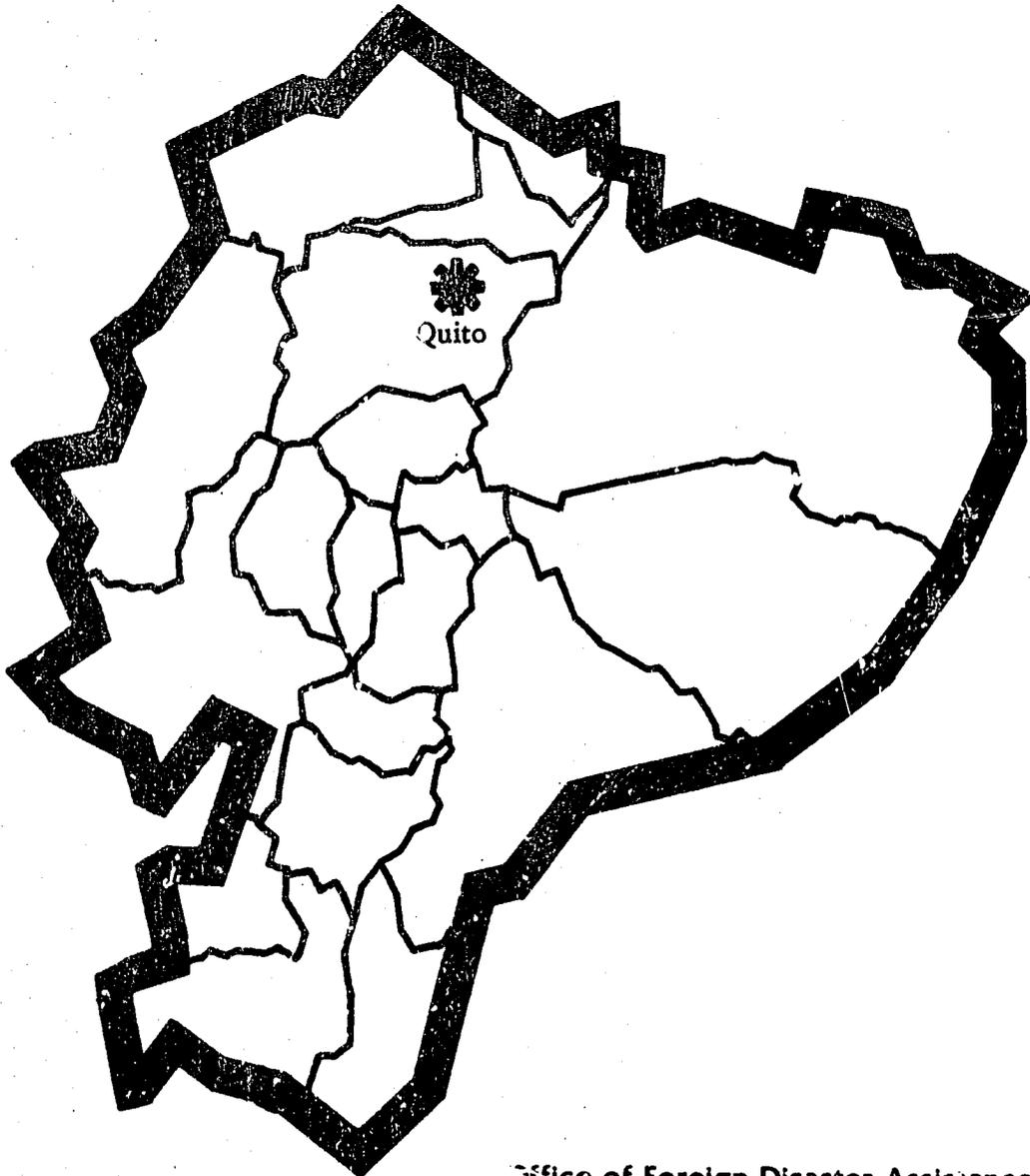


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Ecuador

A Country Profile



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

ECUADOR: 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

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The Country Profile Series is designed to provide baseline country data in support of the planning and relief operations of the Office of U.S. Foreign Disaster Assistance (OFDA). Format and content have evolved over the last several years to emphasize disaster vulnerability, planning, and resources.

We hope that the information provided is also useful to other individuals and organizations involved in disaster-related activities. Every effort is made to obtain current, reliable data; unfortunately it is not possible to issue updates as fast as changes would warrant. Therefore, where the most current names and statistics are important, the bibliography points to regularly updated sources.

We invite your comments and questions. Please address these to OFDA at the address above.

July 1983

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1. General Information1.1 Geographic Codes

AID Standard	518
AID Region	LAC/SA
State Region	ARA/AND/E

1.2 Host Mission in U.S.

Embassy: 2535 15th Street, N.W.
Washington, D.C. 20009
Tel: (202) 234-7200 - chancery
(202) 234-7166 - consulate

For current information on Ecuador
Embassy staff in the United States, consult
the U.S. Department of State, Diplomatic
List.

1.3 U.S. Mission in Ecuador

Embassy: 120 Avenida Patria
Quito
Tel: 548-000

For current information on U.S. Embassy
staff in Ecuador, consult the U.S. Department
of State, Key Officers of Foreign Service
Posts.

US AID Mission: Avenida Colombia y Queseras del Medio
Edificio Computec
Quito
Tel. 521-100

Consulate: 9 de Octubre & Garcia Moreno
Guayaquil
Tel: (04) 511-570
Telex: USICA 308-3452

APO: Miami, 34039

1.4 Time Zones EST; GMT+51.5 Currency and Exchange Rate

Official Currency: Sucre (S/.)
100 centavos = S/. 1

Official Rate: S/. 42.30 = US \$1 (May 1983)
Free Market Rate: S/. 87.47 = US \$1 (2nd quarter 1983)

The official rate applies to dollars derived from 70% of non-traditional exports and all traditional exports. The free market rate applies to the remaining 30% of non-traditional exports and to the provision of certain imports.

The sucre (official rate) was devalued 27% in March 1983, the third devaluation in twelve months. The cost of the U.S. dollar will be raised 4 centavos each working day until it reaches S/. 50 at the end of the year.

1.6 Travel and Visa Information

Passport and Visa Requirements: Valid passport and return ticket are sufficient for visits not exceeding three months. For longer visits, a visa must be secured prior to departure.

Health Requirements: Tetanus, hepatitis, yellow fever inoculations are recommended. If visiting areas outside Guayaquil in the Costa, malaria suppressants are recommended.

1.7 Calendar and Holidays

New Year's Day	Jan. 1
Carnival	*
Good Friday	*
Easter	*
Labor Day	May 1
Battle of Pichincha	May 24

Simon Bolivar's Birthday	Jul. 25
Independence Day	Aug. 10
Independence of Guayaquil	Oct. 9
Columbus Day	Oct. 12
All Soul's Day	Nov. 1
Independence of Cuenca	Nov. 3
Founding of Quito	Dec. 6
Christmas Day	Dec. 25

* Dates vary annually
Fiscal year: calendar year

1.8 Treaties and Agreements

Agricultural Commodities
Aviation - transit and technical stops for
U.S. planes.
Defense
Economic and Technical Cooperation
Investment Guarantees
Mapping
Naval Vessels
Peace Corps
Privileges and Immunities for U.S. Geodetic
Survey Mission
Relief and Rehabilitation Supplies - Duty
Free Entry
Telecommunications - Reciprocal Permits for
Licensed Radio Operators

1.9 International Organization Memberships

FAO, Group of 77, Inter-American Defense
Board, ICAO, Inter-American Development
Bank, International Coffee Organisation,
International Fund for Agricultural
Development, International Hydrographic
Organisation, ILO, International Maritime
Organisation, IMF, ITO, Latin American
Economic System, Latin American Free Trade
Association and Andean Sub-Regional Group,
OAS, OPEC, UN, UNESCO, Union of Banana
Exporting Countries, UPU, World Bank (IBRD,
IDA, IFC), WHO, WMO, World Tourism
Organization.

1.10 Government

Official Name: Republica del Ecuador

Political Status: Sovereign democratic republic

Government Structure: Constitutional rule was restored in 1979 following a decade of military government. The president and vice president are elected for non-renewable four-year terms by popular, direct voting. The Chief Executive is assisted by an 11-member Cabinet and advised by the 19-member State Council. Legislative power is vested in the National Congress which consists of two houses - the Senate, with two representatives from each province, and the House of Deputies, whose members are chosen from each province according to population distribution.

Administrative Structure:

The country is divided into 20 provinces including the Galapagos Islands territory. The provinces are divided into 103 cantons, which are sub-divided into 746 parishes. The president appoints the provincial governors and, in conjunction with the Ministry of Interior, selects the political chief in each canton and the political lieutenant in each parish. Each canton is governed by a popularly elected cantonal council which is headed by a mayor.

1.11 Ethnic and Sociocultural Groups

Ecuador displays a wide range of racial and cultural diversity. About 85% of the population is of Indian descent or mestizo (mixed Indian and European). The remainder is either of European (10%) or African (5%) origin. Indigenous Indians are present in all geographic regions. Most Sierra Indians are based in rural areas and depend on subsistence agriculture. They can often be distinguished by dress and cultural values. The Oriente is inhabited by a number of sedentary Indian groups who represent slightly over 35% of the region's population.

Coastal Indians, many of whom migrated from the highlands, are the most assimilated group. Individuals of European descent are concentrated in urban centers while blacks live mostly in northern coastal areas, particularly Esmeraldas province.

Major Indian Groups:

<u>Group</u>	<u>Location</u>
Otavalo	Imbabura
Salasca	Tungurahua
Puruhua	Chimborazo
Canari	Canar/Azuay
Shuar	Morona/Zamora
Yumbo	Napo
Saraguro	Loja
Cayapa	Manabi
Colorado	Pinchincha
Auca	Oriente
Jibaro	Oriente

1.12 Language

Spanish, the official language, is spoken by nearly all the population. Quechua, the language of the Incas, is still spoken by some Indians in the Sierra.

1.13 Religion

The overwhelming majority of the population is Catholic. In rural areas, indigenous folk beliefs are commonly combined with Christian practices. There are also small minorities of Protestants and Jews in Quito and Guayaquil. A small number of Indians practice tribal religions.

1.14 Geography

Location and Area:

Ecuador is located on the northwest coast of South America, bordered on the north by Colombia, on the south and east by Peru, and on the west by the Pacific Ocean. The Galapagos Islands lie 970 km west of the mainland. Ecuador has a total land area of 284,000 sq km.

Topography:

Three main regions can be distinguished: the Costa, Sierra, and Oriente. The Costa is composed mostly of lowlands and extends from the Pacific Ocean to the western edge of the Andes Mountains. (A small mountain range of volcanic origin rises in portions of western Manabi and Guayas provinces.)

The Sierra is defined by two parallel ranges which run the length of the country. Twenty-two peaks have elevations greater than 4,200 m. The narrow intervening tableland, known as the Inter-Andean Plateau, is nearly 650 km long and contains basins having elevations between 2,000 and 3,000 meters.

The Oriente makes up the eastern third of the country. Predominantly jungle, this area begins on the eastern slopes of the Andes and then gives way to gently rolling land and the headwaters of the Amazon River. Ecuador does not recognize Peruvian sovereignty over a portion of the Amazon basin which Ecuador possessed prior to the Rio Protocol of 1942.

Rivers:

Numerous rivers rise in the mountains and flow either west to the Pacific coast or east to the Amazon River. The coastal region is drained primarily by the Guayas River system which is formed by the following rivers: the Guayas, Daule, Babahoyo, Vinces, and Salado Estero. The Esmeraldas and Santiago rivers also flow into the ocean across Esmeraldas Province. In El Oro Province, the Jubones River flows past Machala into the Gulf of Guayaquil. While all major rivers in the Costa are navigable, their headwaters in the Sierra are swift and their courses meandering.

Although the rivers of the Oriente carry a tremendous volume of water, the region's drainage is poor. The Napo is the most important river receiving the Coca and Aguarico rivers as well as other large tributaries as it takes its course toward Peru, where it joins the Amazon. The Putumayo, along the border with Colombia, also flows into the Amazon.

Climate:

Striking variations in climate prevail in the three geographical regions. The Costa is uniformly warm (24-26° C), but rainfall levels vary from north to south. Precipitation is heaviest in the dense rain forest near the Colombian border (1,270 to 2,032 mm per annum). At Guayaquil about 990 mm of rainfalls yearly, mostly between January and May. The Santa Elena peninsula west of Guayaquil and the extreme southern coastal area are generally arid, receiving approximately 350 mm of rainfall per annum. However, rainfall patterns over the entire coast are cyclical with prolonged periods of drought often followed by a season of intense rainfall. (See also section 2.2, Floods.)

The climate in the Sierra varies with changes in altitude and with the degree to which the slopes are exposed to rain-bearing winds. The temperature drops about 2°C for each 330 m increase in elevation. The rainy season, known as winter, generally occurs between October and May. Most basin communities receive between 750 and 1,500 mm of rainfall early. Snow falls only on the highest peaks, but frost is common in higher populated areas.

The Oriente is Ecuador's warmest and most humid region. The median temperature ranges between 23 and 27°C, and rainfall levels can reach 6,000 mm annually.

See climate chart, Appendix A.

1.15 Population

Demographic Characteristics	Average annual growth rate (1974-81)	3.4%
	Growth rate 1983 (est.)	2.9%
	Density/sq km	32
	Urban population as % of total	44%
	1982 total population	8,038,435
	1981 CONADE population est.	8,644,000

The 1982 Census was not adjusted for probable undercounting and regional discrepancies due to migrations immediately prior to the census.

See Appendix B for regional population data.

1.16 Health

Vital Statistics:	Life expectancy at birth (1981)	62 yrs.
	Mortality rate/1,000 (1979)	7.4
	Infant mortality/1,000 live births:	
	Overall	60
	Rural areas	110

Health Care System: The Ministry of Health (Ministerio de Salud Publica-MSP) is responsible for establishing national health policy and coordinating the provision of health services. Health services are provided by the MSP, the Social Security Institute (Instituto Ecuatoriano de Seguridad Social-IESS), the Armed Forces, and numerous private organizations. In 1980, the National Health Council (Consejo Nacional de Salud) was established to advise the Ministry on health planning. Its membership consists of 13 representatives from various private and public organizations who serve on the technical committees: pharmaceutical supplies, rural health, and nutrition. In addition, a disaster division has been established to coordinate emergency health services. (See also section 3.1, Disaster Planning and Preparedness.) MSP provides health care to slightly over half the population and is now seeking to extend primary health care to the rural population through institution building and expanded staffing.

IESS serves 16% of the population including almost 100,000 people in rural areas through provincial hospitals and visiting practitioners. IESS medical services are funded by employer taxes, payroll deductions, and government contributions. The Armed Forces provide health care to about 7% of the population, mostly in urban areas where its

well-equipped hospitals are located. The remaining 22% of the population seeks medical services from private practitioners, the Red Cross, and other charitable agencies. MSP, IESS, and the Armed Forces often share medical facilities and undertake collaborative health projects.

Facilities/
Personnel:

Quito, Guayaquil, and Cuenca all have specialized hospitals (100 beds or more) which provide internal medicine, surgery, gynecology/obstetrics, and pediatric services. General hospitals also exist in each provincial capital. Cantonal hospitals (15-25 beds) provide mostly outpatient services, although gynecology/obstetrics and emergency care are available. In 1981, there were 116 hospitals, 49 health centers, 125 urban health subcenters providing out-patient services only, and 525 rural health subcenters. The rural health subcenters are located in parishes of over 1,500 people and are staffed by recently graduated physicians specializing in out-patient services.

The distribution of medical personnel is unbalanced in favor of urban areas. In 1981, there were 10,258 doctors or 11.9 per thousand persons. While this ratio is very high for a developing country, nurses numbered only 2,668 or 3.1 per thousand persons, indicating a critical shortage. In addition, there were 590 obstetricians and 3,084 dentists. In rural areas, traditional healers and midwives are still sought by the local population. (See also section 3.7, Health Resources, and Appendices E-I.)

Major Diseases:

Diarrheal diseases are the major cause of death followed by respiratory infections. Epidemics experienced over the last decade include hepatitis, typhoid, equine encephalitis, rabies, malaria (confined to tropical coastal areas excluding Guayaquil). Salmonellosis and tuberculosis are widespread. Children from the ages of 0-5 account for half the mortality, most from measles and whooping cough.

Nutrition:

Malnutrition is present throughout the country. The average diet is deficient in protein, calories, vitamin A, and calcium. As a result, it is estimated that 40% of preschool children suffer from some degree of malnutrition. Goiter, with resulting cretinism, is endemic at higher elevations. Malnutrition and deficiency-related diseases are compounded by the lack of potable water and sanitary systems in rural areas. Only about 10% of rural Ecuadoreans have access to potable water and only 2% have access to adequate sanitary disposal. A nationwide supplementary feeding program for children has been initiated with PL-480 soybeans which are combined with milk and oats to form a gruel, locally called leche avena.

1.17 Economy**Overview:**

Ecuador's GDP totaled US \$6.14 billion in 1981, of which manufacturing represented 19%, commerce 16%, agriculture 15%, finance 12%, and oil and mining 10%. However, the agriculture and petroleum sectors combined account for over 80% of total exports and employ over half the economically active population. The main industrial products include textiles, shoes, tires, processed foods and beverages, galvanized pipes, vehicle frames, pharmaceutical and chemical products, cement, and petroleum derivatives.

Although annual GDP growth averaged 4.5% from 1960 to 1980 and 7.4% during 1976-78, a GDP increase of only 2.8% was registered in 1982, and 1983 GDP growth is expected to be negative. Given a population growth rate of 2.5-3.0%, the deceleration in economic activity will have a negative impact on employment. Urban unemployment is now estimated to be 8.7%, although the underemployment rate is at least twice as much. The prospects for growth in 1983 are limited by reduced agricultural exports due to flood damage, the high cost of capital-intensive imports following the devaluation of the sucre, and

lower revenues from petroleum exports due to lower world prices. The inflation rate which has been fueled by the steady depreciation of the sucre averaged almost 19% p.a. from 1980-82.

**Balance of
Payments:**

The estimated current account (goods and services) deficit for 1982 is US \$1,193 million or 10% of GDP. This situation is primarily a result of interest rate ceilings which encouraged the flow of capital outside Ecuador. Consequently, increased foreign borrowing to finance domestic development exacerbated the disequilibrium in the services sector and increased the foreign debt which reached US \$6.3 billion in 1982. Despite an agreement to reschedule Ecuador's foreign obligations, servicing the debt remains a constraint to stimulating exports and overall economic growth. The continuing worldwide slump in trade and reduced agricultural exports because of flood damage will probably widen the deficit further in 1983.

Exports:

Total export value in 1982 was estimated at US \$2.4 billion FOB of which petroleum accounted for 56%, petroleum products 7%, fish and seafood products 10%, bananas 10%, coffee 6%, and cacao 3%. Shrimp exports registered a 54% increase in 1982 reflecting the gradual shift in exports from coffee and cacao to seafood.

Primary export markets are the United States (43%), Japan (15%), EEC (12%), Colombia (5%), Chile (5%), and Canada (4%).

Imports:

Total value of imports in 1982 was estimated at US \$1.895 billion, a 24% decline from 1981. Raw materials for agriculture and industry increased their share of imports to 36%, although industrial goods still constitute over 50% of the total import bill. Consumer goods represent 9% of all imports.

The recent devaluation of the sucre will probably curtail import growth as inputs for capital goods and raw material prices increase.

Ecuador's principal suppliers of imports are the United States (28%), Japan (13%), the Netherlands (7%), and the Federal Republic of Germany (6%).

1.18 Agriculture

Numerous tropical and temperate crops are grown in Ecuador, but few farmers cultivate more than one or two different products. The following crops are produced primarily for export: bananas, sugar, coffee, and cacao; other crops are grown primarily for domestic consumption. The Guayas Basin is Ecuador's most important agricultural area where 75% of the oilseed crop, 50% of the corn, and 75% of the rice crop is grown. At higher elevations in the Sierra, both food grains and tubers are grown, while fruit orchards are abundant in lower tropical zones. Agricultural products in the Oriente include corn, naranjilla fruit, plantain, cassava, some sugarcane, and coffee. Rice, bananas, and cacao are also cultivated on a smaller scale in the Oriente. Livestock activity consists mostly of hog raising.

Ecuador is the world's largest producer of bananas. El Oro Province produces the greatest quantity although plantations are located throughout the Costa and on the western slopes of the Sierra. Almost 60% of coffee acreage is found in Manabi province; the remainder is in Los Rios, Guayas and El Oro provinces. Most of the cacao plantations are located in Guayas and Los Rios provinces. Sugarcane is cultivated throughout the Costa and Sierra, but is concentrated in Canar and Guayas. Large-scale rice production is confined to the Costa, primarily in Los Rios Province, and the central and eastern portions of Guayas Province. Some rice is also cultivated in the lowlands of El Oro Province.

Corn is grown throughout the country from sea level to altitudes of 2,900 m. The most important producing areas are the Sierra provinces of Bolivar, Tungurahua, Pinchincha, and Azuay. The coastal corn crop matures in four months, about twice as fast as the Sierra crop.

Barley and potatoes are important staple crops grown throughout the Sierra. Barley yields are highest in Carchi, Pinchincha, and Bolivar provinces. Potato production is concentrated in the provinces of Cotopaxi, Chimborazo, Carchi, and Pinchincha. Other Sierra crops include sweet corn, onion, peas, lentils, yucca, and apples. At lower Sierra elevations, the following crops can be found: pears, plums, oranges, avocados, and grapefruit.

Cotton is a secondary crop grown mostly on small holdings in Guayas and Manabi provinces. Oilseed is cultivated in Quevedo, Babahoyo, and Milagro. (See Crop Dates, Appendix C.)

Livestock:

Animal husbandry is practiced in both the Costa and Sierra. Dairy cattle represent 29% of the total stock, cattle raising for beef accounts for 40%, and the balance is used for both purposes. Beef ranching is concentrated in tropical zones while hog raising is found in both the Sierra and Costa.

1.19 Communications

Radio and Television:

Access to radio and television is widespread in both urban and rural areas. In 1981, there were 321 radio stations (at least one in each province) and 10 television stations located in four provinces. All television stations are commercially operated. About 550,000 television sets were operating in 1979. There are over two million radio receivers nationwide.

Telecommunications: Telephone and telex services are provided by the state-owned Instituto Ecuatoriano de Telecomunicaciones (IETEL). The failure rate for telephone calls is high, and although phone connections between Quito and Guayaquil can be dialed directly, they are fault-prone during peak business hours. International calls can be dialed directly from major cities. In 1981, there were over 200,000 telephone lines in Ecuador (95% automatic). There are approximately 1,700 telex subscribers. In addition, IETEL maintains numerous offices in cities and small towns for placing regular and long-distance phone calls as well as telegrams and phonegrams.

See also section 3.12, Communications.

1.20 Transportation

Motor roads:

Ecuador's transportation network is designed to serve the Quito-Guayaquil corridor. Given the relatively short hauling distances and the rugged terrain, roads offer the most efficient mode of transporting commodities, except petroleum products. Non-petroleum road transport accounts for 95% of total intercity freight transport and 90% of passenger traffic. The road network consists of approximately 35,000 km, of which 13% are paved, 38% are gravel, and the rest dirt surfaced. Although the Ministry of Public Works (Ministerio de Obras Publicas) is responsible for maintaining only 8,400 km, the central government assists local and regional authorities with maintenance. The coastal road network is fairly well developed in all areas except the extreme north. Sierra roads serve most provincial capitals and are linked to the Costa by two major routes, one through Santo Domingo de los Colorados in Pichincha Province and another through Guaranda and Babahoyo in Los Rios Province. The Pan American Highway is the sole artery linking the country with Colombia and Peru. The Oriente's road network is not sufficiently developed to adequately link

newly settled communities with the rest of the country. There are about 1,170 km of roads in the Oriente of which only 40 km are paved; the remainder are dirt paths which become impassable during the rainy season.

See also section 3.8, Roads and Motor Vehicles.

Railroads:

The railroad has gradually lost importance in the transportation sector because of its age, poor maintenance, and the small quantity of bulk cargo handled (approximately 3,000 tons per year). The railway is owned and operated by Empresa Nacional de Ferrocarriles del Estado (ENFE) and has a total length of 971 km. Ninety percent of all traffic moves on the Guayaquil-Quito Line. The railroad crosses the coastal area from Duran, just outside of Guayaquil, to Bucay and Simbambe, where it proceeds north to Quito and south toward Cuenca along the Inter-Andean Plateau. The 1982-83 floods damaged numerous bridges and highland segments particularly outside Bucay. As of Spring 1983, only Duran-Bucay, Palmira-Quito, and sections north of Quito were in operation. Rehabilitation of the railway is uncertain because of overriding reconstruction priorities in other sectors. In addition, ENFE has incurred continuous annual deficits, partly because of excessively low fares and insufficient subsidization. Simultaneous ceilings on the price of fuel for trucking have added to the decline in railroad traffic. (See also section 3.9, Railways.)

Ports:

Ecuador has three general cargo ports, two petroleum terminals, a fishing port, and one port specializing in banana handling. Guayaquil, as the main port, accounts for about 80% of the country's imports and 40% of non-petroleum exports. The access channel from the ocean is 72 km long and 200 m wide. New facilities for 5 ocean going vessels were recently constructed 11 km south of the central area. They can accommodate ships up to 11.7 m draft at wharves. The major

petroleum exporting terminal is located at Esmeraldas with an 11 m draft approach from the inner basin to the pier at low tide. Secondary ports include La Libertad, located 135 km from Guayaquil, Manta in Manabi Province, Puerto Bolivar in El Oro, specializing in banana handling, and San Lorenzo in Esmeraldas Province near the Colombian border.

For further information on port accommodations, see Lloyds Ports of the World.

Shipping:

Ecuador is a shareholder of Grancolombiana, the Colombian national shipping company which serves Ecuador. The following shipping lines also service Ecuador's ports: Delta, Hamburg-South American Line. Krutsen and Johnson, and Royal Netherlands.

See also section 3.10, Ports, Waterways and Shipping.

Aviation:

Aviation plays a major role in Ecuador's transportation sector given the country's diverse geography and the lack of surface transportation to many rural population centers. There are a total of 34 airports and airstrips. The two international airports are located in Quito and Guayaquil. Quito's Mariscal Sucre Airport is situated in a densely populated area and is limited to daytime operations.

Airlines:

International air service is provided by Agro Peru, Aerolineas Argentinas, Air France, Air Panama, Avianca, Eastern Airlines, Ecuatoriana, Iberia, KLM, Lufthansa, and VARIG.

The major domestic carriers are Andes, SAETA, TAME, SAN, AECA, ATESA, Ecuavia, and Ecuavia-Oriente. TAME airlines offers several flights per week to the Galapagos Islands.

See also section 3.11, Aviation.

2. Disaster Vulnerability

2.1 Overview of the Physical Environment

Ecuador is located on the equator in the northwestern corner of South America. The country is divided into three major geographical areas: the coast (Costa), the highlands (Sierra), and the Amazon basin (Oriente). The Galapagos Islands can be considered a fourth region. They are of volcanic origin and are located 1,000 km west of the mainland in the Pacific Ocean.

The coastal region is a low plain some 32-185 km in width that parallels the western slopes of the Andes Mountains. The Guayas river system is the main hydrographic feature and supports Ecuador's richest agricultural zone. Four other important rivers are, from north to south: the Santiago, the Esmeraldas, the Chone, and the Jubones. River currents are swift in their upper reaches, but decelerate in the lowlands where they form interior alluvial fans. During the rainy season (approximately January to May) coastal rivers and tributaries overflow their banks onto adjacent settlements and cropland. The western portion of the Costa is characterized by rolling hills which are usually arid and unable to support agriculture. However, an anomalous rainy season can transform these areas into lush ivy-covered fields capable of sustaining some short-term crops.

Annual rainfall variations in the Costa are a function of the relative positions of the cold northward-flowing Humboldt current and the warmer equatorial current brought about by a shift in air masses. The moisture-laden winds that accompany the equatorial current prevail during the rainy season whereas the winds of the Humboldt current are dominant during drier months. The onset and duration of the rains vary from year to year, but are characterized by a cyclical pattern of extended dry periods producing localized droughts. At irregular intervals - about every 6 to 8 years - an exceptionally strong encroachment of the equatorial current, known as El Nino, results in heavy rainfall and widespread flooding. (See section 2.2, Floods.)

The Sierra, or Andean highlands, is a 112-290 km wide region formed by two parallel spines of the Andes, both of volcanic origin: the Cordillera Occidental and the Cordillera Central. A compact high mountain range, the Cordillera Occidental stretches the length of Ecuador. The Cordillera Central is less a range of mountains than a series of lofty peaks. The intervening central plateau known as the Inter-Andean Plateau, is nearly 650 km long and no wider than 70 km. Mountain spurs and volcanic ridges subdivide the plateau into a series of ten self-contained basins having elevations of 2,000 to 3,000 meters. These basins support most of the Sierra's population. Many of the basins are arid despite year-round precipitation and misty conditions on the high plateaus. The soil in the Sierra basins is porous and loose because of its volcanic origin. The Sierra contains four major active volcanoes,

including Cotopaxi, the highest active volcano in the world at 5,943 m. The headwaters of the major rivers of the Costa and Oriente are located in the Sierra.

The eastern region, or Oriente, is defined on the west by the Cordillera Oriental which reaches a height of 3,960 m. Mountain passes along the range provide access to numerous plateaus and small valleys at 600 to 1,500 m elevations and finally, to gently rolling hills and alluvial valleys which provide the transition to the flatter Amazon area below 300 m. The Oriente is mostly virgin jungle and contains many rivers and streams which eventually join the Amazon River in a disputed territory now controlled by Peru.

The Galapagos Islands consist of 14 main islands containing some of the most active volcanoes in the world. There are fifteen large volcanoes of which seven have erupted in recorded time.

2.2 Floods

Flooding occurs annually along populated and agricultural areas of the Costa. The severity and geographical scope of the floods depend on the relative positions of the cold, highly saline Humboldt current, and the warm equatorial current (Warm Intertropical Convergence Zone-ITCZ). During the rainy season from December through April, the ITCZ displaces the Humboldt current from its stationary position north of the equator. The resulting movement of warm tropical water along the coast brings in vast convective air movements which produce rainfall. Occasionally the tropical air mass shifts farther south causing intense and persistent rainfall throughout the Costa including normally arid areas (i.e. southern El Oro province, the Santa Elena peninsula in western Guayas province, and parts of Manabi province). This phenomenon, known as El Nino, has been observed in 1917, 1925, 1932, 1939, 1955, 1966, 1972, and 1982-83. During the most recent episode, the rainy season began two months early in October. In some areas of the Costa daily precipitation approximated 25-30% of the total average annual precipitation.

During a normal rainy season, rivers in El Oro, Guayas, and Los Rios provinces overflow their banks. This includes the Jubones River which flows past the provincial capital of Machala (El Oro) and the Guayas River and its tributaries: the Vinces, Babahoyo, and Daule rivers in Los Rios and Guayas provinces. In the Sierra where the rainy season usually begins two months earlier than in the Costa, floods are less common. Despite rainy and misty conditions year-round, most mountain basins remain dry. However, the saturation of soils along steep slopes and stream channels increases land and mudslide potential. In contrast, river banks throughout the Oriente's extensive fluvial network are frequently inundated, but the threat to lives and property is minimal because of sparse population and little infrastructure development.

The severity of flood damage in Ecuador is closely tied to settlement patterns and the relative development of public services. Both rural and urban communities throughout the Costa are located along flood-prone river banks. Although stilt supports protect cane houses from rising flood waters, an intense and long rainy season can produce widespread damage. In addition to structural damage, standing water exacerbates already poor sanitary and health conditions. Little attempt has been made to mitigate health dangers associated with water stagnation and, as a result, the risk of dermatological diseases and gastrointestinal ailments is high.

Annual flooding in Babahoyo, the capital of Los Rios Province, exemplifies the relationship between inadequate public services and the adverse consequences of flooding. Each year the Babahoyo River overflows and inundates Babahoyo's north bank which consists of cane houses supported by stilts. During the 1982-83 floods, the business district in the south bank was also flooded. Flood water contaminated the already poor water supply and infiltrated the town's sewerage network, resulting in a discharge of raw sewage from the town's culverts. The USG provided assistance to rehabilitate Babahoyo's water system and also loaned two water purification units to provide potable water until the flood waters receded. These measures would probably not have been necessary had the town's sewerage and water systems been properly designed and maintained. Unlike most communities in Ecuador, Babahoyo does have water and sewerage systems; however, the town's experience reflects the deficiencies in public services found throughout the Costa.

The road network in Ecuador is highly vulnerable to flood damage owing to improper grading and poor drainage design. Many unpaved feeder roads in the Costa and the Oriente are impassable during the rainy season (canoes are commonly used for personal and commercial transport). This results in increased transportation costs and commodity shortages. Roads previously subject to flood damage include the 14 km segment east of Guayaquil which provides access to the Machala highway in El Oro Province, Milagro to the east, and other important agrocenters in Babahoyo, Vinces, and Ventanas to the north. Additionally, the only road northwest of Guayaquil to Manta and Portoviejo (Manabi) is frequently closed for repairs during the winter. Practically all the aforementioned roads, including primary and secondary streets in Guayaquil, were affected during the 1982-83 floods.

Bridges are also subject to flood damage during the rainy season because of poor design and maintenance. Abutments and pier supports are often improperly placed and subject to failure when river currents wash away the supporting soil. Following the 1982-83 floods, the Ecuadorean Government installed seven Bailey bridges between Guayaquil and Machala. These one lane bridges are expensive and generally unsuitable for heavy use. Moreover, many of the bridges were placed over precarious supports. Bridge repairs are often delayed because of poor coordination and duplicative efforts among municipalities, provinces, and the Ministry of Public Works.

Flood damage to agriculture is significant not only because of the effect on subsistence farmers, but also due to the impact on agroindustries. Agroindustries affected by flooding include sugar refineries, rice, coffee, and cotton processing industries, and soft drink bottling facilities. Excessive rainfall can prevent the harvest of primary crops as well as the planting of secondary crops. However, cultivation of short-term crops has been encouraged by the government when arid areas such as the Santa Elena peninsula become temporarily fertile.

Floodwaters have different effects on specific crops. Rice is probably the most resistant crop, and typically benefits from heavy rainfall, although canals and terraces are often damaged. Soya crop losses have been extensive and compounded by delays in winter crop planting. The quantity and quality of banana production is affected by excessive rainfall, although some of the damaged crop can be processed for other uses. Sugarcane which is very sensitive to flooding has been subject to extensive losses. Corn is generally unaffected because it is usually planted at higher elevations. The marketability of all crops is impeded by interruptions in transport services.

Livestock and fisheries are also affected by excessive rainfall. Floods increase livestock fatalities because of the loss of pasture land and the reduction of feed supplies. Shrimp farms along the entire coast, particularly El Oro and Guayas provinces, are subject to salinity and temperature changes following sea water intrusion.

See also section 1.18, Agriculture, and Appendix B, Crop Dates.

2.3 Seismicity

Ecuador is located along the circum-Pacific earthquake belt. The northwestern coast, the Gulf of Guayaquil, and most of the Interandean plateau are prime seismic areas.

Earthquakes occurring along the northwest coast usually have epicenters in the Pacific Ocean. These earthquakes threaten the port and refinery facilities at Esmeraldas as well as other coastal settlements. A serious earthquake in 1945 destroyed nearly all of Esmeraldas' newly built brick structures; during the reconstruction period, most residents reverted to traditional housing materials such as bamboo and wood. These structures proved to be sturdier during a comparable earthquake in 1958.

Although the central and southern coast of Ecuador is less seismically active, the Gulf of Guayaquil is considered to be highly vulnerable. A severe earthquake could damage the only bridge across the Guayas River which links Guayaquil to Duran and major roads connecting important

agricultural areas in the Guayas basin and El Oro Province. Fortunately, coastal shipping is not entirely dependent on the port of Guayaquil, so other coastal ports could be relied upon in the event of serious damage to Guayaquil's facilities.

The Inter-Andean Plateau is also a highly seismic area; nearly every Andean community has been damaged to some extent by seismic activity. The most vulnerable areas include Riobamba, Quito, Ibarra, Tulcan, Loja, Latacunga, and Cuenca. Outside Quito, the most critical fault area is located at Ichimbra Guapulo.

The vulnerability of roads to earthquakes varies throughout the Sierra. The primary transport route between Guayaquil and Quito is threatened by the vulnerability of a segment running west of Guayaquil to Santo Domingo de los Colorados. Although the major bridges and overpasses of the Pan American Highway are seismic-resistant, earthquake-triggered landslides could interrupt traffic.

Sierra houses tend to be subject to greater earthquake damage than Costa residences. Most low-income housing in the Costa consists of cane with zinc or thatched roofing, although more vulnerable cinder block and brick structures can be found in urban areas. In contrast, most traditional low-income housing in the Sierra is composed of non-reinforced adobe which is highly vulnerable to earthquake damage.

Most urban housing projects in both the Costa and the Sierra now incorporate seismic-resistant factors. However, because of inadequate enforcement of the code, compliance seems limited to private residences in high income areas. In Quito, low income homes have been built along mountain slopes which are subject to both earthquake and landslide damage. (For a more detailed discussion of housing materials, see section 3.12, Housing and Public Services.)

In the Oriente seismicity diminishes in an easterly direction as geologic folds become less abrupt. A large fault, however, is located in the Pastaza Valley west of the Topo River. Several other faults are found near the Napo and Topo rivers.

2.4 Volcanic Activity

Active volcanoes are situated in the Sierra (see Figure 1) and the Galapagos Islands. The greatest threat in the Sierra is posed by explosions of rock fragments (pyroclastic flows) and ash. Pyroclastic flows have triggered avalanches and floods downstream which have occasionally reached agricultural areas of the Costa. Although ash usually spreads westward away from populated basin areas, Quito has been repeatedly subject to ash cover from Guagua Pichincha volcano, located west of the city.

Cotopaxi volcano in Cotopaxi Province is the world's most active volcano. Its eruption can provoke dangerous mud flows in populated areas to the west. El Sangay volcano, 50 km southeast of Riobamba in Morona-Santiago Province is continuously active. Because of its remote location, it does not pose a serious threat, although ash has fallen over Riobamba, Guamote, and Palmira. El Reventador volcano, 90 km northeast of Quito in Napo Province has erupted numerous times during the last two decades causing ash fall over Quito and other populated areas of the Sierra. Tungurahua volcano, 35 km southeast of Ambato in Tungurahua Province poses considerable danger to settlements along the northern and western flanks of the volcano. An eruption could cause vast ash falls in the western portion of the province and flooding along the Pastaza River. The Galapagos Islands contain 14 volcanoes, seven of which have erupted in historical times.

Very few efforts have been made to identify the volcanic risks to populated areas and agriculture in Ecuador. However, an American professor at Escuela Politecnica Nacional, is presently conducting a comprehensive vulnerability study of Ecuador's volcanoes.

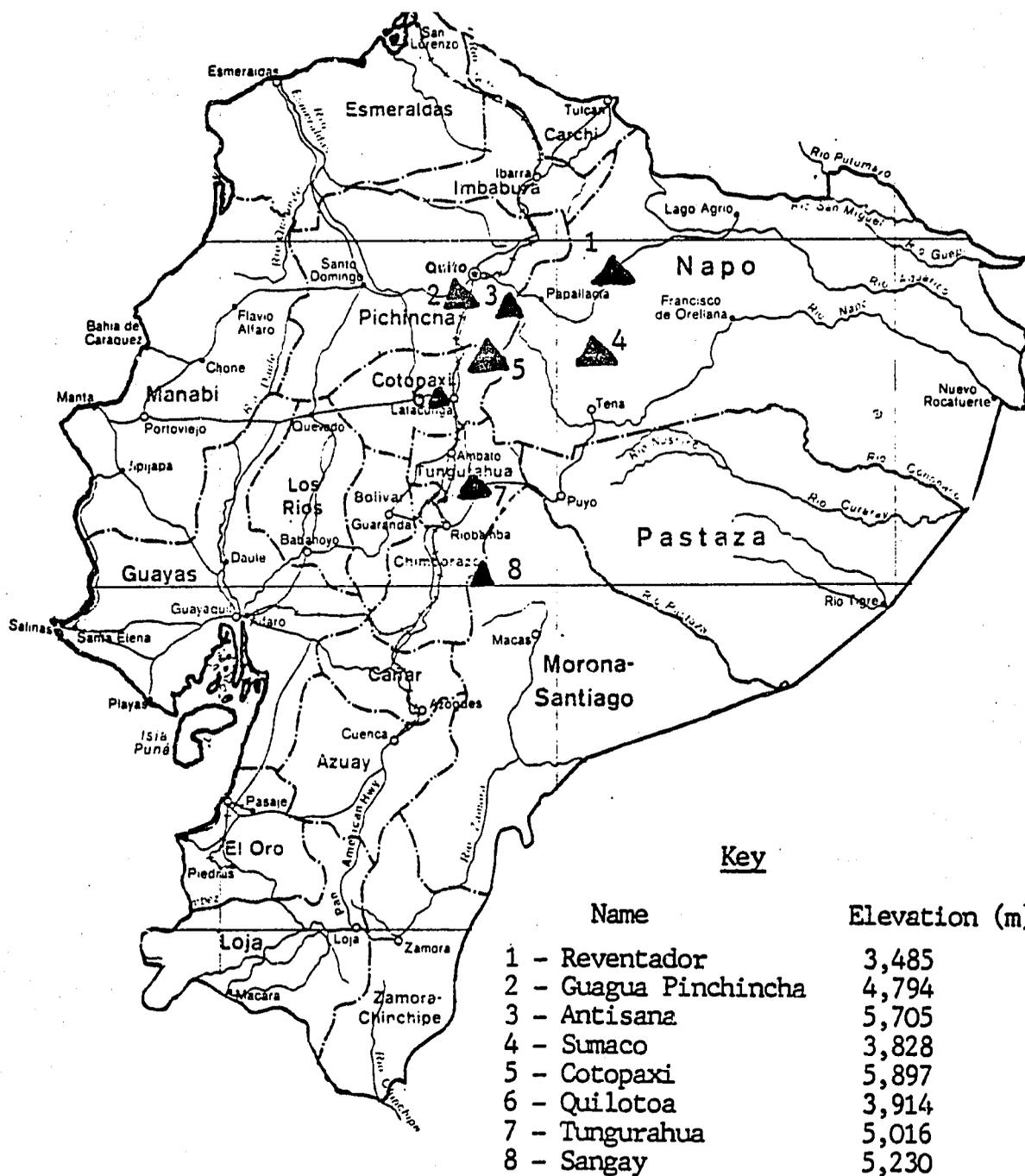
2.5 Landslides

Earthquake and flood activity in Ecuador expose the country's infrastructure and population to significant landslide risk. The incidence of landslides is heightened by continuing deforestation throughout the country and occasional volcanic eruptions. Every rainy season, slides along most flanks of the Andes cause numerous fatalities and road damage. The area between Santo Domingo de los Colorados in western Pichincha and Chone, including a segment of the primary surface route between Quito and Guayaquil, is especially vulnerable to slides. Rock and mudslides triggered by excessive rainfall during the 1982-83 winter impeded road traffic and contributed to a rise in transportation costs. Landslides were also a major factor in shutting down most of the dilapidated national railroad. Railroad maintenance costs are substantial because of the high frequency of landslides along the railroad's ascent from the Costa to the Inter-Andean Plateau.

Ecuador's capital is particularly vulnerable to landslides. The entire northern half of the city is threatened by landslides originating from Pichincha volcano northwest of Quito. Many government offices are located in northern areas of the city and could suffer serious damage in the event of a major landslide. In addition, low income families have built adobe structures along numerous high risk hillsides around Quito.

Figure 1

Active Volcanoes of Ecuador



2.6 Deforestation

Although one half of Ecuador is still forest, deforestation and its negative agricultural and demographic implications affect all three regions of the country. The most serious deforestation in Ecuador is occurring in the Oriente where settlements have been established along access roads to the petroleum fields. In the Oriente and the Costa, government policy has exacerbated deforestation by promoting the colonization of virgin lands and encouraging the clearing of lands for "productive use". If the current pace of deforestation continues, Esmeraldas province will be denuded within 20 years. Parts of the Sierra have been historically bare because of the arid climate, the loose porous volcanic soil, and the lack of soil conservation measures since the colonial period. Nonetheless, human activities at higher elevations are steadily eliminating the remaining vegetation. Improper farming practices and the clearing of forests for firewood and charcoal production are causing serious soil erosion. The areas most acutely affected are Chimborazo, Cotopaxi, and Loja provinces in the Sierra; the extreme western areas of Manabi and Esmeraldas in the Costa, and the Cordillera Oriental.

Soil erosion has become a contributing factor to downstream flooding due to sedimentation of rivers and silting of narrow flood plains in Interandean valleys. Deforestation also triggers landslide activity by reducing soil cohesion and moisture retention and is a major factor in the desertification process. Presently about 5,000 hectares a year are being transformed into desert.

While reforestation projects have been initiated in the Oriente and Costa, many schemes are ill-conceived and incomplete due to a limited understanding of the forests' complex vegetation. Some projects have resulted in the reforestation of the lower portions of steep hillsides but have left the critical higher areas bare. As a result, the landslide potential which the project was designed to minimize remains unchanged. Eucalyptus and pine are the most common species used for reforestation, primarily because of their rapid maturation. Mountain slopes surrounding Quito have been extensively reforested with eucalyptus. See also section 3.19, Mitigation Efforts.

2.7 Drought

In the Sierra, localized droughts recur on a multi-year cyclical basis and usually affect grains, tubers and other subsistence crops. (See section on floods for a more detailed list of Sierra crops.) Poor cropping methods and limited irrigation works aggravate drought potential. In addition, the Santa Elena peninsula west of Guayaquil and some areas of Manabi Province are perennially arid except when an anomalous rainy season renders these locations fertile.

2.8 Disaster History

<u>Date</u>	<u>Disaster Type</u>	<u>Location</u>	<u>Number Killed</u>	<u>Number Affected</u>	<u>Damage (\$ mil)</u>
42/00/00	Earthquake	Western Ecuador	200		
49/08/05	Earthquake	Pelileo	6,000	100,000	20,000
64/00/00	Drought	Widespread	n.a.	600,000	n.a.
66/05/00	Landslide	Quito-Santo Domingo	50	500	n.a.
65/04/00	Flood	Daule River Valley	n.a.	50,000	4,000
67/02/08	Flood	Milagro (Guayas Prov.)	n.a.	20,000	100
66/10/14	Fire	Colimes (Guayas Prov.)		800	134
67/08/00	Epidemic	Guayaquil area	36	528	n.a.
69/05/00	Epidemic	Playas area	400	40,000	n.a.
70/04/08	Flood	Guayas, Esmeraldas, Manabi provinces	20	140,000	500
70/12/09	Earthquake	Loja Province	29	60,000	4,000
70/11/00	Flood	Imbabura Province	0	100	20
71/03/00	Flood	Guayas Province	0	10,000	n.a.
71/03/09	Landslide	Quito	20	6	n.a.
71/03/00	Flood	Guayas Province	0	n.a.	10,000
71/07/00	Flood	N.E. Putumayo River	0	2,400	50
75/07/08	Volcanic Eruption	El Sangay	0	n.a.	n.a.
76/04/09	Earthquake	Esmeraldas Province	10	n.a.	4,000
76/02/11	Landslide	Esmeraldas Province	60	n.a.	n.a.
76/10/04	Earthquake	Cotopaxi Province	0	20,000	n.a.
76/12.00	Volcanic Eruption	Cotopaxi	1	20,000	n.a.
77/01/00	Epidemic	W. Portions of Quito	0	300	n.a.
80/08/18	Earthquake	Guayaquil	6	n.a.	n.a.
82/12/30	Floods	Guayas, Los Rios	30	n.a.	n.a.
		El Oro, Esmeraldas, Manabi provinces	n.a.	n.a.	n.a.
83/07/11	Airplane Crash	Cuenca (Azuay Prov.)	119	n.a.	n.a.

Source: OFDA Disaster History on file at the Office of U.S. Foreign Disaster Assistance in Washington, D.C. Covers 1900 to the present.

3. Disaster Preparedness and Assistance3.1 Host Country Disaster Organization

Although several organizations participate in disaster relief activities, it is the Ecuadorean Civil Defense that has primary responsibility for coordinating the country's disaster preparedness and relief operations. Civil Defense is organized at both the national and provincial levels. At the national level, the Direccion Nacional de Defensa Civil establishes policy guidelines for the provincial civil defense juntas. However, ultimate authority in Civil Defense matters rests with the National Security Council. The provincial juntas are composed of religious and political leaders, and are headed by the governor, (except in Pichincha Province, where the junta head is the Subsecretary of Government). The Civil Defense budget is primarily administrative, although a contingency fund can be tapped during an emergency. In April 1983, President Hurtado Larrea proposed to establish a permanent disaster fund as part of a national emergency plan for disasters.

Civil Defense delegates responsibility and, in some cases, overall coordination to other national, municipal, and private entities. Participants in disaster operations have included the Armed Forces, the Social Security Institute (IESS), and ministries of Public Health, Education, Social Welfare, Public Works, and Defense, the National Police, firemen, the Red Cross, Catholic Relief Services, and other voluntary organizations. In terms of direct relief assistance, the Direccion Nacional frequently assigns relief responsibility for specific geographical areas to public and private organizations active in these areas. In such instances, the local executing agency handles resource mobilization and disaster victim identification.

Unfortunately, Civil Defense and other government agencies have been less than effective in preparing for and responding to disasters. Because hazard identification and vulnerability analyses have been scant and uncoordinated, GOE officials have little understanding of the country's mitigation and preparedness needs. Until recently, landslide hazards and their demographic implications were virtually ignored, as were the risks associated with the development of flood-prone areas.

Another factor affecting disaster management is the paucity of data on human and material resources. Regional agricultural production data, stockpile inventories, and the identification of shelter areas have been inadequate. Although government ministries are responsible for gathering data in their sectors both during and after disasters, neither Civil Defense nor most government agencies maintain current data on resources available for disaster operations. The Ministry of Agriculture relies on the local press for assessments of crop damage, although it is authorized

to carry out this function. During the 1982-83 flood disaster, the lack of records on the design of public works impeded the rehabilitation of roads and bridges in the Costa.

An additional constraint to Civil Defense coordination has been the lack of support and recognition it receives internally and from other government entities. Compliance to legal responsibilities and disaster plans has been haphazard, as political considerations are often an overriding concern to both government organizations and the provincial civil defense. Moreover, because many government entities share responsibilities, Civil Defense must often secure their consent before selecting one to undertake a disaster operation. If questions of jurisdiction are not resolved initially, approval may not be granted and relief projects may be postponed beyond the point where their implementation will be effective. As a result, often the only means of successfully completing a disaster project is to circumvent Civil Defense authority. A project by the Army Corps of Engineers during the 1982-83 flood disaster illustrates this approach. The Army Corps assumed a leading role in digging drainage canals in El Guasmo, a low lying and densely populated area south of Guayaquil. Civil Defense has been tolerant of autonomous efforts of this nature as they have alleviated some of the organization's responsibility to undertake rehabilitation measures.

Civil Defense may also delegate responsibility and create coordinating bodies on an ad hoc basis. In the health sector, the Ministry of Public Health has established the National Emergency Health Committee to coordinate the provision of health services and encourage collaboration among the various organizations capable of providing health care during a disaster. The Committee has promulgated a plan (Plan Nacional de Sector Salud) which delineates responsibilities among these organizations (see Appendix E). Moreover, the Planning and Human Resources Division of the Ministry is in the process of gathering comprehensive data on health facilities and personnel in the private sector, Armed Forces, IESS, as well as the Ministry. During the initial stages of the 1982-1983 flood disaster, Civil Defense convened an inter-ministerial committee to help coordinate efforts among government ministries involved in disaster operations. An Emergency Operations Center was subsequently established in Guayaquil to supervise the logistics of relief assistance in the Costa. In addition, Civil Defense established a special flood commission to coordinate the efforts of non-governmental organizations, and a committee to assess infrastructure damage and reconstruction issues. While these are positive steps in Ecuador's disaster management, they represent a fragmentation of responsibility and perhaps institutional overkill.

3.2 Disaster Planning

Until the 1982-83 floods, disaster preparedness was limited to promotional curricula in public schools and occasional earthquake simulations in some private schools. There is no systematic training of Civil Defense personnel. Although numerous disaster plans have been written, most are non-operational. The most important documents are the National Security Law and the National Civil Defense Plan. Both identify Civil Defense objectives as reducing the risks and effects of disasters, providing disaster assistance, and developing civil defense plans at the provincial level. Nearly every Provincial Civil Defense Junta has formulated disaster plans which usually emphasize the most damaging or recurring local hazard. These plans also identify the roles of policemen, firemen, voluntary agencies, and local representatives of government ministries. Also included are guidelines for each phase of a disaster operation. Detailed inventories of disaster risks and resources are nearly non-existent. The identification of disaster risks, in terms of threats to populated areas, agriculture, and infrastructure, is very limited. One exception is the Ministry of Public Works which has categorized road and highway vulnerability to seismic events. (See also section 3.8 Roads and Motor Vehicles.)

3.3 Ecuadorean Red Cross

The Ecuadorean Red Cross (Cruz Roja Ecuatoriana - CRE) undertakes both direct relief operations and preparedness measures in connection with disasters. CRE is organized in each province under the direction of the Provincial Red Cross Junta. In case of a major disaster affecting several provinces, CRE headquarters will select one provincial office to assume all financial and supervisory responsibility. During the 1983 floods, the Guayas Red Cross, under the direction of a League of Red Cross Societies delegate, conducted relief operations in all the affected provinces. (See Exhibit A, p. 30.)

CRE involvement during a disaster is theoretically regulated by Civil Defense. In practice, however, CRE often operates autonomously, particularly in regard to establishing the criteria for identifying disaster victims and, organizing the logistics of providing relief.

CRE preparedness activities include first aid courses, rescue and evacuation training, and sponsorship of seminars on disaster related topics. These activities are conducted year-round, often jointly with the IESS and the Armed Forces. The CRE maintains permanent stockpiles of food and clothing at numerous provincial locations. In addition, nearly every provincial CRE office operates at least one blood bank. Because the CRE corps is entirely volunteer, it is difficult to quantify human resources at its disposal, as these would differ by location and specific disaster situation.

CRE is not involved in any preventive health education as this is the domain of three agencies within the Ministry of Public Health.

Cruz Roja Ecuatoriana
Avenida Colombia y Elizal
Quito
Tel: 214-966

3.4 Warning Systems

The Geology Department of the Escuela Politecnica Nacional in Quito operates a seismographic network in the Sierra. Three stations are located along the flanks of Guagua Pichincha volcano outside Quito. Seismic activity is also monitored from the Astronomical Observatory in Quito. In addition, geophysicists associated with Civil Defense regularly monitor Pichincha volcano. Until recently, however, the serious landslide potential posed by the volcano has been given little serious attention. (See also section 2.5, Landslides.)

Ecuador participates in the Pacific Tsunami Warning System. Data is collected at a tide gauge station located on the Galapagos island of Baltra. In the event of an off-shore earthquake with a potential tsunami generation, the Instituto Oceanografico de la Armada (IOA) would receive a warning message via the U.S. NASA Communications Station on Cotopaxi Volcano from the U.S. Goddard Space Flight Center. IOA would then communicate news of the tsunami to the public.

Weather data is collected and disseminated by the IOA located in Guayaquil. The Instituto Nacional de Meteorologia y Hydrologia tracks convective storms by means of a satellite receiving station provided by the United States through the World Meteorological Organisation. During the 1982-83 flood disaster, the U.S. National Weather Service provided daily meteorological forecasts of the Costa. These reports proved indispensable to USG staff involved in the flood relief efforts.

Instituto Oceanografico de la Armada
Casilla 5940
Guayaquil

3.5 Food Resources

Stagnant agricultural production since 1980 has led to regular imports of wheat, milk, edible oils, and sugar. Other food imports (average volume) include: barley (30,442 MT), corn (7,500 MT), oats (16,071 MT), rice (24,250 MT), and soybeans (206,000 MT).

Exhibit A - Sample control card used by the Ecuadorean Red Cross to ensure equitable relief assistance during the 1982-83 flood disaster.

30

	1	2	3	4	5	6	7	8
31	NR.....							9
30	CRUZ ROJA DEL GUAYAS							10
29	(Red Cross of Guayas)							11
28	CANTON							12
	(Canton)							
27	CASA NR.....							13
	(House Number)							
26							14
	(Authorized Signature)							
25	FIRMA AUTORIZADA							15
	SELLO (Seal)							
24	23	22	21	20	19	18	17	16

CRUZ ROJA DEL GUAYAS

(Red Cross of Guayas Province)



	ALIMENTO
--	----------

(Food)

	ROPA
--	------

(Clothing)

	TECHO
--	-------

(Shelter)

	MANTA
--	-------

(Blanket)

JEFE DE FAMILIA.....

(Head of Family)

CEDULA.....

(Identification No.)

ESPOSA.....

(Spouse)

CEDULA.....

(Spouse's Identification No.)

(Children)	(Pregnancy)	(Infants 0-4)	(Girls 4-14)	(Boys 4-14)	(Girls 15+)	(Boys 15+)
HIJOS	EMBARAZO	INFANTES	NIÑAS	NIÑOS	SRTAS.	JOVEN
	(0-9 MESES)	(0-4 AÑOS)	(4-14 AÑOS)	(4-14 AÑOS)	(15 AÑOS-)	(15 AÑOS-)

NR.....

NR.....



CRUZ ROJA DEL GUAYAS
(Red Cross of Guayas)

JEFE DE FAMILIA.....
(Head of Family)

CED.....
(Identification No.)

ESPOSA.....
(Spouse)

CED.....
(Spouse's Identification No.)

NOTA: NO PIERDA ESTA TARJETA
(Note: Do not loose this card)

Food stockpiles are maintained by a variety of public and private organizations. See Appendix D for data on the location and capacities of storage facilities.

Localized food shortages can result from landslides, earthquakes, and floods which damage the transportation network and thereby impede delivery of food reserves from other parts of the country. As a result, rice, sugar, wheat, milk, and other food products have been donated during emergencies.

During the 1982-83 floods, the Guayas chapter of the Red Cross distributed food to needy families throughout the Costa. Distribution was facilitated by having the families pick up food packets at central points in several rural towns. Each packet consisted of the following: sugar, soup, rice, sardines, salt, sausages, noodles, coffee, and vegetable fat. Milk powder is generally not acceptable. (See also section 2.2, Floods.)

3.6 Diet

The main staple in the Sierra is maize complemented by barley, oats, wheat, and rye. Frozen potatoes are an important local staple in the High Andean Plateau. In the Costa, rice and wheat bread are the staples. A variety of pulses are consumed on a daily basis throughout Ecuador: dry black and red kidney beans, chick peas, lentils, and lupins. Tubers include cassava, yam, sweet potatoes, and plantains. Seasonal vegetables include tomatoes, onions, cabbages, carrots, and pumpkins. Beef, considered a prestige item, is the most regularly consumed meat item. In the Sierra some fowl, sheep, pork, guinea pigs, and rabbits are consumed, while fish is consumed along the coast. Chillies and garlic are the most important condiments and spices.

3.7 Health Resources

Emergency health care is provided by the Ministry of Public Health (MSP), Social Security Institute (IESS), the Armed Forces, and various private organizations including the Red Cross. It is difficult to assess the availability of health resources for emergency situations because information is usually not shared among these organizations. Nonetheless, some observations can be made. Health personnel are concentrated in large cities, although all medical interns are required to serve in rural areas prior to certification. An overall surplus of physicians prevails, yet there is a serious shortage of nurses. Doctors affiliated with the MSP represent 10% of the national total. The IESS and the Armed

Forces employ a substantial number of doctors and nurses; however, information on their function and location is rarely released to the MSP Planning Division which is responsible for assessing health needs of the nation. The following chart indicates the regional distribution of MSP medical personnel.

MSP Medical Personnel by Province, 1983

	<u>Physicians</u>	<u>Nurses</u>	<u>Dentists</u>	<u>Obstetricians</u>
Carchi	12	5	6	3
Imbabura	21	7	12	4
Pinchincha	247	41	192	28
Cotopaxi	23	7	10	6
Tungurahua	35	6	41	6
Bolivar	17	5	8	2
Chimborazo	27	9	16	5
Canar	38	6	28	4
Azuay	79	14	50	3
Loja	51	13	58	2
Esmeraldas	34	6	17	2
Manabi	73	19	28	6
Los Rios	31	8	14	9
Guayas	251	51	110	32
El Oro	60	9	20	5
Napo	5	3	3	1
Pastaza	5	1	2	2
Morona-Santiago	2	3	2	1
Zamora- Chinchi	8	3	5	2
Galapagos	2	3	3	0
MSP Central Plant	63	27	13	1
TOTAL	1,083	246	638	124

Source: Ministerio de Salud Publica, Division de Planificacion de Recursos Humanos.

Total Health Personnel, 1983

Physicians	10,258
Dentists	3,084
Nurses	2,668
Obstetricians	590
Nurses' Assistants	10,880

Source: Consejo Nacional de Desarrollo (CONADE).

Armed Forces health personnel are concentrated almost entirely in cities, while IESS personnel are dispersed throughout the provinces. A limited number of physicians are affiliated with the Red Cross and other voluntary agencies in each province. (See also section 1.16, Health.)

Neither rural nor urban medical institutions would be able to respond adequately to a disaster involving mass casualties. In rural areas, health centers lack modern medical equipment and provide only outpatient services. Although the major hospitals in Quito and Guayaquil have emergency room facilities, much of the equipment is poorly maintained and obsolete. These hospitals usually operate at maximum capacity during non-emergency periods. Moreover, they have virtually no contingency plans and their staff has little, if any, training for mass casualty situations.

Below are descriptions of selected hospitals:

Quito Hospital has a 24-hour emergency room staffed by 2 residents, 2 interns, and 4 traumatologists. The hospital has basic CPR equipment and a 2-bed intensive care unit. In addition, 50 medical-surgical beds are available.

Vozandes Hospital (Quito) is a 40-bed general hospital with X-ray facilities, a small emergency room, a non-automated lab, and a small intensive care unit. Because the hospital has a high occupancy rate and no ambulance, it would be unable to handle mass casualties in a major disaster.

The IESS - Social Security Hospital (Quito) is a 700-bed medical surgical teaching facility with a well-equipped 10-bed intensive care unit. The occupancy rate remains at nearly 100 percent year-round.

Eugenio Espejo Hospital (Quito) is a 300-bed general hospital. The facility is divided into specialty pavillions with 25-bed open wards; there is also a 12-bed burn unit. The hospital has 2 ambulances but cannot handle trauma cases or cardiac emergencies. Medical equipment is outdated.

Hospital Militar (Quito) is probably the best facility in Quito. It is staffed by approximately 130 physicians. Both the intensive care unit and emergency room are well equipped and maintained.

The Shell Hospital in the Oriente is staffed by 3 resident physicians, 2 nurses, an anesthesiologist, a traumatologist, and an ortho-surgeon. There are now 26 beds, but 20-25 beds are being added. A 24-hour emergency service, including air ambulance is available. The hospital has a 3.6 mhz radio system for ham radio frequency contact with nurses in Colt and Guarand, Ilapi. The facilities and equipment at the Shell hospital are not representative of emergency health services available in the Oriente.

See also Appendix F-H for additional data on health care institutions.

Emergency Phone Numbers in Quito:

Major Hospitals:

Maternidad Isidoro Ayora	231-502/03
Carlos Andrade Marin	526-144
Policlinica de la Policia	210-052
Baca Ortiz	231-998
Gonzalo Gonzales	231-184
Pablo Arturo Suarez	530-101
Centro Medico Pinchincha Calle Veintimilla 1067 y 9 de octubre Tel: 238-810/11/12	Quito Hospital Villalengua 278 Tel: 241-540
Clinica Pasteur Avenida Eloy Alfaro 552 Tel: 546-644/546-519	IESS Hospital Portoviejo y Ayacucho Tel:
Hospital Vozandes Villalengua 267 Tel: 241-540	Eugenio Espejo Avenida Colombia y Pazmino Tel: 230-210
Hospital Militar Queseras del Medio y Avenida Colombia Tel: 529-355	
Red Cross Ambulance Firemen	214-977 102 or 231-122

Emergency Phone Numbers in Guayaquil:

Major hospitals:

Luis Vernaza	300-300
Maternidad Enrique Sotomayor	511-310
Del Suburbio	461-987
Guayaquil	463-484
Social Security Institute (IESS)	430-516
Militar Territorial No. 2	392-883
Alfredo Valenzuela	300-216
De Aislamiento	392-231
Dermatologico	392-274
SOLCA	391-900

Children's Hospitals:

Alejandro Mann	524-541
Leon Becerra	342-313
Del Niño	404-170
Red Cross Ambulance	301-624 or 300-674
Fire station	526-666

Ambulance services nationwide are very limited and unreliable. While each province has at least one ambulance at the local MSP office or at the major hospital, most remote areas are not accessible by motor vehicle. New major hospitals are all being constructed with adjacent heliports, but there are relatively few helicopters available for emergency use. In Quito, the typical ambulance is a Ford Econoline van, or similar vehicle with no life resuscitation or other medical equipment aboard. Extensive delays are common when requesting an ambulance, particularly on weekends. See Appendix I for a listing of ambulances and other vehicles available for transporting injured persons.

3.8 Roads and Motor Vehicles

Ecuador's road network is oriented to facilitating the movement of import/export commodities and serving the Quito-Guayaquil corridor. The busiest route from Quito to Guayaquil descends from the cordillera to the west through Santo Domingo de los Colorados, then south to Quevedo and Daule, and finally into Guayaquil. During dry weather the trip takes from 8 to 11 hours. Alternate paved roads of poorer condition cross westward from the Sierra at several points. The country's best road is the Pan American Highway (1,392 km long) which provides the only north-south link to Peru and Colombia through the Interandean Plateau. From Otavalo to Quito and further south to Ambato, the asphalt-paved highway has limited access from feeder roads. North of Quito, the highway passes through several tunnels. Other highland roads are generally winding with few guard railings. During the rainy season frequent rock and mudslides impede traffic.

Almost all areas of the Costa, except northern Esmeraldas Province, are accessible by road during the dry season. Dirt roads (50% of the total) are impassable during the winter, approximately December to April. Paved roads throughout the Costa are subject to shoulder damage and pothole formation which impede traffic considerably. The road system in Guayaquil provides speedy access to the airport and seaports; however, many secondary roads are inadequately paved. Low income areas of Guayaquil such as El Guasmo, a high density settlement of 300,000 inhabitants, lack any paved roads.

Rafael Mendoza Aviles bridge, 3.2 km long, across the Guayas River is Guayaquil's life line, linking the city to the Duran train station and two of the three major Costa roads. A 25 km segment east of Duran meets two important Costa roads: one, leading south to El Oro Province and another proceeding north to Los Rios Province. The route south to Machala includes seven one lane Bailey bridges which inadequately serve the road's traffic volume. Many bridges elsewhere in the Costa are inadequately supported. Cuenca, Ecuador's third largest city, can be reached by continuing east along the road from Duran into the Sierra Province of Azuay. To the north, Portoviejo, the capital of Manabi Province, and the important fishing port of Manta can also be reached by paved road from Guayaquil. Another road runs west of Guayaquil across the Santa Elena peninsula to the coastal resort of Salinas and northward to the port of La Libertad.

Surface transport is least developed in the Oriente where most roads have been built to reach petroleum fields. With the exception of a few 10-20 km segments outside provincial capitals, all Oriente roads are impassable during the rainy season. Large portions of the mostly uninhabited provinces of Napo, Pastaza, and Morona-Santiago lack any roads at all.

The Research Division of the Ministry of Public Works and Communications publishes an inventory of road characteristics in Ecuador (Inventario Vial del Pais) which includes data on road paving, width, curvature, and distances.

Ministerio de Obras Publicas y Comunicaciones
Direccion de Estudios
Departamento de Estudios de Factibilidad Tecnica - Economica
Avenida 16 de Diciembre y Wilson, Edificio Lasso
Quito

Private bus companies serve rural and urban areas throughout Ecuador. However, public transport in low-income urban areas is often deficient. Motor vehicle proprietors often supplement their income by transporting individual passengers. Pick-up trucks, vans, and jeeps are very popular because of the country's generally poor road conditions. Most other vehicles are small fuel-efficient cars. Although auto bodies are assembled in Ecuador, imports, especially Japanese products, dominate the market.

3.9 Railways

The railroad in Ecuador has gradually lost importance because of its dilapidated condition and lack of bulk cargo for long distance transport. The 1,171 km network serves numerous communities in the Sierra and northern Costa which could not otherwise be reached by motor road. The railway consists of 3 lines: Guayaquil - Quito, Simbambe - Cuenca, and

Quito - San Lorenzo. Guayaquil's station is actually located across the Guayas River in Duran. The Guayaquil - Quito line runs eastward across low lying plains for 87 km to Bucay at the foot of the Andes. Over the next 79 kilometers, the line ascends over 2,900 meters and contains many sharp curves as it passes Simbambe and Palmira at the summit. The line continues northward passing through Riobamba, Ambato, Latacunga, and finally to Quito. The trip from Guayaquil to Quito takes about 12 hours when the line is fully operational. The Quito - San Lorenzo line is 373 km long and crosses Imbabura Province through Otavalo and Ibarra and then turns west at Carchi across northern Esmeraldas to San Lorenzo on the northwest coast. The third line runs 148 km south of Simbambe to Cuenca. There are no connections with either the Colombian or Peruvian railroads. Major repair facilities exist in Altaro and Quito, and smaller shops are located in Bucay, Riobamba, and Simbambe.

Because bridges and tracks at several Sierra locations were damaged by flood-induced landslides, only the following segments of the railway were operating as of Spring 1983: Duran - Bucay, Palmira - Quito, and the line north of Quito to San Lorenzo. Rehabilitation of the railroad is uncertain because of overriding reconstruction priorities following the 1982-83 floods. The railway is owned and operated by Empresa Nacional de Ferrocarriles del Estado, Carrera Bolivar No. 443, Casilla 159, Quito, Tel: 216-180.

Locomotives and Rolling Stock

Diesel electric locomotives	17
Steam locomotives	29
Railcars	39
Passenger cars	35
Flat wagons	78
Container wagons	49
Open wagons	34
Box vans	265
Tank wagons	73

3.10 Ports, Waterways, and Shipping

Foreign and coastal shipping is handled through eight seaports. Guayaquil has two port areas, the old port along the Guayas River and a new facility (Puerto Maritimo) on the Salado estuary, 65 km from the Gulf of Guayaquil and 16 km from Simon Bolivar Airport. Port capacity at the new terminal has been expanded to accommodate five ocean-going vessels along the 914.4 m wharf. New banana, bulk, container, and general cargo facilities are also available. The port has 12 mobile cranes with one heavy lift, and 3 container berths providing a total of 18,800 sq m of

closed storage and 141,800 sq m of open storage. There are also silos, warehouses, and tanks with a total 68,000 ton capacity, but no refrigerated space. Harbor craft at the Puerto Maritimo include 6 tugs ranging from 150 to 800 horsepower and 10 lighters of 150-ton capacity.

At the old port in Guayaquil there are approximately 37 lighters ranging in capacity from 10 to 100 tons and 8 tugs ranging from 16 to 180 horsepower. Several barges and numerous smaller launches and marine craft are available. The ports of Guayaquil are administered by Autoridad Portuaria de Guayaquil, Avendia 25 de Julio, Tel: 430-120, Telex: 04 3444 agpuay ed, Cable: APORTUARIA.

Esmeraldas' port, site of the country's major petroleum exporting terminal, is located 20 km from Tachina Airport. The port has one 6,000 sq m warehouse and one Ro/Ro (Roll-on/Roll-off) pier. A new port is under construction at the mouth of the Esmeraldas river. Esmeraldas' port is administered by Autoridad Portuaria, Casilla 280, Tel: (711) 910, 450; Telex: 02-7586 auspesmed.

Manta is an important fishing port located 35 km west of Portoviejo, the provincial capital of Manabi. The port has an open roadstead with anchorage for large vessels, two warehouses with a total of 6,000 sq m storage, and 2 Ro/Ro ramps. Harbor craft include an ex-US-TYP 32.6 m long vessel, one with 200 horsepower and one small 10.7 m. motor launch for pilotage service. An airport, limited to small Cessna-type aircraft, is located 6 km from the port. The port of Manta is administered by Autoridad Portuaria de Manta, Casilla 4768, Tel: 613-111, Telex: 04-6182 apmant.

Puerto Bolivar, primarily a banana handling facility, is adjacent to Machala, the capital of El Oro Province. The port has 9,728 sq m of closed warehouse space. Machala airport is located 6 km from Puerto Bolivar. The Port is administered by Autoridad Portuaria de Puerto Bolivar, Tel: 778-308.

La Libertad is a secondary port situated just north of Salinas along the Santa Elena peninsula in western Guayas province, 135 km from Guayaquil. The main pier is privately owned by Anglo-Ecuadorean Oilfields Ltd.

San Lorenzo is a minor port near the Colombian border, largely restricted to the handling of lumber exports. A road connects San Lorenzo with the Putumayo River to the east.

Maritime Shipping Lines

There are three state-owned shipping lines and a national merchant fleet of 42 ships (1982). Below is a listing of these companies in addition to privately owned lines.

Compania Maritima Andina - Marand (General cargo service to the U.S.)	Velez 513, Piso 4 Guayaquil 513, Piso 4 Tel: 526-217, 514-956 Telex: 04-3765 marand ed
Ecuanave (Coastal tanker operator)	Junin 415 y General Cordova, Piso 5 Guayaquil Tel: 310-139, 310-140 Telex: 3424 navisa ed Cable: NAVIPAC
Empresa Maritima Transligna, SA (Carrier of chemical products from Ecuador to the U.S.)	Domingo Comin 511 Guayaquil Tel: 432-066, 432-654 Telex: 04-3559 chemic ed
Empresa Turistica Internacional (Passenger and Cargo Services from Guayaquil to the Galapagos aeropuerto Islands)	Los Rios 0-80 Col Bolivariano, diagonal al aeropuerto, Guayaquil Tel: 390-933
Empresa Valmar de Navegacion (General cargo services to Gulf of Mexico ports.)	Domingo Comin y Calle 11 Guayaquil Tel: 431-390, 431-406 Telex: 3385 valmar ed Cable: VALMAR
Flota Bananera Ecuatoriana, SA (owned by GOE and private shareholders, refrigerator cargo services.)	Plaza Icaza 437 Edificio Atahualpa, Piso 9 Guayaquil Tel: 309-333, 309-253 Telex: 3218 flareg ex
Flota Bananera Franco-Ecuatoriana (Purchases and ships bananas to Europe, jointly owned by a Swiss company, Federacion de Bananeros, and the GOE.)	Address not available.
Flota Mercante Grancolombiana (Ecuador is a 10% shareowner of the Colombian national shipping line which connects Colombian and Ecuadorean ports to US Gulf ports, New York, Eastern Canada, Mexico, and Europe.)	Calle Aguirre 104 y Malecon Simon Bolivar Guayaquil Tel: 512-791 Telex: 02-3210 grancoed Cable: GRANCOLOMBIANA

	Calle 18 de Septiembre No. 413 Avenida Amazonas Quito Telex: 2493 granco ed
	1 World Trade Center Suite 1667 New York, NY 10048 Tel. (212) 432-1500 Telex: (INT) 420228/420228
Flota Petrolera Ecuatoriana (FLOPEC) (state owned operator of deepsea and coastal tanker services.)	Avenida Colon y Amazonas Edificio Espana, Piso 4 Quito Tel: 521-236; 546-755 Telex: 02-2211, 02-2761 flopec ed
Galapagos Line, S.A. (General cargo services to Gulf of Mexico ports.)	Fransisco Segura 980, esquina Bogota Guayaquil Tel: 348-933, 309-421 Telex: 04-3631 ed Cable: GALISA
Galapagos Tourist Corporation (Passenger services to the Galapagos Islands.)	Baquerizo Moreno, 1120 Guayaquil Tel: 309-201 Telex: 3428 migor ed Cable: MIGOR
Logistica Maritima, CA - LOGMAR (Coastal tanker operator.)	Sucre 203 y Pinchincha Guayaquil Tel: 514-566, 513-896 Telex: 3591 ed Cable: LOGMAR
Naviera Continental CA - NAVICON (General cargo service to Gulf of Mexico ports.)	10 de Agosto 511 y Chimborazo Guayaquil Tel: 512-082, 526-580 Telex: 04-3518 ed Cable: NAVICON
Naviera del Pacifico CA - NAPACA (Refrigerator cargo servies.)	El Oro 101 y Orilla de Rio Guayaquil Tel: 342-055 Telex: 3531013

Navipac SA
(Coastal tanker operator.)

Primero de Mayo 811-B
Guayaquil
Tel: 392-870, 392-814
Telex: 3424 navisa ed
Cable: NAVISA

Petroecuador Compania Ltda
(Coastal tanker operator.)

9 de Octubre 109
Guayaquil
Tel: 516-452, 528-153
Telex: 3613 petreced
Cable: PETROPOLIS

Transportes Navieros
Ecuatorianos-TRANNAVE
(Controlled by the Navy;
transports general cargo.)

Avenida 9 de Octubre y
Chile
Edificio Citibank
Casilla 4706
Guayaquil
Tel: 308-400, 304-780
Telex: 3249 transnaved
Cable: TRANNAVE

Ocean cargo service is also provided by the following shipping lines: Argentine Lines, Chilean Line (CSAV), Compania Chilena de Navegacion Interoceanica, Canadian Westfal-Larsen Line, Delta Line, Great Lakes Trans-Caribbean Line, Lykes Line, Navicon Line. In addition, small shipping firms in Ecuador operate coastal services to Panama and Peru.

Canoes are an important means of transport in river areas of the Costa, particularly in the winter when many secondary roads are impassable. While practically all major rivers and their affluents in the Costa and the Oriente are navigable, the swift course of Sierra rivers impedes navigation. In river areas, private ownership of canoes is high, though few craft are motorized. Steamers along the Napa and Pastaza rivers of the Oriente reach otherwise inaccessible communities.

3.11 Aviation

Air transport services link isolated communities in all three regions of the country. There are more than 160 airfields in Ecuador, many of which are run by the Armed Forces or privately owned (see Figure 2). The two major international airports are located in Quito and Guayaquil, although customs and immigration facilities also exist at General Rivadeneira Airport in Esmeraldas. The airports at Quito and Guayaquil have comparable facilities and aircraft capacity.

Figure 2'
Airports



QUITO/Mariscal Sucre
Tel: 241-580, 240-299

Quito's Mariscal Sucre Airport is located in the northern section of the city, and can be reached from the business district in about 20 minutes during non-peak hours.

Runway Characteristics

<u>Location Coordinates</u>	<u>Elevation/ Slope</u>	<u>Runway Length/ Width/Surface</u>	<u>Aircraft Length</u>	<u>CL</u>	<u>Fuel/ Octane</u>
0°8'20"S 78°29'6"W A	2814m/0.54	3120m 46 m/asphalt	3120m DC 10-30	A	100 JA1
			4000		

Remarks: alternate aerodromes - BOGOTA/El Dorado, CALI/Palmesca, GUAYAQUIL/Simon Bolivar, LIMA-CALLAO/Jorge Chavez, PANAMA/Omar Torrijos, TALARA/Capitan Montes.

Aids: ILS, PO, RDME, LVA, 35, LR, LTX, LB, LO, MD, MC, MT, MTD, MFD, MTX, MO, H102, L4, 5, 9, Asphalt surface. No telex.

GUAYAQUIL/Simon Bolivar
Tel: 392-100

Simon Bolivar Airport is located three km north of downtown Guayaquil in a high density area adjacent to the Guayas River. A 48,000 sq m bus terminal is being constructed at the north end of the runway.

Runway Characteristics

<u>Location Coordinates</u>	<u>Elevation/ Slope</u>	<u>Runway Length/ Width/Surface</u>	<u>Aircraft Length</u>	<u>CL</u>	<u>Fuel/ Octane</u>
02°09'12"S 79°53'00"W	4m/0.05	2690m/ 46m/asphalt	2440 B 707-330 B 720	A A	100 JA1

Remarks: alternate aerodromes - BOGOTA/El Dorado, CALI/Palmesca, LIMA-CALLAO/Jorge Chavez, PANAMA/Omar Torrijos, TALARA/Capitan Montes.

Aids: ILS 21-11, RDME, RVOR, LVA 21, LR, LTX, LB, LO, MD, MS, MT, MTD, MFD, MTX, MO, H 80, L4, 5, 9. No telex.

Key

Abbreviations

INSTR	Instrument Approach Runway
N-INSTR	Non-Instrument Runway
PA1	Precision Approach Runway Category I
PA2	Precision Approach Runway Category II
REG-NS	International Non-Scheduled Air Transport, Regular Use
REG-S	International Scheduled Air Transport, Regular Use

Radio Aids

ILS	Instrument Landing System
DME	Distance Measuring Equipment
VOR	Very High Frequency Omni-Directional Radio Range
RL	Radio Locator

Lighting Aids

LPA	Precision Approach Lighting System
LSA	Simple Approach Lighting System
LVA	Visual Approach Slope Indicator System
LAV	Abbreviated Visual Approach Slope Indicator System
LR	Runway Edge, Threshold, and Runway End Lighting
LC	Runway Center Line Lighting
LTD	Runway Touchdown Zone Lighting
LTX	Taxiway Lighting
LB	Aerodrome or Identification Beacon
LO	Obstruction Lighting

Marking Aids

MD	Runway Designation Markings
MC	Runway Center Line Markings
MT	Runway Threshold Markings
MTD	Runway Touchdown Markings
MS	Runway Sidestripe Markings
MFD	Fixed Distance Markings
MTX	Taxiway Center Line & Holding Position Markings
MO	Obstruction Markings

Runway Surface and Length

H	Hard Surface (numbers = ft. in hundreds)
S	Non-Hard Surface (numbers = ft. in hundreds)

Additional Lighting

L1 Portable Runway Lights (electrical)
 L2 Boundary Lights
 L3 Runway Flood Lights

Secondary Airports

<u>City (Airport)</u>	<u>Location Coordinates</u>	<u>Eleva- tions(m)</u>	<u>Runway Length/Width(m)</u>	<u>Surface</u>	<u>Facilities and Aids</u>
Ambato (Chachoan)	0112S-7834W	2555	1870/30	Rock face	Buildings and radio owned and operated by Air Force
Arajuno (Arajuno)	0114S-7740W	332	1000/30	Clay	Radio
Ayuy (Ayuy)	0205S-7734	575	1400/30	Clay	No facilities
Bahia (Los Perales)	0035S-8024	3	1500/30	Rock face	Terminal building and radio
Chone (Chone)	0041S-8003	70	899/20	Turf	Terminal building
Cuenca (Mariscal Lamar)	0252S-7859	2532	1951/30	Rock face	Terminal building, and radio beacon
Esmeraldas (General Riva- deneira)	0059S-7940	6	1200/30	Rock face	Terminal building, customs and immigration facilities, radio beacon
Gualaquiza (Gualaquiza)	0325S-7832	750	1200/20	Clay	Terminal building
Jipijapa (Jipijapa)	0210S-8035	247	1000/30	Turf	No facilities

<u>City (Airport)</u>	<u>Location Coordinates</u>	<u>Eleva- tions(m)</u>	<u>Runway Length/Width(m)</u>	<u>Surface</u>	<u>Facilities and Aids</u>
Loja (La Toma)	0356S-7921	1238	899/30	Rock face	Terminal building and radio
Macara (Velasco Ibarra)	0423S-7957	450	1000/30	Clay	Terminal building
Macas (Macas)	0219S-7807	1000	1200/30	Rock face	No facilities
Machala (Machala)	0316S-7957	4	800/15	Rock face	Terminal building and radio
Manglar Alto (Manglar Ato)	0150S-8045	5	1000/20	Rock face	Terminal building and radio
Manta (Eloy Abfaro)	0057S-8041	10	1200/30	Rock face	Terminal building, radio, and beacon
Mendez (Chupianza)	0244S-7819	500	600/20	Clay	No facilities
Montalvo (Montalvo)	0240S-7658	351	701/20	Clay	N.A.
Muey (Muey)	0215S-8046	20	899/25	Rock face	Terminal building
Nuevo Roca fuerte (Nuevo Rocafuerte)	0056S-7535	207	1200/30	Clay	Radio
Pasaje (Pasaje)	0320S-7949	-	1351/30	Rock face	Terminal building, radio
Pastaza (Pastaza)	0131S-703W	1040	1400/30	Rock face	N.A.
Portoviejo (Portoviejo)	0102S-8027	34	2500/46	Rock face	Terminal building, radio

<u>City (Airport)</u>	<u>Location Coordinates</u>	<u>Eleva- tions(m)</u>	<u>Runway Length/Width(m)</u>	<u>Surface</u>	<u>Facilities and Aids</u>
San Lorenzo (San Lorenzo)	0116N-7854	3	700/25	Turf	N.A.
Santo Domingo (Santo Domingo)	0015S-7910	-	1200/30	Rock face	N.A.
Sucua (Sucua)	0223S-7811	650	700/30	Turf	N.A.
Taisha (Taisha)	0223S-7730	510	1101/30	Clay	N.A.
Tenguel (Tenguel)	0300S-7948	10	800/20	Clay	N.A.
Tena (Tena)	0058S-7749	630	1000/25	Turf	N.A.
Tulcan (El Rosal)	0049N/7742	2851	2500/30	Rock face	N.A.

Source: Jaime Orodomez P. , Deputy Director of Civil Aviation, and the Ecuadorean Armed Forces.

Domestic Airlines and Aircraft - 1983

<p>ATESA - Aerotaxis Ecuatorianos, S.A.</p>	<p>Avenida Amazonas 367 Quito Fleet: 3 Noratlas, 1 Cessna 336, 1 Cessna U-206</p>
<p>ANDES - Aerolineas Nacionales del Ecuador, S.A. Ecuador, S.A. (Regular cargo services to Miami, Panama, Quito, and Guayaquil)</p>	<p>Building 1034 P.O. Box 523068 Miami, Fl 33152 Tel: (305) 526-6380, (800) 327-4472 Telex: 515067 Cable: ANDESAIR Fleet: 2 C144, 2 DC-6A, 1 DC-833F(freight)</p>

Airlines

Autoservicio Ecuatoriano, C.A.
(Charter service)

Guayaquil
Tel: 392-711
Telex: 3330 Guayaquil
Cable: AECA
Fleet: 2 Cessna 402,
1 Cessna 310 Turbo, 2 Cessna
182, 2 Canadair Cl 44D Swing
Tails, 2 Turbo Commanders,
1 DC-8 55, 1 DC-8 62F(cargo)

Ecuadorean Air Force

Casilla 2077
Quito
Fleet: 1 Boeing 727, 1
Boeing 737, 4 Electra, 1
C-130 H, 3 DC-6 B, 5 HS-748,
2 Pumas, 6 Alouettes.

Ecuatoriana - Empresa Ecuatoriana de
Aviacion
(Government owned; scheduled
international passenger service
to Chile, Colombia, Mexico, Panama,
Peru, and Venezuela.)

7270 N.W. 12th St.
Miami, FL 33152
Tel: (305) 526-5854,
(800) 327-3129
Fleet: 4 B707 and 3 B720C.

Ecuavia Cia. Ltda.
(Air Ambulance service available.)

Casilla 3364
Guayaquil
Tel: 390-986, 393-310
Telex: 3464 ed ecuvia
Cable: ECUAVIA
Fleet: 12 Pipers.

Ecuavia - Oriente, SA

Casilla 3418
Quito
Tel: 247-415
Telex: 2151
Cable: ECVAVIOR
Fleet: Eight Bell
helicopters.

SAETA - Sociedad Ecuatoriana de
Transportes Aereos
(Domestic passenger and freight
services.)

Casilla 2943
Quito
Tel. 247-705, 518-811,
217-681
Telex: 2570
Cable: SAETA
Fleet: 3 Caravelle VI-N
1 B727-100, and 2 Vicker
Viscount 700.

<p>SAN - Servicios Aereos Nacionales, S.A. (Domestic passenger and freight services.)</p>	<p>Casilla 754 Cuenca Tel: 800-238 Telex: 048 583 Cable: SAN AIRLINES Fleet: 3 Caravelle 6R, 1 Vicker Viscount 828, and 2 B727-100</p>
<p>TAME - Transportes Aereos Nacionales Ecuatorianos (Government-owned; domestic scheduled services for passengers and freight, mostly to Quito, Guayaquil and Cuenca; also serves the Galapagos Islands.)</p>	<p>Colon 1346 y 10 de Agosto 239 Quito Tel: 510-911, 547-000 Telex: 2731 Cable: TAME Fleet: 1 L-188 Electra, 2 Avis 748, 1 B748, 2 De Havilland DHC-6 and 1 B727-200.</p>

Air Distances

From Guayaquil to:	Statute Miles	From Quito to:	Statute Miles
Cuenca.....	79	Talata.....	358
Havana.....	1,748	New York.....	2,830
Houston.....	2,423	San Juan.....	1,536
Kingston.....	1,405	Santiago.....	2,357
La Paz.....	1,269	Sao Paulo.....	2,678
Lima.....	706	Houston.....	2,357
Loja.....	132	Lima.....	825
Managua.....	1,079		
Manta.....	101		
Medellin.....	650		
Panama City.....	778		
Quito.....	170		
San Juan.....	1,707		
Talara.....	188		
Tegucigalpa.....	1,288		

3.12 Communications

Because Civil Defense has not developed any emergency communications system, it depends on the equipment available to the Armed Forces, National Police, and amateur radio operators. The Armed Forces and National Police operate radio communication systems, but rely largely on the government telephone and telegraph networks for emergency communications. In the event of a disaster, radio and television would serve

as mediums to warn the population of disaster risks and other related messages. There are seven commercial television channels which reach many rural locations. Although TV ownership is low, access in rural areas is quite extensive. Over 300 radio stations are now operating and there is nearly one receiver for every two persons. The Government of Ecuador, under the authority of IETEL, is undertaking an ambitious telecommunications extension project to link all rural communities. To date, Ericson Co. of Sweden has provided most of Ecuador's telephone equipment. In addition, all amateur radio operators are required to offer their services and equipment to Civil Defense in an emergency situation. This has been an unsatisfactory means of providing emergency communications due to poor coordination between operators and the GOE. Hand-held radios for use in disasters are virtually non-existent.

Major television networks:

Corporacion Ecuatoriana de Television (commercial)	Casilla 1239 Guayaquil
Tele Ondes Azuayas (commercial)	Casilla 4980 Cuenca
Telezamazonas (commercial)	Casilla 4844 Quito
Telecentro (commercial)	Edificio Filanbanco 9 de Octubre y Pichincha 6° Piso Guayaquil
Television del Pacifico (commercial)	Casilla 130 B Quito
Televisora Nacional Cia., Ltda (commercial)	Casilla 3888 Quito
Tesem (commercial)	Casilla 108 Esmeraldas

Major radio stations:

Emisoras Gran Colombia (commercial)	Casilla 2246 Quito
Radio Tropicana (commercial)	Edificio El Torreon 8° Piso, Avenida Boyaca 642 Guayaquil

Radiodifusora del Ecuador
(commercial)

Edificio El Torreón
8° Piso, Avenida
Boyaca 642,
Apartado 4144
Guayaquil

3.15 Housing and Public Services

Ecuador faces a severe housing shortage. Although substantial efforts have been made to construct new homes, the urban housing deficit is estimated at 800,000 units. Many families have moved into already occupied dwellings which are deteriorating and lack adequate services. In Quito, colonial-era homes of volcanic stone and adobe construction often house as many as ten families. Moreover, uncontrolled settlement of urban peripheries has created additional pressures for basic services. In Guayaquil, thousands of families have built homes on the flood-prone swamps of El Guasmo, located between the business district and the new port. Although a network of canals has been installed in El Guasmo to drain floodwaters, other suburban areas are still threatened by the accumulation of stagnant water during the rainy season.

Suburban slums are less common in provincial capitals and secondary towns; however, the following cities are facing increasing housing pressures: Quevedo, Santo Domingo, Machala, Portoviejo, Manta, Chone, and Cuenca.

In the Oriente, settlements have been generally established along both sides of new roads. The plots facing the roads are usually 200-250 m wide and 2,000 m deep. As these locations fill up, newcomers stake claims 2,000 m back from the property line of the earlier settlers. The new settlements are, thus, farther from all-weather roads, services, and local markets.

Housing Materials in Ecuador

<u>Region</u>	<u>Foundation</u>	<u>Walls</u>	<u>Roofing</u>
Costa			
Urban	Cinder block, brick wood, concrete	Brick, cinder block, iron concrete	Asbestos, reinforced concrete, cement, zinc
Rural	Bamboo, wood stilts, cinder block	Bamboo, reed cane	Metal, zinc, thatch, paramo straw

<u>Region</u>	<u>Foundation</u>	<u>Walls</u>	<u>Roofing</u>
Sierra Urban	Concrete, adobe, brick	Concrete, adobe, cinder block	Tile, reinforced concrete, fiber matting
Rural	Stone, concrete	Adobe, adobe brick, iron.	Wood, tile, fiber matting
Oriente	Wood	Hollow cane	Leaf, metal

3.14 Public Utilities and Services

The public water supply system suffers from both irregular service and poor water quality. Municipalities and districts are responsible for managing water systems, but insufficient financial resources make expansion and improvement of the systems difficult.

In urban locations tank trucks supply water to areas lacking water systems. This is often supplemented by distribution from steel drums at central locations where residents collect water with pails. Water purification systems were temporarily used during the 1982-83 floods in Babahoyo and Baba until the municipal water systems were restored.

For more detailed information on housing and public services, see Housing Survey for Disaster Relief and Preparedness: Latin American Washington, D.C.: OFDA, 1981.

3.15 Energy Resources

The most important sources of energy are crude petroleum, hydropower, and firewood. Petroleum dominates the energy sector and accounts for over half of Ecuador's export earnings. Over 90% of the petroleum is produced by the CEPE - Texaco consortium. In addition, City Ecuadorean Petroleum Company extracts some oil from fields in the Oriente and the Santa Elena peninsula. The country's major refinery is located near the northwest port city of Esmeraldas. Due to insufficient refinery capacity, Ecuador swaps crude petroleum for gasoline products from Shell-Curacao for the domestic market. In fact, increases in domestic consumption far exceed production levels. Some concern has been expressed over Ecuador's future ability to export oil because of this disparity. However, the April 1983 discovery of unprecedented reserves in El Guarumo (Oriente) has helped to allay these concerns.

Firewood is used by over 50% of Ecuadorean residences, particularly in rural areas, for home heating and cooking. In the Sierra, firewood is placed under a grate plate to light an open fire, while brick stoves are used extensively in the Costa. Few alternative energy projects have been initiated to reduce the use of firewood and alleviate the effects of deforestation. There has been some limited testing of biogas plants in Santo Domingo de los Colorados (western Pichincha).

Ecuador's estimated hydropower potential is 22,000 MW of which only 1% has been tapped. River and streams in all three regions of the country provide extensive opportunities for hydropower development, which represents one of the Ecuadorean government's major investment priorities (15% of the total investment budget). An ambitious rural electrification scheme is being integrated with the hydropower projects.

Natural gas and coal are negligible sources of energy which have been minimally exploited. There are some natural gas reserves in the Gulf of Guayaquil; all other gas is flared from oil fields in the Oriente. About 22 million metric tons of coal were mined in 1981. Although an Atomic Energy Commission was established, there have been no studies on the feasibility of nuclear power.

Distribution of Energy

Ecuadorean Electrification Institute (Instituto Ecuatoriano de Electrificación - INCECEL) is the government agency responsible for energy services and contractual agreements with private firms. There are presently 16 electric companies and one electric power cooperative.

Power supplies in the Sierra and the Costa are being integrated in order to benefit from economies of scale and eliminate the large number of smaller power stations. In addition, the electric power companies are in the process of consolidation. The following is a list of the new regional electric power systems with the corresponding percentage of the population having residential power: North (46.5%), Pichincha (63%), North-Central (29.5%), South Central (29.7%), South (24.3%), Esmeraldas (25.6%), Manabi (25.8%), Guayas - Los Rios (55.3%), and El Oro (37.7%). The Galapagos Islands and the Oriente are being excluded from the consolidation. Hence, the distribution of electric power varies by region and population density. While almost 90% of urban inhabitants have electric power, only 13% of rural residents are connected to power systems. In 1980, 1,029.3 MW were produced. Nearly all power lines in urban areas are mounted overhead; thereby, facilitating the extension of electricity to new developments.

3.16 US Mission Disaster Plan and Resources

The U.S. Diplomatic Mission Disaster Relief Plan was reviewed and updated in September 1982. The plan identifies the responsibilities of the Chief of Mission, Mission Disaster Relief Officer (MDRO), and the Emergency Action Committee. The chain of command and sectoral functions at the Mission, OFDA information requirements, and the Defense Department's potential role are described. In the event of a major disaster the Deputy Chief of Mission will assume the role of MDRO. Currently the position of MDRO is being filled by the A.I.D. Executive Officer.

The Agency for International Development has been assisting Ecuador since 1942 in nearly every social and economic sector. The current development program focuses on the following areas: rural/urban poverty, population growth, and environmental issues. USAID seeks to encourage policy changes to improve resource allocation, technology transfer, institution building, agricultural development, and delivery of health services in support of Ecuador's Integrated Rural Development Program. Recent projects include an environmental conservation program and the development of low-cost renewable energy sources.

USG PL-480 assistance under Title II programs are implemented by CARE and Catholic Relief Services. CARE provides soy to the Ministry of Public Health for its supplementary feeding program. The EEC and the World Food Programme are also providing ingredients for the food supplement which, when processed, is known locally as leche avena. GOE is responsible for all the programs operating costs and will soon replace the current supplement with locally grown rice and soy. The World Food Programme and the EEC will continue to supply half of the program's rice and milk through 1988.

USG assistance to Ecuador for disaster purposes includes development of a civil defense awareness curriculum for the Ministry of Education, the provision of seismic monitoring equipment (pending Spring 1983), the temporary installation of water purification units during the 1982-83 flood disaster, strategy for draining stagnant water from low-lying settlement south of Guayaquil, and emergency management training in Puerto Rico for selected Ecuadorean officials. Other technical assistance includes the identification of landslide hazards by a U.S. landslide specialist and an assessment of safety requirements at Guayaquil's airport. The establishment of a short-wave radio network for emergencies is planned.

Equipment and Resources

The Embassy has over 60 official vehicles (3 in Guayaquil) with a combined capacity of 300 persons including the drivers. At any given time at least 10% is out of operation.

AID Motor Vehicle Fleet

<u>Number</u>	<u>Year</u>	<u>Model/Make</u>
4	1980	Ford Fairlane Sedans
2	1980	Chevrolet Blazers
1	1982	Chevrolet Suburban
1	1980	Chevrolet Suburban
1	1983	Chevrolet Blazer
1	1980	Chevy Pick-up
1	1969	Chevy Pick-up
1	1980	Ford LTD Sedan

Total 12

Source: Mr. Ceballos. AID Quito. April 1983.

The Embassy has a mobile 500-gallon tank which can be pulled by a carryall or a truck, and a water purification system which could, at maximum production, provide drinking water to 100 people per day. Health units with limited medical supplies are located both in the Embassy and at the Peace Corps office. The Embassy health unit has three stretchers, one wheelchair, and nine portable oxygen units. The Peace Corps unit is staffed by two contract RN's and a part-time physician.

Communications at the Embassy consist of 37 telephone lines including a direct international line in the Ambassador's office. At the USAID there are ten PBX lines with two international direct dial lines. The Embassy has a three channel 35 W base station with 22 portable and 13 mobile radios. The long range radio consists of two single sideband stations, of which one can function on ham frequencies with the U.S. telephone system through SOUTHCOM/Panama. Both communications systems can be used in the field with a portable generator. AID has a 6 watt base station in addition to several hand-held GE PE 66 radios and HN 56 3 channel radios.

3.17 International Organizations

Food and Agriculture Organisation (FAO)
 Edificio San Gregorio
 San Gregorio 120 y Avenida 10 de Agosto, 3er Piso
 Quito
 Mailing address: Casilla 1048
 Telephone: 234-651, 232-996, 232-379
 Telex: 2588

International Bank for Reconstruction and Development
and Development (IBRD - World Bank)
Edificio Benalcazar 1000
Avenida 10 de Agosto y Riofrio
Quito
Telephone: 521-963

International Monetary Fund (IMF)
Ministerio de Finanzas
Direccion de Contabilidad Gubernamental
Avenida 10 de Agosto 1661
Quito
Telephone: 542-505, 239-220 ext. 156

Latin American Energy Organization
San Gregorio 120 y 10 de Agosto
Quito

Organization of American States (OAS)
6 de Diciembre 4580
Quito
Tel: 247-122

Pan American Health Organization (PAHO)
Edificio del Ministerio de Salud
Juan Larrea 444
Quito
Tel: 522-100

Regional Advisor in Communications for Latin
America and the Caribbean
Edificio Fransisco de
Orellana, Oficina 701
Avenida Orellana 1791
y 10 de Agosto
Quito

United Nations
Oficina Cominesa
Avenida 10 de Agosto y Villalengua
6° y 7° Piso
Quito
Mailing address: Casilla 4731, Sucursal No. 3
Telex: 2177 Unpro ed
Cable: UNDEVPRO ED 2177
UNDRO contact: Miss Siegel

World Food Programme (WFP)
Edificio Cominesa
Avenida 10 de Agosto 5470
y Villalengua, 6° y 7° piso
Quito
Telephone: 457-155, 458-666
Contact: Dr. Arturo Posada

World Health Organisation (WHO)
Oficina Sanitaria Panamericana
Isabel La Catolica 1040 y Coruna
Quito
Telephone: 522-100
Contact: Dr. Luis Arcila

3.18 Private Voluntary Agencies

During an emergency the Ministry of Social Welfare (Ministro de Bienestar Social) coordinates relief activities of domestic and international voluntary organizations. Regular meetings of the various agencies are held during and after disasters. During the 1982-83 floods, the Ecuadorean Civil Defense established the Special Flood Committee (Comite Especial de Inundaciones) to coordinate operations among relief organizations.

CARE
Edificio Proinco
Reyna Victoria 447, 5° Piso
Quito
Tel: 234-550, 231-574
Contacts: Brian Cavanaugh, Dr. Raul Cardena

Conferencia Episcopal
Avenida America 1866 y la Gasca
Quito
Telephone: 230-298, 238-221
Contacts: Father Oswaldo Perez

Catholic Relief Services (CRS)
US Catholic Conference
Avenida America 1866 y La Gasca
Quito
Mailing address: Apartado 2234
Contact: Vernon Ficklin

CRS is involved in a variety of disaster-related activities through its counter-part agency, Comision de Promocion Humana (CPH). A Secretariat of the organization is represented in each province. CPH

often initiates disaster work independently and informs the Ministry of Social Welfare ex/post. Disaster relief projects are carried out by brigades of clergymen, nurses, and social workers. There are also numerous dispensaries with some nurses. Reconstruction activities include bridge and home repairs.

Foster Parents Plan (Plan Padrinos)
Edificio Pinturama, 2° Piso
Avenida Quito 2135 y Capitan Najera
Guayaquil

Assists in community construction and sanitation projects in the provinces of Guayas and Bolivar. Also provides funds for health and educational services.

Other local PVOS which have provided material and/or financial resources include la Brethern Unida, Comite Ecumenico de Derechos Humanos, Central Ecuatoriano de Servicios Agricolas, and Fondo Ecuatoriano Popularum Progreso.

3.19 Mitigation Efforts

The Government of Ecuador (GOE) has undertaken few activities to eliminate or reduce the probability and/or effects of disasters. In the Costa, nearly all houses along flood-prone areas are built over stilts to accomodate rising tides; however, during the 1982-83 flood disaster, water levels rose above the floors of most houses. Although residents of these areas have adapted to the annual floods, the lack of sewerage and water systems at most locations creates serious health risks. Ideally, the GOE should discourage settlement along floodplains. This seems unlikely as long as waterways remain the primary means of transport because of poor road conditions during the rainy season. Although some sandbagging has been undertaken near Babahoyo (Los Rios) and Machala (El Oro), the results have been mixed and few dikes or stream channels exist.

A noteworthy effort to mitigate the effects of floods was undertaken by the Ecuadorean Army Corps of Engineers with USG assistance. The project was conducted during the anomalous rainy season of 1982-83 when El Guasmo, a swampy flood plain south of Guayaquil inhabited by several hundred thousand migrants, was inundated with water. In cooperation with the municipal water authority, the local Foster Parents Plan, and area residents, the Army Corps of Engineers drained the stagnant water and constructed a series of canals to prevent future accumulation of rain water. The project represented a permanent improvement to the community in both sanitary and environmental terms. Evidence of its success was demonstrated by the immediate decline in respiratory and gastro-intestinal diseases.

Eucalyptus has been planted throughout the Sierra. While it is effective as a windbreak in tall grassy areas where the soil is fine, eucalyptus is not universally appropriate for controlling soil erosion. The nature and concentration of surrounding growth are critical factors in determining the effectiveness of eucalyptus for soil conservation objectives. Pine trees have also been planted along Sierra hillsides in order to mitigate landslide potential. However, these projects often do not include the higher elevations which remain exposed to soil erosion.

There are also socio-cultural constraints to reforestation efforts in the Sierra. Because of the severe shortage of land in the highlands, forestry projects often displace pasture and farmland, frequently inducing human migration to the Costa. The rural highlander's ability to adapt to a new location is hampered by his unfamiliarity with the environment and local economy. Forestry projects should, therefore, be balanced with social considerations.

3.20 Disasters and the Development Process

The impact of disasters on Ecuador's economy is significant because of the country's weak international financial position. Any disaster resulting in major crop losses will reduce exports and diminish the country's ability to make interest payments on its U.S. \$6.3 billion foreign debt (1983). The diversion of resources for rehabilitation activities and the probable need for reconstruction materials and assistance from abroad will also compound the debt situation. The 1982-83 flood disaster illustrates the effects of a major disaster on the national economy. Unusually heavy rainfall throughout the Costa damaged agricultural crops and induced forcible unemployment in rural areas where absorption by other economic sectors was impossible. Unemployment, in turn, affected consumer demand because of the loss of income. Damage to the transportation network raised shipping costs and impeded the distribution of the unaffected crops. Thus, direct damage to agriculture was compounded by the difficulty of getting the produce to markets, resulting in some food shortages in early 1983. The reduction in commercial activity is expected to result in a 1-2% decline in GDP and a U.S. \$70 million loss in foreign exchange. The disaster followed a year when economic growth was expected to be the lowest since 1951 because of the fall in petroleum prices and reduced revenues from traditional exports. Hence, the disaster represented an additional shock to Ecuador's weak economy, and necessitated a reallocation of financial resources originally slated for development projects.

The 1982-83 floods also demonstrated the relationship between disasters and social development in Ecuador. Although the floods resulted from an anomalous rainy season, it was often deficiencies in public services which triggered the disaster. In Babahoyo (Los Rios Province), poor design and maintenance of water system exacerbated the health hazards.

associated with the floods. Local authorities were unable to expeditiously rehabilitate the contaminated water system, nor did they take any immediate action to eliminate the dispersion of raw sewage in the town's streets. To provide potable water to the residents of Babahoyo, the USG temporarily installed water purification units in Baba and Babahoyo. This action would probably not have been necessary had the provision of public services been more effective. The extension and maintenance of these public services are clearly developmental issues which were raised by the disaster situation. In other words, the developmental problems were more relevant to the disaster than the natural cause.

Similarly, in El Guasmo, drainage canals had to be installed during the 1982-83 flood disaster because settlement of the area was not accompanied by adequate development of public services. The municipal authorities' offer of free land in El Guasmo had encouraged migration from drought-stricken areas of the Sierra. However, the rapid urbanization imposed demands for public services which could not be filled. Before the drainage canals were dug and culverts installed, rain water, in excess of that absorbed by the soil, would collect in ponds and inundate the community. The drainage project served as an immediate rehabilitation effort as well as a permanent contribution to the community's development. The effort demonstrated how a developmental problem was corrected in a disaster situation; further support for the interrelationship between disasters and the development process.

Developmental issues are also relevant in the area of disaster planning. As explained in section 3.1, Host Country Disaster Organization, the lack of information on disaster hazards and resources for disaster relief is a major constraint to effective emergency management. Similar information is also a prerequisite for identifying development priorities. For instance, statistics on agricultural production by crop and location are indispensable for both disaster management and economic development. In forestry the development of the lumber industry as well as reforestation activities require knowledge of the nature and scope of deforestation.

Public works projects can achieve developmental goals and also serve to mitigate the effects of disasters. For example, the dredging of the Guayas River would not only augment the discharge capacity of flood waters but would also provide passage to ships with deeper hulls. Also, the reconstruction of flood damaged roads with superior drainage capacity would minimize the road network's vulnerability and ensure a reliable infrastructure for commerce. This kind of project would integrate developmental considerations during the rehabilitation stage of a disaster. In the field of education, preventive health instruction related to local disaster hazards could minimize disaster impact. The 1982-83 floods demonstrated the deficiencies in public health education. In Babahoyo, although potable water was made available from the USG installed water purification units, many residents continued to consume the local water. In addition, children were permitted to wade and bathe in contaminated flood water, thereby increasing the risk of dermatological

diseases. These experiences illustrate the need to extend disaster awareness education beyond civil defense to encompass all sectors likely to be affected in a disaster.

APPENDICES

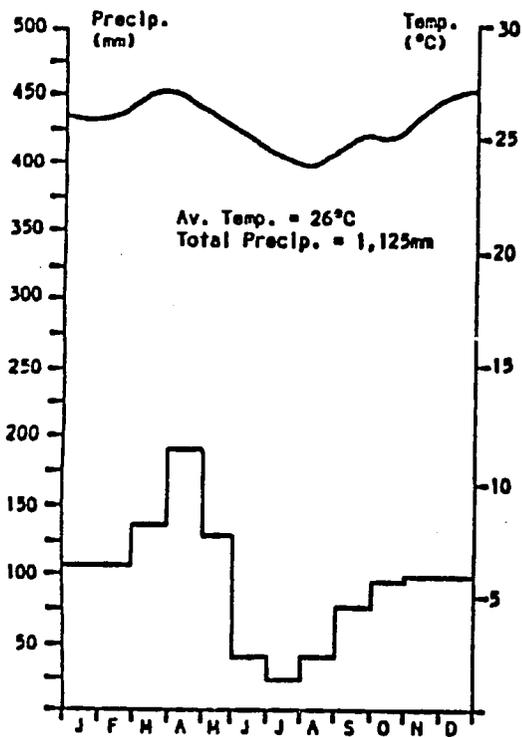
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- B. Population by Province and Canton
- C. Crop Dates
- D. Public and Private Grain Storage Facilities, by Region
- E. Health Care Jurisdiction During Disasters
- F. Inventory of Health Services
- G. Overall Hospital Capacity
- H. Inventory of Public Health Services
- I. MSP Ambulances and Other Vehicles

Select Climatic Stations

Costa

Guayaquil

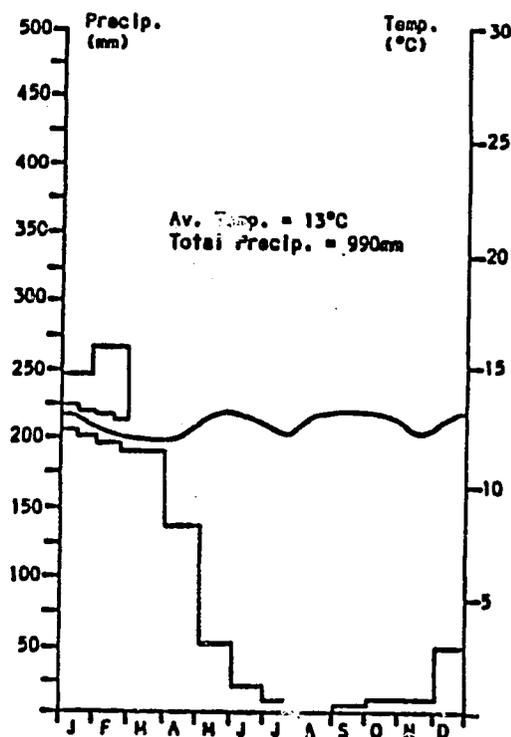
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 Long.: 79° 52' W
 Elev.: 12m



Sierra

Quito

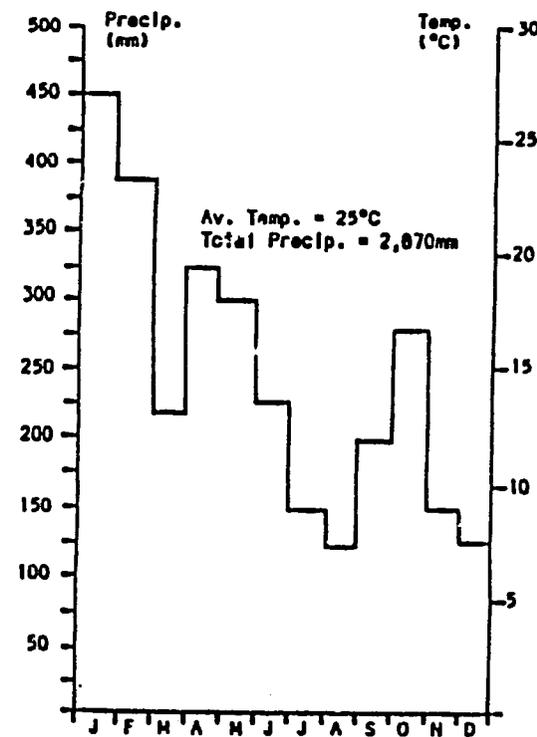
Lat.: 0° 10' S
 Long.: 78° 35' W
 Elev.: 2,850m



Oriente

Nuevo Rocafuerte

Lat.: 0° 59' S
 Long.: 75° 27' W
 Elev.: 100m (est.)



APPENDIX A

Source: James, Latin America, 4th Edition, 1969.

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APPENDIX B

Population by Province and Canton (1982 census)

Bolivar	148,161	Esmeraldas	247,870
Guaranda	76,297	Esmeraldas	141,030
Chillanes	20,089	Eloy Alfaro	23,779
Chimbo	23,553	Muisne	16,795
San Miguel	28,222	Quininde	44,599
		San Lorenzo	21,667
Canar	180,285		
Azogues	68,351	Galapagos	6,201
Biblian	20,954	San Cristobal	2,433
Canar	90,980	Isabela	630
		Santa Cruz	3,138
Carchi	128,113		
Tulcan	59,533	Guayas	2,020,517
Espejo	12,605	Guayaquil	1,300,484
Mira	13,451	Balzar	581,187
Montufar	42,524	Daule	142,132
		El Empalme	52,398
Chimborazo	329,922	Milagro	106,767
Riobamba	148,883	Naranjil	33,496
Alausi	44,406	Naranjito	21,259
Salinas	67,395	Samborodon	25,438
Colta	55,031	Santa Elena	74,268
Chunchi	14,578	Urvina Jado	40,307
Guamote	24,775	Yaguachi	98,386
Guano	42,249		
		Imbabura	224,421
Cotopaxi	279,622	Ibarra	111,238
Latacunga	123,788	Antonio Ante	27,387
Pangua	18,552	Catacachi	28,890
Pujili	77,145	Otavalo	62,616
Salcedo	45,606	Pinampiro	14,290
Saquisilí	14,531		
		Loja	358,558
Cuenca	440,571	Loja	120,035
Cuenca	272,397	Calvas	29,962
Giron	34,825	Catamayo	20,225
Gualaceo	42,779	Celica	20,961
Paute	35,853	Espindola	17,920
Santa Isabel	30,848	Gonzanama	25,342
Sigsig	23,869	Macara	17,920
		Paltas	44,815
El Oro	330,110	Puyango	17,104
Machala	114,516	Saraguro	25,622
Arenillas	21,062	Sozoranga	9,367
El Guabo	23,072		
Huaquillas	20,227	Los Rios	450,227
Pasaje	44,393	Bahahoyo	105,208
Pinas	29,806	Baba	27,918
Portovelo	8,814	Puebloviejo	18,804
Santa Rosa	40,974	Quevedo	160,771
Zaruma	27,246	Urdaneta	20,988
		Ventanas	50,598
		Vinces	65,940

APPENDIX B (continued)

Manabi	840,318	Tungurahua	328,070
Portoviejo	166,124	Ambato	221,392
Bolivar	55,046	Banos	14,637
Chone	177,606	Patate	9,619
Jipijapa	73,270	S de Pillaro	31,411
Junin	18,645	Quero	13,989
Manta	103,562		
Montecristi	31,686	Zamora-Chinchipe	44,841
Pajan	43,466	Zamora	19,774
Rocafuerte	51,561	Chinchipe	8,738
Santa Ana	57,715	Yacuambi	3,031
Sucre	88,273	Yantzaza	13,298
24 de Mayo	29,355		
		TOTAL Country*	8,038,435
Morona-Santiago	52,249	CONADE (1981 est.)	8,644,000
Morona	16,769		
Gualaquiza	6,060		
Limon-Indanza	9,217		
Palora	2,154		
Santiago	6,828		
Sucua	11,221		
Napo	113,042		
Tena	25,458		
Aguarico	3,075		
Archidona	14,976		
Lago Agrio	23,200		
Orellana	28,526		
Putumayo	3,159		
Quijos	9,189		
Zucumbios	5,459		
Pastaza	32,536		
Pastaza	27,899		
Mera	4,637		
Pichincha	1,369,059		
Quito	1,110,248		
urban	858,736		
suburban	22,678		
rural areas	228,834		
Cayambe	40,989		
Mejia	38,258		
Pedro Moncayo	14,666		
Ruminahui	32,640		
Santo Domingo	132,258		

* 1982 census not adjusted for probable undercounting and regional discrepancies due to migrations immediately prior to census.

Source: IV Population Census. Instituto Nacional de Estadística y Censos, November 1982.

APPENDIX C

<u>Region and Crop</u>	<u>Crop Dates</u>	
	<u>Planting Months</u>	<u>Harvesting Months</u>
<u>Coast</u>		
Bananas	--	Year-round
Cacao	--	March-May July-November December-January
Coffee	July-August	July-December
Corn	December-January	May-June
Cotton	December-January	July-October
Peanuts	--	June-September
Rice	January June	April-June September-December
Sugar cane	year-round	July-February
<u>Sierra</u>		
Barley	November-January	July-August
Beans	January-March	June-October
Corn	September-December	July-October
Oats	November-February	August
Potatoes	January-February	July-September
Quinoa	July-August	November-December
Wheat	January	July

Source: FAO Agricultural Report, Planting and Harvesting Dates in Latin America.

APPENDIX D

Public Grain Storage Facilities, by Region (January 1978)
(metric tons)

	<u>Silos</u>	ENAC * (1)	<u>Warehouses</u>	ENPROVIT ** <u>Warehouses</u>	<u>Total</u>
<u>Sierra</u>					
Carchi	2,699		455	-	3,154
Imbabura	-		909	-	909
Pichincha	3,964		7,013	4,318	15,195
Cotapaxi	-		182	-	182
Tungurahua	-		909	-	909
Chimborazo	3,000		9,013	614	12,627
Bolivar	4,000		136	-	4,136
Canar	-		182	-	182
Azuay	-		682 (2)	432	1,114
Loja	3,560		91 (3)	250	3,901
Subtotal	17,123		19,572	5,614	42,277
<u>Costa</u>					
Esmeraldas	-		91	-	91
Manabi	-		91	-	91
Guayas	16,000		11,182	2,136	29,318
Los Rios	-		45	-	45
El Oro	-		91	-	-
Subtotal	16,000		11,500	2,136	29,536
TOTAL	33,123		31,072 (4)	7,750	71,945

* Empresa Nacional de Almacenamiento y Comercializacion de Productos Agropecuarios (ENAC)

** Empresa Nacional de Productos Vitales (ENPROVIT)

- (1) Includes EDIALGE silos (15,000 mt) taken over by ENAC.
- (2) According to data from Seguridad Alimentaria, there are only 455 MT.
- (3) According to Seguridad Alimentaria there exists a 4,545 MT warehouse which belongs to MAG.
- (4) Of which 14,545 tons is rented from the private sector.

APPENDIX E

Health Care Jurisdiction During Disasters

<u>Institution</u>	<u>Training</u>	<u>Rescue</u>	<u>First Aid</u>	<u>Medical Care</u>	<u>Sanitation</u>	<u>Epidemiological control</u>	<u>Nutrition*</u>
Ministry of Public Health	X		X	XX	XX	XX	X
Red Cross	X	X	XX			X	X
IESS-Medical Dept. (Social Security Institute)	X					X	
Ministry of Social Welfare (Firemen)	X	XX	X		X		
Civil Police	X	X	X				
Guayaquil Council	X					X	
Individual Hospitals and Clinics						X	
Armed Forces	X	X	X	X		X	
Municipalities and Provincial Counties	X				XX	X	
Medical Departments of Universities	X					X	

XX - Primary responsibility

X - Complimentary responsibility

* in conjunction with the Ministry of Agriculture and Livestock

Source: Ministerio de Salud Publica, Division de Desastres, 1983.

APPENDIX F

Inventory of Health Services

	IESS (Social Security Institute)		Private Institutions	
	<u>Hospitals</u>	<u>Dispensaries</u>	<u>Clinics and Hospitals</u>	<u>Dispensaries</u>
TOTAL SIERRA	7	263	67	55
Carchi	-	8	2	1
Imbabura	1	15	1	1
Pichincha	1	181	49	30
Cotopaxi	1	7	2	-
Tungurahua	1	6	5	7
Bolivar	-	1	1	-
Chimborazo	1	18	7	4
Canar	-	3	-	2
Azuay	1	19	6	7
Loja	1	5	2	2
TOTAL COSTA	9	50	114	139
Esmeraldas	1	-	5	3
Manabi	1	17	13	2
Los Rios	1	2	23	5
Guayas	5	26	61	122
El Oro	1	5	12	7
TOTAL ORIENTE	1	5	1	3
Napo	-	4	-	3
Pastaza	1	-	1	-
Morona Santiago	-	-	-	-
Zamora Chinchipe	-	1	-	-
Galapagos Islands	-	1	-	-
TOTAL	17	319	282	197

Source: Directorio y Codificacion de los Establecimientos de Salud,
Ministerio de Salud Publica, 1981.

APPENDIX G

Overall Hospital Capacity (1981)

<u>Province</u>	<u>Hospital beds</u>	<u>Emergency-room beds</u>	<u>Total</u>
TOTAL SIERRA	7,747	112	7,859
Carchi	179	11	190
Imbabura	325	-	325
Pichincha	4,133	81	4,214
Cotopaxi	310	-	310
Tungurahua	490	1	491
Bolivar	170	-	170
Chimborazo	575	6	581
Canar	145	4	149
Azuay	896	-	896
Loja	524	9	533
TOTAL COSTA	7,038	209	7,247
Esmeraldas	249	14	263
Manabi	788	6	794
Los Rios	485	6	491
Guayas	5,009	137	5,146
El Oro	507	46	553
TOTAL ORIENTE	536	34	570
Napo	206	32	238
Pastaza	140	2	142
Morona Santiago	113	-	113
Zamora Chinchipe	77	-	77
Galapagos Islands	30	-	30
TOTAL	15,351	355	15,706

Source: Consejo Nacional de Desarrollo (CONADE).

APPENDIX H

Inventory of Public Health Services
(MSP, Red Cross, Blood Bank)

	<u>Hospitals</u>	<u>Health Centers</u>	<u>Urban Health Subcenters</u>	<u>Rural Health Subcenters</u>	<u>Dispensaries</u>	<u>Health Posts</u>
TOTAL SIERRA	62	28	51	326	114	130
Charchi	3	1	1	17	5	3
Imbabura	4	1	2	31	8	14
Pichincha	17	10	22	46	58	3
Cotopaxi	4	2	2	32	5	8
Tungurahua	4	2	4	27	5	20
Bolivar	2	2	1	23	4	-
Chimborazo	7	1	9	35	3	22
Canar	2	3	4	34	4	17
Azuay	11	3	1	48	10	-
Loja	8	3	5	33	12	43
TOTAL COSTA	51	20	61	169	77	66
Esmeraldas	6	2	2	26	5	27
Manabi	11	7	17	48	8	5
Los Rios	4	-	7	21	3	-
Guayas	22	11	21	38	47	11
El Oro	8	-	14	36	14	23
TOTAL ORIENTE	15	1	13	30	13	58
Napo	5	1	7	8	2	4
Pastaza	3	-	1	10	5	14
Morona Santiago	5	-	3	8	3	26
Zamora Chinchipe	2	-	2	4	2	14
Galapagos Islands	2	-	-	-	2	6
TOTAL	130	60	125	525	206	260

Source: Directorio y Codificacion de los Establecimientos de Salud,
Ministerio de Salud Publica, 1981.

APPENDIX I

MSP Ambulances and Other Vehicles - 1982*

<u>Province</u>	<u>Vehicle Type</u>	<u>Quantity</u>	<u>Location</u>
Azuary	Ambulance	5	Hospital
	Automobile/Van	2	Hospital
	Automobile/Van	6	MSP Headquarters
Bolivar	Ambulance	1	Hospital
	Automobile/Van	4	MSP Headquarters
Canar	Ambulance	3	Hospital
	Automobile/Van	10	MSP Headquarters
Chimborazo	Van	3	
	Automobile	12	
Cotopaxi	Truck	3	Sanitary Works
	Ambulance	3	Institute (IEOS)
	Automobile	3	
El Oro	Ambulance	4	
	Automobile	4	
Esmeraldas	Ambulance	2	
	Van	2	MSP Headquarters
	Auto/Van/Ambulance	8	
Loja	Van	2	Quevedo Hospital
	Van	1	Vinces Hospital
	Automobile	7	MSP Headquarters
Manabi	Automobile	13	MSP Headquarters
	Ambulance	5	
	Van	1	MSP Headquarters
Morona-Santiago	Jeep	1	
	Automobile/Van	2	MSP Headquarters
Napo	Ambulance	1	Hospital
	Automobile/Van	10	
Pastaza	Automobile/Van	10	
	Ambulance	1	Hospital
	Automobile	2	
Tungurahua	Ambulance	1	
	Automobile	2	

* Does not include IESS, Armed Forces, and Red Cross equipment or MSP resources in Pinchincha and Guayas provinces.

Source: Dr. Jose Arroyo, Ministerio de Salud Publica, 1983.

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