more than \$32 million in foreign exchange. Chile's economy suffered major setbacks. Among the effects of the drought: unemployment skyrocketed due to reduced production of both copper and agricultural goods; thousands of livestock died; a food shortage forced 120,000 people to government relief programs for all or part of their food. Uncommon climatic conditions persisted for several years and, by 1972, an estimated 30,000 people were still in need of emergency food assistance because of the drought.

Southern Chile, particularly Region IX, experienced a drought in 1987, likened to that of 1969. Definitive statistics are not yet available but economic losses appear to be substantial.

2.8 Forest Fires

The incidence of forest fires appears to be on the upsurge. Two factors account for this: first, the availability of better data provides a more accurate picture of the problem, and second, increased development activity in rural areas heightens the risk. However, the average hectareage burned has been significantly reduced over the past fifteen years, since the inception of National Forestry Corporation (CONAF) and strict implementation of the Fire Management Program. These successful efforts notwithstanding, available data suggest the need for a concerted public education campaign aimed at eradicating the incidence of forest fires. (See also Section 3.6 Forestry.)

The fire season begins in October and usually ends with the first rains in April or May, with some variation between the central zone and the south. Between 3,000-5,000 fires burn each fire season; the majority are started by humans.

Forest Fires in Chile -- Incidence & Damage
1964-86 Fire Seasons

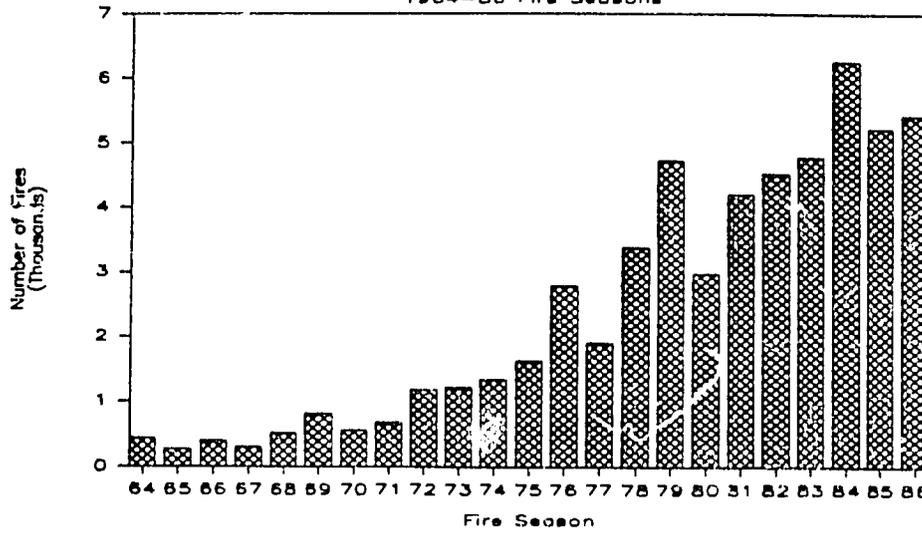
Fire Season	Number of Fires	Hectares Burned	Average Area Burned (ha)
64	435	19,600	45.1
65	269	17,200	63.9
66	396	19,900	50.3
67	307	15,820	51.5
68	507	61,314	120.9
69	807	34,747	43.1
70	551	16,725	30.4
71	669	22,603	33.8
72	1,172	81,570	69.6
73	1,214	42,763	35.2
74	1,332	19,162	14.4
75	1,630	9,604	5.9
76	2,785	24,266	8.7
77	1,909	26,459	13.9
78	3,380	29,963	8.9
79	4,718	76,215	16.2
80	2,977	22,536	7.6
81	4,197	32,056	7.6
82	4,520	26,842	5.9
83	4,782	45,748	9.6
84	6,252	80,191	12.8
85	5,223	47,572	9.1
86	5,429	62,753	11.6
	55,461	835,609	

Source: CONAF, August 1986

Note: Fire season runs October through April (approximately).
Fire season year is defined by year in which season ends,
e.g., "64" denotes the 1963-64 season.

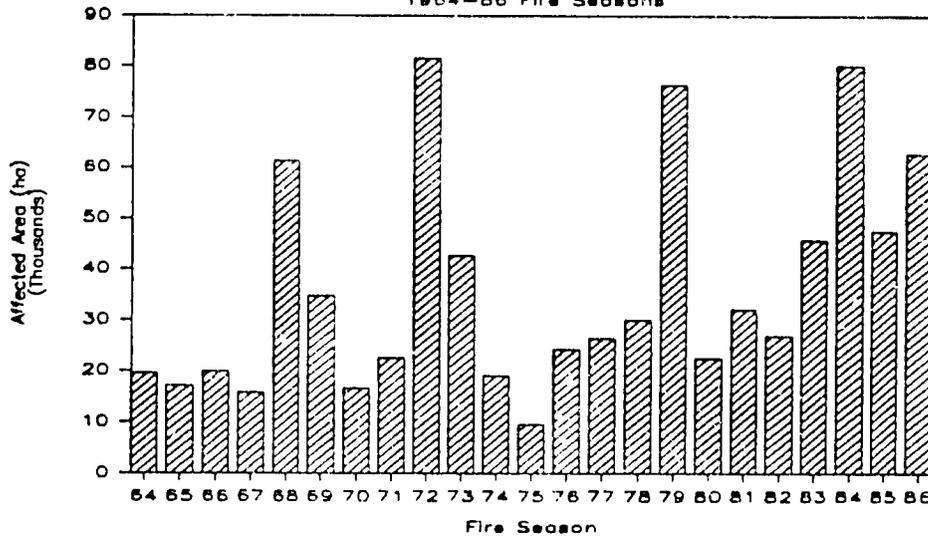
Incidence of Forest Fires in Chile

1964-86 Fire Seasons



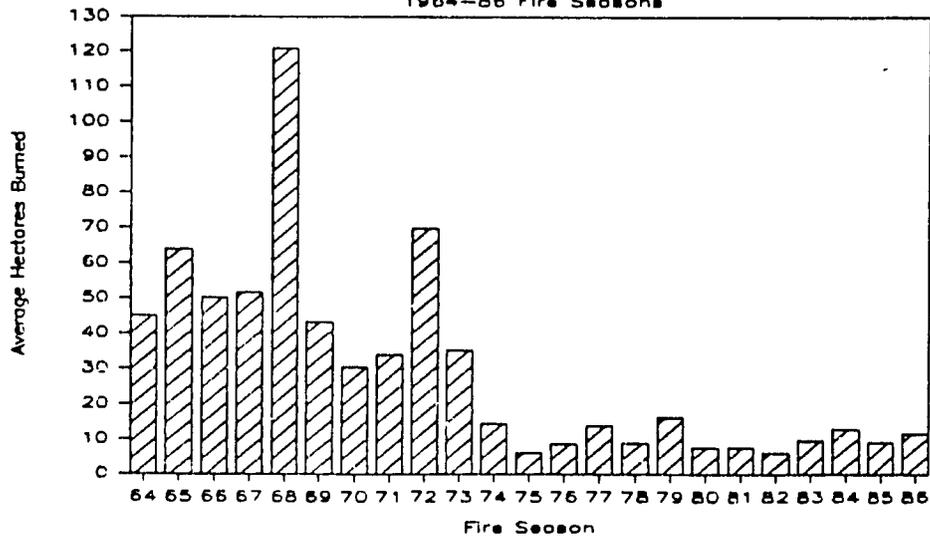
Areas Affected by Forest Fires in Chile

1964-86 Fire Seasons



Average Hectares Burned Per Fire

1964-86 Fire Seasons



The area most prone to forest fires lies between Santiago and Puerto Montt (Region X), with the highest risk in Valparaiso (Region V), where the coastal hills are densely populated, and Concepción (Region VIII), where 40 percent of the total area of Monterey pine is planted. During the 1986-87 season, Region V and the Metropolitan Region were most affected by forest fires.

Chile's forestry industry currently enjoys steady growth rates and the GOC actively promotes development in this sector, providing incentives to private entities. Forest fires endanger these initiatives as well as dairy and livestock industries in the south, presenting potential economic losses in affected regions.

2.9 Selected Major Disasters

<u>Date</u>	<u>Disaster Type</u>	<u>Location</u>	<u>Number Killed</u>	<u>Number Affected</u>	<u>Damage (\$000)</u>
8/16/06	Earthquake	-	1,500	-	-
1/24/39	Earthquake	Concepción	30,000	58,500	920,000
5/22/60	Earthquake	Arauco Peninsula	6,000	2,000,000	550,000
3/2/64	Volcanic Eruption	Villarica	25	2,000	-
3/28/65	Earthquake	Central valley	400	20,000	125,000
7/65	Floods	Antofagasta to Aisen	600	350,000	10,000
12/28/66	Earthquake	Taltal and Catalina	4	-	-
1968	Drought	Nationwide, especially central valley	-	120,000	55,000
7/8/71	Earthquake	Valparaiso	85	-	236,000
1/1/72	Drought	Central zone	-	30,000	55,000
6/74	Floods	Middle and south	32	40,000	10,000
6/22/82	Floods	Mapocho River	15	23,000	-
3/3/85	Earthquake	Central zone	180	980,000	1,500,000
6/15/86	Floods	Central zone	15	-	-
7/10/87	Floods	Central zone	49	116,000	-

(Note: dash indicates data not available)

Sources: OFDA Disaster History Report, August 1987
U.S. Embassy Santiago MDRP, August 1983

3. Disaster Preparedness and Assistance

3.1 Host Country Disaster Organization

National Civil Protection System In 1965, a damaging earthquake struck the central valley and prompted the formulation of the National Civil Protection System. Integral to the system, the National Emergency Office and the National Emergency Plan were developed in the 1970s. The system requires the entire nation's participation to improve Chile's ability to confront and recover from a disaster rapidly, ensuring minimal interruption of development plans.

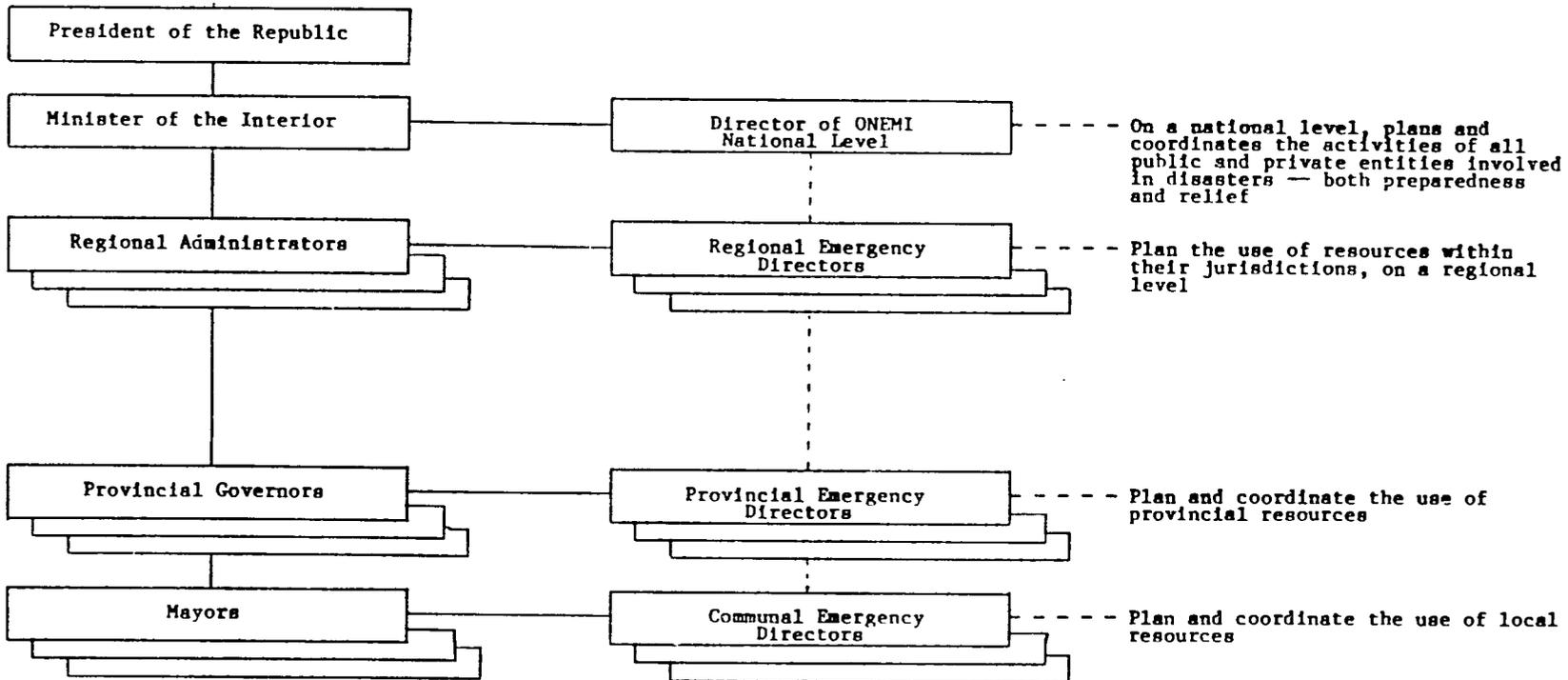
The National Civil Protection System comprises ministries, services, and both public and private institutions, including voluntary agencies. Maintaining its own structure, each entity adapts itself to accomplish, collectively, the mission of the National Emergency Plan. In an effort to avoid improvisation, each organization with a role in implementing the Plan devises its own emergency plans and directives. In addition, jurisdictional authorities prepare their own plans which make provision for the need to act autonomously in the event that their area is isolated by a disaster. (Any area may need to fend for itself for up to thirty-six hours or more after a disaster strikes.) All plans and emergency instructions must agree with those of the region, province, or comuna in which the organization operates.

The National Civil Protection System mirrors Chile's administrative divisions and strives for decentralization. Through the National Emergency Office, the Ministry of the Interior coordinates action at the national level and, through interior government authorities -- regional administrators, provincial governors, and mayors -- at regional, provincial, and communal levels. This approach to disaster response operates as an integrated network of gradations. Each administrative division is encouraged to deal with the situation independently, using its own resources. Employing the administrative framework serves to contain the situation, reducing confusion and wasted effort.

Regional administrators, governors, and mayors preside over regional, provincial, and communal emergency committees, respectively. Emergency directors heading these committees assist the jurisdictional officials. Not merely ad hoc delegations, these committees are permanent working groups which coordinate the use of local resources for both preparedness and relief endeavors, regularly carrying out civil protection programs. The committees are located in the capital city or administrative center of the region, province, or community. It is the responsibility of regional administrators, provincial governors, and mayors to establish and maintain Emergency Operations Centers in these same sites. The centers must have communications facilities to enable efficient coordination of state services and resources of private and voluntary entities. Maintenance of the centers rests with each

NATIONAL DISASTER ORGANIZATION

Republic of Chile
Ministry of the Interior
National Emergency Office



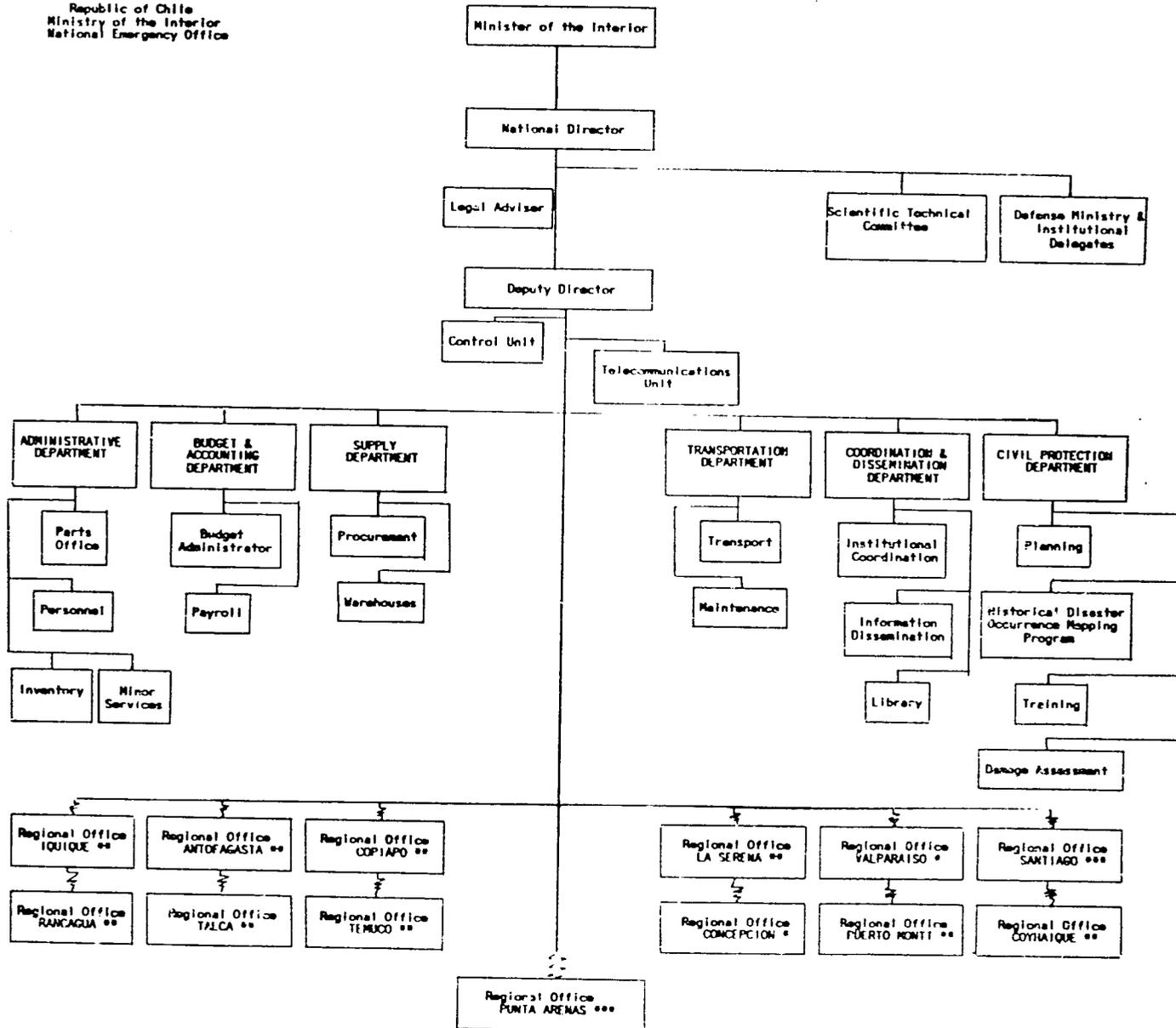
Source: ONEMI, March 1981

jurisdictional government. National Emergency Directives, issued by the Ministry of the Interior, regulate the activities of emergency committees which essentially function as extensions of the National Emergency Office.

Two basic principles underlie the National Civil Protection System: mutual aid and a stratified use of resources. No institution or jurisdictional area is self-sustaining to the point where it can deal easily with the range of disasters which might affect it. Thus, mutual aid is an important concept in Chilean internal disaster response. Secondly, in keeping with a decentralized approach, resource use corresponds to local availability and administrative stratification. In a severe disaster, a response is initiated at the communal level, in accordance with the prevailing emergency plan or communal directive. All available local resources are used. If the magnitude of the disaster exceeds the jurisdiction's means, the mayor then informs the provincial governor of the situation and requests help. Should provincial resources be inadequate, the same procedure applies on up the administrative framework, until reaching the central level where the National Emergency Office's resources are tapped. If normal budgetary resources are short, then the GOC may resort to using two percent of the central budget for disaster relief, as provided for in the Chilean Constitution. Further, the GOC may launch an international appeal for assistance through UNDRO.

National Emergency Office Promulgated in March 1974, Chilean Law No. 369 established the National Emergency Office (Oficina Nacional de Emergencia), subordinate to the Ministry of the Interior, as the GOC entity responsible for maintaining and refining Chile's Civil Protection System. The National Emergency Office (often referred to by its Spanish acronym ONEMI) coordinates and administers activities intended to prevent or mitigate natural or man-made disasters. Its motto, "Let's Not Wait Until Things Happen," governs ONEMI's approach to its mandate. ONEMI's principal undertakings follow.

- Prepares emergency plans and directives, ensuring their implementation.
- Undertakes collaborative research projects aimed at averting disasters or, if unavoidable, minimizing consequential damages.
- Educates the public to respond quickly, safely, and in an orderly manner to disasters.
- Coordinates the disaster response efforts of GOC ministries and services, and private institutions (both national and international).
- Coordinates assistance provided by friendly countries and international assistance organizations. This coordination function also applies when Chile donates disaster assistance to other countries.



* Have ONERI personnel and radio equipment
 ** Have ONERI radio equipment and personnel provided by the Region
 *** Do not have radio equipment; function with Regional personnel

Oficina Nacional de Emergencia
Ministerio del Interior
Beauchef No. 1637
Santiago, Chile
Telephone: 71-8333

Mailing address:
Oficina Nacional de Emergencia
Classificador 1-C, Correo 25
Santiago, Chile

ONEMI operates the National Emergency Operations Center on a 24-hour basis and maintains communications with all elements of the National Civil Protection System. ONEMI's National Emergency Data Bank stores standardized baseline data on all regions, including population statistics, listings of public and private organizations which might have a role to play in a relief response, and disaster history information for planning purposes.

ONEMI directs relief efforts on a national level. When a serious disaster strikes, ONEMI's role is to coordinate and execute logistical arrangements such as transporting relief supplies (blankets, tents, cots, etc.) to support regions when they have exhausted their own stocks and local commercial sources.

Organizationally, ONEMI comprises the Office of the Director and six departments: Administrative, Budget and Accounting, Supply, Transportation, Coordination and Information Dissemination, and Civil Protection.

ONEMI's Director is designated by and reports to the Minister of the Interior and is responsible for the office's overall performance. The legal adviser counsels the Director on all matters of the law. The ONEMI Deputy Director coordinates and oversees all endeavors by the departments and other dependencies. In addition, the Deputy Director controls all internal activities and administrative functions of ONEMI. Two special units assist the Deputy Director in carrying out his duties: 1) The Control Unit regulates internal control systems. For example, this unit assesses the effectiveness of administrative controls over procurement, management, and use of ONEMI's financial resources. The Control Unit devises standards and mechanisms for internal control. 2) The Telecommunications Unit, a technical unit, has primary responsibility for maintaining ONEMI's Telecommunications System and addresses all aspects of telecommunications throughout the National Civil Protection System.

ADMINISTRATIVE DEPARTMENT: Responsible for all administrative and personnel issues.

BUDGET AND ACCOUNTING DEPARTMENT: Develops and administers the annual budget.

SUPPLY DEPARTMENT: Formulates inventory, procures, and maintains relief stocks. This department distributes items needed for daily operations as well as emergency stocks for in-country disasters or for assistance to other disaster-stricken countries. (ONEMI maintains Regional Emergency Centers with permanent stores of emergency supplies for disasters in-country and for shipment to other disaster-stricken nations.) The distribution system is tightly controlled. ONEMI's stocks are derived from several sources: supplies may be bought with regular ONEMI funds, donated from various sources, or procured with funds from special appropriations. In certain cases determined by the Director, donated articles are distributed directly to the victims or distribution is turned over to voluntary agencies and like entities.

TRANSPORTATION DEPARTMENT: Studies and plans the use of transportation resources, on a national level, for use during emergencies and also devises alternative procedures. Additionally, this division coordinates with other groups, both public and private, to overcome any logistical bottlenecks. ONEMI maintains a fleet of vehicles prepared to move personnel and supplies.

COORDINATION AND INFORMATION DISSEMINATION DEPARTMENT: This department promotes the concepts of disaster prevention and preparedness through a variety of media (e.g., training sessions, public information radio spots and brochures, school evacuation exercises, and a monthly informational bulletin with a circulation of 5,000). It delivers these messages to GOC ministries, services, and institutions, as well as national and international organizations. The program is geared partly toward securing the collaboration of these entities -- with their human, material, and technological resources -- in the prevention of disasters and formulating solutions to disaster-related problems. The public is the program's other constituency, as the department strives to educate the public about ONEMI, its role, on-going scientific and technical studies, and preparedness measures people can take to protect themselves in the event of a disaster. All these are steps in the effort to improve Chile's Civil Protection System.

In time of disaster, this division disseminates information to the public and also coordinates international relief assistance.

CIVIL PROTECTION DEPARTMENT: This section engages in diverse activities during normal times and in emergencies. These undertakings include planning and implementing standards, studies, and programs; assisting the Director in planning and organizing the country to meet the objectives set forth in the National Emergency Plan; studying disaster types -- both natural and man-made -- and analyzing causes, aggravating factors, and likely needs and requirements in the event of disaster, as well as corresponding prevention and mitigation measures. This department develops technical disaster preparedness training programs aimed at priming ONEMI staff and civil protection experts. The training programs use ONEMI's experience and the results of its on-going disaster studies as a base for learning.

During a disaster, the Civil Protection Department supports the relief operation at the main office and, if necessary, at the disaster site by maintaining situation status control, evaluating damage, and keeping statistical records.

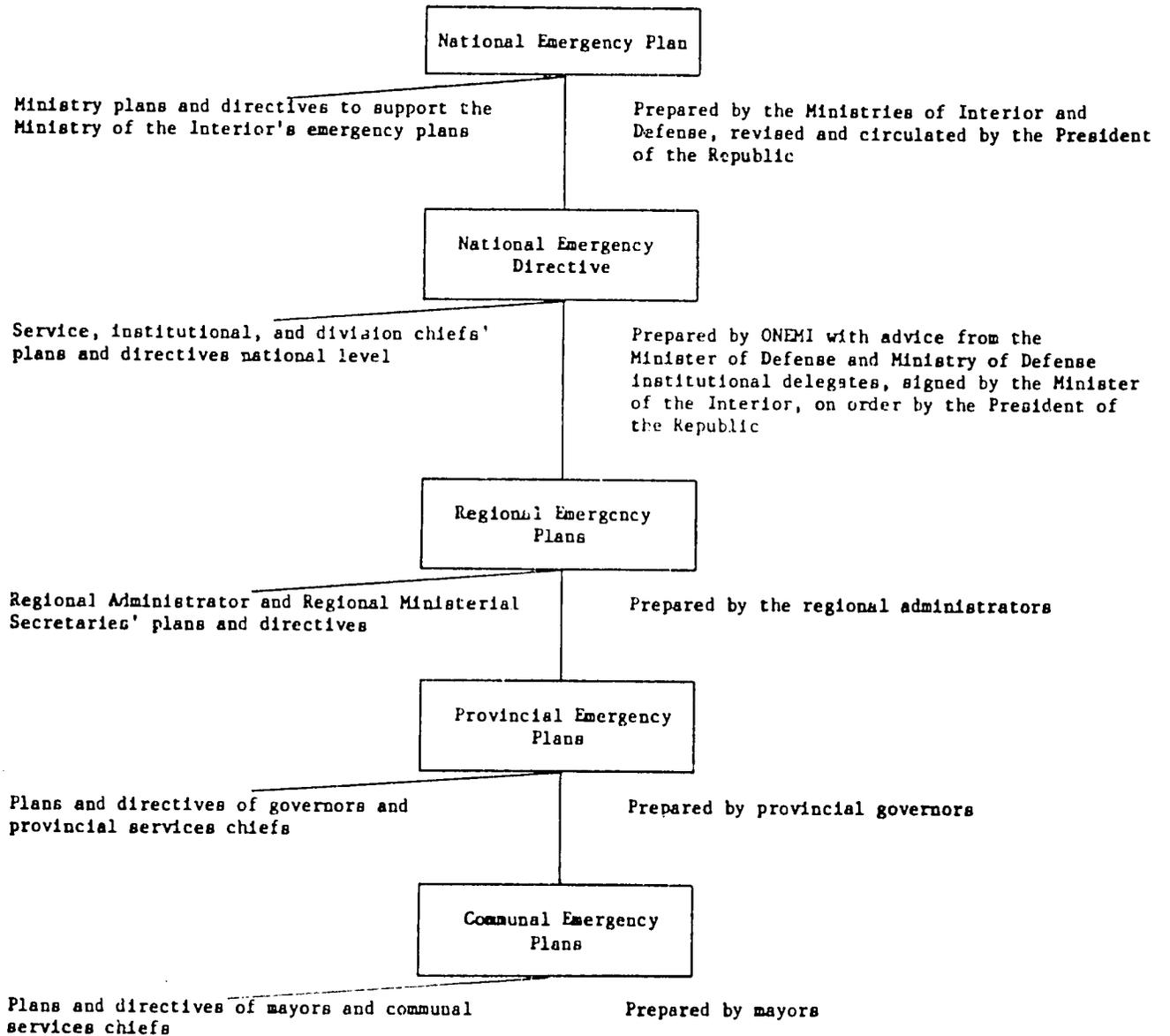
ONEMI's Current Status During both the 1985 earthquake and the 1986 floods, President Pinochet established an ad hoc Cuartel de Emergencia (Emergency Headquarters) which supplanted ONEMI's disaster relief coordination role. The Cuartel de Emergencia became the focal point for information flow and decision making. However, these Cuarteles did not operate at ONEMI's main offices and, consequently, were removed from the traditional central information receiving site. This deviation from established law and practice caused considerable confusion among donor countries and non-governmental organizations. As a result, some relief efforts were duplicative. A permanent División de Emergencia (Emergency Division) -- staffed with active duty military officers -- was also established, seemingly in conflict with ONEMI's function. Whether these developments have diluted ONEMI's authority and clout remains to be seen.

In May 1987 ONEMI's Director of nearly a dozen years resigned. His replacement, Colonel Hector Orrego, has indicated that ONEMI will work closely with the military in the future. The precise effects on ONEMI's operational structure and Chilean disaster relief may not be evident for some time.

National Emergency Plan Written in 1977, the National Emergency Plan provides for a coordinated and sensible response to Chile's susceptibility to disasters. The Plan strives to accomplish four objectives: 1) To ensure the continuity of the nation's development plans through the identification of risks and hazardous conditions as well as corresponding preventive action. 2) To restore normalcy, if altered, by mobilizing all resources. This includes guaranteeing the availability of vital necessities to the populace, especially potable water, food, shelter, transportation, communications, and sanitary, energy, and fuel services. 3) To inform and train the public and civil protection specialists in responding quickly, safely, and in an orderly manner to disasters ranging from earthquakes to forest fires, toxic gas leaks to drought, and epidemics to atomic radiation. 4) To provide a viable system to prevent and control disasters in Chile -- without creating new organs of government -- using existing resources in a coordinated fashion and implementing carefully crafted plans.

The Plan covers two distinct phases: Readiness and Execution. The Readiness phase comprises Planning & Preparedness and Organization to Confront Disasters. The Execution phase encompasses Emergency Operations and Lifeline Restoration & Emergency Rehabilitation. Reconstruction is the last stage of the cycle but remains outside the Plan's area of operations, falling instead to the National Planning

Emergency Plan Schema



Source: ONEMI

Office (ODEPLAN) and the Ministries. The Plan names ONEMI as the GOC entity with full authority during a disaster to coordinate and direct the activities of any organization, including public and private groups, with a role in a relief effort.

When a disaster occurs, the affected area may be proclaimed a Disaster Zone by GOC Supreme Decree. The regional administrator requests the declaration from the Minister of the Interior, who submits it to ONEMI for evaluation. Final endorsement comes from the Minister of the Interior. (Also, if a disaster is imminent -- based on reports from reliable technical sources -- the threatened area may be declared to be in a State of Disaster Alert.)

If the affected area constitutes more than one region, the Minister of the Interior, in coordination with the Ministry of Defense, designates a Disaster Zone Chief to represent the Interior Minister on-site and assume command of the situation. This Chief is usually a high official or general in the Armed Forces.

From the start of a large-scale relief response, an integrated effort is sought. Once a disaster decree has been issued, the Ministries and other organizations (such as the Civil Defense, Red Cross, Amateur Radio Operators Emergency Network, and similar voluntary entities) place whatever means of assistance they have at the disposal of ONEMI or the Disaster Zone Chief.

The Plan provides for roles in both the Readiness and Execution phases for the Ministries of Foreign Affairs; Defense; Economy, Development, and Reconstruction; Finance; Public Education; Justice; Public Works; Agriculture; Land and Colonization; Labor and Social Security; Health; Mining; Housing and Urban Planning; Transportation and Telecommunications; the General Government Secretariat, and ODEPLAN.

Each GOC Ministry has a responsibility to execute its own plans in order to fulfill the objectives of the National Emergency Plan. Toward this end, each designates a high level official to act as coordinator and liaison with ONEMI. In addition, each lead agency must instruct its dependencies to collaborate and participate in preparedness and relief endeavors at national, regional, and local levels. Disaster-related enterprises include carrying out vulnerability analyses and preventive measures; assigning specific functions to personnel during emergencies; investing in preventive measures to either correct unsafe conditions or ensure rapid restoration of normalcy; and compiling statistics on direct or indirect damages wrought by natural or man-made disasters to GOC Ministries and their dependencies. This allows government officials to make informed decisions on investments of a preventive nature.

Civil Defense The Chilean Civil Defense (Defensa Civil, DC) was established in 1945, patterned after the British Civil Defence. The DC's mission is to maintain an organized and well-trained force able to come

to the aid of fellow citizens in all kinds of emergencies. While the Directorate is official (under Ministry of Defense sponsorship), the operational structure is composed strictly of volunteers.

From its headquarters in Santiago, the Directorate administers the DC's 140 active local committees (comités locales), strung along the length of the country from Arica to Porvenir (in the Strait of Magellan). Because of financial restrictions, the DC cannot provide significant material assistance, but is a potentially valuable source of manpower. Approximately 30,000 volunteers constitute the ranks of the Civil Defense. In the March 1985 earthquake, 9,000 DC volunteers pitched in to assist fellow citizens.

As one segment of the whole of Chile's Civil Protection System, the DC is responsible for training its volunteers in disaster response and preparedness measures. DC volunteers receive different types of technical training, such as first aid, communications, rescue operations, and firefighting. Furthermore, local DC headquarters coordinate with Ministry of the Interior authorities and emergency directors to define the DC's support role, based on available volunteers in the jurisdictional area. However, the degree of DC integration in ONEMI endeavors is unclear.

3.2 Non-Governmental Organizations

Cruz Roja Chilena
Avenida Santa María 0150
Santiago, Chile
Telephone: 77-1448

The Chilean Red Cross (CRC) delivers social and health services to those in need and has been active in providing disaster relief to the Chilean people. The CRC consists of a Central Committee which governs the organization and forges policy, and an Executive Board which implements policy and directs daily operations. The CRC currently has four regional committees (these do not correspond to national administrative divisions) headquartered in Valparaíso, Concepción, Temuco, and Puerto Montt. These work closely with regional emergency directors and local authorities to facilitate preparedness, coordination, and quick response to disasters. There are some 200 CRC entities in Chile, most of which are health posts. CRC volunteers, 8,000 strong, are dispersed throughout the country, from Arica to Puerto Williams.

In time of disaster, the CRC mobilizes its volunteers to administer first aid to victims, operate temporary shelters, conduct needs assessments, and collect and distribute food, clothing, and medicines. All these activities are closely coordinated with local officials.

The CRC's central warehouse in Santiago is stocked with clothing, blankets, tents, and bandages. As a rule, its regional warehouses are not well-stocked. The CRC also maintains the League of Red Cross Societies' (LRCS) Southern Cone regional stockpile and distributes inventory to other countries in the region, at the request of LRCS Geneva. These stores may be used by the CRC with the consent of LRCS in the event of a serious disaster.

During the aftermath of the 1985 earthquake, 56 CRC detachments supported 118 towns and communities in the stricken area. CRC volunteers attended 130,000 Chileans -- activities included assisting in relief planning and coordination, administering first aid and nursing care to 14,277 victims, working in shelters, distributing relief supplies, searching for missing people, and conducting needs assessments.

Cáritas Chile
Erasmus Escala 1822
Santiago, Chile
Telephone: 696-6645, 698-9495

Mailing Address:
Casilla 13520
Correo 21
Santiago, Chile

Created in 1956, Cáritas Chile was the first Cáritas on the Latin American continent. Cáritas is an entity of the Catholic Church providing social assistance and development programs to Chileans. Organized into a total of 24 dioceses, Cáritas operates on the national, diocese, and parish levels. Cáritas's programs concentrate on remedying child malnutrition, fostering human and community development, and promoting better health among the population. Cáritas distributes U.S. Food for Peace commodities through its programs.

Cáritas Chile has been the leading NGO in recent disaster relief operations. In case of disaster, Cáritas Chile coordinates the overall effort of the organization, while the dioceses work with parish and community groups to restore normalcy to affected areas. Cáritas advocates self-help and community participation in relief efforts to help "damnificados," or disaster victims, recover psychologically as well as materially.

There are usually three phases in Cáritas's disaster relief programs: Emergency, Rehabilitation, and Reconstruction. During the Emergency phase, Cáritas workers in dioceses and parishes of the affected areas assess damage and needs in the community. Temporary shelters are set up in public schools, churches, and community centers. Food, clothing, and medical attention are provided to the damnificados. After the initial emergency winds down, Cáritas channels contributions from foreign donors into rehabilitation projects, eventually leading into long-term reconstruction efforts.

Over the last two years Cáritas has assumed a disaster relief mode three times: in the aftermath of the 1985 earthquake and the floods of 1986 and 1987. In response to each of these major disasters, OFDA has

donated disaster relief funds to the Chilean people through Cáritas. After the 1985 earthquake, OFDA funds paid for the delivery of 206 mediaguas (wooden shelters) and 830 packages of construction materials to those left homeless or with houses in need of repair.

Cáritas provided immediate relief to the flood victims in 1986 and mounted repair and reconstruction, technical assistance, and seed distribution programs. OFDA contributed \$100,000 to Cáritas's emergency shelter program. These funds covered the construction of 200 mediaguas (23.4 m² each) throughout the damaged zone. Thirty units were set up in Lo Barnechea, 50 mediaguas went to Rengo, and 110 mediaguas were distributed in Molina, Lontué, and Licantén.

The floods of July 1987 proved to be worse than those of 1986. Cáritas once more mounted an emergency program to assist the flood victims. The U.S. Embassy contributed \$15,000 of its Ambassador's Disaster Relief Authority to Cáritas. The funds were combined with other international donations and went toward an emergency shelter program designed to provide 314 emergency shelters. In addition, OFDA contributed \$100,000 for another emergency shelter program implemented by Cáritas reaching between 100 and 115 families.

Adventist Development and Relief

Agency/Organización Filantrópica Adventista del
Desarrollo (ADRA/OFASA)
Avenida Américo Vespucio Norte 134
Santiago, Chile

ADRA/OFASA supports community development activities and provides food, clothing, equipment, and disaster relief supplies to Chileans in need. The organization maintains a central warehouse in Santiago with stocks of food, clothing, tents, and medicine. Warehouses stocking only clothing are located in Antofagasta and Temuco.

ADRA/OFASA has been active in providing emergency relief to Chile's disaster victims. ADRA/OFASA works closely with ONEMI and other NGOs in identifying the nature of assistance to the damnificados. After the earthquake of 1985, based on ONEMI's determination that shelter constituted a real need, ADRA/OFASA used \$75,000 for building 86 mediaguas. Working mostly in Rengo and Melipilla, ADRA/OFASA worked with the municipalities as well as pastors and social workers to determine those damnificados most in need. In addition, ADRA/OFASA distributed food, tents, clothing, and medicine.

In the aftermath of the 1987 floods, ADRA/OFASA received \$10,000 from the U.S. Ambassador's Authority for the provision of food, clothing, and emergency shelter in Colina, a town just north of Santiago.

Fundación INVICA
Erasmus Escala 1835
Santiago, Chile
Telephone: 696-7822, 71-7858, and 698-2461

Fundación INVICA was created in 1959 with support from Caritas Chile. INVICA's principal objective is to promote community and national development through housing endeavors, concentrating on middle and lower-income families. The foundation has delivered 30,000 housing units (directly or through other institutions) and spurred the growth of different types of housing cooperatives in Chile.

Following the destruction wrought by the 1985 earthquake, INVICA spearheaded a \$1.5 million emergency shelter program. INVICA coordinated the efforts of a group of private enterprises to assist 4,000 rural and urban families throughout the affected zone. The program entailed three modes of assistance: packages of construction materials for repair of damaged homes, assembly of 18 m² mediaguas, and Aldeas de Paso, a structures comprising 24 units, each unit measuring 18 m². OFDA contributed \$600,000 to this emergency shelter effort.

Instituto de Promoción Agraria (INPROA)
Avenida Miguel Claro 2334
Santiago, Chile
Telephone: 46-0318

INPROA is a private non-profit organization created in 1963 by Cardinal Raúl Silva Henríquez, then Archbishop of Santiago, and Monsignor Manuel Larrain, Bishop of Talca. INPROA's initial mission was to support the Catholic Church's incipient agrarian reform program. Today INPROA's goals are to raise the quality of life of campesino families, train campesino leaders to assume responsibility for their labor, and stimulate and strengthen grass-roots organization in the Chilean campo. The Institute's programs concentrate on technical assistance training, rural health, family agriculture, youth, and rural women.

The 1985 earthquake severely affected the Chilean campo. One in every three rural dwellings was partially or totally destroyed, a total of 40,000 rural homes were affected. Donations from fellow Chileans as well as from foreign donors enabled INPROA to mount an emergency shelter program which reached 3,173 rural families. Three types of shelter assistance were available: (1) packages of construction materials for repair and reconstruction, (2) mediaguas of 20 m², and (3) mediaguas of 30 m². With technical assistance from INPROA campesinos rehabilitated and reconstructed their communities. The shelter program reached campesinos in Melipilla, San Pedro, San Vicente, Rengo, Peumo, and Talagante. OFDA funds went for the provision of 680 packages of construction materials and 222 mediaguas.

In response to the 1987 floods, INPROA received \$170,000 from OFDA to furnish an estimated 300 families with mediaguas and packages of construction materials for the repair of damaged dwellings.

Corporación Privada de Desarrollo (CORPRIDE)
Merced 130 y 150
Curicó, Chile
Telephone: 1390, 1483, and 499

Mailing Address:
Casilla 17
Curicó, Chile

A private non-profit organization created in 1977, CORPRIDE seeks to develop Chile's human resources with a view toward promoting the country's economic, social, and cultural development. CORPRIDE provides vocational and educational training as well as technical assistance to workers and groups in agriculture, industry, commerce, and the service sectors. The corporation began its operations in Curicó (in Region VII) but has expanded to cover regions IV through X.

The earthquake of 1985 opened a new field of endeavor to CORPRIDE. Using its community ties and technical capabilities, CORPRIDE assessed damage and needs requirements, sharing this information with the local government and working with the community to restore normalcy. In addition, CORPRIDE received a portion of the OFDA emergency shelter funds and built 200 mediaguas for homeless earthquake victims. During the June 1986 floods CORPRIDE responded by providing comprehensive damage and needs assessments for the area surrounding Curicó.

3.3 Warning Systems

Seismic Warning

The Chilean Seismological Service was established in 1906 as a result of a damaging earthquake. The Service increasingly became associated with the Universidad de Chile and in 1925 officially came under the aegis of that institution. The Service now falls under the rubric of the Department of Geology and Geophysics, part of the School of Physical Sciences and Mathematics. The University supports the Service financially, however due to university fiscal limitations, the Service cannot operate on a 24-hour basis. The government provides no funds for maintenance, although funds may be awarded for specific research projects. The Service conducts technical research studies, collects and analyzes seismic data, and disseminates information to ONEMI and the public on earthquake activity.

The principal channel for earthquake and other seismic activity monitoring is the National Seismic System Network, a series of permanent seismographic stations distributed throughout the country. Some stations are operated by other universities, by prior arrangement with the Universidad de Chile. Locations of the country's seismic stations follow.

Arica - operated by the Universidad del Norte

Antofagasta

Calama

Tololo - one short-duration instrument and one long-duration

Santiago - has 15 telemetered stations -- from Jahuél, 100 km north of the capital, to Rancagua, south of Santiago -- between the coast and the cordillera. The most important station is located in Peldehue and has six components. All other stations in the area have one vertical short-duration instrument (sensitive to higher frequencies).

Concepción

Temuco

Puerto Montt

Punta Arenas - this station suffers from chronic maintenance problems resulting largely from a shortage of funds.

Antarctic - two stations belonging to the Instituto Antártico Chileno. A five-station network is planned to carry out a microplate study.

In addition, the U.S. Geological Survey (USGS) funds two stations, in Antofagasta and Peldehue, which form part of the Worldwide Seismic Network. The Seismological Service also can set up temporary monitoring systems, such as the one established to study the aftershocks of the March 1985 earthquake.

Regular distribution of stations is important to fix the epicenter of an earthquake accurately and quickly. To arrive at a precise calculation, cooperative efforts among stations and, sometimes, nations are required. While the Chilean Seismological Service does not operate on a 24-hour basis, the staff does the best they can. If an earthquake strikes during work hours, seismologists begin immediately analyzing data to determine the epicenter location. During non-business hours, the Service has duty officers on call. However, should an earthquake that is not immediately perceptible in Santiago occur in the middle of the night, these scientists may not know of the occurrence. This problem has been partially solved by an enterprising night watchman. Over the years the caretaker has learned enough from the seismologists to enable him to detect the occurrence of a serious earthquake from the equipment and immediately alert the duty officer to a potentially damaging tremor.

Chilean scientists participate actively in programs of the South American regional seismological center headquartered in Lima. The Centro Regional de Sismología para América del Sur (CERESIS) was formed in 1965 and now includes scientists and engineers from most South American countries. CERESIS is funded by the participating countries and also continues to receive grants from UNESCO and AID/OFDA for special projects. Among its activities, CERESIS conducts seismic studies, publishes educational material, and holds technical conferences and training sessions.

OFDA funded the Seismic Hazards Mitigation in the Andean Region (SISRA) project, implemented in 1981 under the technical supervision of the USGS. Among the project's objectives are the compilation of existing data on historical seismicity and neotectonics to assess seismic hazards in the Andean region, development of a prototype satellite seismograph-telemetry link using the Geostationary Operational Environmental Satellite for possible future data transmission, and preparation of a model to accurately estimate casualty and economic losses from earthquakes. Among SISRA's products are a twelve-volume set of historical earthquake data by country, epicenter maps, and a neotectonic map of South America.

In 1985, the SISRA project incorporated a study of aftershocks of the March 1985 Chile earthquake. Using GOES seismographs, the USGS, working with the Universidad de Chile, collected and analyzed data ultimately applicable to hazard zoning.

OFDA currently has budgeted preparedness funds for a Seismic Zoning and Implementation of Improved Earthquake Resistant Design in Chile, with the technical supervision of the USGS. The three-year project aims at reducing disaster vulnerability of newly constructed or reconstructed housing and other facilities in population centers in Chile. A collaborative effort among USGS, Chilean scientists, engineers, and disaster officials will yield ground motion maps for construction site planning and improved design criteria and codes. Educational and technical assistance will be provided by the USGS.

Tsunami Warning

Like other countries in the Pacific Basin, Chile is vulnerable to the destructive power of tsunamis. While tsunamis cannot be prevented, their effects can be mitigated by warning and evacuating threatened coastal populations. The Pacific Tsunami Warning Center (PTWC), in Hawaii, issues alerts of imminent tsunami arrivals to threatened nations bordering the Pacific Ocean. Due to operational limitations, areas within one hour of the earthquake's epicenter cannot be warned in time by the PTWC.

The OFDA-funded Tsunami Hazard Reduction Utilizing Systems Technology (THRUST) pilot project was devised to cover this critical interval with a near-shore tsunami warning system. THRUST is designed to assess, within ten minutes, earthquake magnitude/tsunami potential for an area approximately 100 km in radius. Once a tsunami has been generated, people living in areas within 10-60 minutes travel time from the earthquake's epicenter can be alerted and evacuated. (No extant system can cover the 0-10 minute interval. Public education campaigns must teach people to recognize the warning signs of an impending tsunami so that they can abandon the area immediately.) The THRUST system supplements the existing Pacific-wide and regional tsunami warning centers. Hawaii, Alaska, Japan, U.S.S.R., and French Polynesia operate systems which provide warnings of any tsunami generated in their respective regions.

Three criteria governed THRUST's development: (1) The system had to be readily integrated into the existing local warning capabilities, to facilitate acceptance; (2) to reduce costs, the system had to be assembled from existing technology; and (3) the system had to be reliable to assure continued support by local authorities.

Chile's National Tsunami Warning System became operational in 1964 under the direction of the Naval Hydrographic Institute (Instituto Hidrográfico de la Armada, IHA). The IHA is the lead GOC agency responsible for data collection and tsunami warning issuance. The University of Chile's Geophysics Department (Seismological Service) and the IHA collaborate on data collection, analysis, and interpretation after a strong earthquake. ONEMI is the third partner in the system which strives to safeguard lives and property in the face of a tsunami threat.

OFDA commissioned the Pacific Marine Environmental Laboratory (PMEL) of the U.S. National Oceanic and Atmospheric Administration (NOAA) in 1982 to conduct the THRUST pilot project. The PMEL coordinated the work of experts in the fields of oceanography, seismology, numerical modeling, data management, satellite communications, ocean engineering, and tsunami warning operations to develop the THRUST system.

THRUST operates by a series of signal relays dependent on the Geostationary Operational Environmental Satellite (GOES). When an earthquake occurs it activates accelerometers (one installed at IHA, the other at the Geophysics Department in Santiago) which transmit signals to the GOES telemetry link. The satellite pulses the signal to NOAA's Command Data Acquisition (CDA) station at Wallops Island, Virginia, where an analysis of the earthquake is made and generation of seismic waves confirmed. A signal dispatched from CDA triggers an alarm at IHA's control center in Valparaíso, which in turn generates a stored tsunami alert message, including the seismic event's date and time. This message serves as a guideline for warning center personnel to follow. (The PTWC receives the warning simultaneously and can alert the entire Pacific region.) IHA staff evaluate the threat and proceed to alert endangered zones, using ONEMI's established information dissemination channels.

THRUST technically is capable of completing the data collection and analysis process in less than five minutes. However, this information is merely a tool for decision makers -- it does not replace the human decision-making factor in the issuance of tsunami warning information. The system is now fully operational; a final evaluation is scheduled for the fall of 1987.

To complement the THRUST-generated warnings, ONEMI organized a series of planning meetings with Valparaíso and Viña del Mar officials involved in contingency planning for emergencies. These sessions produced the THRUST Project 1986 Tsunami Operations Plan for Chile. The plan identifies key officials and their responsibilities, addresses evacuation procedures for local authorities to follow in the event of a tsunami, and includes maps depicting inundation areas, evacuation routes, and hospitals in both cities.

3.4 Health Resources

Chile's health sector comprises both public and private subsectors, with the public service the more important of the two. The Ministry of Health (MOH) heads the public subsector of the health care system, establishing standards and regulating activities. Health policies are oriented toward preventive health services, emphasizing maternal, perinatal, and child programs -- especially children and mothers with nutritional deficiencies -- as well as those for the elderly, people with chronic ailments, and the rural population.

The public system cares for 75 percent of the population and controls 90 percent of the available beds. While accounting for only ten percent of hospital care, the private sector's importance in outpatient care is reflected by its more than 25 percent share of all consultations. Physicians practicing in the public subsector also participate in the private system, as do health companies and associations, selected universities, and the armed forces.

The national network of care services consists of 198 hospitals, 265 clinics, and 991 rural health clinics. Approximately 40,000 beds are available, 33,000 of which belong to the public health system and the balance to universities and the armed forces. Chile has one physician for every 1,250 inhabitants and one university-trained nurse or midwife for every 1,800 residents.

The local pharmaceutical industry produces about 90 percent of the drugs consumed in Chile. The industry manufactures pharmaceuticals using active raw ingredients imported from other nations. There are fifty pharmaceutical companies with their own plants and a number of transnational companies that market their products. The 1969 National Drug Code (Formulario Nacional) regulates drug use and ensures the availability of alternative basic products at lower prices. The Public Health Institute is responsible for quality control of drugs and biological products.

In a disaster context, the MOH has a role in both the Preparedness and Execution phases of the National Emergency Plan. Preparedness responsibilities include assigning a coordinator to work with ONEMI; instructing and training MOH personnel in disaster-related issues and

skills; maintaining a written evacuation plan in each hospital; organizing emergency medical units with a 30 minute response time capability or units able to disperse into the field within eight hours of a disaster strike; organizing the operation of blood banks, ambulances, and communications systems. During the Execution phase, the MOH's material and personnel resources are at the disposal of the Ministry of the Interior, to be applied to the needs of the affected population.

Chilean health officials recognize the importance of disaster preparedness within their field and the need for continuing training and educational endeavors. The Hospital Evacuation and Safety Plan (Plan de Seguridad y Evacuación Hospitalarias, published by ONEMI) -- known as Plan SEH -- highlights the importance of both emergency preparedness plans and professionals well-trained in dealing with the health care problems endemic to disasters. The Universidad de Chile's School of Public Health (Escuela de Salud Pública) for years has incorporated the disaster element in its graduate health administration curriculum and, in 1985, in its medical school curriculum. In recent years PAHO has stimulated interest in the relation between health and disasters. PAHO has developed an array of training materials, provided expertise, and planned and participated in seminars on the subject.

The March 1985 earthquake significantly affected the health sector: 22 hospitals, 21 clinics, and 31 rural health posts were damaged or destroyed. Hospital infrastructure damage was greatest in the Metropolitan Region, while clinics and health posts in Region V were especially affected. Hospitals suffered a reduction in the number of available beds, losses of health supplies, and structural damage. Twelve hospitals, nine clinics, and 15 health posts had to be replaced due to structural damage. Despite the extent of damages, provision of medical services to the population was not inhibited seriously.

The value of independent generators and backup water supply systems (deep wells) was evidenced in the aftermath of the earthquake. Because most intermediate and large hospital centers are equipped with emergency generators, they were able to continue to provide adequate health care despite disruptions of the central power system.

3.5 Agriculture

The Ministry of Agriculture (Ministerio de Agricultura, MINAG) has primary responsibility for the agricultural sector. A Sub-Secretariat of Agriculture and the Agricultural Planning Office (Oficina de Planificación Agrícola, ODEPA) assist the MINAG in implementing policy. Autonomous institutions such as the Agriculture and Livestock Service (Servicio Agrícola y Ganadero, SAG), the Agricultural Research Institute (INIA), CONAF, and private groups under the MINAG's supervision also have specific responsibilities in the execution of agricultural policy.

During the 1973-83 decade Chile's free market economic policies meant a freeing of markets, prices, and interest rates and the elimination of subsidies. However, Chilean farmers had a tough time competing in the world agricultural market where products were heavily subsidized. In addition, lower-priced imports elbowed domestic agricultural goods. Consequently, in 1983 the GOC introduced support systems for wheat, sugar, and vegetable oils.

Free market practices stimulated the expansion of the fruit industry as Chile veered away from traditional crop production and concentrated on non-traditional export crops for which the country had a comparative advantage, primarily fresh fruit. Export fruits, including grapes, apples, pears, nectarines, and plums, constitute one of Chile's principal foreign exchange earners. The growth of fruit cultivation came largely at the expense of cereals, making grain Chile's most important food import.

Chile's major traditional annual crops number fourteen and include cereals, pulses, oilseeds, sugarbeets, and potatoes. Wheat is Chile's most important crop in terms of area planted and production, but the crop suffered a decline with the push to increase fruit exports. However, a GOC report lists Chile's 1986 yield as a 40 percent increase over the previous year, suggesting remarkable strides in wheat production presumably due to GOC intervention.

Thirty-seven percent of Chile's land area is suitable for farming, forestry, and pasture. The dearth of arable land constrains agricultural expansion. Out of a potential three million ha, approximately 1.3 million ha are in crop production, 1.1 million ha are regularly irrigated. Most farming occurs in the central area -- from just north of Santiago to Puerto Montt -- where the bulk of arable land is found. About 353,000 farms cover Chile; these are divided into three categories devised by the MINAG for purposes of services and credit. Farm sizes are expressed in a standard unit of measurement -- Irrigated Hectare Equivalent or IHE -- representing the potential of a given hectare.

Commercial Farms (more than 12 IHE): Some 20,000 farms (about six percent of the total) fall into this category. Commercial farms occupy 52 percent of agricultural land and generate 70 percent of the total agricultural production. Due to the agrarian reform program which ended in 1974, most of these farms do not exceed 80 IHE, the limit on farm size imposed under the 1967 agrarian reform law (repealed in 1979).

Small-Scale Farms (0.8 IHE to 12.0 IHE): These farms number approximately 145,000 (41 percent of the total) and constitute 45 percent of agricultural land and yield about 30 percent of the total agricultural output.

"Minifundio" Farms (less than 0.8 IHE): Minifundios account for 188,000 farms (53 percent of the total). In the majority of instances, because of the size or ecological quality, the minifundio does not produce enough

or generate enough income for family subsistence. These farms use 1.5 percent of all agricultural land and accounted for only a negligible contribution to the GNP.

Although statistics are meager, it is clear that disasters take their toll on Chilean agriculture. Concentrated human activity in the central zone increases disaster vulnerability. With the greatest portion of cultivable land located here, natural disasters invariably inflict damage and destruction to the agricultural sector.

3.6 Forestry

Approximately 45 percent of Chile is suitable for forestry. There are 7,600,000 ha of native forest, while plantations of "artificial" forest cover approximately 1,200,000 ha, growing by 80,000 ha per year. It is the tree plantations that are the major source of wood. Monterey pine (*Pinus radiata*) comprises 1,082,000 ha of plantation coverage; eucalyptus and poplar constitute the balance. Introduced into Chile in the late nineteenth century, Monterey pine grows rapidly and can be cultivated at low cost. Prime for pulp, the wood of the Monterey pine is used extensively in Chile's paper industry. Chileans are experimenting with techniques to improve the quality of Monterey pine wood which, due to excessive knots, is not inherently good for construction material. In addition, drying techniques are being refined.

Due to climatic conditions, Chile has no forest north of 32°S (just south of Ovalle). Forest plantations cover lands of the coastal range and the central valley, between 32°S and 41°S latitudes (around Puerto Montt). The planted area is highly concentrated between 35°S and 38°S latitudes (between Curicó and Temuco). South of Temuco, natural hardwood forests cover the slopes of the Andes.

In the 1950s Chilean forestry products went primarily for internal consumption and, to a lesser degree, to an incipient private paper industry. During the 1960s several paper and cellulose industries came into existence, aided by GOC contributions. Beginning in 1974, the Chilean forestry sector, influenced by a national open market economic policy, underwent a period of growth. A 1974 forestry promotion law (No. 701) provided incentives to the private sector for developing forest plantations. Products from these include paper, pulp, and wood boards (fiber, particle, and plywood). Forestry exports grew from 2.9 percent of exports in 1973 to 10.5 percent in 1984.

The National Forestry Corporation (Corporación Nacional Forestal, CONAF) regulates forest plantations in an effort to maintain output and not exhaust the timber supply. Between 50,000-80,000 ha of plantation forest are felled yearly. Internal demand and consumption cannot absorb this yield and export is requisite.

Forest Fire Control - A Brief History and Current Status

Chilean forest fire control measures have evolved over the last three decades. Beginning in 1962, the GOC began to formulate an earnest policy for forest fire control. The Forestry Police Section of the Carabineros (State Police) comprised 14 U.S.-trained experts and was charged with administering the Woodland Law and its regulations. The first firefighting brigades, made up of civilian volunteers, were formed, supported with USAID-provided equipment.

In 1965 a severe storm mowed down extensive areas of forest in Region VIII, creating a hazardous situation. The possibility of the felled timber igniting during the 1966 fire season alarmed GOC officials. As a result, the Ministries of Agriculture and the Interior initiated aerial fire detection patrols.

During the late 1960s, impelled by the drought, a consortium of government agencies devised the Forest Fire Protection Program. Among its accomplishments, the program produced a Forest Fire Protection Plan; established the first forest fire-related Operations Centers in Santiago, Valparaiso, and Concepción; and incorporated the use of aircraft (Canso planes, contracted from Canada) in fighting forest fires.

The Corporación Nacional Forestal (CONAF), subordinate to the Ministry of Agriculture, was established in 1972, supplanting earlier organizations. CONAF is the GOC agency responsible for planning and administering forestry activities.

CONAF administers the Fire Management Program (formerly the Forest Fire Protection Program) which incorporates firefighting, prevention, and suppression and appropriate fire use activities. Working in cooperation with ONEMI, CONAF coordinates large-scale firefighting efforts according to ONEMI-regulated emergency plans. In addition to its firefighting function, CONAF promotes forest fire prevention programs. Since the early 1980s, in concert with the private sector, CONAF has endeavored to create public awareness of the forest fire problem as well as available preventive measures. In 1983 CONAF adopted a mascot, Coipo Forestin, to assist in public education campaigns. Particularly appealing to children, Forestin instills an early awareness of the danger of forest fires and preventive measures, much like Smokey the Bear in the United States.

Firefighting Resources

During the 1986-87 fire season, CONAF used 23 aircraft for aerial fire detection patrols and 10 for firefighting: one Canso 4,400-liter-capacity air tanker (retardant), three Ag-Wagon aerial spraying planes (750 l capacity), and six helicopters with buckets. CONAF usually leases its aircraft from private industry. Spanning the area from Region IV to Region XII, 11 regional and 15 provincial coordination centers were in service during the fire season. Throughout the vulnerable zone, 50

observation towers and five observation posts assisted detection efforts. Seventy brigades (1,400 men) fought the fires of the 1987 season.

As a rule CONAF does not subscribe to the use of chemical drops from airplanes to extinguish fires. The agency prefers to attack fires from the ground with existing firefighters and equipment.

Maintaining well-trained personnel is essential to this approach and CONAF has participated actively in OFDA-sponsored programs. In November and December 1985, OFDA, the U.S. Forest Service (USFS), and CONAF organized a wildfire suppression course. The Chilean agency hosted the course which brought 36 participants from other Latin American countries to Los Andes, Chile, to learn about forest firefighting tactics and logistics. In addition, CONAF has begun to export its expertise. For example, in January 1987 when two forest fires ravaged southwestern Argentina, the Chileans sent several brigades to assist in fighting the fires. The agency is prepared to continue lending a hand to its neighbors in firefighting activities.

3.7 Housing

The Ministry of Housing and Urbanization (Ministerio de Vivienda y Urbanismo, MINVU) is responsible for setting housing policies and programs, although increasingly the private sector has been given responsibility for planning, financing, marketing, and constructing housing. The public sector administers four housing programs. Municipal authorities administer the Municipal Sanitary Unit Program (lote con servicio); MINVU manages the Social Housing Program, the Allocated Subsidy Program, and the Contractual Savings Program. All but the last are designed to benefit groups below the urban poverty threshold. The Contractual Savings Program was started as an emergency measure to promote housing construction by middle-income families.

Over the past one hundred years, a steady rural to urban migration has recast the country demographically. Chile has shifted from being a predominantly rural society (approximately 80 percent) to one which is more than 80 percent urban. This transformation, in conjunction with other factors such as the normal deterioration of the country's housing stock and the destruction of homes by natural disasters (an estimated 11,700 units are destroyed or become marginally habitable per year), has resulted in a massive housing shortage. In 1986 Chile's housing stock consisted of 2,774,380 units, with a deficit estimated at between 700,000 and 800,000, growing annually by 60,000 units.

During the 1950s and 1960s the GOC did not adequately meet critical housing needs. The sheer magnitude of the problem has consistently overwhelmed GOC efforts. A variety of programs were developed during the Frei administration (1964-70) but had little impact on the problem. The

Allende administration also failed to develop successful government housing programs for the urban poor. Under the current regime, GOC policy has been to limit the role of the public sector. In 1978 MINVU reorganized public sector housing programs -- in effect withdrawing public sector participation in the direct provision of public housing. Instead the GOC furnishes low-income families with subsidies with which to purchase homes from private developers. Before 1978, 60 percent of Chile's housing units were built by public agencies; by 1982 public housing starts had virtually ceased. In 1984 the private sector constructed 99 percent of Chile's housing.

The post-war (World War II) period accelerated migration to the cities. Rural immigrants searching for employment opportunities flooded Santiago where limited services and little provision for low-income housing existed. The lack of affordable housing engendered improvisation. With overloaded resources eventually exhausted, it was the migrants themselves who took the first step in confronting the housing problem by moving out of their tenement slums and seizing unoccupied land. Makeshift communities burgeoned at such a rapid rate they were dubbed "callampas" (mushrooms). These communities frequently are located in marginal areas where disaster vulnerability is highest.

The concentration of two or more families under one roof goes largely undocumented and thus the magnitude of the housing shortage may not be known with accuracy. The phenomenon of the "allegados" compounds the problem. The term allegado derives from someone who "arrives" in the city to live with a family member or friend until he/she is able to find work and a place to live. In the disaster context, the reduction of rent-free urban landscape and the high price of land make it next to impossible for a displaced family to rebuild a dwelling close to where they may have formerly lived. And so a family in this situation may seek help from relatives or friends, perpetuating the allegado syndrome.

In rural dwellings adobe is the construction material of choice as it is readily available and low-cost compared with brick, block, and wood. As a building material, wood can be considered optimum for shelters. However, most lumber available for low-cost housing is not pressure treated, kiln dried, or graded for strength. Thus its integrity as a construction material is questionable.

Stemming from the 1985 earthquake, the housing sector sustained an estimated \$270 million in damage, including the repair of damaged housing and the replacement of destroyed housing. In all, 75,724 dwellings were destroyed, and damaged homes numbered 142,480. In general, the most severe damage to housing can be attributed to poor design and construction as well as inadequate soil engineering before construction. Adobe structures bore the brunt of the damage and destruction from the earthquake. MINVU delivered packages of construction materials and housing units. A total of 21,484 emergency housing units were built for

the urban sector. In rural areas MINVU assisted 8,122 families with construction supplies. In addition, programs in progress were re-oriented to help those affected by the disaster. (See CHILE - 1985 Earthquake case report, Appendix A.)

In response to earthquake damages, OFDA made \$1.1 million available to four Chilean non-governmental organizations (NGOs) to mount emergency shelter programs consisting of medlagua (traditional wooden shelters) construction and distribution of construction materials packages. OFDA dispersed the monies among *Cáritas Chile*, *INVICA* (Institute for Housing and Savings Cooperatives), *INPROA* (Institute for Agricultural Promotion), and *CORPRIDE* (Private Development Corporation of Curicó). OFDA funds facilitated the construction of 6,138 emergency shelter units.

The June 1986 floods destroyed 1,500 homes, rendered 4,600 uninhabitable, and damaged 7,100 to varying degree. Flooding damaged an estimated 20 percent of the housing stock rebuilt in 1985. MINVU delivered 1,071 emergency shelter units (mediaguas and construction packages) and planned the construction of 400 units for urban flood victims. OFDA allocated \$125,000 to *Cáritas Chile* for an emergency shelter program which built 200 mediaguas.

Preliminary estimates of flood damage in July 1987 indicate that damages exceed those of the year before. At this writing, OFDA plans to fund a \$265,000 emergency shelter project designed to assist 2,500 people. The program will provide packages of construction materials for repairing damaged dwellings and mediaguas to be set up on non-vulnerable sites.

3.8 Water Supply

The *Servicio Nacional de Obras Sanitarias (SENDOS)* exerts supervisory authority over the water supply and sewerage sector. *SENDOS*, a financially autonomous entity under the wing of the Ministry of Public Works (MOP), devises and enforces national sanitation policies. Working through its regional offices, *SENDOS* is directly responsible for the water supply and sewerage operations in 11 of Chile's 13 regions.

In addition to *SENDOS*, the water sector comprises four other entities: two public sector companies in Santiago (*Empresa Nacional de Obras Sanitarias, EMOS*) and Valparaíso (*Empresa de Obras Sanitarias de la Región V, ESVAL*), a small private company in Santiago's high-income Lo Castillo neighborhood, and a municipal company in Maipo, a low- to middle-income area of Santiago. *EMOS* and *ESVAL* are responsible for all activities related to the provision of water and sewerage services within their respective jurisdictions.

In 1983 an estimated 89 percent of the urban population had access to piped water and 69 percent was connected to sewerage systems. About 55 percent of the concentrated rural population had access to piped water, of which 80 percent travels through house connections. Water pollution, however, threatens to nullify these service levels. Raw sewage, discharged into open waterways, contaminates water sources relied on heavily during the dry summer months for both domestic and agricultural purposes. Water pollution particularly affects the Santiago Metropolitan Region where about 280 million m³/year of untreated sewage is dumped into the Mapocho and Maipo rivers and the Zanjón de la Aguada, a canal running through the center of the city.

Lack of potable water figured in the aftermath of both the 1985 earthquake and the 1986 floods. The earthquake ruptured several Valparaíso water mains, leaving some high-lying areas without water for prolonged periods. San Antonio's water system also suffered damage from the tremor. As a result of the floods, mud clogged the intake valve at the main water purification plant in Santiago and, additionally, a 200 m portion of pipeline of the principal aqueduct was destroyed. For EMOS the floods were something of a worst-case scenario because their emergency water source and two main conduits were impaired, inhibiting water supply to distribution plants. The company responded by setting up a distribution system using tanker trucks to dole out emergency water rations. Electricity supply is another potential problem for the water system as only one complex (Vizcacha) has its own generator. A study to assess the provision of electrical self-sufficiency to each plant is underway. EMOS is also engaged in elaborating an emergency plan for future disasters.

3.9 Energy

Chile's energy reserves are substantial. Geography, however, tempers the situation as many energy sources (particularly gas and oil) are located in the south, far from principal consumption centers. National Energy Commission (Comisión Nacional de Energía, CNE) figures estimate proven coal reserves at 620 million tons with a life span of 600 years, figured on the 1985 production level of one million tons. Proven oil reserves are estimated at 13 million cubic meters, which would fulfill the country's oil needs for three years. Natural gas reserves, at an estimated 80 million cubic meters, would satisfy Chile's natural gas needs for 50 years. Hydroelectrical potential is estimated at 18,000 megawatts and 103 terawatt hours. As of 1985, only 2,262 megawatts had been developed with an average of 11 terawatt hours. Hydroelectric power is scheduled to increase 35 percent over the next five years with three major projects at Alfalfal, Canutillas, and Pehuenche.

1985 Energy Supply and Consumption

<u>Primary Energy Supply</u>	<u>Thousand Teracalories</u>	<u>Percentage</u>
Crude oil (of which 56 percent imported)	39.87	42.1
Natural gas	13.38	14.1
Coal (of which 21 percent imported)	12.10	12.8
Hydroelectricity	8.91	9.3
Wood and others	20.55	21.7
Total supply	94.81	100.0

The CNE was established in 1978 as an autonomous agency reporting to the President of Chile responsible for implementing energy policies and coordinating plans and regulations. The CNE works with ODEPLAN to ensure sector actions fit the National Development Program. The Ministry of Economy approves electric tariffs and regulates compliance with sector regulations and procedures. State-controlled companies play an important part in the sector. The electricity and coal companies are incorporated, with the GOE's holding company, CORFO (Corporación de Fomento de la Producción), controlling a number of them.

At 86 percent, Chile has one of the highest rates of access to electrical power in Latin America. About 96 percent of the urban and 35 percent of the rural population have access to electricity. The Empresa Nacional de Electricidad S.A., ENDESA (98.2 percent CORFO-owned), generates 62 percent of Chile's electric power (and 80 percent of its total public supply of electric power production). According to ENDESA, 26 percent of the national hydroenergy potential is concentrated in the central zone, while 41.4 percent is in the southern area. In 1984 only 8.6 percent of Chile's hydro potential was being exploited. ENDESA estimates that by 1994, when planned power centers are operational, 14.6 percent of the country's hydro potential will be employed.

3.10 Communications

Chile was the first country in Latin America to have an operating satellite station. The National Telecommunications Corporation (Empresa Nacional de Telecomunicaciones, ENTEL) has a monopoly on international satellite communications. In addition, ENTEL provides the main line for national inter-urban telephone communications and has agreements with several telephone companies which provide local service.

The communications system depends on a series of line-of-sight repeaters located strategically down the length of Chile. Twenty-nine repeaters are strung between Arica and Santiago. To the south, 20 repeaters are found from Santiago to Chiloé. Beyond Gamboa (site of the

southernmost repeater) repeaters are not maintained because of the rough terrain. Approximately 60 kilometers' distance exists between repeaters. Longovilo is the ground station for Chile's international satellite communications.

Earthquakes have damaged the communications system in the past. Tower and repeater sites are constructed in compliance with seismic resistance codes. Nonetheless, the Longovilo ground station suffered a temporary interruption (about 25 minutes) as a result of the March 1985 earthquake. The attendant shaking disoriented the antenna, necessitating minor readjustment. No equipment was damaged but the recently completed building sustained enough damage to require partial reconstruction.

Emergency Communications In 1982 ONEMI established an Amateur Radio Operators National Emergency Network to be activated in a disaster or national emergency. The objectives governing the Net are to (1) replace normal communication channels when, due to a disaster, these are partially or wholly inoperative or nonexistent; (2) serve as an alternate communications link handling assigned traffic after regular connections have been repaired; and (3) fulfill a training function when Disaster Coordinators deem such exercises necessary.

Like other elements of the Chilean National Civil Protection System, the National Emergency Network is organized along national, regional, provincial, and communal lines. An ONEMI-designated National Coordinator organizes, coordinates, and supervises the Net which has two main components: Red de Emergencia Nacional (REN) and the Red de Emergencia Regional (RER).

The REN comprises fixed radio stations operating on HF in each regional capital and constitutes a main line covering the national territory. The Net's National Coordinator channels the information flow to and from ONEMI's National Emergency Operations Center via the National Emergency Coordinating station, operating on HF. These stations are linked to Regional Coordinators via VHF.

The RER is made up of fixed, mobile, and portable stations dispersed throughout provinces and comunas, spanning entire regions. Ideally, these stations operate on VHF but, if unavoidable, links may be made on HF if different than those established for REN stations. A Regional Coordinator, with the consent of the Regional Administration and collaborating closely with the Regional Association of Radio Clubs, organizes RER operations.

National Emergency Frequencies and Alternates

<u>Band</u>	<u>Regular Frequency</u>	<u>Alternate Frequency</u>
80 m	3735 KHz	3750 KHz
40 m	7050 KHz*	7065 KHz
20 m	14200 KHz	14220 KHz
2 m	145.32 MHz*	146.52 MHz

* Indicates permanently monitored emergency calling frequencies (both HF and VHF).

3.11 Ground TransportRoads

Chile's road network covers approximately 79,000 km, of which 9,824 km (12 percent) are paved. The area around Santiago and the central valley is best served. Three major stretches of north-south roads (totaling 4,459 km) dominate the road system: the Longitudinal Road (or Route Five), an extension of the Pan American Highway, is the main artery of the network, extending from Region I to Region X; the Austral Road runs from Puerto Varas in Region X to Villa O'Higgins (Region XI); and Route Nine, in Region XII, covers the area between Paso Baguales on the Argentine border and Fuerte Bulnes, south of Punta Arenas. More than 60 percent of domestic freight is transported on Chile's roads and Route Five is the backbone of the Chilean transport system.

The so-called Basic Network, comprises 22,831 km of the National (longitudinal and major transversal roads) and Regional Roads. Some 56,165 km of principal and secondary local roads constitute the Local Network.

The Ministry of Transportation and Telecommunications formulates GOC policy for all transport sectors. The Ministry of Public Works (Ministerio de Obras Públicas, MOP) is responsible for all transport infrastructure works as well as road planning. In addition, the MOP collects tolls and implements the vehicle weighing program, working in tandem with the Carabineros.

The June 1986 floods washed away portions of Route Five in the central zone, isolating some areas. Damages were severe enough to require a shutdown of the thoroughfare for several days. In all, 40 bridges were destroyed or damaged and 104 roads rendered impassable, impairing the movement of both relief and commercial goods.

Rail Transport

The country's railway system totals 9,600 km. Roughly 6,000 km (mainly the Southern Railway, the Santiago-Valparaíso and Calera-Los Andes links of the Northern Railway, and the privately owned Antofagasta-to-Bolivia Railway) are 1.676 m gauge; the balance (most of the Northern Railway) is predominantly 1 m gauge. Railways carry nearly one-quarter of Chile's freight and disruption caused by flooding or earthquakes can be devastating to the economy.

3.12 Seaports

Strung along Chile's 4,200 km of coastline are some 70 port installations. The ten major commercial ports are state-owned, administered by the National Port Company (Empresa Portuaria de Chile, EMPORCHI). The remaining seaports belong to private mineral and petroleum companies. The Bureau of Port Works (Dirección de Obras Portuarias), of the Ministry of Transportation and Telecommunications, plans and reviews all projects related to port infrastructure. In case of disaster, the Port Works Bureau conducts damage assessments and evaluates technical solutions to disaster-generated problems.

Chile's chief general cargo ports are Arica, Iquique, Antofagasta, Coquimbo, Valparaíso, San Antonio, San Vicente/Talcahuano, Puerto Montt, Chacabuco, and Punta Arenas. The four most important are: Valparaíso, San Vicente/Talcahuano, San Antonio, and Antofagasta. Overwhelmingly, international goods (90 percent) are transported by ship and 98 percent of export traffic is by ship (World Bank, 1985).

The March 1985 earthquake seriously damaged the infrastructure at the ports of Valparaíso and San Antonio. San Antonio suffered a 40 percent reduction in capacity. Piers Nos. 1, 2, and 3, as well as a pier ready for inauguration when the earthquake struck, were put out of commission. Piers Nos. 4, 5, 6, and 7, plus a new pier inaugurated in March are all in working order. Valparaíso also suffered heavy losses to its port facilities, losing one-third of its operational capacity. Both ports are compensating for their reduced capacities by lengthening work shifts and making operational adjustments where necessary.

EMPORCHI reportedly spent \$5 million on basic repairs and upgrade of port infrastructure since the 1985 earthquake. No reconstruction has taken place. However, an ad hoc intergovernmental Ports Commission took up the issue of earthquake reconstruction. The Japan International Cooperation Agency, the World Bank, and other international entities collaborated in assisting the GOC formulate a reconstruction strategy. The next phase entails reconstruction, slated to begin in 1988.

3.13 Air Transport

In 1980 Chile's usable airfields numbered 340, of which 46 had hard-surfaced runways. There are eleven commercial airports, six of which handle international traffic. The two principal international airports are Chacalluta, 18 km northeast of Arica, and Comodoro Arturo Merino Benítez (formerly Pudahuel), 21 km outside of Santiago. The national airline, Línea Aérea Nacional de Chile (LAN-Chile), operates nine aircraft: four Boeing 707s, three 737s, and two 767s. LAN-Chile provides both national and international air service. Other airlines serving Chile include Air France, AeroPerú, Avianca, Canadian Pacific, Eastern, Ecuatoriana, Iberia, KLM, Ladeco, Lufthansa, Pan Am, Swissair, and Varig.

Aircraft Entry Requirements

All private aircraft overflying or landing for non-commercial purposes must submit advance notification at least 24 hours before departure (if by cable, 36 hours in advance).

Non-scheduled commercial aircraft overflying or making technical or commercial stops must submit notice at least 12 hours in advance (by cable, at least 24 hours) and should provide: (a) name of aircraft operator; (b) aircraft nationality, registration marks and type; (c) purpose of flight; (d) point of origin and destination of passengers and cargo; (e) last airport of landing before entering Chile; (f) name of pilot; and (g) date, time, route of flight, and point of landing in Chile (or if overflying without landing, date, time, route of flight and points of entry and exit from Chilean airspace).

Special Notices

1. In the case of one single flight, or sporadic flights, the aircraft must carry on board the corresponding insurance policy or a certificate issued by the aeronautical authority of the state where it is registered, certifying that the insurance has been contracted. These documents must be shown to the competent officer upon request.
2. In the case of a series of non-scheduled flights, the corresponding insurance policies must be submitted after the first flight to the Junta de Aeronáutica Civil, which will approve them. In this case, all information on the insurance must be sent to the Ministry of Transport and Telecommunications, Junta de Aeronáutica Civil, Bombero Salas 1390-7 Piso, Santiago, Chile.
3. To guard against possible delays in the event that the required notification message is not received, it is recommended that a copy of the message endorsed by the telegraph company be carried by the pilot to prove that the message was sent. It is further recommended that immediately upon arrival the pilot check with the addressee to ascertain whether the message was received.

Airports of Entry

<u>Location</u>	<u>Airport Name</u>	<u>Coordinates</u>	<u>Longest Runway</u>	<u>Field Lighting</u>	<u>Fuel Availability*</u>
Antofagasta	Cerro Moreno	23°26'S, 70°27'W	2,590 m	High intensity runway lights Visual Approach Slope Indicator	100, JA1
Arica	Chacalluta	18°21'S, 70°20'W	2,164 m	Low intensity runway lights Visual Approach Slope Indicator	100, JA1
Concepcion	Carriel Sur	36°46'S, 73°04'W	2,286 m	High intensity runway lights High intensity approach lights Sequenced flashing lights Visual Approach Slope Indicator Precision Approach Path Indicator	100, 100 LL, JA1
Iquique	Diego Aracena	20°32'S, 070°11'W	2,469 m	High intensity runway lights Visual Approach Slope Indicator	100
Easter Island	Mataverí	27°09'S, 109°26'W	2,896 m	Low intensity runway lights Low intensity approach lights	JA1
Puerto Montt	El Tepual	41°26'S, 73°06'W	2,652 m	High intensity runway lights High intensity approach lights Visual Approach Slope Indicator	100, JA1
Punta Arenas	Presidente C.I. del Campo	53°00'S, 70°51'W	2,774 m	High intensity runway lights Visual Approach Slope Indicator	100, JA1
Santiago	Arturo Merino Benitez	33°23'S, 70°47'W	3,200 m	High intensity runway lights High intensity approach lights Sequenced flashing lights Precision Approach Path Indicator	JA1

All are hard-surfaced runways.

* Fuel Availability of other than 100 Octane and 100 Octane with low lead content (100 LL) is not cited. JA1 indicates jet fuel ASTM type A1 with additives and icing inhibitor.

(Runway lengths have been rounded off to nearest whole number)

4. In the event the authorization solicited requires an answer from the Chilean aeronautical authorities before initiating the flight, a prepaid reply must accompany the request, unless the petition is made sufficiently in advance to permit a reply by ordinary air mail.

5. Aircraft remaining in Chile for more than 30 days require special authorization from the Director-General as well as flights whose passengers will be participating in special events and air travel club flights.

Source: International Flight Information Manual, April 1987, Vol. 35. U.S. Department of Transportation, Federal Aviation Administration.

3.14 U.S. Government Assistance

U.S. Government (USG) policy toward Chile is to support a rapid transition to a fully functioning democracy. Driven by concern for human rights violations, the USG provides no military or developmental aid to Chile. The USAID Mission closed in 1981 and the Peace Corps terminated its program in 1982. In 1976 the U.S. Congress prohibited the provision of military and security assistance to Chile. Reinstatement of such aid is subject to Presidential certification that (1) the GOC has taken action and come into compliance with internationally recognized human rights principles; (2) such assistance is in the national interest; and (3) the GOC is not aiding and abetting international terrorism. Moreover, the government must demonstrate that it has taken steps to cooperate in bringing to justice by all legal means those indicted by a U.S. grand jury in the murders of a former Minister in Dr. Allende's government, Orlando Letelier, and his colleague, Ronni Moffit.

The USG has maintained an ongoing Food for Peace program and has provided disaster relief assistance to Chile. USAID's Food for Peace office provides Section 416 commodities (butteroil, cheese, and non-fat dry milk) and wheat flour destined for Chile's poor on both a government-to-government basis and through NGOs. Both program types are coordinated through the Secretariat of Social Development and Assistance (Secretaria de Desarrollo y Asistencia Social) to ensure no duplication in program beneficiaries. The commodities are integrated into existing maternal-infant, pre-school, community development, and school feeding programs serving low-income populations at risk of malnutrition. Catholic Relief Services (CRS) and its national counterpart Caritas Chile, and the Adventist Development and Relief Agency (ADRA), with its counterpart Organización Filantrópica Adventista del Desarrollo (OFASA), channel the food to Chileans in extreme poverty through their own programs.

In accordance with A.I.D.'s Handbook 8, Foreign Disaster Assistance, the U.S. Ambassador or acting Chief of Mission may declare a disaster in a foreign country if 1) the magnitude of the disaster is beyond the host country's ability to respond adequately, 2) the host country has requested assistance, and 3) it is in the interest of the U.S. Government to provide assistance. The Ambassador is authorized to provide up to \$25,000 immediately (referred to as the Ambassador's Disaster Relief Authority); additional relief expenditures are approved and coordinated by the Agency for International Development's Office of U.S. Foreign Disaster Assistance. OFDA can provide emergency relief and short-term rehabilitation assistance in the form of grants, relief commodities, logistical support, technical assistance, etc.

The U.S. Embassy's Mission Disaster Relief Plan (MDRP), dated August 1983, sets forth Mission organization and procedures in the event of a disaster. Additionally, the MDRP contains important contact names and numbers, information on local resources (particularly transportation), Chile's disaster history, and a USG resource inventory. The MDRP is currently being updated to reflect recent changes.

Disaster Preparedness Training

OFDA's Latin America and Caribbean Division, through a disaster preparedness strategy stressing regional endeavors, supports and promotes activities that strengthen national emergency organizations. In cooperation with ONEMI and PAHO, OFDA co-sponsored the Latin American Workshop on Operational Management of Natural Disasters in June 1986. The nine-day program brought together 40 participants from eight countries in the region. Chile also hosted a Wildfire Suppression Course for 36 firefighters from 12 countries.

OFDA has funded the attendance of Chilean specialists to a number of preparedness workshops and seminars throughout the region and in the U.S. Many of these events are sponsored through multi-year grants to organizations such as the Organization of American States, PAHO, Partners of the Americas, and the National Fire Protection Association. (See Appendix E for a list of participants and programs attended.)

3.15 International Organizations

Organization of American States (OAS)
Los Conquistadores 1700, Piso 17-B
Pedro de Valdivia Norte
Santiago, Chile
Telephone: 232-8188, 8827, and 8828

Mailing Address, if available:

Casilla 16284, Correo 9
Santiago, Chile

UNICEF

Isidoro Goyenechea 3322
Comuna de Las Condes
Santiago, Chile
Telephone: 231-4210 through 4212

Casilla 100, Correo 10
Las Condes, Santiago,
Chile

United Nations Development Program (UNDP)
Avenida Pedro de Valdivia 0193, Piso 7
Santiago, Chile
Telephone: 223-4183

In the event of a disaster, the UNDP advises UNDRO Geneva of the situation and relief requirements. In addition, a \$30,000 fund is available immediately for emergencies.

World Health Organization/Pan American Health Organization (WHO/PAHO)
MacIver 541, Piso 5
Santiago, Chile
Telephone: 33-0625

Canada, Italy, Japan, West Germany, and the United States have traditionally lent support to Chile.

Embassy of Canada
Ahumada 11
Santiago, Chile
Telephone: 696-2256

Casilla 427
Santiago, Chile

Embassy of Italy
Calle Román Díaz 127
Telephone: 225-9029

Embassy of Japan
Avenida Providencia 2653, Piso 19
Santiago, Chile
Telephone: 232-1807 through 1812

Casilla 2877
Santiago, Chile

Embassy of West Germany
Calle Agustinas 785
Santiago, Chile
Telephone: 33-5031

Casilla 9949
Santiago, Chile

CHILE - Earthquake

Date: March 3, 1985

Location: Central zone, including the Metropolitan region of Santiago

No. Dead: 180

No. Affected: 979,792

No. Homeless: 500,000

Damage: The earthquake caused extensive damage to roads and bridges, ports, railroads, water supply and sewerage, hospitals, schools, and housing. A total of 75,724 houses were destroyed and 142,480 were damaged. In some of the smaller rural communities within the most seriously affected zone, 80% to 90% of all homes were either completely destroyed or severely damaged. The Government of Chile (GOC) estimated total damage at between \$1.5 and \$1.8 billion. The World Bank reported an estimated \$500 million in damages, including the following itemization of damage to public property: ports, \$80 million; roads and bridges, \$15 million; railroads, \$24 million; and water and sewerage, \$10 million.

The Disaster

In the early evening of March 3, a devastating earthquake registering 7.8 on the Richter scale jolted the heavily populated central zone of Chile. The quake's epicenter was located in the Pacific Ocean, 40 km west of the coastal town of Algarrobo. The ground shook for nearly two full minutes and reverberations were felt as far away as Buenos Aires, Argentina (1,280 km to the east). Although the tremor generated a small tsunami (1.1 m), no adverse effects resulted. The affected area, from La Serena to Concepción, measures about 78,700 sq. km and contains 67% of the country's population. Damage was heaviest in the port towns of San Antonio, Valparaíso, and Viña del Mar, while less extensive damage occurred in Santiago, Rancagua, San Fernando, and other smaller communities. A series of less forceful aftershocks kept the Chilean people in a state of anxiety for the next few days, although no attendant damages were reported. However, smaller aftershocks continued to plague Chile for weeks; one of the strongest (7.2 on the Richter scale) occurred on April 8 and caused some damage.

The low death toll (180 dead) is misleading because it does not reflect the magnitude of the earthquake's destructive force. The relatively minimal loss of life can be ascribed to two factors: first, because of the area's marked seismic activity, Chileans are frequently exposed to earthquakes and know how to react. Second, the earthquake struck on a warm Sunday afternoon when many people were outdoors, away from the hazards posed by buckling buildings. Nevertheless, the injured numbered approximately 2,500 and the homeless over 500,000.

Water systems in the affected areas were heavily damaged. The telephone system provided erratic service and electricity was out for several hours, even days in some cases. The housing sector sustained extensive losses. Older structures, particularly those of adobe and brick, suffered the worst damage.

Tents, schools, and other improvised temporary shelters housed the growing number of homeless. As a result, school openings, following the summer holidays, were delayed for 30 days. In Santiago, thousands of families, disquieted by the fear of aftershocks, camped out in the streets amid the rubble of wrecked buildings. The GOC reported that 26 regional hospitals were damaged, 12 beyond repair with the remaining 14 rendered 50% operational.

The port town of San Antonio sustained the worst damage. More than 70% of San Antonio's homes and businesses were destroyed or damaged. On March 6, the town had no water except what was delivered by firetrucks. The port itself suffered crucial losses, reducing its working capacity to 45%. Three out of seven piers were completely destroyed while two were seriously affected, leaving only two piers partially operative.

In Valparaiso, potable water was scarce due to broken water mains. In some high-lying areas water was unavailable for almost a week. Up to 30% of Valparaiso's housing was damaged or destroyed. At the port, the quake left only one of ten piers fully operational. In addition, toppled cranes and ruined storage facilities reduced the port's working capacity to 77%.

Action Taken by the Government of Chile (GOC) and Local Red Cross

The Chilean Government coordinated its relief effort through an inter-ministerial emergency commission established by President Pinochet. A General Emergency Headquarters for the relief effort was created in the Ministry of the Interior. On March 5, the President declared the Fifth, Sixth, and Metropolitan regions catastrophe zones, thus making these areas eligible for up to 2% of government budget expenditures, as provided for in the Chilean constitution. As a preventive health measure, a large-

scale typhoid vaccination campaign was initiated in the affected areas on March 6. On March 7, the province of Curicó in Region VII was also declared a catastrophe zone. The Chilean Red Cross participated in the relief effort, with more than 1,000 volunteers involved in rescue and relief operations such as firefighting, transporting the injured to hospitals, conducting needs assessments, and distributing tents and blankets from a LRCS regional warehouse in Santiago.

Despite the ad hoc creation of the General Emergency Headquarters, the National Emergency Office (ONEMI) of the Ministry of the Interior continued to carry out its mandated disaster relief responsibilities. These included data collection and analysis, damage and needs assessment, as well as the receipt, inventory, transfer, and delivery of all relief supplies from both national and international sources.

Given the overwhelming number of homeless, the provision of shelter was a top priority. Many lacked the resources to resolve their housing problems and required assistance from the GOC. The onset of inclement winter weather added to the urgency of the situation. To address shelter needs, the GOC implemented several emergency measures, one of the most notable being the construction and distribution of 28,000 to 30,000 wooden shelters (known as mediaguas) targeted for the neediest of the earthquake victims. A combined effort of the Ministry of Housing, Chilean sawmill companies, and municipal governments carried this project to its successful completion. The Ministry of Housing adjusted its 1985 Housing and Subsidy Programs to focus on the earthquake victims; of 24,000 units to be constructed for low-income families, 7,600 were to be built in earthquake affected areas. Further concessions to the plight of the homeless included granting 19,000 housing subsidies to families buying or building homes for under \$6,500. Also, the GOC launched a program to evaluate and repair damaged dwellings in housing projects constructed before the earthquake.

In addition to these steps, other emergency shelter efforts included the Santiago Municipal Government's voluntary contribution program, which amassed funds for over 20,000 roofing sheets for housing repairs. The State Bank of Chile instituted a low-cost loan program for home repair. INDAP, the GOC's small farmer development organization, started a construction materials delivery program aimed at getting wood, nails, and roofing material to 12,000 rural families.

Assistance Provided by the United States Government (USG)

On March 5, U.S. Ambassador James Theberge declared that the earthquake constituted a disaster of sufficient magnitude to warrant U.S. Government assistance. Exercising his disaster relief authority,

Ambassador Theberge donated \$25,000 to the Barros Luco Hospital for repairs to the children's ward. OFDA immediately dispatched its regional disaster preparedness advisor, Paul Bell, to assist the GOC in a damage and needs assessment, to make recommendations on the appropriate USG response, and to coordinate the USG relief effort with Chilean authorities. Three additional specialists were sent to Chile from neighboring USAID Missions to supplement Bell's expertise. The OFDA team met with GOC officials and private voluntary agency officials to determine the most effective relief strategy. The team concluded that the USG response should concentrate on the urgent requirements for shelter, water, and the replacement of essential medical supplies.

OFDA authorized a \$50,000 contribution to the Ministry of Health (MOH) for immediate needs in the health sector. In response to the request for potable water and temporary shelter, a chartered commercial Lockheed Electra transported 5,999 5-gallon plastic water containers, 28 3,000-gallon portable water tanks, 3 100-lb. containers of HTH chloride for water purification, and 125 rolls of plastic sheeting to benefit about 1,200 families. These supplies totaled \$110,414 and transport amounted to \$96,653. Two ONEMI trucks delivered the relief supplies to the port of San Antonio. Paul Bell and Salvatore Pinzino, the OFDA team's logistics expert, accompanied the supplies to San Antonio and trained local personnel in the efficient use of the plastic sheeting. Chileans used it for repairing roofs, shoring up sagging walls, and rebuilding destroyed rooms. A second shipment of 1,000 rolls for 12,000 to 15,000 temporary shelters was sent to Chile aboard a U.S. Air Force C-5A. The plastic sheeting was worth \$281,584 and the airlift cost \$175,843.

Responding to the urgent need to replace hospitals destroyed in the earthquake, OFDA contributed \$120,000 for a provisional, locally produced pre-fab hospital with an 80-bed capacity for the city of Rengo. Other donors provided funds for additional hospital units.

OFDA allotted additional funds to further help remedy water and shelter deficiencies. Tarps and plastic water jugs valued at \$30,000 and plastic sheeting worth \$33,930 were procured on the local market. Other efforts to provide temporary shelter included the disbursement of \$1,100,000 in grants to four indigenous PVOs (Caritas Chile, the Private Development Corporation of Curicó, the Institute for Agricultural Promotion, and the Institute for Housing and Savings Cooperatives) to benefit 5,760 families, or about 26,000 homeless Chileans.

The OFDA team recommended the purchase of a portable communications package capable of long-range coverage. This would enable effective coordination and distribution of relief supplies. The communications system consisted of eight hand-held radios and accessories such as

chargers, antennas, a VHF monitor receiver, and one mobile transceiver. OFDA obligated a total of \$5,605 for the communications ensemble. Much of this radio equipment can be used in future disasters in the region.

In response to a request from the GOC's Secretariat of Development and Social Assistance, an Earthquake Emergency Program, designed to benefit 200,000 low-income earthquake victims, was carried out in two stages. Through USAID's Food for Peace office (FFP), the USG provided a total of 5,980 MT of Section 416 dairy products. These were distributed to participants in projects to construct emergency shelter and sanitation facilities in the designated catastrophe zones. The first stage, of three months' duration, entailed the reallocation of 1,980 MT of dairy products from the Ministry of the Interior's Flood Emergency Program. Stage two amounted to a total of 4,000 MT of dairy commodities: 1,440 MT of cheese and 2,560 MT of NFDM (including 400 MT from the Ministry of Education's School Feeding Program). Ocean transport for the new commodities was covered by the USG on an exceptional basis due to GOC monetary constraints.

Summary of USG Assistance

Ambassador's Authority - donated to Barros Luco Hospital, Santiago, for repair of children's ward.....	\$25,000
Grant to GOC Ministry of Health for immediate health sector needs (PAHO contributed a matching amount).....	\$50,000
Relief supplies.....	\$99,814
Commercial airlift.....	\$96,653
Plastic sheeting.(1,000 rolls).....	\$281,584
DOD C-5A airlift.....	\$175,843
Local purchase of 80-bed temporary hospital.....	\$120,000
Local purchase of tarps, water jugs, and plastic sheeting.....	\$63,930
Communications equipment.....	\$5,605
Grants to four local PVOs for shelter programs.....	\$1,100,000

LWR - \$22,000 in cash

WVRO - blankets, food, medicine, medical aid, and construction materials; valued at \$100,000

TOTAL \$360,000

Assistance Provided by the International Community

International Organizations

Economic Commission for Latin America (ECLA) - \$20,000 toward reconstruction of the village of Pomaire

EEC - emergency aid including medicine, tents, and mattresses, valued at \$210,000; 250 MT of cereal at a cost of \$34,825; and \$212,745 in cash

ICRC - 2.5 MT of powdered milk, value not reported

PAHO - \$300,000 for medical supplies

UNDP - \$30,000 in cash

UNESCO - \$5,000 to CERESIS (South American Regional Seismologic Center) to support a reconnaissance team

UNICEF - \$125,000 for medical equipment, medicine, and vaccines

Governments

Argentina - 1,000 blankets, 250 mattresses, 200 tents, and 1,000 12-kg boxes of non-perishable food; value not reported

Australia - \$14,493 in cash

Belgium - \$45,454 in cash

Canada - \$29,200 through PAHO for medical supplies

Colombia - 1,000 blankets, 1,000 sheets of roofing material, an unknown number of mattresses, and unspecified amounts of food and sanitary equipment; value not reported

Dominican Republic - 2,221 kg of powdered milk, 1,818 kg of refined sugar, 1,025 kg of clothing, and 18,014 kg of medicine; value not reported

Ecuador - \$10,000 cash from Civil Defense and unspecified amounts of food, blankets, and medications; value not reported

Germany, Fed. Rep. - cash grant of \$29,850 through Caritas Germany

Japan - cash grant of \$192,344

Nicaragua - \$10,000 in cash through the Chile Red Cross

Norway - cash grant of \$26,260 through Norsk Folkehjaelp in cooperation with Caritas Chile

Paraguay - blankets, clothing, medicine, and sugar, value not reported

Peru - one field hospital with a contingent of 14 doctors and medicine for maternity patients and children, 100,000 envelopes of hydrating salts, 3,000 bottles (20 doses each) of DPT vaccine, 5,000 bottles (20 doses each) of tetanus vaccine, 240 25-kg packages of rice, 65 77-kg packages of beans, 140 boxes of tinned fish, 2.5 MT of powdered milk, 10 boxes of evaporated milk, 4 MT of clothing, 100 blankets, 200 plastic jerrycans, 167 boxes of dextrose, and one industrial kitchen; value not reported

Sweden - \$26,595 in cash through the Chile Red Cross

Switzerland - \$200,000 in cash for reconstruction of some schools in rural areas and \$100,000 designated for temporary shelter

United Kingdom - \$262,500 in cash through PVOs and \$43,572 through Caritas Chile and the Chile Red Cross

Uruguay - unspecified amounts of food, principally meat, rice, and flour; value not reported

Vatican - \$20,000 in cash through Caritas Internationalis

Venezuela - in cooperation with the International Civil Defense Organization, dispatched six teams of rescue experts, medicine, and other supplies; value unknown.

Voluntary Agencies and Other Private Groups

Action d'Urgence Internationale - two teams of volunteers, value not reported

Australia Catholic Relief - \$7,500 through Caritas Internationalis

Bolivia Red Cross - unspecified quantity of medicine, value not reported

Brazil Red Cross - \$3,144 in cash to the Chile Red Cross and 6,000 water purification tablets valued at \$748

Caritas Belgium - \$10,000 through Caritas Internationalis

Caritas Brazil - \$1,000 through Caritas Internationalis

Caritas Ecuador - \$1,000 through Caritas Internationalis

Caritas Germany, Fed Rep. - \$102,000 through Caritas Internationalis

Caritas Italy - \$25,000 through Caritas Internationalis

Caritas Netherlands - \$14,000 through Caritas Internationalis

Caritas Spain - \$26,500 through Caritas Internationalis

Caritas Switzerland - relief supplies, clothing, and vaccines, valued at \$36,324

China, People's Rep., Red Cross - \$40,000 in cash through LRCS

Collaboration Sante Internationale - \$36,764 in cash for emergency medicine and basic medical supplies

Colombia Red Cross - 750 kg coffee, 500 kg sugar, 500 kg rice, 2,000 blankets, 1,320 camping mattresses, 100 bed sheets, and 115 kg bandages; total contribution valued at \$25,000

Denmark Red Cross - \$8,403 in cash through LRCS

Developpement et Paix - \$17,843 through Caritas Internationalis

Ecuador Episcopal Conference - \$8,190 through Caritas Internationalis

Ecuador Munera Lenten Campaign - \$10,000 through Caritas Internationalis

Ecuador Red Cross - blood plasma and blankets, valued at \$3,038

Japan-Chile Association - \$10,385 in cash

Japan Parliament Members - \$3,846 in cash

Japan Shipbuilding Industry Foundation - \$11,538 in cash

Latin American Women's Association, Tokyo - \$769 in cash

Norwegian Salvation Army - cash grant of \$10,504

Oxfam/UK - \$10,000 in cash to the relief fund of the Vicaria de la Solidaridad of Santiago, \$2,000 to the Vicaria Pastoral Juvenil in San Antonio for emergency work

Peru Red Cross - 2.5 MT of powdered milk, 100 blankets, and clothing; valued at \$2,533

Secours Catholique (France) - \$11,000 through Caritas Internationalis

Secretariat of Latin America Caritas (SELAC) - \$1,000 through Caritas Internationalis

Spain Red Cross - 2,000 kg of powdered milk, 1,000 liters of edible oil, baby food, 20 tents, 2,000 blankets, 2,000 trousers, six 2,000-liter water tanks, 75 camp beds, 50 box mattresses, medicine, and medical material; total value \$63,953

Sweden Red Cross - 370 tents, 3,000 blankets, and 20 MT of clothing and rubber boots; valued at \$32,819

Swiss Institute for Serotherapy and Vaccination - 10,000 boxes of vaccines, value not reported

Uruguay Red Cross - 10 bales of clothing, value not reported

TOTAL \$2,484,639

CHILE - Floods

Date: June 15-17, 1986

Location: Central Chile, particularly the Fifth, Sixth, Seventh, and Metropolitan regions; Region Six was the hardest hit.

No. Dead: 15; 8 persons reported missing

No. Affected: 41,005 reported homeless without public shelter and 13,113 homeless in public shelters (June 25)

Damage: Considerable damage to the water system in Santiago and to roads, bridges, and other public infrastructure in the central region; significant losses to private housing.

The Disaster

Heavy rains, falling between June 15 and 17, fed rivers and streams in Chile's central zone. These downpours, combined with a freak snowmelt (activated by unusually high temperatures in the Andes), caused serious flooding in the Metropolitan Region of Santiago and Regions Five, Six, and Seven. The floods washed away portions of the Pan-American Highway -- the only north-south link for much of the country -- necessitating a shutdown of the thoroughfare for several days and cutting off some areas from supply by land. In all, 40 bridges were destroyed or damaged and 104 roads cut.

Housing was hardest hit. A total of 1,500 homes were destroyed, 4,600 rendered uninhabitable, and more than 7,100 suffered some damage. Region Six bore the brunt of the flooding: approximately two-thirds of the homes in this area were damaged. The Claro River broke out of its normal channel and flooded the town of Rengo with swiftly flowing water for three days. After the waters receded, most houses and commercial buildings were still standing, with few buildings destroyed or even visibly damaged. However, closer inspection revealed that the interiors of whole city blocks of adobe buildings were covered with several centimeters of mud and floors had buckled from expansion.

Mud clogged the intake valve at the main water purification plant serving Santiago, depriving about 40 percent of the city's population of potable water. In addition, a 200-meter portion of pipeline of the principal

aqueduct was destroyed. Many schools and hospitals suspended or reduced operations due to the lack of water.

Action Taken by the Government of Chile (GOC)

On June 20, President Augusto Pinochet declared 18 townships in the Metropolitan, Sixth, and Seventh regions catastrophe zones. A General Emergency Headquarters, staffed by Army officers, was established in the Ministry of the Interior. (A similar body was created after the March 3, 1985, earthquake. See CHILE-Earthquake, OFDA Annual Report, FY 85.)

The GOC concentrated its efforts on infrastructure repair, particularly the Santiago water system and the critical north-south highway. The ministers of the Interior and Public Works announced emergency measures to deal with the lack of potable water affecting 40 percent of Santiago's population. Temporary solutions to the water problem included reopening old wells, rehabilitating out-of-use water channels, and requesting the public to minimize its use of water. Army crews set up temporary bridges to replace those swept away by rushing currents. In addition, Air Force aircraft evacuated victims and delivered relief supplies.

Assistance Provided by the United States Government

In response to the flooding, U.S. Ambassador Harry G. Barnes, Jr. declared on June 20 that emergency relief was warranted. On June 25, Ambassador Barnes delivered a \$25,000 check to Caritas Chile, which mounted an emergency shelter project to help low income people rendered homeless by the floods. This project entailed the construction of 50 wooden shelters (mediaguas) in the affected areas.

The damage to housing was scattered and deceptive. Initial reports indicated that the number of damaged homes was limited; however, subsequent information revealed that the situation was far more serious. Flood waters eroded adobe walls and weakened foundations, leaving many structures uninhabitable although they appeared sound from without. To further compound the effects, the flood damages came on top of an existing housing deficit estimated at approximately 750,000 to 800,000 houses.

In view of this situation, OFDA provided an additional \$100,000 to assist Caritas Chile develop a more extensive shelter project in the areas of greatest need. These funds allowed for the construction of 200 mediaguas and other emergency shelters for an estimated 1,000 people. The 200 mediaguas were divided among four communities where Caritas representatives and local parishes worked closely with community leaders

in implementing the program. In Lo Barnechea, a small community on the periphery of Santiago, 30 wooden shelters were built. The remaining units were distributed in communities lying to the south of the capital: 60 units were erected in Rengo; Molina received 70 new structures; and 40 shelters were constructed in Licantén.

Summary of USG Assistance

Ambassador's Authority given to Cáritas Chile for an emergency shelter program.....	\$25,000
Grant to Cáritas Chile for an expanded shelter program.....	\$100,000
TOTAL	\$125,000

Assistance Provided by U.S. Voluntary Agencies

None reported

Assistance Provided by the International Community

None reported

Agency for International Development
Office of U.S. Foreign Disaster Assistance

Situation Report No. 1
Tuesday, August 11, 1987
10:00 a.m.

CHILE - Floods

Areas Affected: Predominantly central Chile, beginning at the southern edge of the northern desert (Region III, Atacama) and extending to Region IX (Araucanía). Hardest hit were Santiago and rural areas of Region V (Valparaíso) and VI (Libertador General Bernardo O'Higgins). Most affected are poorer areas and shantytowns in both urban and rural locations throughout the damaged zone.

Dead: 49, with 18 persons reported missing.

No. Affected: 116,364 "damnificados," or disaster victims. As of August 3, 16,781 people have sought refuge in public shelters.

General Situation

- Beginning on July 10 a weather front brought strong winds and heavy rains to Chile's central zone, drenching the landscape and feeding rivers that then raged out of control. The resulting floods caused severe damage in an area wracked by natural calamities over the last two years. Beginning with a powerful earthquake in March of 1985 and followed by extensive flooding in June of 1986, Chile's central zone has sustained human and economic losses from which it is still recovering.
- Chile's winter has been exceptionally cold and hard this year, with abundant rain, mist, and snow. Usually visible only on the Andean Cordillera, snow now blankets lower areas around the capital. In Santiago, low temperatures registered between -4° and 5° Celsius and the high was 8° late last week. From 1981 to 1985 the average minimum low temperature in the city has been 4.3° and the average maximum high 14.7°.

- A second front brought additional inclement weather on July 23, aggravating the plight of those already hurt by the floods and cold.
- Floods damaged 21,470 houses and destroyed 2,521.
- The long-term effect on agriculture is not easily quantified but may prove to be of severe proportions. Significant hecтарage of farm land is covered with water and may not be available for spring planting.
- Flood waters inundated and temporarily isolated 125 towns.
- Rail service to the south was halted for approximately one week.
- Rainfall damaged several sections of the Pan American Highway, the country's sole north-south artery. Near La Serena, approximately 500 km north of Santiago, the thoroughfare was closed because of damage. At La Calera, 100 km to the north of the capital, the highway was closed, then reopened with a 40-ton weight restriction. Throughout the affected area, 164 roads were flooded badly or cut and 51 bridges were destroyed.
- In Santiago, the Mapocho river overflowed, seriously damaging a newly-constructed highway. The flood waters streamed into the city's major water purification plant. It could not be immediately verified if any contamination had occurred. However, authorities recommended that people boil their water before consuming it.
- The situation was critical for people living in shantytowns in Santiago and environs (Colina, Lampa, Batuco, Melipilla) as well as in Regions V and VI (La Calera, Los Nogales, San Fernando, San Vicente). All their belongings were saturated with rain and flood waters. People had to contend with soaked bedding, damaged dwellings, as well as a severe shortage of emergency shelter, roofing material, and blankets.
- About 80 km north of Santiago is Colina, a town with some 35,000 people. An elevated irrigation channel was breached in several places, flooding vast areas of the town. Of the five roads leading into Colina, only one dirt road was passable. In the Población O'Higgins all 450 homes were damaged. About 30 dwellings had been destroyed, most of which had been erected after the 1986 floods and were situated close to the irrigation ditch.
- The town of San Fernando (with a population estimated at 60,000), located in Region VI 150 km south of the capital, was hit hard by this year's floods. Commercial establishments and

some residences in the center of town suffered water damage with little structural damage. Closer to the river (Río Tinguiririca) and in poorer areas, however, damage was worse. The flood waters destroyed more than 100 homes, mostly adobe. People's possessions were drenched. Unable to withstand the violent current, a bridge over the Río Tinguiririca collapsed. This same bridge had failed during the 1986 flooding and had been rebuilt. As a result of the bridge failure, that portion of the Pan American Highway was closed for several days until a temporary bridge could be installed.

- Fatalities increased sharply on July 28 when a merchant vessel sunk off the San Vicente Bay (Region VIII) and water inundated small mines in the same region. The victims of these events were added to the flood-related death toll.
- Blankets and bedding are critical needs.

Action Taken by the Government of Chile (GOC) and Non-governmental Organizations (NGOs)

- The National Emergency Office of the Ministry of the Interior (referred to by its Spanish acronym ONEMI) carried out its role as emergency relief coordinator. ONEMI issued regular situation reports detailing the number of people dead and affected, areas damaged, and needs requirements.
- The GOC did not declare a disaster and consequently did not invoke the Constitutional provision for applying two percent of the central budget to disaster relief. The GOC instead directed the Ministries of Public Works, Housing and City Planning, and Health to readjust their current budgets to accommodate flood damages.
- The Air Force assisted in evacuating people from isolated areas and transported food to remote areas.
- The Ministry of Public Works concentrated its efforts on repairing damaged infrastructure, mainly bridges and roads.
- The Ministry of Housing and City Planning offered three solutions to the housing problem: providing 1,360 mediaguas (wooden shelters) for flood victims; re-allocating 1,536 basic housing units (70 percent of which are located in the Santiago Metropolitan area) from the Ministry's regular subsidy programs to the damnificados; and using \$70,000 to purchase construction materials, primarily roofing, for repair of damaged homes.

- Local television stations and businesses organized food and clothing collection drives to benefit flood victims.
- The Chilean Red Cross (CRC) mobilized 3,500 of its volunteers to lend aid to their fellow citizens. Thirty-four CRC branches were active assisting 34 villages. The CRC opened 87 shelters and gave first-aid treatment to 26,100 flood victims. The CRC also distributed clothing, shoes, blankets (650), and food.
- Two indigenous NGOs, *Cáritas Chile* and ADRA/OFASA (Adventist Development and Relief Agency), began working to meet the needs of the disaster victims, distributing food and clothing to people in emergency shelters.
- ONEMI depleted its inventory of blankets (13,000) and nearly all supplies of blankets on the local market were exhausted. ONEMI arranged to purchase a local factory's production of 2,800 per week. However, *Cáritas Chile* has purchased the available supply of blankets through August 7.
- The short-term needs of the victims have been met by the GOC and NGOs, supplemented by international donations.
- By August 10, *Cáritas Chile* had received a total of \$694,000 from the EC, Italy, France, England, *Cáritas Internationalis*, the Vatican, and the United States (\$15,000 of the Ambassador's Authority). With these funds, *Cáritas* will mount a \$314,000 emergency housing program to provide 314 dwellings. The remaining funds will be applied to the purchase of blankets, food, and medicine.

Assistance Provided by the U.S. Government

- On July 17, Deputy Chief of Mission George F. Jones determined that the needs of the disaster victims outweighed the GOC's capacity to respond. The Chargé declared the situation a disaster warranting USG assistance and exercised the Ambassador's Disaster Relief Authority of \$25,000.
- The Ambassador's Authority was donated to *Cáritas Chile* and ADRA/OFASA for immediate relief assistance. *Cáritas* received \$15,000 to provide disaster relief in poor shantytowns in Santiago. The money was combined with other contributions for an emergency shelter program. The balance of \$10,000 was donated to ADRA/OFASA for the provision of food, clothing, and emergency shelter in Colina.

- The Mission Disaster Relief Officer and other Embassy staff surveyed the affected areas near Santiago to evaluate the extent of the damage and assess the need for further USG aid. The Embassy's assessment revealed that the situation was worse than expected and that this year's floods exceeded those of 1986 in severity. The critical shortage of blankets and bedding alarmed the team. In addition, the team observed that, aside from the Caritas effort, little was being done to address the shelter problem.
- OFDA dispatched Regional Preparedness Advisors Paul Bell and Ricardo Bermúdez from San José, Costa Rica, to assess the situation and make recommendations for further USG assistance. They arrived in Santiago on July 29.
- OFDA sent 9,000 wool blankets from its New Windsor, Maryland, stockpile to help ease the blanket shortage. The blankets were transported aboard a DOD C-5A cargo plane from Dover AFB in Delaware to Howard AFB in Panama. From Panama a DOD C-141 aircraft carried the blankets to Santiago, arriving on Tuesday, August 5. The blankets are valued at \$36,000 and transport cost \$12,000.
- On August 10, OFDA approved a \$265,000 emergency shelter program designed to assist 2,500 Chileans. Caritas and INPROA (the Institute for Agricultural Promotion) will implement the program which combines the delivery of construction materials packages for the repair of damaged dwellings and the assembly of emergency shelter units on non-vulnerable sites. INPROA's effort will reach 300 families with both packages and dwellings, while Caritas plans to assist between 100 and 115 families with emergency units.

Summary of USG Assistance

Ambassador's Authority of \$25,000:	
Caritas Chile.....	\$15,000
ADRA/OFASA.....	\$10,000
9,000 wool blankets.....	\$36,000
DOD C-141 transport of blankets.....	\$12,000
Emergency Shelter Program	
Grant to INPROA.....	\$165,000
Grant to Caritas Chile.....	\$100,000
TOTAL	\$338,000

Assistance Provided by the International CommunityInternational Organizations

EC - Food, medicine, 5,000 tents, 10,000 roofing sheets, and cash to Cáritas; total value \$282,933 (see also Italy entry).

LRCS - Medicine, blankets, food, clothing, and footwear; value not reported

Governments

Australia - \$20,000 cash through the Chilean Red Cross (CRC)

Egypt - \$2,150

Germany, Fed. Rep. - \$54,645 cash contribution for local purchase of pharmaceuticals, 1,500 blankets, and 250 mattresses. Funds were donated to Cáritas Chile, Fundación Misión, and Sociedad Proayuda del Niño Lisiado.

Italy - \$400,000 granted to Cáritas Chile. These funds have been combined with a portion of the EC's contribution and will be used for several relief endeavors: \$270,000 for an emergency shelter program, \$22,000 for the purchase of blankets, and the balance for food and medicine.

Norway - \$52,239 cash through Cáritas Norway to Cáritas Chile

United Kingdom - \$48,309 cash to Cáritas Chile for local purchase of relief items

Voluntary Agencies

Church World Service - \$5,000 for food assistance

German Agro-Action - \$24,590

World Council of Churches - \$20,000

DFDA-Sponsored Training
Chilean Participants
(Note: T=Third-country training, U=U.S., and I=In-country)

Name	S X	Agency (if available)	Location of Course	FY Type
** PROJECT= 1st LA Symposium on Natural Disasters				
Kausel, Edgar	M		Quito, Ecuador	86 T
Lopez, Victor A.	M		Quito, Ecuador	86 T
** PROJECT= 2nd Annual International Earthquake Conf				
Eisenberg, Dr. Alfredo	M	University of Chile	Los Angeles, CA	87 U
** PROJECT= Earthquake Engineering Conference				
Flores, Rodrigo	M		San Francisco, CA	84 U
** PROJECT= NFPA Fire Protection Conference				
Marquez, Alberto	M	Volunteer Firefighters	RiodeJaneiro, Brazil	86 T
** PROJECT= NFPA Fire Training Seminar				
Marques Allisos, Alberto	M	National Firefighters	Brasilia, Brazil	86 T
Sandaval Labbe, Leonardo	M	National Firefighters	Brasilia, Brazil	86 T
** PROJECT= OAS Risk Assessment Course				
Contreras Garcia, Pilar	F	National Planning Office	Merida, Venezuela	86 T
Garrido Rubio, Cecilia Teresa	F	National Planning Office	Merida, Venezuela	86 T
** PROJECT= OAS/DRD Natural Hazards Training Workshop				
Lanzarotti, Juan	M	National Forestry Corporation (CONAF)	Merida, Venezuela	86 T
** PROJECT= ONEMI L.A. Workshop on Operational Management				
Ahumada, Rafael V.	M	National Emergency Office (ONEMI) - Bio Bio	Santiago, Chile	86 I
Berroeta, Hugo S.	M	Region VI Administration	Santiago, Chile	86 I
Briceno, Jose	M	Ministry of Interior	Santiago, Chile	86 I
Caceres, Luis Cristi	M	National Emergency Office (ONEMI)- Bio Bio	Santiago, Chile	86 I
Calderon, Pablo F.	M	National Emergency Office (ONEMI)- Region XI	Santiago, Chile	86 I
Contreras, Ricardo Sequel	M	National Emergency Office (ONEMI)- Region I	Santiago, Chile	86 I
Doerner, Walter	M	Metropolitan Region Administration	Santiago, Chile	86 I

DFDA-Sponsored Training
Chilean Participants
(Note: T=Third-country training, U=U.S., and I=In-country)

Name	S X	Agency (if available)	Location of Course	FY Type
Echiburru, Jose	M	National Fire Office	Santiago, Chile	86 I
Faundez, Jorge Alvarez	M	Region II Administration	Santiago, Chile	86 I
Gleiser, Jenny	F	Red Cross	Santiago, Chile	86 I
Lopez, Guillermo G.	M	Region III Administration	Santiago, Chile	86 I
Lorca, Angel F.	M	Region X Administration	Santiago, Chile	86 I
Medanic, Maria Angelica	F	National Emergency Office (ONEMI)- Region IV	Santiago, Chile	86 I
Petric, Andro	M	National Emergency Office (ONEMI)- Region V	Santiago, Chile	86 I
Serra, Ivan	M	School of Health - University of Chile	Santiago, Chile	86 I
Vidal, Pedro Ruiz	M	Secretariat of Education - Region VI	Santiago, Chile	86 I
** PROJECT= Partners' Disaster Assessment Course (I)				
Arnello R., Dr. Jose Raul	M	Ministry of Health	Washington, DC	86 U
Fernandez Braccasi, Flor	F	CARITAS/Chile	Washington, DC	86 U
** PROJECT= Partners' Toxic Spills Course				
Sandoval, Leonardo	M	Fire Dept - Santiago	Washington, DC	86 U
** PROJECT= USFS Forest Fire Fighting Techniques				
Amigo Latorre, Manuel	M		Reno, NV	86 U
Boswich Alvarado, Juvenal	M		Reno, NV	86 U
Sanhueza Bravo, Patricio	M		Reno, NV	86 U
** PROJECT= USFS Wildfire Suppression Training				
Knockaert P., Hugo	M		Marana, AZ	84 U
** PROJECT= USGS Geologic Hazards Program				
Guerra, Jorge E.	M	ONEMI	Denver, CO	84 U

U.S. Disaster Assistance to Chile 1964-1987

<u>Year</u>	<u>Disaster</u>	<u>Commodity/Service</u>	<u>Provided Through</u>	<u>Cost(\$)</u>
1964	Volcanic Eruption	24 MT of Title II food	CRS/CWS	\$5,620
1965	Earthquake	Airlift	Pan Am	38,260
		Airlift of ADRA-donated supplies		11,692
		Title III food		76,340
		Medicine (tetracycline)		16,630
		Tents	DOD	32,700
		Airlift of tents and medicines	DOD	88,000
		Water purification units: operating costs		6,000
		Airlift of water purification units		<u>14,074</u>
				\$283,696
1966	Flood	Airlifts of blankets, tents, and cots	Delta/ Pan Am	72,275
		5,000 blankets	ANRC	16,550
		2,500 cots	DOD	17,500
		2,350 MT of Title III food		566,660
		901 tents	DOD	<u>20,723</u>
				\$693,708
1967	Earthquake	11 MT of Title II food	CRS	\$1,900
1969	Drought	1,100 MT of Title II food	GOC	241,000
		990 MT of Title II food	WFP	81,000
		1,086 MT of Title II food	GOC	139,058
		Ocean freight costs	WFP	40,000
		Ocean freight costs	GOC	<u>50,000</u>
				\$551,058

<u>Year</u>	<u>Disaster</u>	<u>Commodity/Service</u>	<u>Provided Through</u>	<u>Cost(\$)</u>
1971	Storm	Airlift	DOD	12,426
		2,000 wool blankets		6,800
		2,000 cotton blankets		4,320
		Clothing (raincoats and rubber boots)		4,870
		1,000 cots		3,180
		52 MT of Title II food	CARE/CRS	8,456
			ADRA	
		Ocean freight/food transport	CARE/CRS	2,000
			ADRA	
		100 space heaters	DOD	900
		Medical supplies		212
		Medicine		57,646
		Transport of relief supplies	DOD	<u>2,325</u>
		\$103,135		
1971	Earthquake	Airlift		55,000
		12,000 wool blankets		40,800
		1,511 cots		4,800
		207 MT of Title II food	CARE/CRS	35,681
			ADRA	
		2,070 MT of Title II food	WFP	623,000
		Food transport		9,000
		Medical supplies		68,000
		288 tents		<u>25,704</u>
				\$861,985
1972	Drought	3,197 MT of Title II food		662,000
		Food transport		<u>200,000</u>
				\$862,000
1973	Civil Strife	10,000 wool blankets	ICRC	46,310
		Title II food		20,000
		Medical supplies		163,717
		U.S. inland transport		<u>1,370</u>
				\$231,397
1974	Flood	Airlift	DOD	13,560
		Airlift of cots and blankets	DOD	149,702
		9,788 blankets		41,599
		4,848 cots		53,328
		9 MT of Title II food	CARE	2,816
		42 MT of Title II food	CRS	12,562
		5 MT of Title II food	ADRA	1,622
		Transport		<u>14,110</u>
		\$289,299		

<u>Year</u>	<u>Disaster</u>	<u>Commodity/Service</u>	<u>Provided Through</u>	<u>Cost(\$)</u>		
1985	Earthquake	Ambassador's authority: Barros Luco Hospital		25,000		
		Airlift		96,653		
		Disaster experts		34,260		
		5,980 MT of Section 416 food	GOC	5,000,000		
		Food transport	GOC	78,000		
		Grants for emergency shelter	NGOs	1,100,000		
		Grant to MOH for medical supplies and medicine	GOC	50,000		
		Temporary hospital - Rengo		120,000		
		1,125 rolls of plastic sheeting		316,782		
		Airlift of plastic sheeting	DOD	175,843		
		Local purchase of plastic sheeting		33,930		
		8 radios		5,605		
		Transport		3,000		
		3 drums HTH		300		
		5,999 5-gal. water containers		9,319		
		Water containers (local purchase)		30,000		
		28 3,000-gal. portable water tanks		<u>64,316</u> \$7,143,008		
		1986	Flood	Emergency shelter project	Cáritas	\$125,000
		1987	Flood	Emergency shelter	Cáritas	15,000
				Clothing/food	ADRA	10,000
9,000 wool blankets				36,000		
Airlift of blankets	DOD			12,000		
Emergency shelter	INPROA			165,000		
Emergency shelter	Cáritas			<u>100,000</u> 338,000		
TOTAL				\$11,489,806		

Source: OFDA Commodity/Service File, August 1987

InterviewsU.S. Embassy

Wendell L. Belew, Economic Counselor
Renato Hidalgo, Food for Peace Officer

GOC

General Victor Aquiles López, Director, ONEMI (and staff)
Colonel Gustavo Arenas, Undersecretary, Ministry of Telecommunications
Miguel Valenzuela, Obras Portuarias
Jaime Arancibia, Housing Policy Division, Ministry of Housing
Ricardo Zurob, Civil Aviation
Julio Parra, Ministry of the Interior
Victor Nicoletti, Mayor, Rengo
Admiral Jorge Baeza, Director, EMPORCHI
Captain Carlos Varig, Deputy Director, IHA
Brigadier General Mario Álvarez, Director, CD

Hugo Knockaert, National Fire Management Program Chief, CONAF
Raul Molina, CONAF Valparaíso Regional Center
Eduardo Carrasco, ENTEL
Iván González, Chief of Security, EMOS
Ricardo Saavedra, Chief of Potable Water Projects Department, EMOS

Universidad de Chile

Professor Edgar Kausel, Seismologist
Dr. Iván Serra, Professor, School of Public Health

U.N.D.P.

Estela Singh, Deputy Resident Representative

PAHO

Dr. Miguel Aguilar, Country Representative

NGOs

Chilean Red Cross - Dr. Harold Coglán, Jorge Tapia, and Omar Blanché
Cáritas Chile - Father Baldo Santi, Vice President, and Flor Fernández,
Chief of Special and Emergency Projects
ADRA/OFASA - Walter Britton
INVICA - Ramón Undurraga, General Manager, and Ramón Venega
INPROA - José Nagel, Executive Director
CORPRIDE - Guillermo Crespo, General Manager, and Arturo Urrutia
CRATE - Jorge Brito

Bibliography

- Banco Central de Chile, Síntesis Estadística de Chile 1981-1985. Santiago, Chile: July 1986.
- Bernard, E.N. et al., "Tsunami Hazards Reduction Utilizing Systems Technology, THRUST." July 1987.
- Blong, R.J., Volcanic Hazards: A Source Book on the Effects of Eruptions. Academic Press, Orlando, Florida: 1984.
- Cáritas Chile, Informe 1986. Santiago, Chile.
- Cline, Michael K., A Technical Review of the Sisra Project, A Part of the Ceresis Program. Prepared for the U.S. Office of Foreign Disaster Assistance.
- Collier's Encyclopedia, Volume VI. MacMillan Educ., Co.: 1983.
- Constable, Pamela and Arturo Valenzuela, "Is Chile Next?" Foreign Policy, Number 63, Summer 1986, pp. 58-75.
- Corporación Nacional Forestal, Caracterización del Sector Forestal Chileno. March 1986.
- _____. Control de los Incendios Forestales en Chile.
- _____. Estadísticas de Ocurrencia y Daño de Incendios Forestales, Temporadas 1964 a 1986. Santiago, Chile: 1986.
- Corporación Privada de Desarrollo, Curriculum Institucional. Curicó, Chile: March 1986.
- Crino, Augusta et al., Final Disaster Summary Report, Chile Earthquake - March 3, 1985. Prepared for the Office of U.S. Foreign Disaster Assistance.
- Cruz, Fernando, Replacement of Low Income Housing After a Major Disaster, The Case of Chile. Prepared by PADCO, Inc., for the Office of U.S. Foreign Disaster Assistance, Washington, D.C.: 1986.
- Defensa Civil de Chile, ¿Qué es la Defensa Civil de Chile? Santiago, Chile.
- _____. La Defensa Civil de Chile.
- Economist Intelligence Unit, Country Report Chile, No. 2-1987. London, U.K.: 1987.

- _____. Quarterly Energy Review: Latin America and the Caribbean, 1986-4. London, U.K.: 1986.
- Embassy of Chile to the United States of America, Chile. Rockville, MD: 1985
- Empresa Nacional de Electricidad, S.A., Endesa Energy, Santiago, Chile: 1984.
- Encyclopedia Britannica, Volume IV. Encyclopedia Britannica, Inc.: 1981.
- Encyclopedia of the Third World. Revised Edition, Volume I. Facts on File, Inc: 1982.
- Europa Publications, The Europa Year Book 1984, A World Survey. London, U.K.: 1984.
- Facts on File, Inc. Facts on File: Weekly World News Digest, Volume 47, No. 2420, April 10, 1987.
- Fundación INVICA, Esto es PROVICOOP. Santiago, Chile.
- _____. Informe Final del Proyecto OFDA-AID-INVICA. Santiago, Chile.
- Gelcich, Sergio, Chile. Pacific Ores and Trading, Curacao: 1975.
- Instituto Nacional de Estadísticas, Compendio Estadístico: Chile 85. Ministerio de Economía, Fomento y Reconstrucción, Santiago, Chile: 1985.
- Instituto de Promoción Agraria, INPROA y Campesinos, Caminando Juntos: Actividades 1985. Santiago, Chile.
- Maldonado, Fernando P., CONAF: The Chilean Forest Service and its Fire Management Program. Corporación Nacional Forestal: 1982.
- Medina Lois, Dr. Ernesto. "La Capacitación Profesional en Administración de Salud en Situaciones de Desastres," Cuadernos Médicos Sociales, Volume XXVII, No. 1, March 1986, pp. 28-32. Colegio Médico de Chile, Departamento de Salud Pública.
- Merrill, Andrea T., editor, Chile: A Country Profile. American University, Washington, D.C.: 1982.
- Ministerio de Vivienda y Urbanismo, Inversión en Programas de Emergencia Sismo 1985.
- _____. Informe Sobre Programas de Emergencia a Damnificados Temporales.

- Ministry of Foreign Affairs, Chile Today, January 1987, No. 49. Santiago, Chile.
- Office of U.S. Foreign Disaster Assistance, Latin America Housing Survey for Disaster Relief and Preparedness. Washington, D.C., 1981.
- ONEMI, Decreto Ley No. 369 Orgánico de ONEMI y su Reglamento. Santiago, Chile.
- _____. Plan Nacional de Emergencia.
- _____. Resolución Exenta No. 251, Santiago, Chile: 24 May, 1982.
- Pan-American Health Organization, Health Conditions in the Americas, 1981-1984, Volume II. Scientific Publication #500. Washington, D.C.: 1986.
- _____. Program Budget, PAHO Document #210. Washington, D.C.: May 1987.
- Reyes Ortiz, Mario et al. "Brief Description of the Effects on Health of the Earthquake of 3rd March 1985 - Chile," Disasters, 10/2/86, pp. 125-140.
- Ruffner, James A., editor, The Weather Almanac. Frank E. Bair Gale Research Co., Michigan: 1984.
- Stallsmith, Pamela, "Tsunami Warning Project Launched," Frontlines. Agency for International Development, August 1983.
- The Current History Encyclopedia of Developing Nations. McGraw Hill Book Company: 1982. Pp. 346-349.
- Time-Life Books, Planet Earth: Volcano. Alexandria, Virginia: 1982.
- Undurraga Montes, Ramón, "Cooperativismo y Desarrollo," Organización de la Demanda en Atención de las Necesidades Habitacionales de los Sectores de Bajos Ingresos. Santiago, Chile.
- U.S. Department of State, Chile Background Notes. Bureau of Public Affairs, Washington, D.C.: April 1986.
- _____. Chile Post Report. Foreign Affairs Information Management Center, Washington, D.C.: December 1985.
- U.S. Information Service, Embassy of the United States of America, Chile. Santiago, Chile.
- U.S. Department of Commerce, Foreign Economic Trends and Their Implications for the United States, (FET 86-93). Washington, D.C.: 1986.

Venezian, Eduardo, Chile and the CGIAR Centers, Study Paper No. 20. World Bank, Washington, D.C.: 1987.

Walker, Bryce, Planet Earth: Earthquake. Time-Life Books. Alexandria, Virginia: 1982.

World Bank, Chile: An Economic Memorandum. Washington, D.C.: 1984.

_____. Chile, Public Sector Housing Project. Washington, D.C.: 1984.

_____. Chile, Agricultural Services and Credit Project. Washington, D.C.: 1984.

_____. Chile, Pehuenche Hydroelectric Project and Alto Jahuel-Polpaico Transmission Project. Washington, D.C.: 1987.

_____. Chile, Road Sector Project, Washington, D.C.: 1985.