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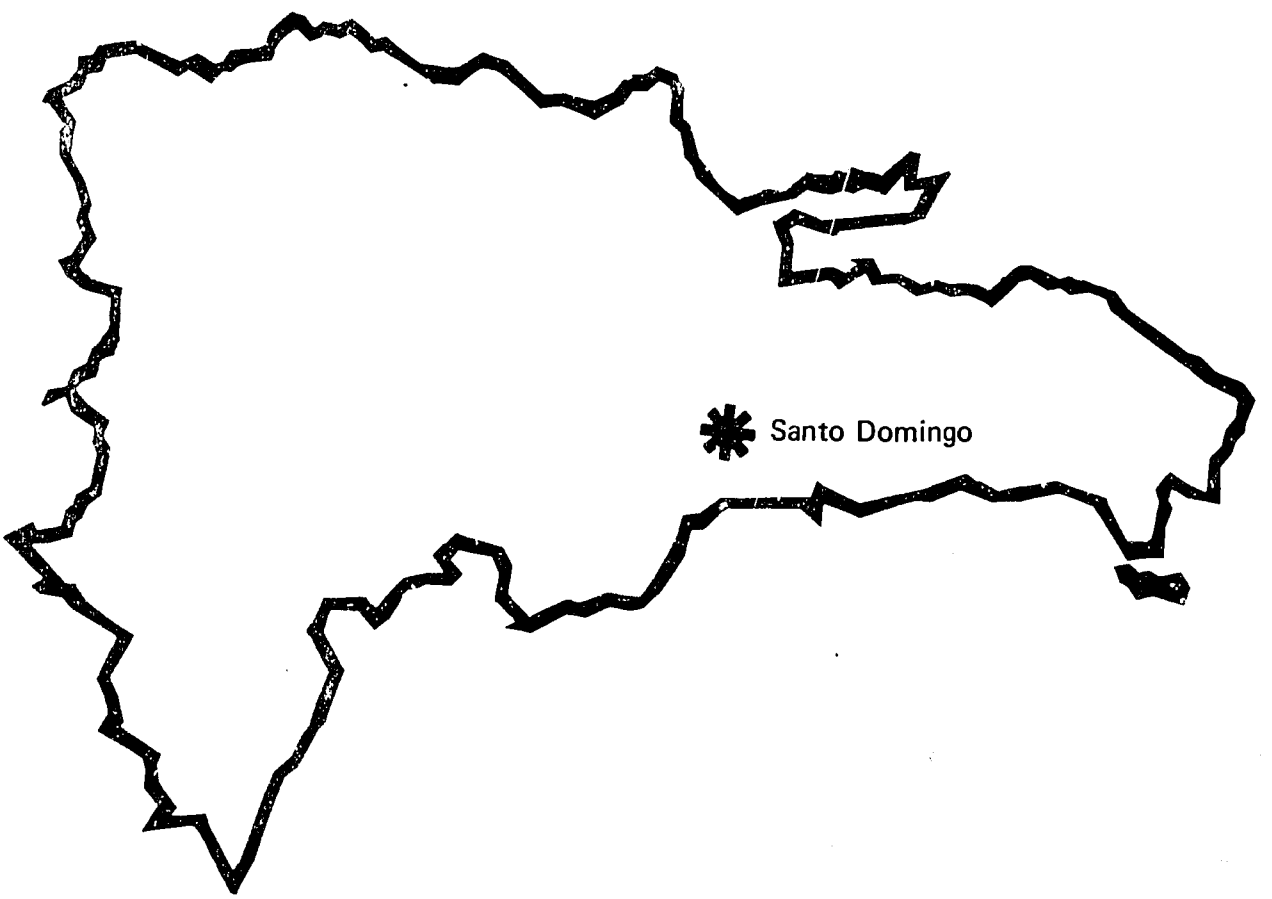
Dominican Republic

A Country Profile



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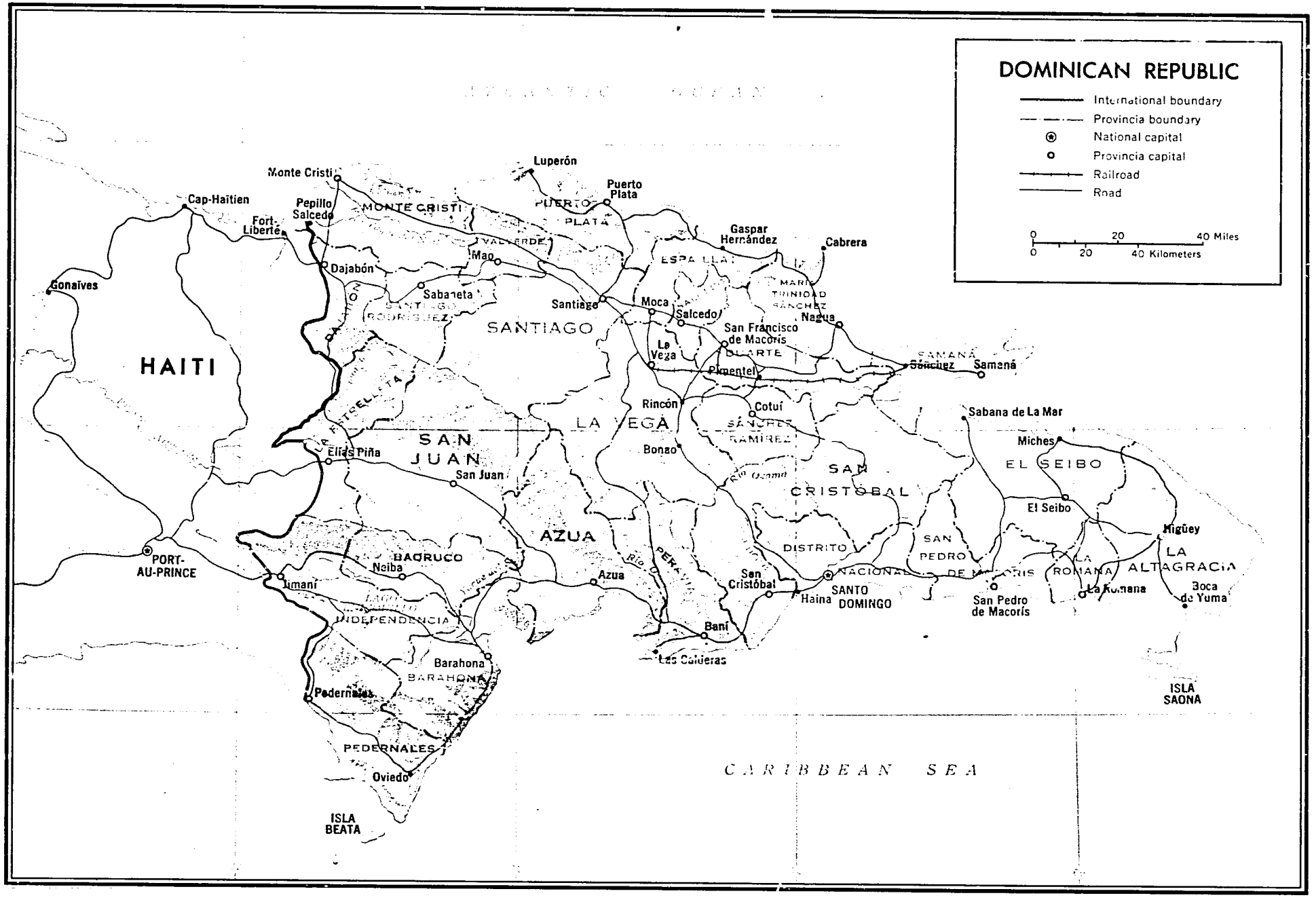
Agency for International Development
Washington, D.C. 20523


DOMINICAN REPUBLIC
International boundary
Provincia boundary
National capital
Provincia capital
Railroad
Road
0 20 40 Miles
0 20 40 Kilometers
HAITI
Monte Cristi
Cap-Haitien
Pepillo Salcedo
Fort-Liberté
Luperón
Puerto Plata
Gaspar Hernández
Cabrera
Gonaïves
Dajabón
Mao
Sabaneta
Santiago
Moca
Salcedo
Nagua
San Francisco de Macorís
La Vega
Pimentel
Sánchez
Samaná
Rincón
Cotuí
Sabana de La Mar
Miches
Elías Piña
San Juan
Bonao
El Seibo
Higüey
PORT-AU-PRINCE
Neiba
Azua
San Cristóbal
Haina
SANTO DOMINGO
San Pedro de Macorís
La Romana
Boca de Yuma
Jimaní
Baní
Las Calderas
Barahona
Pedernales
Oviedo
ISLA BEATA
ISLA SAONA
CARIBBEAN SEA
MONTE CRISTI
PUERTO PLATA
VALVERDE
ESPAILLAT
MARIA TRINIDAD SANCHEZ
SANTIAGO RODRIGUEZ
SANTIAGO
DUARTE
SAMANA
LA VEGA
SANCHEZ RAMIREZ
SAN JUAN
SAN CRISTOBAL
EL SEIBO
AZUA
BAORUCO
DISTRITO NACIONAL
SAN PEDRO DE MACORIS
LA ROMANA
LA ALTAGRACIA
INDEPENDENCIA
BARAHONA
PEDERNALES

THE DOMINICAN REPUBLIC: 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

Evaluation Technologies, Inc.
Arlington, Virginia
under contract AID/SOD/PDC-C-2112

The profile of the Dominican Republic is part of a series designed to provide baseline country data in support of the planning and relief operations of the Office of U.S. Foreign Disaster Assistance (OFDA). Content, scope, and sources have evolved over the course of the last several years; the relatively narrow focus is intentional. To avoid redundancy, some topics one might expect to find in a "country profile" are not covered here.

We hope that the information provided will also be useful to others in the disaster assistance and development communities. Every effort is made to obtain current, reliable data; unfortunately it is not possible to issue updates as fast as changes would warrant. A cautionary note, therefore, to the reader: statistics are indicators at best, and if names and numbers matter, the bibliography will point to a current source.

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

May 1984

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1. General Information

1.1 Geographic Codes

AID Standard	517
State Regional	ARA
FIPS	DR

1.2 Host Country Embassy & Staff in U.S.

Embassy of the Dominican Republic
1715 22nd St., NW
Washington, D.C. 20008
Phone: (202) 332-6280

For current information on the Dominican Republic staff in the United States, refer to the U.S. Department of State, Diplomatic List.

1.3 U.S. Mission in the Dominican Republic

Embassy: Corner of Calle Cesar Nicolas Penson and Calle Leopoldo Navarro
Santo Domingo
Phone: (809) 682-2171
Telex: 3460013

APO: Miami 34041

1.4 Time zones

EST + 1 hour
GMT - 4

1.5 Currency

Official rate: Dominican Peso (RD $1) = U.S. $1

Parallel rate: The U.S. dollar floats freely on the parallel market; during 1983 and early 1984, the range has been about RD $1.45-$2.50 to U.S. $1.

1.6 Travel and Visa Information

Passport or tourist card required; visa not required. A tourist card is valid for 15 days and costs $5; it can be extended 45 days; proof of citizenship is required. There is no charge for a visa.

1.7 Calendar and Holidays

New Year's Day.....Jan. 1
Altagracia.....Jan. 21
Duarte Day.....Jan. 26
Independence Day.....Feb. 27
Good Friday.....*
Labor Day.....May 1
Corpus Christi.....*
Restoration Day.....Aug. 16
Our Lady of Mercy (Mercedes) Day....Sept. 24
Christmas Day.....Dec. 25

* variable dates

1.8 Treaties and Agreements

Agricultural Commodities
Aviation
Customs
Defense
Economic and Technical Cooperation
Evacuation
Investment Guaranties
Labor
Mapping
Peace Corps
Telecommunication
Trade and Commerce
Visas
Weather Stations

1.9 International Organization Memberships

FAO, G-77, GATT, IADB, IAEA, IBA, IBRD, ICAO, ICO, IDA, IDB-Inter-American Development

Bank, IFAD-International Fund for Agricultural Development, IFC-International Finance Corporation, IHO-International Hydrographic Organization, ILO, IMCO-Inter-Governmental Maritime Consultative Organization, IMF, INTELSAT, IRC-International Red Cross, ISO-International Sugar Organization, ITU, OAS, PAHO, SELA-Latin American Economic System, UN, UNESCO, UPU, WHO, WMO, WTO.

1.10 Government

Political Status: The present constitution, enacted in 1966, established the Dominican Republic as a representative democracy with power divided among executive, legislative, and judicial branches.

Government Structure: Executive power is exercised by the president and vice president, who are popularly elected for a four-year term. There is universal and compulsory suffrage for all over age 18 or married, except members of the armed forces and police, who may not vote. The bicameral legislature, the National Congress, consists of a 27-seat Senate (26 provinces and the National District) and a 120-seat Chamber of Deputies (one representative for each 50,000 inhabitants, with at least two per province); members are also elected for four years. The nine members of the Supreme Court are elected by the Senate.

Regional Organization: The Dominican Republic comprises a National District (containing the capital and governed as a municipality) and 26 provinces, each administered by a governor appointed by the president. The provinces are subdivided into either municipalities (77) governed by elected mayors and municipal councils, or by municipal districts (20), governed by elected commissioners. Each municipality is subdivided into sections, headed by first magistrates, and these, in turn, into wards, headed by second magistrates. The central government directly administers another 1,600 townships.

1.11 Ethnic and Sociocultural Groups

Mulattoes are considered a separate race in official censuses and form the largest group in the Dominican Republic, accounting for about 73% of the population. Approximately 16% of the population is white and about 11% is black, mostly of Haitian origin. Ethnic groups include Chinese, Japanese, and other Asians.

1.12 Languages

Spanish is the official language and is spoken by about 98% of the people. The remaining 2% speak Haitian Creole, especially along the Haitian border. The use of English is growing due to cultural connections with the U.S.

1.13 Religions

Roman Catholicism is the state religion, and an estimated 98% of the population is nominally Catholic. The secular power of the Church has decreased since the regime of Rafael Trujillo and his family (1930-1961), who encouraged Church/state relations, but the Church still plays a major role in running educational and health institutions.

There are small Protestant, Haitian voodoo, and Jewish communities. Religious freedom is protected by law.

1.14 Geography

Location and Area: The Dominican Republic lies in the Caribbean Sea between latitudes 17° and 19° N and longitudes 68° and 72° W. It is located about 1,072 km southwest of Florida and about 120 km west of Puerto Rico. The Dominican Republic comprises the eastern two-thirds of the island of Hispaniola,

and includes the islands of Beata, Catalina, Saona, Alto Velo, and Catalinita. It has a total land area of 48,734 sq. km extending 386 km east to west and 261 km north to south. Its only international boundary of 290 km is with Haiti and it has been historically subject to disputes.

Topography: The country is divided into highlands and lowlands, the former consisting of four parallel mountain ranges and the latter of long parallel valleys between the ranges, all lying in a predominantly northwesterly direction. There are also numerous small valleys and basins and extensive marshlands in the bay areas.

The four major mountain ranges are: 1) in the south, the Sierra de Baoruco, with crests averaging 900-1,200 m, and peaks up to 1,800 m; 2) slightly to the north of the Baoruco range, the Sierra de Neiba, with similar elevations; 3) the highest range and principal watershed of the island, the Cordillera Central (known as Massif du Nord in Haiti), with crests averaging 1,500-2,500 m, and the highest peak in the West Indies, Pico Duarte, at 3,175 m; and 4) parallel to the northern Atlantic coast, the Cordillera Septentrional, with an average elevation of 1,200 m. The Cordillera Oriental, an extension of the Cordillera Central, is a smaller range that runs through the narrow eastern section of the country.

Each major valley has a drainage system. The Cibao Valley, the largest and most fertile, is drained by the Yaque del Norte, the country's longest river, and the Yuna River. The San Juan Valley is drained by the Artibonito River and its tributaries, and the Yaque del Sur and its tributary, the San Juan. The Caribbean coastal plain is drained by the Ozama and the Macoris rivers. All these rivers are shallow and subject to seasonal changes.

Climate: The country lies in a tropical maritime zone, but the heat is moderated by ocean currents and year-round trade winds.

Seasonal variations in temperature are slight, rarely falling below 15.6° C or rising above 32.2° C. The average is between 22.2° C and 28.3° C, varying from coastal lowlands to mountainous highlands, where frost is common at higher elevations (above 1,200 m).

Rainfall is heaviest in the north and east and the entire coast is subject to severe hurricanes during the rainy season, from June through November. The mean rainfall is between 139 cm and 152 cm, the highest (279 cm) recorded on the northeastern slopes of the Cordillera Oriental.

1.15 Population

The Dominican Republic, with approximately 6.2 million people, is the second largest country in the Caribbean. Its population growth rate is relatively high, at about 3% per annum. In the last 20 years the ratio of urban to total population increased from 30 to 54%, and the rate of urban growth is almost double the national growth rate.

Principal towns
(Population as of December 1981)

Santo Domingo	1,313,172
Santiago de los Caballeros	278,638
La Romana	91,571
San Pedro de Macoris	78,562
Concepcion de la Vega	54,432
San Juan	49,764
Barahona	49,334
San Felipe de Puerto Plata	48,348

Source: The Europa Year Book, 1983.

1.16 Health

Vital Statistics:	Births/1,000 population	35
	Deaths/1,000 population	9
	Infant mortality/1,000 live births	78
	Life expectancy at birth, years	62.3

Health indicators are unreliable due to the incomplete registration of births and deaths; the underregistration of deaths has been estimated at up to 90%.

Health Facilities: About 9% of the national budget goes into public health services, reaching an estimated 60% of the population. The private subsector covers approximately 10% and is heavily concentrated in the larger cities. In theory, the Ministry of Public Health and Social Welfare (SESPAS) covers 83% of the population, but recent estimates indicate that as many as 1,750,000 inhabitants may be without access to any health care services. The public health service is divided into rural, local, area, regional, and national levels. The rural level provides basic services in health protection with emphasis on maternal and child care. Approximately 6,000 people are served by each rural clinic.

The following table shows the number of health personnel and the ratio per 10,000 population in 1980:

	Number	Ratio/ 10,000 pop.
Physicians	2,849	5.4
Dentists	180	0.3
Nurses	477	0.9
Nursing Auxiliaries	4,349	8.2
Health Promoters (rural volunteers)	5,400	---

Source: IDB, Project for Support and Expansion of Health Services, 1981.

In comparing the human resources to those of other developing Latin American countries, the numbers are relatively satisfactory; however, physical resources are not, especially in rural establishments. The number of hospital beds in the country (including private facilities) is 9,003, a ratio of 1.7 per 1,000 population; rural clinics provide out-patient care only.

Diseases:

A high percentage of deaths are attributed to unknown causes. Approximately 53% of deaths in 1979 were not medically certified. The leading known causes of death are diarrheal diseases, enteritis, and infectious and parasitic diseases, in particular tuberculosis, measles, congenital syphilis, diphtheria, and typhoid fever. Vaccination or other control measures could prevent deaths due to communicable diseases, especially measles and whooping cough. Recently, the incidence of malaria has been increasing and poliomyelitis is still endemic. Malnutrition is highly prevalent in children.

See also Section 3.4, Health Resources.

1.17 Economy

In recent years, the Dominican economy has been hit by adverse events beyond its control: 1) the sharp increase in world oil prices, increasing the import bill of petroleum products to over half of total export earnings; 2) the decline of sugar prices since 1976; and 3) the 1979 hurricanes, which caused extensive damage to infrastructure, housing, and agricultural crops.

Agriculture is the most important economic activity in terms of employment and exports. The agricultural sector, however, is highly vulnerable, suffering from outbreaks of disease and pests, weather hazards (e.g., damage estimated at RD $890 million was inflicted by Hurricane David in 1979), and declines in world prices for sugar, coffee, cocoa, and tobacco, which account for approximately 90% of total agricultural exports. Exports of gold and silver also bring in large revenues, and tourism is increasing as a major source of employment and revenue.

In 1982 about 60% of total export earnings were used for oil imports. However, a petroleum deposit has been discovered in Barahona with a potential output which could eventually supply half of current consumption.

The Dominican Republic's GDP totaled U.S. $6,649 million in 1980, of which services represented 36.6%, industry 26.4%, agriculture 21.1%, and commerce 15.9%. Though agriculture represents less than a quarter of the GDP, it accounts for about 75% of total exports and provides a living for about 50% of the population. GDP growth was down to 3% in 1981 and no growth was expected in 1982. Unemployment was estimated at 25% in 1982, and underemployment at another 25%.

Balance of Payments: In 1981, the balance of payments deficit was U.S. $458 million. The foreign debt stood at over U.S. $2,000 million and the central bank was out of reserves. The new government, installed in 1982, introduced wage and price controls, tax increases, and measures to reduce imports.

Exports: Exports in 1982 totaled U.S. $768 million, primarily composed of sugar and its by-products, dore (a gold/silver alloy), ferronickel, coffee, cocoa, and bauxite. Major markets are the United States, Benelux, Venezuela, Puerto Rico, Spain, Italy, and West Germany.

Imports: Imports in 1982 totaled U.S. $1,249.5 million, primarily composed of petroleum, foodstuffs, industrial raw materials, and capital equipment. Major suppliers are the United States, EEC, Japan, Great Britian, Canada, and Puerto Rico.

1.18 Communications

Radio: The telecommunications system is based on a nationwide radio relay network. There are over 130 commercially operated radio stations with short- and medium-wave and FM transmitters. Of these, about 23 are in Santo Domingo and 15 in Santiago de los Caballeros. A number of stations are owned by Radio Television Dominicana, also the leading television station, which is nationwide and government-owned. Adult education classes

are broadcast by Radio Santa Maria de la Vega. In 1978 there were 212,000 radio receivers, or about 40 per 1,000 inhabitants.

Television: Television was introduced in 1952 and now covers 90% of the population. There are four channels, one government-owned and three private. There were 385,500 sets in 1978.

Telephones: There are approximately 3.6 telephones per 100 people, and much of the rural area is without telephone service, which is erratic, even in Santo Domingo.

See also Section 3.7, Communications.

1.19 Transportation

Roads: The road network of the Dominican Republic is considered the best in Latin America and it is the country's primary means of transport. It covers 17,500 km, about 83% of which is paved. The main highways are the Carretera Sanchez, from Santo Domingo to Elias Pina on the Haitian border, part of a direct route to Port-au-Prince, Haiti; Carretera Mella, from Santo Domingo to Higuey in the southeast; and Carretera Duarte, from Santo Domingo to Monte Cristi in the northwest.

Ports: Santo Domingo is the largest seaport; the second is Puerto Plata in the northwest; other major ports are Haina, Andres, Barahona, Las Calderas, San Pedro de Macoris, and La Romana Boca Chica.

There is no island waterway system, as most rivers are not navigable except by small craft; there is some commercial traffic on the Nizao River.

There is very little coastal shipping. A small Merchant Marine and a number of foreign shipping companies operate services to the U.S. and other Caribbean islands.

Rail:	The railroad system, covering about 1,600 km, is used primarily for transporting sugar from plantations to port. There is no passenger service.
Airports and Airlines:	The largest airports are the Santo Domingo International Airport, known as the Airport of the Americas, and the international airport at Puerto Plata, which opened in 1979. There are approximately 50 smaller domestic airports or fields, 40 of which are usable and ten with permanent surface runways. Compania Dominicana de Aviacion, operating on international routes, and Alas del Caribe, operating on internal routes, are the national airlines. See also Section 3.8, Transportation Resources.

2. Disaster Vulnerability

2.1 Overview of the Physical Environment

The topography of the Dominican Republic is complicated and varied. It includes five distinct highland areas running along a northwest to southeast axis and separated by fertile valleys. The major mountain range is the Cordillera Central, which containes the highest peak in the West Indies, the Pico Duarte (3,175 m). A smaller range, the Cordillera Septentrional, runs parallel to the northwest coast; two lesser ranges form the southwestern highlands; and the Cordillera Oriental forms the minor highland area in the east. The extreme northwest and extreme southwest are dry, low, and semi-arid, while the southeast consists of rolling lowlands.

Four major rivers drain the highlands. The Yaque del Sur drains the Cordillera Central in the south and empties into the Bay of Neiba; the Yaque del Norte drains the northern slopes and flows into the Bay of Monte Cristi; and the eastern part of the island is drained by the Yuna, which flows into the Bay of Samana, and the Ozama, whose mouth is near Santo Domingo.

Vegetation varies with the topography. The mountains are forested with pines and hardwoods, although the lower, more accessible slopes have been practically denuded by commercial lumbering operations and small farmers practicing slash-and-burn agriculture. In the drier regions, low shrubs and scrub trees predominate, but as rainfall increases, grasslands and dense forests occur. The fertile upland valleys and the lower mountain slopes are well cultivated with a variety of crops. The coastal area varies from mangrove swamps to sandy beaches.

Although the island lies in the tropics, the hot moist climate typical of this zone is tempered in many areas by altitude and the Northeast Trade Winds that blow from the Atlantic year-round. There are some local variations, but the country generally has a mild pleasant climate. The national mean temperature is 25° C and it rarely goes above 32° C or below 21° C. The heaviest precipitation is in the northeast, where the average rainfall is 2,500 mm a year. As the trade winds pass over the mountains, they lose their moisture until, in the far western area near the Haitian border, the average annual rainfall drops to about 750 mm.

Average Annual Rainfall (mm)

Sierra de Baoruco	750-2,000
Azua, Bani, San Cristobal	750-2,250
Ozama River Basin	1,400-2,250
San Pedro de Macoris and Romana	1,000-2,250
Higuey	1,000-1,750
Miches and Sabana de la Mar	2,000-2,700

Northern Coastal Zone	1,000-2,300
Yuna River Basin	1,170-2,250
Yaque del Norte River Basin	500-2,000
Dajabon River Basin	750-2,000
Yaque del Sur River Basin	700-1,500
Lake Enriquillo Basin	600-1,200
Artibonito River Basin	1,200-2,000

2.2 Hurricanes

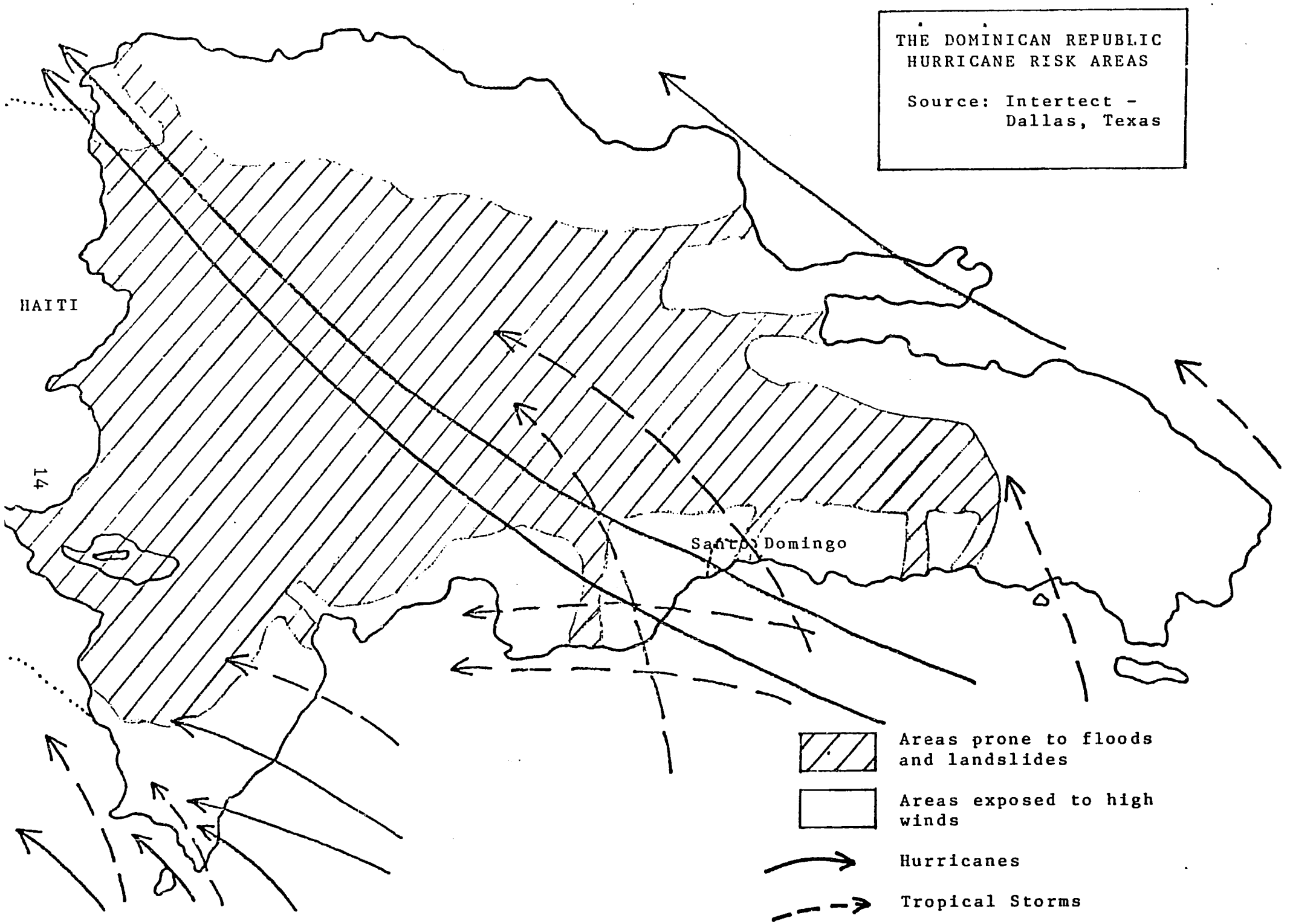
Situated in a major hurricane zone, the Dominican Republic is constantly in danger from tropical storms and hurricanes. Generally, the hurricanes form in the North Atlantic and are carried to the area of the Greater and Lesser Antilles by conducting currents.

Hurricane season begins on June 1 and continues through November, but the time of greatest frequency is from the middle of August to the middle of September. (See section 2.7, Disaster History.)

The country has been hit almost every year since the Spanish began keeping records in the late 19th century. The number of hurricanes and tropical storms that have affected the Dominican Republic during the last 100 years totals 139, mostly in the southwestern part of the island. See map, page 14.

In 1930, the country was devastated by "San Zenon" which destroyed Santo Domingo and caused about 2,000 deaths. Since then, the worst disasters have been Hurricane David and Hurricane Frederick, both of which devastated the country five days apart in 1979. The storms crossed the island from Punta Palenque, Najayo, to the province of Monte Cristi and brought winds that reached 240 km per hour and rainfall which caused flooding country-wide. These phenomena caused about 2,000 deaths, injured thousands of others, and affected about 1.2 million people, which represents about 23% of the total population. Material damage has been calculated at about US $800 million. Fifty-eight bridges were destroyed, 2,000 km of roads were badly damaged, 100,000 families were without shelter, and agricultural losses were extensive. Including Hurricane Allen in 1980, the combined damage was estimated at US $945.8 million, representing about 15.5% of the nation's GDP at that time.

Summarizing the damage wrought by Hurricanes David and Frederick shows to what extent the Dominican Republic is vulnerable. The combination of rain and wind damage was devastating, especially for a developing country with limited resources.


THE DOMINICAN REPUBLIC
HURRICANE RISK AREAS
Source: Intertect -
Dallas, Texas
HAITI
Santo Domingo
Areas prone to floods and landslides
Areas exposed to high winds
Hurricanes
Tropical Storms

Roads and Bridges: Hurricane David's winds created a large amount of debris. Streams swollen by heavy rainfall carried the debris along until it began to collect at points of constrained flow such as bridges and culverts. As a result, natural dams began to form, backing up water around clogged bridges. The water eventually overflowed these obstructions and caused the soaked ground and temporary dams to give way. Just as the water from David had begun to subside, Frederick's heavy rains repeated this sequence of events.

On principal routes, more than 100 km of roads and 31 bridges were destroyed by mudslides or washouts. Of 6,000 km of rural roads, approximately 2,000 km were rendered unusable and over 100 bridges were damaged. All roads in the central and southern sections were severed, making overland transportation virtually impossible. Hundreds of towns were isolated, and food and potable water were soon in short supply. During the rehabilitation and reconstruction phases, damage to the rural transportation network severely limited the rural population's access to food, housing materials, health services, farm inputs, and markets.

Electric Power: The hurricanes caused extensive damage to the electric power system. Hydroelectric power plants at Valdesia and Tavera were knocked out of commission. The transmission system from Santo Domingo southwest to Azua was almost destroyed, and more than 35% of the distribution systems throughout the provinces of Bani and San Cristobal were downed. The Dominican Electricity Corporation was unable to repair the system adequately because materials such as poles, wire, and transformers were in short supply. Lack of refrigeration caused the loss of perishable food and medicine.

Housing: The heaviest damage to housing was in the provinces west of Santo Domingo, often in isolated and mountainous locations. In an area of about 160 sq. km between and to the north of Bani and San Cristobal, 75% of all housing was destroyed. Most damage was caused by the high winds which ripped roofs, doors, and windows from their moorings. The destruction of shelter and other community infrastructure created serious health and displaced persons problems. According to a study conducted by Intertect ("Improvement of Rural Housing in the Dominican Republic to Withstand Hurricanes and Earthquakes," April 1981), almost 80% of the population still lives in non-engineered structures that cannot withstand high winds. This is true for both rural areas and urban centers.

Agriculture: The total value of crop and poultry losses was estimated at $266.5 million, or about 25% of agricultural GDP. Most of the damage was to small farms, but an additional $46.4 million was the estimated loss from physical damage to irrigation, farm and poultry industry installations, and small marine fisheries. As a result of the storm damage, there were considerable shortages of traditional food crops, mainly plantains and root crops, necessitating greatly increased

food imports. Lost exports, primarily coffee, were valued at about $100 million. The combined effect of increased food imports and lost export income was to significantly worsen the GODR's already strained balance of payments situation.

Crops are susceptible to both high winds and flooding. Damage to the coffee crop during the 1979 hurricanes was largely the result of shade trees blown down during the storms. The coffee plants themselves were not badly damaged by the wind, but rather by the crushing weight of other trees. As a result, the Dominican Republic has been experimenting with cultivating a different variety of coffee plant that requires less shade. Plantains, also, are highly vulnerable and cultivated in high risk areas. Moisture loosens their roots and the wind easily uproots them. They are an important staple and farmers have found no acceptable substitute.

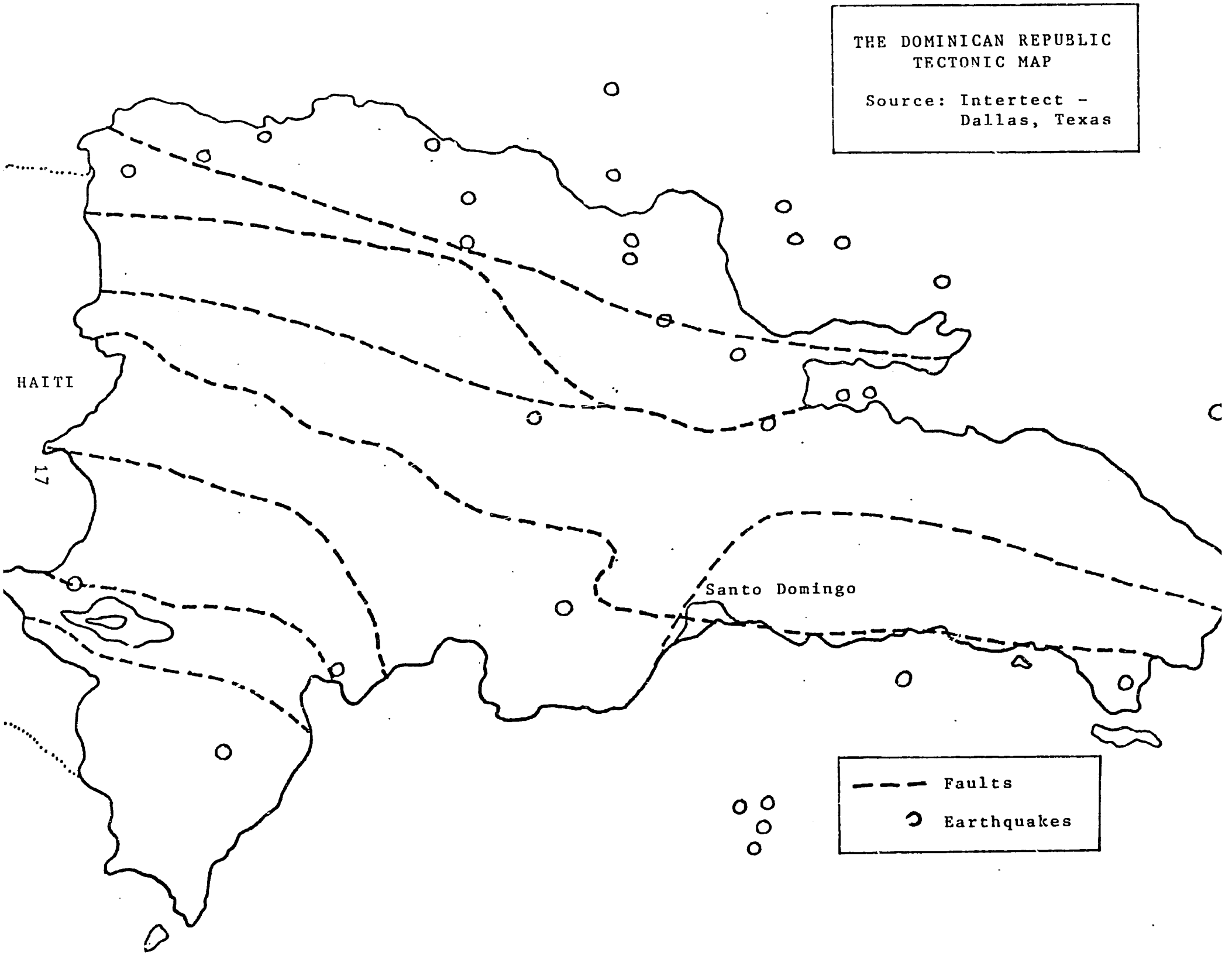
In 1979, the plantain crop in the southwest was destroyed, but in other areas survived the storms. Plantains were still available in the country, but the damaged roads prevented their distribution. Other foods that were less bulky were flown in to isolated areas.

Dominican forests were ravaged by the storms. Approximately 94,000 trees, mostly pine and primarily in public forests and parks, were felled. In respect to the lumber that could be recovered, the fallen trees represented a potentially valuable resource. However, the long-term negative effects such as increased erosion, siltation, and flooding posed a serious environmental threat.

2.3 Seismicity

The entire island of Hispaniola lies within the Caribbean earthquake zone, on the northern limit of the Caribbean Plateau. The Cibao Fault in the north and the Ocoa and San Juan Faults in the south run east-west across the country. To the east, the Mona Passage between Puerto Rico and the Dominican Republic, is considered a zone of great seismic activity producing daily micro-earthquakes in the Caribbean Sea. The eastern coastal plain is also vulnerable. See map, page 17.

Between 1900 and 1960 shallow earthquakes occurred in the Cibao Valley, the Caribbean coastal plain, and along the northeast coast. The cities of Santiago, San Jose de Ocoa, and Santo Domingo have all suffered considerable earthquake damage in the past, most recently in 1971 when a cement plant near Santo Domingo was seriously damaged, necessitating heavy


THE DOMINICAN REPUBLIC
TECTONIC MAP
Source: Intertect -
Dallas, Texas
HAITI
Santo Domingo
Faults
Earthquakes

imports. The last major earthquake (8.1 on the Richter scale) occurred in 1946, causing enormous damage in the north and in the Cibao Valley. Since then seismic activity has decreased, but statistical data on the occurrence of earthquakes in the Dominican Republic reveal a 50-year cycle of seismic activity which will repeat itself in 1996. During this century, instrumental data show that the Mona Passage is the most vulnerable area.

The southern coast between Bani and Barahona and near Santo Domingo is particularly vulnerable to tsunamis generated by quakes in the eastern Atlantic. The Lisbon quake of 1755 generated 10-meter waves that reached the West Indies 12 hours after the initial shock; an earthquake in August 1946 destroyed several cities and caused a wave, three meters high and three km in length, that destroyed the town of Matanzita.

2.4 Floods

Basically, flooding in the Dominican Republic is due to: 1) overflowing river banks caused by intense and prolonged rainfall, often at a great distance from the actual flooding; 2) the invasion of sea water from high waves resulting from storms or seismic movement; and 3) overflowing dams. Due to its location and topography, the country is very susceptible to flash flooding, and almost every year there is major flooding causing extensive damage and loss of life. See map, page 14.

The long valleys between mountain ranges form the country's lowlands. The fertile alluvial soils of the valley flood plains and terraces are intensely cultivated and the shallower soils are used for pasture. The Cibao Valley, measuring from 14-27 km in width, is the largest valley and considered the country's breadbasket. Its eastern portion, known as the Vega Real, includes the Dominican Republic's richest agricultural land.

The main problem caused by floods produced by rivers overflowing their banks is the damage to crops growing on the flood plains. The zones most affected are the Bajo Yuna, the Nagua Plain, and the alluvial plain of the Yaque del Sur River.

The government considers the Bajo Yuna a favorable rice growing area, which would be productive if the flooding problem could be overcome. Engineers have conducted numerous studies on how to efficiently drain excess water from the land and how to control the Yuna River's course. The National Water Resources Institute (INDRHI) has compiled information on hydrometeorology, hydroeconomy, geology, and soils. After becoming thoroughly familiar with each river's behavior, the goal is to control the current in a permanent path so as not to damage bridge supports and approaches, and to assure that irrigation plants continue to operate.

Through structural engineering, river waters can be contained or detoured. Non-structural means would be planning land use based on the above information and educating the populace as to the dangers of living and cultivating in flood zones.

Major Crops and Harvest Dates:

Crops	Harvest Period
Maize	Jan.-Feb. and June-Dec.
Rice	Jan.-Feb. and July-Dec.
Sugar cane	Jan.-May and Dec.
Potatoes	Jan.-Mar. and Oct.-Dec.
Sweet potatoes	Jan.-Aug. and Dec.
Cassava	Feb.-May and Aug.-Dec.
Yautias (Xanthosama sagittaefollum)	Apr.-Dec.
Onions	Jan.-May and Nov.-Dec.
Dry beans and kidney beans	Jan.-Aug. and Nov.-Dec.
Bananas	Apr.-Oct.
Plantains	Mar.-Nov.
Pineapples	Apr.-Oct.
Coconuts	Jan.-Aug.
Groundnuts	May-Dec.
Coffee	Jan.-Feb. and Aug.-Dec.
Cacao	Mar.-June and Oct.-Jan.
Tobacco	Jan.-May and Dec.

The potential for serious flooding is compounded by deforestation and subsequent erosion. Eroded river banks are lower than they were previously, as they no longer have the reinforcement of tree roots. As a result, the rivers burst their banks relatively frequently during the rainy season from June to October. In these low-lying areas, there is a constant risk of flooding.

2.5 Deforestation and Erosion

One cause of deforestation is the clearing of land for sugarcane cultivation. Production of subsistence crops, some cocoa, coffee, and bananas, and the raising of pigs and cattle has given way to the exclusive cultivation of sugarcane in many communities. These areas are often completely treeless. Another cause of deforestation is migration to previously state-owned land in the hill areas. This land was occupied and cleared mainly during the 1960s when decreasing income from coffee crops and the rumored availability of the land prompted new settlements. There is practically no forest left in this region and crop yields have dropped by half in some areas since this process began 20 years ago. Thus, erosion of the land from flooding and deforestation is closely

related to the historical development of the country into a predominantly cash crop -- sugar cane and coffee -- producer. Slash-and-burn farming and charcoal production have further contributed to deforestation.

2.6 Forest Fire

Fire control is a serious problem for a short period of the year, ranging from two to four months between December and April. The country's dry southwest and northwest regions are the most vulnerable areas. The majority of fires are caused by human carelessness, but lightning is also a factor.

Detection and reporting of fires is very difficult due to the remoteness of much of the country and the lack of rural communications. In addition, charcoal production and slash-and-burn agriculture make fires such a natural part of the landscape, that a potentially dangerous fire is not easily seen until it is very large and out of control.

A forest fire in the Cordillera Central, near the city of Constanza, in February 1983 burned across 25-30 sq. km of dry pine and brush, heavily damaging about 50% of the affected area's soil and timber. Both the Armed Forces and FORESTA, the Dominican Forest Service, worked to control the fire, although neither had proper clothing or adequate equipment. The government has subsequently sought international assistance to train and equip the national firefighting service.

2.7 Disaster History

Date	Disaster Type	Location	Number Killed	Number Affected ('000)	Damage ($mil)
9/3/30	Hurricane	Santo Domingo	2,000	n.a.	40.0
10/2/63	Hurricane	Nationwide	400	n.a.	60.0
4/19/65	Forest Fire	Pico Duarte	n.a.	n.a.	1.0
4/24/65	Civil Strife	Santo Domingo	1,500	22	5.0
8/24/64	Hurricane	Barahona, Neiba Bay	7	n.a.	1.0
9/29/66	Hurricane	SE coast, Barahona	74	7	5.0
1968	Drought	Nationwide	n.a.	240	5.0
1978	Swine Fever Epi.	Nationwide	n.a.	n.a.	n.a.
8/31/79	Hurricane	Nationwide	1,400	1,200	150.0
4/27/79	Flood	North, Northeast	32	1	n.a.
5/81	Flood, Rains	Nationwide	20	150	n.a.
2/13/83	Forest Fire	SE of Constanza	0	-	-

Source: OFDA Disaster History on file in Washington, D.C. Covers 1900 to the present.

3. Disaster Preparedness and Assistance

3.1 Host Country Disaster Organization

A National Disaster Commission was created in October 1981 to develop a National Preparedness Plan. Four of the thirteen institutions represented on this Commission worked together to develop the basic part of the plan. They are the Civil Defense Office, the Seismology Institute, the Technical Ministry of the Presidency, and the Weather Service. The Executive Secretary of the Commission, representative of the Ministry of Public Works and Communications (SEOPC) served as coordinator.

Civil Defense has been designated as the agency in charge of implementing the national plan in time of disasters. The plan is very detailed, assigning responsibilities to all government agencies and calling upon the resources of the private sector, including banking, transportation, and commercial establishments. A major portion of the plan assigns specific tasks to the various agencies involved. Thirteen annexes provide additional details about agency responsibilities for communications, damage assessments, emergency medical services, evacuation, emergency shelter, search and rescue, security, and logistics.

The National Disaster Plan, including the list of responsible agencies and their tasks, is available through OFDA and the U.S. Mission in Santo Domingo. Although the Plan is very thorough, the Civil Defense Office is inadequate to perform its task of implementation in case of disaster. Some drawbacks noted are the lack of an Emergency Operations Center (EOC) and the need for personnel, an organizational structure, and communications facilities to support disaster operations. While the Civil Defense headquarters in Santo Domingo is not equipped to serve as an EOC, it does maintain 24-hour radio contact with substations and other agencies around the country from a small minimally equipped office. The Office of Civil Defense also publishes informational booklets that are distributed in schools and has detailed maps indicating the locations of temporary shelters and evacuation points around the country.

Civil Defense, the National Police, and the Armed forces cooperated effectively in the most recent major disaster in 1979. However, the numerous private and government agencies working in disaster preparedness and relief do not have the same close relationship with Civil Defense and problems of communication and authority have occurred.

Ms. Milagros Nanita, of SEOPC, is a valuable source of information on host country preparedness and is involved in all areas of disaster planning. To centralize data on disaster resources, SEOPC has requested that the governors of each province send the following information to its central office: available shelters; vehicles belonging to state agencies; evacuation resources such as trained personnel and transportation; and locations of communication equipment (VHF, HF, or UHF) which can be linked to the National Meteorological Service network.

Another source of information on the status of disaster preparedness in the Dominican Republic is a three-volume set of papers presented at the First National Symposium on Natural Disasters, July 1981, available at SEOPC (as well as in the OFDA Library in Washington, D.C.). Included are presentations made by the Office of Civil Defense, the Armed Forces, the Ministries of Agriculture, Public Health, and Public Works and Communications, the Dominican Electric Corporation, the National Institutes of Hydrology and Potable Water and Sewers, the Geographic and Seismology Institutes of the National University, the Dominican Red Cross, and others. The papers include each agency's plans for future mitigation projects, available resources, and the vulnerabilities in each sector in different disaster situations.

3.2 Dominican Red Cross

The Dominican Red Cross (DRC) has provincial, municipal, and rural offices throughout the country. In case of disaster, the local groups assess the damage and request aid from the provincial or national centers. Theoretically, government authorities, especially the Office of Civil Defense, delegate responsibility to the DRC, but because of its organization, resources, and number of trained personnel, the DRC is often the first agency involved in rescue and relief work when a disaster strikes.

The National Relief Plan of the DRC lists its responsibilities as census taking and reporting (of victims); assisting in evacuation and rescue; providing first aid and caring for the sick; and providing temporary shelter, clothing, food, and blankets. The National Council of the DRC is responsible for program development. Under the National Council is the National Relief Office which is charged with, among other responsibilities, implementing national programs, guiding and supporting provincial groups, and working closely with Civil Defense and voluntary agencies.

The National Office also provides training for permanent voluntary personnel, or Rescue Teams, and conducts campaigns to teach the general public first aid. It maintains an on-going educational program which in 1983 graduated 3,487 people in First Aid, in addition to others from courses in Swimming, Lifesaving, Awareness in Disasters, and Rubble Removal and Rescue. Four courses were nationally televised with participation of the National Meteorological Service, the Dominican Seismology Institute, and Civil Defense.

The DRC operates three blood banks in Santo Domingo, San Francisco de Macoris, and Santiago de los Caballeros. It also maintains warehouses of clothing, blankets, mosquito nets, tents, and emergency medicine and medical supplies. In Santo Domingo, the National Office has available: 16 ambulances, 2 passenger microbuses, 2 4-ton Toyota trucks, 1 Jeep, 1 car, and 1 bloodmobile. Red Cross provincial centers can provide a total of an additional 18 ambulances and a well trained youth group of rescue

workers. The central DRC office lacks backup generators and a radio system to communicate with regional offices. Currently the DRC depends on telephone and telegraph connections which are sometimes deficient.

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National Director for Relief and Emergencies
Cruz Roja Dominicana
Juan E. Dunant No. 51
Santo Domingo, Dominican Republic
Tel: (809) 682-4545

3.3 Warning Systems

The National Meteorological Service and the University Seismology Institute collect and disseminate information on approaching storms and possible earthquake activity.

According to a WMO report (April 20, 1982), the Dominican Republic has a well-established meteorological service with a substantial amount of equipment and instruments installed at observation stations throughout the country. The following divisions comprise the system:

1. Climatology and Agrometeorology
2. Aeronautical Meteorology and Forecasting
3. Cyclones and Special Studies
4. Meteorological Training and Information
5. Instruments and Communications
6. Hydrometeorology

Meteorological reports and bulletins are received at the Office of Civil Defense, where the threat level is determined. Following the determination of an impending storm, commercial and amateur radio stations are notified and instructed to issue regular weather bulletins. If an emergency situation develops, warning notices are broadcast to the population and, if necessary, evacuation plans are implemented. Generally schools, public buildings, and churches serve as disaster shelters.

The Emergency Communications Network proved to be effective in the 1979 disaster, both in collecting data and broadcasting warning bulletins, although it lacks sufficient radio equipment.

The information centers for the country in case of a disaster are:

1. Civil Defense
2. State Office of Meteorology
3. Dominican Electricity Corporation
4. Operations Center of the Armed Forces and National Police
5. State Office of Telecommunications
6. State Ministry of Agriculture

Flood warning systems are not as efficient and effective as the hurricane warning system, as no procedure has been implemented to monitor precipitation amounts or the major river beds.

3.4 Health Resources

The health sector consists of public and private sub-sectors, with an overwhelming burden (90%) of responsiblity falling on the former. The Ministry of Public Health and Social Welfare (SESPAS), the Dominican Social Security Institute (IDSS), and the Medical Services of the Armed Forces and the National Police comprise the public sector.

SESPAS is the main public health agency. For administrative purposes, it has divided the country into seven Health Regions and a Central District, Santo Domingo (sometimes referred to as Region 0). SESPAS maintains current information on the number of hospitals, medical personnel, beds, and ambulances available in each region. In addition, all public health doctors and their locations and specialties are listed.

SESPAS lists the principal causes of death and sickness related to disasters as follows:

Injuries
Drownings
Shock and Trauma
Bronchopulmonary Illnesses
Gastroenteritis
Measles
Typhoid Fever
Malaria
Hepatitus

The first three causes occur mainly during or immediately after a disaster; the others occur at later periods.

The most common health hazards that surface in the wake of a disaster are lack of potable water; damage to sanitary installations; accumulation of garbage; increase in the rodent and vector populations; and reduction of the food supply, either from spoilage or other damage. Malnutrition, which is endemic, increases in disaster situations.

Mitigation efforts include SESPAS' plans to store medicine and supplies in each of its establishments to be used only in cases of disaster. It also plans to maintain a minimum stock of food as well as the transportation resources needed to distribute the food during an emergency. Health education includes public awareness orientation to prevent sickness and injuries in emergencies. Health promoters and educational institutions emphasize these methods during the pre-hurricane season. SESPAS has also implemented a program of rural latrine construction.

A meeting was held in December 1981, under the auspices of PAHO and Panama's Ministry of Health, to discuss the major health problems of the region in times of disaster. The problems they noted in post-disaster relief efforts were: lack of preparedness and coordination, duplication of unsolicited aid, abundance of inappropriate medications, unnecessary vaccination campaigns, arrival of volunteers without knowledge of Spanish, and lack of attention to high priority problems.

Operational Level of the Health Services Network

Type	Number	Area	Facilities
Health Promoters	5,400	Isolated rural districts	Volunteers working in the field to educate and encourage community awareness and participation in health projects
Rural Clinics	312	Rural population centers	Health teams of doctors, paramedics, nursing aids, and support staff conducting educational activities and prevention and recovery; out-patient only (total: 402 doctors)
Subcenters	55	Cities other than provincial capitals	Same as rural clinics, but with some beds for in-patient care (total: 210 doctors; 116 beds)
Regional Hospitals	34	Subcenters	Basic hospital care
		Provincial capitals	Basic hospital care
		Regional headquarters*	Complete hospital care (total: 4,163 doctors; 3,694 beds; 51 ambulances)
Central Hospitals	11	Santo Domingo	Complete and specialized hospital care (total: 337 doctors; 2,591 beds; 10 ambulances)

* Santo Domingo, Bani, Santiago, San Francisco de Macoris, Barahona, San Pedro de Macoris, San Juan de la Maguana, Sabaneta

Source: SESPAS, 1983 data.

3.5 Food Resources and Storage Facilities

The basic diet in the Dominican Republic includes rice, beans, plantains, yucca, vegetable oil, meat, fish, and fresh vegetables. Acceptable P.L. 480 Title II substitutes are bulgur wheat, soybean oil, corn-soya mix, wheat-soya blend, non-fat dried milk, and wheat flour.

The 1979 hurricanes hit the areas that produce food for the domestic market especially hard, both in terms of crop loss and overland transportation routes for bringing in essential agricultural inputs and moving produce to market. Some authorities felt that there were enough food crops left undamaged to avoid excess imports, and that the main problem was distribution from unaffected market areas to isolated disaster zones. In some cases, helicopters were the only possible means of transportation and it was therefore necessary to send in low bulk foods, instead of a local staple such as plantains. In response, the USG brought in C-rations; and the U.S. Peace Corps baked bread for distribution to isolated towns using ingredients from P.L. 480 commodities available in-country. However, the C-rations flown in were costly, and in some instances, rejected by the population because the new food caused diarrhea; the Peace Corps bread was a great improvement over the previous shipments of P.L. 480 bulk grains delivered in an unprocessed state.

The National Price Stabilization Institute (INESPRE) has storage facilities, mobile dehumidifiers for stored products, and transportation facilities, which include refrigerated trucks, to move warehoused goods to safe ground before a predicted storm and subsequently back for distribution to the affected area.

In addition to the GODR food reserves, Catholic Relief Services (CRS), CARE, and Church World Service (CWS) maintain warehouses of P.L. 480 commodities. The warehouses were well stocked when the hurricanes struck in 1979, and these supplies, mainly milk, rice, and wheat, were diverted for emergency assistance. CARE's P.L. 480 supplies are stored in open-sided warehouses on the waterfront, but inland warehouses are also available where food can be moved during a hurricane.

Storage Capacity

Organization	No. Warehouses	Estimated Capacity (sq. m)
CARE	4	63,500
CRS	3	94,455
CWS	1	5,559
State Sugar Council (CEA)	3	139,500
Others	4	74,400

CARE has reported problems with heat damage, and CRS has reported problems with rodents.

INESPRE reports the following storage capacity:

Region	Capacity	
	cubic meters	kg
Southeast	38,489	66,958,900
Central	38,947	66,392,400
Northeast	39,034	66,799,200
Northwest	24,905	42,873,000
Southeast	26,534	45,947,900
Total	167,909	288,971,400

The above total includes conventional warehouses, refrigerated warehouses, and silos.

3.6 Housing

Rural:

There are five basic types of dwellings in the rural areas of the Dominican Republic.

1. Yagua: These houses are built of flattened palm leaves. The stems are fastened to a lightweight wood frame. They predominate in the northeast.

2. Tejamani (wattle-and-daub): This type is made of a wood pole frame with cane woven between the vertical posts. Some are covered with mud to seal the walls. They predominate in the west.

3. Concreto Armado (poured-in-place concrete): These houses are made by pouring thin walls of concrete between a wooden frame. They predominate in the southwest.

4. Casa de Madera (wood frame house): This type is constructed of pine boards and palm wood siding.

5. Casa de Bloque (concrete block): These houses are built of concrete block masonry.

Tejamani and yagua construction represent housing of the lowest income groups, while concrete block is used by higher income groups. Corrugated iron sheeting (laminated with zinc) is the most popular roofing material and has replaced grass or palm leaf roofs in most areas. Some concrete block houses have reinforced concete slab roofs; corrugated asbestos cement sheets are also used, primarily in urban areas. A shift in materials used in informal construction is occurring

as the depletion of native resources is forcing increased dependence on concrete. Most housing construction materials are produced domestically.

In general, buildings made of lightweight materials are more susceptible to hurricane damage, and those made of earth or cement block are more susceptible to earthquake damage. Roof construction is similar for all housing types. In most cases, the roof is the weakest part as it is not properly anchored and braced.

Most block houses have adequate iron reinforcement, but, due to the low quality of masonry, concrete block and concreto armado structures are highly vulnerable to earthquakes. In addition to poor construction, practices, siting is a concern. Houses built on hillsides in earthquake risk zones, especially in the mountainous areas of La Vega where there are large tracts of unstable soils, would probably collapse from land slippage during an earthquake.

The major hazard, however, is hurricanes. The majority of rural houses in the Dominican Republic cannot withstand the forces of the high winds that regularly strike the country. Winds, tidal waves, flooding, landslides, and land slippage are continual threats. Damage caused by these phenomena is primarily a problem of location, except for wind damage, which can be reduced with appropriate construction methods.

Urban:

Damage caused by Hurricanes David and Frederick dramatically increased rural to urban migration and exacerbated an existing housing shortage (the current housing deficit is estimated at 400,000 units). Overcrowding and the demand placed on urban facilities has been a major problem in the Dominican Republic since the 1930s. This trend continues today as small farmers search for employment in the cities rather than continue subsistence farming.

Barrios (marginal urban settlements) have grown rapidly, especially in Santo Domingo, and usually in dangerous, undesirable zones such as steep ravines and low-lying river banks. These overcrowded settlements must be evacuated when hurricanes threaten, due to possible flooding and landslides. The Dominican Civil Defense has effectively carried this out, but evacuating potential victims does not deal with the causes of the problem. To reduce or relocate the barrio population entails providing safer land and housing and increasing employment opportunities in rural areas.

Nearly three-fourths of Santo Domingo's families live in low-income marginal housing. Of these, 34% live in cuarterias and traspatios. Cuarterias are rows of attached units consisting of one or two rooms. Traspatios are small dwelling units constructed in the back of other houses. Block walls and zinc roofs are standard. Both these housing types are generally located near the center of the city. Water is obtained from public faucets or bought from neighbors or water vendors;

sanitary waste disposal and trash collection systems are lacking in the majority of cases. Electricity is generally available, although blackouts are common.

The total population of the area affected by the 1979 hurricanes, from San Cristobal to the province of Barahona, was 733,350 in 1970 and more than a million and a half in 1981, emphasizing the on-going urban migration trend. Many of the "temporary" migrant houses, built on available but unsafe marginal ground, such as the banks of the Ozama River in Santo Domingo, are two-by-fours covered with plastic, zinc, or cardboard. In the event of a disastrous storm or earthquake, these poorly constructed houses would probably kill more people than the actual winds or quakes.

Housing Institutions and Urban Services

The 1979 hurricanes caused the heaviest damage in the provinces west of Santo Domingo, often in isolated and mountainous rural locations. In the first days after the storms, about 200,000 homeless people were sheltered in churches and public buildings. To help them return home, the National Housing Institute (INVI) worked with private agencies in an emergency program to repair damaged homes enough to provide minimal shelter for each family. INVI's objectives were to use locally available materials, including those recovered from the damaged structures, and offer employment to as many people as possible by using teams of paid workers or community self-help labor. Job creation was significant in alleviating the problem of unemployment due to displacement and industrial and commercial shutdowns.

The emergency assistance and relief shelter programs in 1979 developed into reconstruction projects which in turn became development and mitigation efforts. USAID, INVI, and PVOs collaborated in this process. In an attempt to achieve permanent coordination among public and private low-income housing institutions, INVI initiated an inter-institutional council, CII-VIVIENDAS, whose members include government agencies, national and international voluntary agencies, and community and financial institutions. The organization's goal is to plan and implement programs for low income families with both national and international financing. The need to collect and disseminate information on construction techniques prompted the subsequent establishment of a Center of Appropriate Technology, CETAVIP, partially funded by USAID, to work with CII-VIVIENDAS. These institutions are active in promoting low cost seismic- and wind-resistant housing.

The current members of CII-VIVIENDAS are:

Government Sector

National Housing Institute (Instituto Nacional de la Vivienda-INVI)
Agrarian Reform Institute (Instituto Agrario Dominicano-IAD)

Office for Community Development (Oficina para el Desarrollo de la Comunidad-ODC)
Technical Secretariat of the Presidency (Secretariado Tecnico de la Presidencia)
Ministry of Public Works and Communications (Secretaria de Obras Publicas y Communicaciones-SEOPC)
Central Bank of The Dominican Republic (Banco Central de la Republica Dominicana)
Institute for the Development of the Southwest (Instituto para el Desarrollo del Suroeste-INDESUR)

Private Sector

Dominican Development Foundation (Fundacion Dominicana de Desarrollo-FDD)
Dominican Federation of Cooperatives (Federacion Dominicana de Cooperativas-FEDOCOOP)
Dominican College of Architects and Engineers (Colegio Dominicano de Ingenieros, Arquitectos y Agrimensores-CODIA)
CARE Dominicana
CARITAS
Church World Service (Servicio Social de Iglesias Dominicana-SSID)
San Jose Foundation (Fundacion San Jose-FSJ)
Community Construction Association of Bani (Asociacion Comunitaria para la Construccion de Bani)
Association for the Development of San Jose de Ocoa (Asociacion para el Desarrollo de San Jose de Ocoa)
Central Committee for Housing of the Diocese of Barahona (Comite Central de la Vivienda, Diocesis de Barahona)
Community Development Foundation (Fundacion para el Desarrollo Comunitario-FUDECO)
Association for World Ministry (Asociacion Alcance Ministerio Mundial)

Basic urban services are provided by the following institutions:

Santo Domingo Aqueduct and Sewage Company (Corporacion del Acueducto y Alcantarillado de Santo Domingo-CAASD)

National Institute of Potable Water and Sewers (Instituto Nacional de Aquas Potables y Alcantarillado-INAPA)

Dominican Electric Corporation (Corporacion Dominicana de Electricidad-CDE)

Ministry of Public Works and Communications (Secretaria del Estado de Obras Publicas y Comunicaciones-SEOPC)

Dominican Municipal League (Liga Municipal Dominicana-LMD)

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

Available at the A.I.D. Mission in Santo Domingo are detailed reports of the types and costs of A.I.D. relief projects in 1979 and 1980 as well as photos and a videotape of damaged structures and emergency rehabilitation shelters of A.I.D., INVI, and PVO's. Contact: Aaron Benjamin, USAID Urban Development Officer, Santo Domingo.

3.7 Communications

The General Office of Telecommunications (Direccion General de Telecommunicaciones or DGT) is a division of the Ministry of Public Works and Communications. It is responsible for national public and private telegraph service, the government and public telephone service in areas not served by private firms, and regulation of radioelectric frequencies. The DGT network linked to the Dominican Telephone Company (CODETEL) can reach the entire country and overseas. For international telex and telegraph service, DGT connects directly with RCA, ITT Santo Domingo, and Barbados. DGT's National Communications Network consists of central radio bases, relay stations, and mobile units in VHF and SSB HF; 86 communities are connected through Santo Domingo. All relay stations (as of 1981) are located on a central mountain peak called Alto de la Bandera. The national emergency network frequency is 154.025 MHz.

In the early 1980s, the communications system expanded greatly. Every important town now has a radio station, and there are five television stations. The entire country can be notified of an emergency hurricane alert by radio, as was demonstrated in 1979.

DGT has maps and detailed lists of locations of radio stations, telephone and telegraph offices, and their power sources and areas served. This information is also available at OFDA in Washington.

3.8 Transportation Resources

Roads and Bridges

Santo Domingo is the hub of a transportation system that serves virtually all parts of the country. While some routes are indirect and thus time consuming because of linkage problems through the mountains, the network is generally considered good. Major highways of concrete or asphalt extend in all directions from Santo Domingo, and secondary roads branch out from these. The major highway, however, which links Santo Domingo to Santiago, is only a two-lane route with soft shoulders, no central dividing line, no lighting, and a damaged surface.

Statistics from 1981 cite 5,500 km of major roads (paved) and 12,000 km of rural roads (unpaved), an extensive network in comparison to other developing nations and in relation to the country's population and size. A great amount of public funds are invested in this system, yet it is one of the most vulnerable areas, especially to damage caused by floods and landslides. In rural areas the narrow dirt roads are easily washed away.

Most goods are transported by truck to market centers. Even under normal circumstances, paved highways are poorly maintained and not constructed to withstand the weight of the larger trucks currently in use. After a major storm, damage is extensive and heavy machinery for repair in short supply. After hurricanes David and Frederick, supplies had to be airlifted to approximately 250 towns, isolated because of road damage. The Department of Rural Roads has a list of equipment, such as compactor rollers, dump trucks, and tractors, available in each region. The Ministry of Public Works (SEOPC) can provide similar lists which include private contractors and government facilities as well as maps of the roads most vulnerable to floods and landslides.

SEOPC has estimated damage to roads and bridges from the 1979 hurricanes as follows:

	Damage	Magnitude	Cost (RD$)
Main roads	Erosion	672 km	
	Landslides	181 km	35.8 million
Rural roads (unpaved)	Destruction	2,500 km	
Bridges	Destruction and partial damage	132 bridges	12.8 million

Since that time, those highways, roads, and bridges which are regularly affected by floods and landslides have been identified and mapped. Permanent structural changes to roads or actual route changes to prevent recurrent damage are being studied. SEOPC has also recommended that provisional mobile bridges be kept available. They can be assembled and disassembled easily to reestablish communication along important routes. Another recommendation is that bridge approaches be constructed so that they give way to flood waters, thus allowing the current an outlet and saving the bridge from destruction. The approaches could subsequently be rebuilt.

It is important to assess road damage as soon as possible after a disaster to pinpoint areas cut off from communication. Such an assessment allows responsible agencies to decide which roads should be reopened first and identify areas in need of airlifted supplies. In 1979, although U.S. Army pilots immediately carried out reconaissance flights for this purpose, some officials noted that the assessments would have been more

accurate if personnel familiar with the land had been included who could have noted the changes wrought by the hurricanes. With this in mind, about a week later, the USAID engineer and Dominican engineers did fly over the damaged road network and identify the major zones of destruction, including markets served by each road, main agricultural products of the zone, and the relative importance of each road to the economy. This information will apply to future disasters as well, since floods and landslides continue to affect these zones. The USAID Mission in Santo Domingo and OFDA in Washington have these reports.

Airports

The Dominican Republic has two international airports. The largest, De Las Americas, located about 25 km east of Santo Domingo, handles a high percentage of all passenger and cargo traffic. It is designated for scheduled international air transport; has a precision approach runway and lighting system; an instrument landing system; and a runway which can accommodate B707-300Bs and DC10-30s. Puerto Plata has a new (1980) international airport which was designed to encourage the tourist trade on the northern coast. The airport at La Romana is authorized for international flights provided that three days' notice is given.

Most main cities have domestic airports, and there are approximately 15 minor airports and 20 landing strips. Important domestic airports are in Puerto Plata, Arroyo Barril, Sabana de la Mar, Higuey, Herrera, Barahona, Cabo Rojo, and San Juan. The Air Force also maintains air bases throughout the country.

Airfields	Length (meters)	Elevation (meters)
Las Americas	3,353	17
Puerto Plata	3,962	10
La Romana	1,826	8
Santiago	1,884	125
Herrera	914	sea level

Ports

Seaports handle 90% of the Dominican Republic's commerce, and the coastline is dotted with harbors. International ports are Santo Domingo, Barahona, Cabo Rojo, Haina, Andres-Boca Chica, San Pedro de Macoris, La Romana, Puerto Plata, and Manzanillo. Domestic ports are Puerto Viejo, Samana, Sanchez, and Sabana de la Mar. There are two tourist ports, El Botado and Sans Souci. The latter is a relatively new passenger vessel wharf in the Santo Domingo harbor.

The port of Santo Domingo is located at the mouth of the Ozama River. The harbor may be entered 24 hours a day except when the river current is exceptionally heavy. Warehouses are available for storage. Ship's gear is normally used for loading and discharging, since there are some shore cranes but no heavy lift facilities. Fuel, water, and provi-

sions are available. Docks and breakwaters are in generally poor condition and considered obsolete. Sans Souci, located in the same harbor, has excellent new facilities, although limited to serve the tourist trade.

Andres-Boca Chica is a smaller port east of Santo Domingo and close to the main international airport. Traffic has increased here since the installation of a large crane and open storage space. One warehouse is available.

The port of Haina is located a short distance from the most industrialized zone of the capital and handles the most commercial traffic. It was badly damaged during the 1979 hurricanes and has also suffered from lack of maintenance. Facilities include bulk sugar loading installations, four dockside warehouses, Ro/Ro (Roll-on/Roll-off) facilities, and bunker fuels available by lighter.

For further details regarding approach, accommodation, storage facilities, crane capacity, and ship repairs, consult the current edition of Lloyd's of London, Ports of the World.

3.9 Energy Resources

The nation's industrial potential is hampered by its lack of fuels. Oil imports used almost 50% of export earnings in 1981 and accounted for 92% of electricity production. One of the government's major investments, therefore, is in energy production and the search for alternative sources.

Most power needs are supplied by thermoelectric plants, with hydroelectric plants increasing in number. Gasoline, kerosene, aviation fuel, and fuel oil must all be imported. Although petroleum usage has been decreasing, the price of oil continues to have a devastating impact on the balance of payments and is at the heart of the country's economic difficulties. One comparison shows the problem concisely: in 1974, 1,000 lbs. of sugar bought 12 barrels of oil; in 1981, it bought three barrels.

The government has granted foreign oil companies concessions to undertake exploratory drilling, and in 1981 a petroleum deposit was discovered at Charco Largo, Barahona. Its potential output was estimated at 20,000 b.p.d., which could conceivably take care of half of the national consumption. The Dominican Petroleum Refinery, owned 50% by the state and 50% by Shell, opened at Haina in 1973. Its refinery capacity is 1,500,000 MT per year.

The government's Dominican Electricity Corporation (CDE) handles most production, distribution, and marketing of electricity, except for sugar mills and the Falconbridge nickel plant, which supply their own needs.

The 1979 hurricanes caused a loss of about 77 MW of effective generating capacity, 22.8% of the total capacity at that time. The damaged plants, mainly the Tavera, Valdesia, and Jimenoa hydroelectric complexes, were forced out of service, and the transmission and distribution systems also suffered considerable damage. The Tavera Dam provides electric power and increases the availability of irrigation water in the Cibao; the Valdesia Dam, on the Nizao River, serves the dry southwest. These dams form a vital part of the country's irrigation system, which has allowed the Dominican Republic to increase its use of available agricultural lands and to open new areas for cultivation.

Electric plants and distribution lines are highly vulnerable, and the CDE places a high priority on disaster preparedness. Forming part of its organization are a Principal and a Secondary Center of Operations, which take charge during emergencies. All main plants have been constructed to withstand earthquakes measuring 8 on the Richter scale. The CDE, with the University of Texas, operates a system to detect microseisms which indicate active faults near main hydroelectric dams and possible future sites. The CDE has published an "Emergency Manual" detailing preparedness operations in the event of a hurricane, including evacuation of areas near dams and short-term shut downs. The agency also maintains data on flood control levels for plant reservoirs.

Although the CDE has detailed plans for disaster situations, everyday maintenance and production problems are recurring. Many plants do not function at full capacity, and power outages are frequent. This interrupts office work on an almost daily basis, unless the company has its own emergency generator. The American Embassy and the A.I.D. Mission, as well as many private homes, have private generators.

Following is a list of the CDE's energy facilities, published in the January 31, 1984 issue of the newspaper, Listin Diario:

Site	Nominal Capacity	Available Power (MW)
	Gas Turbines	
Timbeque No. 1	21.1	out of service
Timbeque No. 2	21.1	19.0
Los Mina No. 1	35.6	under repair
Los Mina No. 2	35.6	28.0
San Pedro	28.3	22.0
Barahona	28.3	under maintenance
Mobile No. 4	8.4	7.0
Mobile No. 5	8.4	7.0

Site	Nominal Capacity	Available Power (MW)
	Thermoelectric Plants	
Haina No. 1	54.0	30.0
Haina No. 2	54.0	35.0
Haina No. 3	84.9	60.0
Haina No. 4	84.9	under maintenance
Haina No. 5	84.9	70.0
Santo Domingo No. 5	12.6	8.0
Santo Domingo No. 6	12.6	8.0
Santo Domingo No. 7	12.6	9.0
Santo Domingo No. 8	26.5	20.0
Puerto Plata No. 1	27.5	under maintenance
Puerto Plata No. 2	36.0	35.0
Falconbridge No. 1	-	50.0
Falconbridge No. 2	-	40.0
	Diesel Turbines	
Mobile No. 1	1.6	1.0
Mobile No. 3	1.6	1.0
Diesel Santiago	12.0	2.0
	Hydroelectric Plants	
Tavera No. 1	40.1	25.0
Tavera No. 2	40.1	-
Rincon	10.1	5.0
Hatillo	8.0	under construction
Jimenoa	8.4	6.5
Valdesia No. 1	27.0	15.0
Valdesia No. 2	27.0	15.0
Sabana Yagua	13.0	closed
Las Damas	7.5	3.9
Los Ranchitos	0.8	out of service
Total Capacity:	880.8	529.2

Actual Demand: Minimum (12:00 mid.-7:00 AM) - 350.0 MW
Average (6:00 PM-12:00 mid.) - 475.0 MW
Maximum (7:00 AM-6:00 PM) - 535.0 MW

Reservoir Levels
(meters above sea level)

Dams	Maximum	Actual	Minimum for Operation
Tavera	327.00	294.83	312.00
Valdesia	150.00	131.08	130.75
Rincon	122.00	109.49	108.00
Hatillo	86.50	75.80	70.00
Sabaneta	644.00	635.32	612.00
Sabana Yagua	396.40	372.52	377.00

3.10 U.S. Mission Disaster Plan and Resources

The Mission plan, written in 1982 and updated in 1984, details the responsibilities of the Chief of Mission, the Mission Disaster Relief Officer (MDRO), and other members of the Emergency Action Committee designated as part of the Mission Disaster Relief Team. Currently, the USAID/DR Program Officer serves as MDRO.

The USG can provide assistance in excess of the Ambassador's $25,000 Disaster Assistance allotment, with OFDA approval, after the following sources are checked in the Dominican Republic: Food for Peace commodities; U.S. voluntary agency supplies, their distribution facilities, and other capabilities; supplies and equipment that can be loaned or donated from ongoing A.I.D. projects and Military Assistance and Advisory Group (MAAG) supplies, such as trucks, jeeps, construction equipment, medicines and medical equipment, tools, seeds, etc.

Current USAID/DR projects include energy conservation, on-farm water management, agriculture sector training, rural roads maintenance, health and nutrition, small industry development, and housing/appropriate technology.

Although the GODR Office of Civil Defense is the Dominican agency that nominally heads disaster programs, and other government agencies are also designated as responsible for their sectors, the Mission has worked more closely with voluntary agencies in the past. Three important U.S. voluntary agencies are CARE, Catholic Relief Services, and Servicio Social de Iglesias Dominicanas, Inc. (SSID), all of which were active in food distribution and housing construction in 1979. The leader in community development is the Dominican Development Foundation (Fundacion Dominicana de Desarrollo-FDD), which is involved in numerous A.I.D. projects.

Annexes to the Mission Disaster Relief Plan include current lists of local contacts with phone numbers and addresses, lists of disaster-related information located in the Mission, and detailed lists of type and number of vehicles available from MAAG, Peace Corps, CARE, and CRS.

The MDRO has circulated a questionnaire to all U.S. Mission and PVO personnel and contractors and their spouses requesting information for a skills inventory for use in the event of a local disaster. Information on experience, technical training and licenses, and sector will be compiled and kept on file at the Mission.

The Mission has its own generators available and in use periodically, as electrical power is often interrupted.

3.11 International and U.S. Voluntary Agencies

International organization offices in Santo Domingo are:

PAHO
SESPAS
Apartado 1464
Santo Domingo, DR
Tel. (809) 565 3454

UNDP
Apartado 1424
Avenida Anacoana #9
Santo Domingo, DR

Most other International Organizations are represented in the Dominican Republic.

There are approximately 42 private, non-profit U.S. organizations working in the Dominican Republic. Some of the most active are:

Accion International/AITEC
a/c Fundacion Dominicana de Desarrollo
Calle Mercedes #4
Santo Domingo, D.R.
Tel.: (809)688-8101

mailing address:
Apartado Postal 857
Santo Domingo, D.R.

AITEC operates administrative training programs for small farmers and provides loans and management assistance to small businesses, in conjunction with FDD.

CARE
Almacenes CARE
Feria Ganadera
Santo Domingo, D.R.
Tel: (809) 533-1684, 2285, 2328

mailing address:
Apartado Postal 1411
Santo Domingo, D.R.

CARE operates low-cost housing projects in conjunction with local housing cooperatives (FEDOCOOP). It also operates projects in agriculture, medicine, and public health, and distributes P.L. 480 food to pregnant and nursing women and children under five at rural health centers and throughout the southwest.

Catholic Relief Services
Calle 51 esq., Calle 10
Ensanche la Fe
Santo Domingo, D.R.
Tel: (809) 566-7766

mailing address:
Apartado Postal 1457
Santo Domingo, D.R.

CRS supports food-for-work projects and distributes P.L. 480 Title II food. Agricultural projects include irrigation systems, training courses, and farm road construction. CRS also conducts an applied nutrition program in cooperation with Caritas Dominicana.

Church World Service
Servicio Social de Iglesias Dominicanas (SSID)
Apartado Postal 659
Santo Domingo, D.R.

CWS supports SSID, which provides community assistance through evangelical church action. Projects include rural development, water resources, fisheries, and nutrition education programs.

Evangelical Mennonite Church, Inc.
Apartado Postal 24
San Juan de la Maguana, D.R.

The Evangelical Mennonite Church supports cooperatives and credit unions, provides student grants, and operates agricultural projects, mainly in San Juan and Elias Pina Provinces.

W.K. Kellogg Foundation
Apartado Postal No. 1152
Santiago de los Caballeros, D.R.

This foundation operates a rural development program in health and nutrition in cooperation with the Ministry of Health and agricultural institutes.

MAP International
327 Gundersen Drive
Carol Stream, Illinois

mailing address:
P.O. Box 50
Wheaton, Illinois 60187

MAP sends donated medicines and hospital supplies in response to the requests of missionary doctors.

Pan American Development Foundation
1625 Eye St., N.W., Suite 622
Washington, D.C. 20006
Tel: (202) 789-3969

PADF was instrumental in founding the Fundacion Dominicana de Desarrollo (FDD), a non-profit Dominican organization active in the development process in the Caribbean. FDD is now fully independent but works closely with PADF in a "Tools for Training" program that channels donated equipment from U.S. companies to technical schools in Latin America and the Caribbean. PADF also conducts public health programs.

Partners of the Americas
Dominican Republic Partners
Santo Domingo, D.R.
Tel.: (809) 567-7786, 567-1957

mailing address:
Lic. Radhames Mejia
Universidad Catolica
Madre Maestra
Apartado Postal 2748
Santo Domingo, D.R.

The Michigan Partners cooperates with the Dominican Republic Partners in operating training programs in community education, agriculture, and nutrition, and a medical professional exchange.

Save the Children Federation
Fundacion para el Desarrollo
Comunitario, Inc.
(FUDECO)
Centro de los Heroes
Avenida 27 de Febrero
Edificio Galerias Comerciales -
Apt. 301
Santo Domingo, D.R.
Tel: (809) 567-1175

mailing address:
Apartado Postal 366-2
Santo Domingo, D.R.

SCF supports FUDECO, a local development foundation; operates community group projects on health/nutrition, appropriate farm technology, agricultural production, sewing, and land resource management; and, through FUDECO, assists small rural communities in organizing development programs.

Seventh-Day Adventist World Service, Inc.
6840 Eastern Ave., N.W.
Washington, D.C. 20012
Tel: (202) 722-6000

This organization provides cash and medical supplies to institutions operated by the General Conference of Seventh-day Adventists throughout the Dominican Republic.

United Methodist Committee on Relief
475 Riverside Drive
New York, New York 10115
Tel: (212) 678-6281

UMCOR is one of the agencies in a program coordinated by Servicio Social de Iglesias Dominicanas (SSID) that includes 600 Protestant churches. It supports a nutrition and health program to educate mothers of malnourished children, as well as public awareness and training projects.

World Vision Relief Organization, Inc.
919 West Huntington Drive
Monrovia, California 91016
Tel: (213) 357-7979

This organization operates water projects, nutrition and health education programs, literacy and agricultural projects, and income generation programs.

3.12 Mitigation and the Development Process

The Island of Hispaniola is extremely vulnerable to natural disasters due to its location and topography. There has been a tendency in the Dominican Republic to blame all environmental problems on Hurricanes David and Frederick, yet these natural disasters exacerbated man-induced problems. The hurricanes did cause major flooding, but the Cordillera Central watersheds were already seriously degraded before 1979, and this long-term abuse of land and water resources amplified the consequences of the natural disasters.

Periodic natural disasters are unavoidable, but other factors can be changed. Rapid population growth and resultant pressures on scarce land resources, both in marginal urban areas and mountain slopes, have seriously damaged the natural resource base and have led to settlements on unsafe lands.

Traditional slash-and-burn agricultural practices on steep mountain slopes in the upper watersheds cause a series of negative consequences to the land and to water projects (e.g., dams, reservoirs) developed downstream. More intensive land use and shorter fallow periods have led to high rates of erosion and lower agricultural productivity. The fact that most small farmers do not own their own land has further aggravated the situation. Farmers who own and operate their own farms have a long-term commitment and are more likely to use the best conservation methods, whereas tenant farmers might or might not agree to establish soil conservation practices; as tenants change, so might the commitment. Demand for charcoal and firewood, and centuries-old techniques for their production have further increased deforestation and subsequent erosion in the highlands, leaving the thin soil barren and rocky. Also, inadequate road building practices have added enormous quantities of sediments to the country's river systems. In addition to the loss of farm and forest land, one of the results of such resource degradation, aggravated by natural disasters, is that regional and national development projects, including irrigation systems, hydroelectric projects, and aquaducts are being damaged by rapid siltation.

Although not actually dealing with the root problems of land misuse and undirected migration of the increasing population, the GODR has developed programs for the rapid recovery of agricultural land after disasters to avoid food shortages. A Silo Storage Program is also being developed to ensure that two months worth of basic foods are available in the event of a disaster. Still needed are zoning regulations for the lands that are systematically damaged each year by flooding and landslides. Highways, roads, and bridges always affected by floods and landslides have been identified, and studies have been conducted either to modify their routes or change them structurally.

In the housing sector, the government has attempted to update building codes to include regulations consistent with technological advances. In rural sections and poor urban barrios, most people still live in houses built with poor construction materials and inadequate engineering standards. (See section 3.6, Housing, for a detailed description of the shelter relief efforts in 1979 and subsequent housing development projects involving PVOs, GODR ministries, and A.I.D.)

In the agricultural sector, A.I.D. is working with the GODR to create a more favorable agricultural production environment while protecting the natural resource base. Projects include On-Farm Water Management, in conjunction with the National Hydraulic Resources Institute, to distribute the nation's water resources; Rural Roads Maintenance and Rehabilitation to improve farm-to-market roads using trained village laborers; Energy Conservation and Resources Development; and Forestry Management, to manage resources through reforestation.

A.I.D.'s previous goal of establishing a rural health delivery system has been implemented in the form of rural clinics. Current projects focus on structural change and policy reform in the area of health services management within SESPAS. In an effort to encourage private sector involvement in health services, A.I.D. is investigating the development of community-managed water/sanitation organizations.

The P.L. 480 Title I program in FY 1983 generated about RD $18 million, which financed projects including rural roads, rural housing, sanitation, reforestation, and irrigation.

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