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

EL NIÑO SOUTHERN OSCILLATION - ENSO 1997/98 AND RISK MANAGEMENT IN THE LATIN AMERICAN AND CARIBBEAN REGION

By

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CONTENTS

ACRONYMS

ADC	Andean Development Corporation
CEPREDENAC	Regional Center of Natural Disaster Prevention in Central America
DMC	Meteorological Office of the Director of Chile
DOC/NOAA/OGP	Department of Commerce, National Oceanic and Atmospheric Administration, Office of Global Programs
ECLAC	Economic Commission for Latin America and Caribbean
ENSO	El Niño Southern Oscillation
FAO	United Nations Food and Agriculture Organization
IAI	Inter-American Institute for Global Change Research
IADB	Inter-American Development Bank
IDNDR	International Decade for Natural Disaster Reduction
IRI	International Research Institute for Climate Prediction
LAC	Latin America and Caribbean
MDRO	Mission Disaster Relief Officer
MEC	Mission ENSO Coordinator
NGO	Non-governmental organization
OCHA	Office for the Coordination of Humanitarian Affairs
OFDA	Office of U.S. Foreign Disaster Assistance
ONEMI	National Office of Emergency of Chile
PACIS	Pan-American Climate Information System
PAHO	Pan-American Health Organization
SST	Sea surface temperature
SHOA	Hydrographic, Oceanographic and Atmospheric Service of Chile
UNDP	United Nations Development Program
USAID	United States Agency for International Development
WB	World Bank
WFP	United Nations World Food Program
WMO	World Meteorological Organization

1. El Niño Southern Oscillation

For several centuries, Peruvian fishermen have considered the appearance of relatively warmer sea surface water, which arrives at the end of December along the northern coast of the country, to be a normal occurrence. This warm current was associated with Christmas – the celebration of the birth of the Christ child – thus the name "El Niño."

This change in the surface of the sea, which could linger for several months, was later associated with a reduction in the presence of anchovies (a vital resource to the Peruvian economy), changes in levels and distribution of rainfall, and alterations to Peru's flora and fauna. The occasional increase in temperatures of the Pacific Ocean's surface along the equatorial line was considered to be a local phenomenon until 40 years ago, when the effects were thought to be limited to Peru and Ecuador, and to a lesser degree, Colombia and Chile.

In 1920, Sir Gilbert Walker observed a pendulum-type relation in the barometric pressure of the southern Pacific Ocean. When the pressure was high in the western Pacific, it was low in the eastern Pacific and vice versa, which caused notable changes in the direction and the speed of the winds on the surface of the water. Walker called this phenomenon the "Southern Oscillation."

It was not until the end of the 1960s that a professor from the United States, Jakob Bjerknes, identified the relationship between the pendulum shifts in pressure that Walker discovered, and the periodic strong and warm current that moves along the coasts of Ecuador and Peru. An association was established between the two phenomena, El Niño in the ocean and the Southern Oscillation in the atmosphere, which explains the current name, El Niño Southern Oscillation, or ENSO.

Subsequent research has demonstrated that the warming of the sea surface from the central and eastern regions of the Pacific Ocean to Ecuador can interfere with so-called "normal" climatic patterns in far-off places around the globe. Scientists refer to these phenomena as "teleconnections."

During El Niño, the increase in sea temperatures and humidity in the atmosphere causes a change in normal convection patterns, thereby displacing "normal" areas of convergence and associated rains, and modifying atmospheric circulation.

The greater part of inter-annual variability in the tropics, and a substantial part of the variability in the subtropics of the Northern and Southern Hemisphere, is related to and linked with ENSO.[1] During an ENSO event, the atmospheric pressure is higher than normal in Australia, Indonesia, Southwest of Asia, and the Philippines. This event manifests itself in dry conditions, which occasionally turn into full-scale droughts. Dry conditions also prevail in Hawaii and Central America, and extend into the northeast regions of Brazil and Colombia. On the other hand, excessive rains prevail in the eastern and central Pacific, along the west coast of South America, parts of South America near Uruguay, and part of the United States during the winter.

ENSO[2]-related changes often have a profound impact on society because of the droughts, floods, heat waves and other phenomena that cause chaos in health, agriculture, fisheries, and environmental systems, and thereby increase the demand on energy resources, and contaminate air quality. For example, the changes in oceanic conditions can have disastrous consequences for fish and sea birds, and for this reason, many industries along the South American coast related to fishing and guano (fertilizer obtained from the excrement of a specific type of bird) are forced to shut down. Other sea creatures are favored by these changes, such as wild shrimp, which are harvested in great quantities in places where they would otherwise be scarce.

The intensity of an El Niño depends on the magnitude of its associated anomalies and the area of influence.[3] Although important, the intensity of the event is distinct from its impact on climate and human activities. Climatic effect depends on the time of the year in which the phenomenon is present, and the socioeconomic impact is related more to the vulnerability of specific regions of a country and to certain sectors of national activity.[4]

In recent decades, great importance has been given to the observation of El Niño. ENSO brings monsoon rains, droughts, and other climate changes to a large part of the planet, including the equatorial Pacific, the United States, Canada, Latin America, and Africa. When ENSO presents itself, it rains in the east Pacific, and in the west Pacific it is dry. Unlike the annual climatic variations, which are predictable, ENSO appears at irregular intervals every two to seven years - always with different characteristics. Usually, it occurs around Christmas, and lasts from 12 to 18 months. The most serious episode registered thus far occurred in 1982-1983. Since then, there have been two – one from 1986-1987, and a prolonged event that lasted from 1990 until 1995. The anomalies of the last ENSO started in May 1997 and continued up to mid 1998, the magnitude and impact of which earned it a place in the category of severe events.

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[1] Trenberth, Kevin, The El Niño – Southern Oscillation System, National Center for Atmospheric Research Boulder, Colorado, USA. - A Colloquium on El Niño-Southern Oscillation (ENSO): Atmospheric, Oceanic, Societal, Environmental, and Policy Perspectives 20 July - 1 August 1997 - Boulder, Colorado, USA

[2] Adapted from Chapter 3, J.P.Sarmiento "El Niño Southern Oscillation 1997/98. Experiencias de América Latina y el Caribe" OPSOMS, Draft. 1998.

[3] IDEAM, Fenómeno de El Niño, Colombia,1997

[4] J.P.Sarmiento "El Niño Southern Oscillation 1997/98. Experiencias de América Latina y el Caribe" OPSOMS, Draft. 1998.

2. Description of the ENSO 97/98

2. 1 Chronology[5]

The first forecast of the ENSO 97/98 was published in the Experimental Long-Lead Forecast Bulletin (NWS/NMC/CAC) December 1996. It was anticipated that during 1997 a warm event of weak to moderate intensity would occur. In May 1997, it was observed that wind intensity had weakened greatly, indicating the possible continuation and intensification of the positive sea-surface temperature (SST) anomalies. By June 1997, the various atmospheric variables, convectional cloudiness in the central equatorial Pacific, intensity of the trade winds, and oceanic variables (SST, sea level, depth of the thermocline) jointly indicated the beginning of an El Niño event. The transition toward a warm event was occurring earlier, and much more abruptly, than the norm in terms of SST predictions for the central equatorial Pacific.

The first effects appeared toward the end of May and ran until the third week of June, when a series of frontal systems affected Chile. Eighty-seven thousand people were affected, 10,000 of whom were left homeless. Significant damages occurred between Regions III and X, affecting housing, educational infrastructure, health, road networks and fishing sectors. Cumulative precipitation by June had greatly surpassed the average.[6]

While alterations in SSTs and other climatic indicators pointed to an intensification of ENSO conditions, things were relatively quiet after the events in Chile, and a sizable number of meetings and events were organized to develop action plans for confronting the likely impacts of a growing ENSO.

On October 9, 1997, Hurricane Pauline – a category 4 storm with windspeeds that surpassed 500 km/hr – pummeled the Mexican states of Oaxaca and Guerrero.[7] Fifteen people died[8], 22 were reported missing and 41,100 people were affected in Oaxaca. In the State of Guerrero 123 people died and 3 were reported missing.

Also in October, a rainfall deficit was reported in Colombia, which caused significant problems for agricultural and livestock activity, as well as for the dairy industry. The impact on coffee production was particularly severe. The lack of rainfall also caused a

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[5] Adapted from Chapter 4th "Impacto del ENSO 97/98 en América Latina y el Caribe" OPSOMS, by Juan Pablo Sarmiento. Draft. 1998.

[6] República de Chile, Ministerio del Interior, Oficina Nacional de Emergencia, INFORME CONSOLIDADO TEMPORALES JUNIO 1997. 30 DE Julio de 1997.

[7] Pan American Health Organization (PAHO), Informe de Situación Huracán Pauline, México, Reliefweb, 13 Oct 1997.

[8] UN Department of Humanitarian Affairs (DHA), Mexico Hurricane Pauline Situation Report No.1, DHAGVA - 97/0531, 12 Oct 1997.

drastic reduction in river volume, rendering rivers, such as the Magdalena, difficult to navigate. Another effect of the climatic anomaly was the spread of large forest fires.

In November, unusually heavy rains were reported along the coast of Ecuador and northern Peru, which were related to the size of both anomalies – the SSTs off the South American coast, and the southward displacement of the Inter Tropical Convergence Zone. In Ecuador, landslides, which were caused by the heavy rains as well as soil saturation and deforestation, were reported in the foothills and Inter-Andean region. Heavy surf also severely affected coastal communities. The most affected areas were the provinces of Bolivar, Cotopaxi, El Oro, Esmeraldas, Guayas, Los Rios, and Manabi. Approximately 7,000 families (35,000 people) were affected. Twelve hundred families (6,000 people) lost their homes or required special assistance. Nearly 5,500 people were evacuated to field shelters in Guayas, El Oro, and Esmeraldas. Twenty-three people were reported dead during the month of October.[9]

In November 1997, the U.N. Food and Agriculture Organization (FAO) reported that, "Agricultural production in Latin America is especially vulnerable to El Niño. The first manifestations of the phenomenon in 1997 affected the grain and bean crops of the first harvest in almost all of the countries of Central America and the Caribbean. Crop losses in 1997 in the sub-region were estimated to be on average between 15 and 20 percent, in comparison with the previous year. However, several other countries reported considerably higher losses. The second harvests, which were collected in October, have been affected principally by the excessive rainfalls in September (typical of the hurricane season), and secondly, by the exceptionally dry weather associated with El Niño. The prospects of recovering losses already suffered are almost nonexistent in most of the countries. Additionally, planting grain crops in the first season of 1998, which starts in March, would run a serious risk if the drought continued into March/April. In addition to the loss of corn harvests in the first season of 1997/98 caused by the initial effects of El Niño, considerable damages were also reported in rice and bean harvests. During the growing period the climate was predominantly dry for the harvests of the second 1997/98 season. In South America, the first 1998 planting season has started in the Andean countries. Most of the grain harvests of 1997 had already been collected when the first effects of El Niño were starting to be felt. However, in the Southern parts of the sub-region, the area of wheat planted in 1997 was reduced considerably in the principal producer countries because of excessive rains."[10]

In Brazil, floods and strong winds caused by El Niño were reported in the state of Rio Grande do Sul at the end of November, causing approximately 12,700 people to lose their homes. Itaqui was the area most affected, with 4 people reported dead.[10]

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[9] DHA Ecuador El Niño Floods Situation Report No.2, 25-Nov-1997.
[10] Food and Agriculture Organization (FAO), Efectos de el Niño sobre la producción agrícola en América Latina, Date: 25 Nov 1997.
[10] DHAGVA - 97/0865, Brazil El Niño Preparedness Measures Situation Report No. 2, 4 Dec 1997.

In Peru, intense rains were reported during the month of December, which generated floods and landslides in the departments of Tumbes and Pasco, affecting approximately 4,786 people. The first published figures indicated that 9,279 people were affected nationwide. Approximately 1,390 houses were damaged and 160 destroyed; 2,763 hectares of banana and rice crops were destroyed; 24 kilometers of roads lost; 8 bridges destroyed; and 9 people were reported dead.[11]

Also in December, intense rains in Paraguay caused the overflowing of the Paraguay River, resulting in flooding in the urban area of Asunción, Alberdi, San Pedro, President Hayes, Alto Paraguay and in Concepción.. The National Emergency Committee indicated that nearly 13,000 families (60,000 people) were affected by the floods. Seven thousand, nine hundred families (35,000 people) were evacuated, and 1,500 families (6,700 people) were isolated by the floods.[12] By late December the Paraguay and Neembucu rivers had risen 8 meters above normal, surrounding Pilar, the capital of Neembucu province.[13]

Late January and early February were also critical for Ica, a provincial city located south of Lima, Peru. Flash floods feeding into the rain-swollen Ica River generated serious damage. There are no records of similar events during previous ENSOs.

At the beginning of February, ENSO brought torrential rains to the north of La Paz, Bolivia. An avalanche in a mining area left more than 65 dead and 125 injured. Yet, simultaneously, in the high valleys and sections of the altiplano, more than 300,000 people were affected by drought. Sources of drinking water became scarce, water for crops and animals dried up, and in some cases, people began migrating toward the cities.

The January rains in northern Peru were exceptional. The frequency of rains increased in February and in the first half of March, but the intensity moderated even though there were occasional strong rains. In the city of Piura, 412.2 mm of precipitation fell in February. In eastern parts of the city, precipitation surpassed 100 cm during this period. This situation generated exceptional increases in the flow of the Piura River – higher than any registered during the 1982-83 event. The observed maximum flow was 4,424 m3/s on March 12, whereas the maximum in 1983 was 3,200 m3/s. The excessive volumes in 1998 caused the destruction of roads and bridges, in addition to the flooding of populated areas, which was worse than in 1983.

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[11] UN Department of Humanitarian Affairs (DHA), DHAGVA - 97/0877, Peru El Niño Floods DHA Situation Report No. 2, Relief Web, 23 Dec 1997.

[12] UN Department of Humanitarian Affairs (DHA), DHAGVA - 97/0880, Paraguay El Niño Floods Situation Report No.1, Relief Web, 26 Dec 1997.

[13] UN Department of Humanitarian Affairs (DHA), DHAGVA - 97/0881 Paraguay El Niño Floods Situation Report No.2, Relief Web, 30 Dec 1997.

In March, the Government of Peru (GOP) estimated that 600 kilometers of its road network had been destroyed, while more than 4 kilometers of destroyed bridges left a number of areas isolated around the country. The most affected departments were Tumbes, Piura, Lambayeque, La Libertad, Cajamarca, Cusco, and Lima. Meanwhile, a lake formed in the middle of the Sechura desert (1,100 kilometers to the north of Lima), which is one of the most curious ENSO-related effects.[14] For a short time, it was the second largest lake in Peru (after Lake Titicaca), however, it is believed that the lake will disappear in less than a year.[15]

Paradoxically, in the same month of March, a devastating fire started in the state of Roraima, Brazil,[16] which required extensive national and international assistance. In Guyana, a group of 15,000 indigenous people were faced with a critical food shortage stemming from an extreme shortfall of rain, which was attributed to the ENSO.[17]

In April, the northern part of Argentina – the provinces of Entre Rios, Santa Fe, Corrientes, Misiones, Chaco, and Formosa – were subjected to fierce storms accompanied by intense rains, causing serious damages to agriculture and roads, and generating the need to evacuate about 32,800 people. In the Province of Chaco, floodwaters isolated approximately 100,000 people, while throughout Argentina, the floods affected close to 290,000 people and 5 people were reported dead.[18]

Also in April, Uruguay reported serious floods in various parts of its territory, comparable to the situation in 1959. The floods were due to the steady swelling of the Paraguay, Paraná, and Uruguay rivers. It was calculated that 8,000 people were affected in the cities of Artigas, Bella Unión, Salto, Paysandu, Rivera, Mercedes, Villa Soriano, Durazno, Treinta y Tres, Vergara and Melo. In the region of the Olimar and Cebollati rivers, 1,300 people had to be evacuated due to damages to homes roads and bridges, and nearly 10% of the rice production was lost.[19]

The NCEP-NOAA dynamic model predicted a slow decay of the phenomenon during the May-June period, meaning that during the winter and in the following spring (austral), positive SST anomalies would persist in the equatorial Pacific, although of a relatively

[14] USAID/OFDA Impacto de ENSO en Bolivia - Análisis del evento, J.P.Sarmiento, febrero 1998.
[15] UN Department of Humanitarian Affairs (DHA), OCHA/GVA - 98/ Peru El Niño Floods OCHA Situation Report No. 7, Relief Web, 06 Mar 1998.
[16] UN Office for the Coordination of Humanitarian Affairs (OCHA), OCHA/GVA - 98/0176 Brazil - El Niño Forest Fires OCHA Situation Report No. 1, Relief Web, 27 Mar 1998.
[17] UNDP, Drought in Guyana draws international response, Relief Web, 30 Mar 1998.
[18] UN Office for the Coordination of Humanitarian Affairs (OCHA), Argentina El Niño Floods OCHA Situation Report No. 1, OCHAGVA - 98/0189, Relief Web, 22 Apr 1998.
[19] UN Office for the Coordination of Humanitarian Affairs (OCHA), Uruguay - El Niño Floods OCHA Situation Report No.1, OCHAGVA - 98/0192, 30 Apr 1998.

small magnitude. In May, the dynamic-statistical model jointly developed by Scripps and the Max-Planck Institute, the statistical model by the Climate Diagnostic Center (CIRES-NOAA), and the two NCEP-NOAA statistical models (analog and canonic correlation) all expected an evolution toward a La Niña event, which would occur by the beginning of the next austral spring.

Paraguay continued experiencing torrential rains in May that caused the Paraná River to overflow its banks, resulting in floods in the southern part of the country. In the Province of Neembuco, floodwaters affected more than 15,000 people. In the regions of President Hayes, Boquerón, and Alto Paraguay there were more than 30,000 people affected by the floods. In Asunción, approximately 20,000 people were evacuated to 84 camps. Official information indicated that 75,000 people were relocated to field shelters. Dairy production, crops of peanuts, cotton, and sorghum were damaged.[20]

Simultaneously, in Central America, Costa Rica experienced a reduction in rainfall during the rainy season (May/November 1997), associated with an especially dry season and high temperatures (December 1997/April 1998). The most affected sectors were water resources, agriculture, livestock, fishing, and electrical generation - even tourism was affected.[21]

In June, the majority of SST forecast models continued to predict a transition toward a cold event (La Niña) for the second half of 1998. The scientific community pointed out the success of the European community model (ECMWF) which, since the beginning of the year, had predicted a reactivation of the thermal anomalies during autumn in the Northern Hemisphere.

Another impact of El Niño were the forest fires in Mexico and Central America, which had been growing in intensity and frequency since January 1998. In June, the fires grew spectacularly in number and area, mobilizing the support of the international community. Only in July was it possible to control the fires. There were approximately 2,927,927 hectares[22] burned throughout the region, equivalent to the size of El Salvador, or 60% of the territory of Costa Rica. The U.S. State of Florida also underwent the ravages of the forest fires during the month of June, where initial calculations indicated that 200,000 hectares were burned.

During the ENSO 97/98 period, there were other phenomena unrelated to the climate changes that had a severe impact on the American Hemisphere, including the following:

[20] UN Office for the Coordination of Humanitarian Affairs (OCHA), Paraguay El Niño Floods OCHA Situation Report No. 4, OCHAGVA - 98/0198, 07 May 1998
[21] UN Office for the Coordination of Humanitarian Affairs (OCHA), Costa Rica El Niño Drought OCHA Situation Report No.1, OCHAGVA - 98/0201, 20 May 1998
[22] US Agency for International Development (USAID) OFDA Situation Report 1-20: Mexico & Central America - Fires , 1998

- On October 14, 1997 there was an earthquake that registered 6 on the Richter Scale in the northern region of Coquimbo, Chile, which resulted in eight deaths, 55 injured, and severe damages to housing and infrastructure.[23]

- On May 22, 1998 at 00:39, an earthquake of 6.8 degrees on the Richter Scale shook 70% of Bolivian territory. A few hours later 71 inhabitants were confirmed dead in Totora and Aiquile,[24] approximately 400 kilometers southeast of La Paz. There were reports of 50 injured and more than 16,800 people affected. In Aiquile 80% of the houses were destroyed and in Totora 40%. These two towns, which are located in the department of Cochabamba, share an extended period of drought with Oruro and Northern Potosí, which has been accentuated by the ENSO 97/98.

- On August 4, 1998, an earthquake registering 7.1 degrees on the Richter Scale affected the Ecuadorian Pacific coast, in particular the Province of Manabí north of Caráquez Bay. The quake caused 3 deaths and left 40 people injured, while nearly 1,000 people lost their homes. This same area had been severely affected a few months previously by intense rains associated with the ENSO Phenomenon. One of the installations most damaged was the Caráquez Bay Hospital, which had transfer the patients to Portoviejo, the capital of the Province, because of the serious level of damage.[25]

These occurrences make the need for risk management all the more compelling, a process that would include the construction of complex scenarios for coping with various hazards, especially for highly vulnerable and under-developed communities.

2.2 Declared disasters

Based on the official declarations of the United States government, the following is the list of disasters related to ENSO at the global level. The disasters in Latin America are underlined:

Country	**Disaster**	**Declare Dates**
Indonesia	Fire/Health Emergency	10/01/97
Somalia	Complex Emergency	10/07/97
Mexico	Hurricane	10/10/97
Papua New Guinea	Drought	10/22/97
Djibouti	Floods	11/10/97
Kenya	Floods	11/17/97

[23] Pan American Health Organization (PAHO),Terremoto de Chile informe de situación # 1. Reliefweb 14 Oct 1997.
[24] UN OCHA, Bolivia-Earthquake OCHA Situation Report No.3, OCHAGVA – 98/0209 26 May 1998.
[25] UN OCHA, Ecuador-Earthquake OCHA Situation Report No.2, OCHAGVA – 98/0263 6 Aug 1998.

Ethiopia	Floods	11/20/97
Kenya	Cholera Epidemic	12/24/97
Indonesia	Drought	02/02/98
Peru	Floods	02/03/98
Tanzania	Floods	03/04/98
Philippines	Fire	04/02/98
Brazil	Fire	04/07/98
Indonesia	Drought/Fire	04/28/98
Paraguay	Floods	04/30/98
Ecuador	Floods	05/05/98
Argentina	Floods	05/08/98
Mexico	Fire	05/15/98
Guatemala	Fire	05/16/98
Honduras	Fire	05/20/98
El Salvador	Fire	05/21/98
Costa Rica	Fire	05/22/98
Nicaragua	Fire	05/22/98

2.3 Impact of the ENSO 97/98

Obtaining objective and comparable damage statistics has been one of the greatest difficulties. Furthermore, there is no methodology that makes it possible to differentiate between the direct, indirect or secondary effects of the event. For example, there is not even agreement on establishing a common point of reference for evaluating direct effects - whether to use the current value of the damaged infrastructure, its depreciation, or the cost of replacement.

In order to establish a point of comparison between countries, the estimates of El Niño's socio-economic impact cited below are from a report by the NOAA,[26] which is a compilation of the global impact of the climatic event. The data included here focuses on El Niño's impact on the American Hemisphere.

Regional Cost of the ENSO 97/98 Warm Event

The following table shows the reported estimates of direct damage attributed to the ENSO warm event:

North America		19.50%
Meso & S. America		54.40%
Africa		0.40%

[26] NOAA/OGP, ENSO COMPEDNDIUM, First Draft 09-09-98.

Asia		9.70%
Indonesia & Australia		16.10%

Total $ 33.2 Billion

Country Cost

This table records the estimates of direct damage attributed to the ENSO warm event by country:

Country	Total Cost
Argentina	3,000
Bolivia	1,200
Brazil	4,700
Chile	400
Colombia	420
Costa Rica	140
Ecuador	2,538
El Salvador	200
Guatemala	380
Honduras	350
Nicaragua	220
Panama	160
Paraguay	260
Peru	3,600
Uruguay	220
Venezuela	280
Total	18,058

Area Affected

The following table presents forest and agricultural land lost to fires, flooding and drought:

Region	Hectares
Africa	193,704
Asia	1,441,442
Australia and Indonesia	2,845,526
Central and South America	5,056,574
North America	12,832,349
Total	22,369,595

Health Impact

In the following table:
- *Mortality* refers to lives lost in ENSO-induced disasters;
- *Morbidity* refers to persons infected with water or vector-borne disease associated with the ENSO (reported cases only – not statistical estimates); and
- *Affected* refers to persons injured or suffering (i.e. malnutrition) from an ENSO-induced disaster, but does not include the dead, homeless, or infected.

Country	Mortality	Morbidity	Affected
Argentina	17		
Bolivia	135		
Brazil	45	287,709	
Chile	35		
Colombia			
Costa Rica			
Ecuador	280		83,033
El Salvador			
Guatemala			
Honduras			
Nicaragua			290,000
Panama			
Paraguay	25		
Peru	441	3,483	350,000
Uruguay	18		
Venezuela		2,551	
Total	997	243,743	723,033

Displaced and homeless

The table below shows the number of persons either permanently or temporarily displaced as a result of ENSO-related disasters:

Country	Displaced/Homeless
Argentina	150,000
Brazil	12,700
Ecuador	13,500
Paraguay	35,000
Peru	200,000
Total	**411,200**

3. Climate Fora

Efforts to Advance the Application of Climate Forecasts, July 1997-June 1998.[27]

Since 1993, the U.S. Agency for International Development's Office of U.S. Foreign Disaster Assistance (USAID/OFDA) has been working with the U.S. National Oceanic Atmospheric Administration's Office of Global Programs (NOAA/OGP) to use climate forecast information to reduce disaster impacts worldwide. This partnership reflects the organizations' complementary mandates, under which NOAA coordinates the provision and dissemination of early climate forecasts, based on El Niño and other key indicators. USAID promotes its application to prevent and prepare for impacts associated with droughts, floods and storms. Cooperation between these two U.S. government agencies has made information available to the International Research Institute for Climate Prediction, which publishes climate forecasts for use in vulnerable regions worldwide. Joint planning and funding also led to the convening of nearly a dozen regional climate outlook and applications fora in Latin America, Africa and Asia, which provided information that saved lives and reduced disaster relief costs during the ENSO 97/98.

In Latin America, climate outlook fora, applications workshops and conferences were convened in Peru, Uruguay, Brazil, Jamaica and Panama. Each event brought together climate stakeholders from research and forecasting communities, and individuals involved in risk management efforts in climate-sensitive sectors. Information generated by these events contributed to the reduction of risks and maximization of benefits posed by the strong El Niño event. Citing the actual and potential utility of these endeavors, participants recommended the institutionalization of mechanisms and activities to advance the production, dissemination and application of climate forecast information.

OFDA/Latin America-Caribbean (OFDA/LAC) has participated in each of these fora. OFDA/LAC's specific interest was to incorporate the concept of risk management into the work of those who prepare climate predictions and translate them for critical sectors, as well as for end users of climate information systems.

4. OFDA/LAC Strategy Regarding ENSO

As a result of the first climate forum in Peru in October, OFDA/LAC and OFDA/Washington agreed to develop an ENSO project for Latin America, as they were concerned by the potential effects of ENSO in several countries of the region –

[27] OFDA/NOAA – PACIS Reports 1998.

particularly Peru, Ecuador, and Bolivia. Although these countries were not the only ones likely to be severely affected by ENSO, the outlook provided by NOAA indicated that there was a high probability that they would experience the worst effects.

<u>Elements</u>

The strategy adopted by OFDA/LAC consisted of the following three elements:

A Mission ENSO Coordinator (MEC) would be hired in each of the USAID Missions in Ecuador, Peru, and Bolivia, with funding shared by OFDA and the USAID Missions;

- A Regional ENSO technical coordinator would provide periodic guidance and technical advice to the three Mission ENSO Coordinators; and

- An ENSO Documentation system would be established to collect, assemble, classify, cross-reference, preserve electronically and make available to concerned entities useful information on the effects, response, and lessons learned.

<u>Guidelines for Missions</u>

The following guidelines were given to the USAID Missions regarding the MEC's tasks:

- Compilation of information concerning El Niño - it was suggested that Missions consult the Internet Homepage for NOAA and other websites;

- Contact official government agencies, such as, Meteorology, Civil Defense, Health, Agriculture and relief entities, to determine the level of impact expected, and their capacity to respond to the event, including political, economic, social, cultural and institutional aspects;

- Contact international agencies to determine what actions are being planned in order to avoid duplication of efforts and emphasize the positive aspect of international cooperation, recognizing that the UN Development Program (UNDP), the Pan-American Health Organization (PAHO), the World Food Program (WFP), Inter-American Development Bank (IADB) and other multilateral and bilateral agencies, as well as non-governmental organizations (NGOs), play an important role;

- Analyze the possible impact of El Niño on USAID projects. Analyses should include projects in the design stage, those being carried out, and even those that have been terminated, in order to monitor ENSO's overall impact on development;

- Follow-up on El Niño by recording important facts and data such as:
  Legislation and guidelines regarding the topic

Sectoral contingency plans
Significant press coverage
Agency impact reports
Ongoing institutional and community response to the impact of El Niño

- On-going feedback and recording of the evolution of the evolution of ENSO 97/98 will help the systematization of experiences gained during the current event and benefit future responses to El Niño events.

- Provide informed opinions concerning the probable impact of El Niño on emergency and contingency plans developed by national, regional, departmental and local governments, which should result in recommendations for the Mission as to its role vis-a-vis El Niño;

- Maintain continued contact with USAID/OFDA for sharing information regarding the above-mentioned points, and to establish a plan of action to confront the probable adverse effects of El Niño.

4.1 Risk Management

Risk management was an essential approach for OFDA-LAC's ENSO project. Some key terms are defined below:

Hazards result from a natural process or human activity that can affect a specific location with a specific magnitude and duration.

There are scientific indicators for measuring the progress of ENSO – changes in SST, atmospheric pressure, etc. – but for risk management, rains and temperature are the most practical and useful measures. Actions taken on the basis of these indicators can be designed either to avoid problems, or to take advantage of certain favorable conditions.

Vulnerability: an internal risk factor related to a subject or system exposed to a hazard, related to its intrinsic tendency to be damaged.

Scientific and technical hazard studies are important, but emphasis needs to be placed on understanding the internal characteristics of the subject exposed to specific hazards. Physical, social, economic, educational, political and cultural factors, among others, contribute to creating what is termed "global vulnerability".

In their book *Desastres Naturales, ¿Fuerza mayor u obra del hombre?,* Anders Wijkman and Lloyd Timberland write that, "vulnerability is equal to the lack of development." In other words, vulnerability is an unresolved development problem.[28]

Proximity or exposure to a hazard, capacity/resources and marginality determine the level of vulnerability:

- Given an increase in population, more people are exposed to hazards, i.e., more people are living in disaster-prone areas such as riverbanks, unstable soils, etc.;

- A high percentage of a population is worried about survival on a day to day basis. They don't think about an earthquake, or flash flood – only about how they can find food for today and tomorrow;

- Marginality is one of our main problems today. Ethnic, religious, social, economic, political and educational problems contribute to this marginality.

Risk: the probability of exceeding a specified level of social, environmental and economic damage, in a specific place and time.

Risk results from the relation between a specific hazard and vulnerability, which can be expressed by the equation R = H V.

Only when this relationship is understood, can we determine risks. Understanding risks will allow us to reduce both hazards and vulnerability, before they become disasters.

Acceptable Risk: the specific value of damage that the community is prepared to support.

Accepting risks is an action that each of us undertakes daily. When somebody, aware of the risks involved, decides to live on a dike, near or on a seismic fault, he or she accepts certain risks. When a mayor decides to build a bridge, he or she needs to know the flow of the river, its maximum levels, and have sufficient funds available to evaluate appropriate options and determine acceptable risk.

Until the 1990's, most people working in emergencies and disasters considered disaster management as the ultimate goal. The focus was on identifying hazards and anticipating measures to minimize the impacts. Disaster Management emphasizes preparedness and response/relief through a) scientific and technically-sophisticated agencies and; b) the

[28] Wijkman, Anders and Timberlake, Lloyd, Desastres Naturales, ¿Fuerza mayor u obra del hombre?, First edition in Spanish, Earthscan, London, 1985.

relief agencies, health services, public works, the military and other logistical organizations.

Risk Management: interventions that will help to avoid and/or reduce the adverse effects of an event. Activities focus on prevention (avoiding risks) and mitigation (reducing risks). In risk management there are other, newer players – development institutions, planning offices, community organizations – in addition to the institutions mentioned above. The concept of risk management is still relatively new in Latin America, and while there has been some progress in its incorporation into planning processes, there is still a long way to go.

Because the term "risk management" is more comprehensive than "disaster management", it is preferred by today's academics and practitioners.

The ENSO event – given its periodicity, magnitude and the possibility of anticipating its arrival – presents a unique opportunity for applying and observing the results of risk management over the relatively short-term.

4.2 Implementation of the strategy

Juan Pablo Sarmiento, a consultant with experience in disaster management at the national level, was hired as the Regional ENSO Technical Coordinator in November 1997. Sarmiento also works with OFDA/LAC's Training Program. His role was to participate in meetings of technical and scientific nature, coordinate with international cooperation and funding agencies, and to provide advice to USAID Missions and national disaster institutions, in close coordination with the Regional Advisor for South America, René Carrillo.

November was also the month for moving the ENSO project forward in the three selected missions – Ecuador, Peru, and Bolivia. Freedom was given to the missions for selecting their MECs. While the missions used different selection and hiring processes, there was agreement that the contracts would have a six-month duration.

Not until December was the first MEC was hired - USAID/Ecuador being the first to comply. Michael Hacker was hired under a purchase order, which turned out to be the most expedient hiring process. Hacker is a former USAID direct-hire and resident of Ecuador.

In the case of Peru and Bolivia, the process was much slower as the Missions decided to use personnel service contracts (PSC), which required open competition. Staff was not hired until early January 1998, due to the bureaucratic hiring process. In Peru, an

American citizen, Julie Leonard, was hired. Leonard has lived in Peru for several years and was the former representative of Save the Children Canada.

In Bolivia, Salvatore Pinzino, another former USAID employee, was hired. Pinzino is an American with vast experience in food programs and disaster assistance, and lives in Bolivia.

A documentalist with a background in Public Health – Jane Begala – was also hired in OFDA/LAC for a three month period. Her job was to organize the correspondence and the documentation on ENSO.

4.3 MEC Training

On January 13-14, 1998, a workshop was held in San José, Costa Rica with the purpose of presenting and discussing basic information related to El Niño. The topics included ENSO Team composition, guidelines, structure, and mode of operation for establishing an effective ENSO Team.

The participants were the MECs from Bolivia, Peru, and Ecuador; Dr. Ronald Woodman of the Instituto Geofísico of Peru; Paul Bell; Nina Minka; René Carrillo; and Juan Pablo Sarmiento.

As part of their training, the MECs were invited to participate in a course held in Columbia on "Disaster Assessment and Needs Analysis," which introduced them to the methodology promoted by OFDA in Latin America.

4.4 Location of the MECs and scope of work

The MECs had different locations within the Missions' structures. In Peru and Bolivia, the MECs worked in close coordination with the Mission Disaster Relief Officer (MDRO), while in Ecuador, the MEC reported directly to the Mission Director. During the first five months the initial approaches to the work were also different. Both Peru and Bolivia immediately experienced ENSO impacts that involved the Missions, and both MECs became involved in response operations.

USAID/Bolivia's El Niño response was based on Pinzino's experience and MDRO Laurence Rubey's interest. The MEC/Bolivia provided both proof and technical advice to the Mission and to the Bolivian governments' entities on the growing drought situation in the Sierra. Using resources from the Mission's regular food security program, three NGOs already working with USAID – and in particular, Project Concern International (PCI) – became involved in the emergency response, with very positive results.

Following the earthquake in Aiquile on May 22, 1998, an assistance project financed by OFDA and implemented primarily by PCI was initiated. As the MEC's contract had already ended, the response was handled by the MDRO with the support of OFDA Consultants Carlos Córdova and Jorge Grande.

In Peru, the principal impacts occurred during the months of January, February and March, which generated a response by OFDA, consisting of rolls of plastic sheeting, water reservoirs and grant funding. The grants were implemented by the NGOs, ADRA, CARE, and CARITAS, while some of the resources were transferred to the National Institute of Civil Defense (INDECI). The MEC's contract was extended twice, given the intensity and dispersion of El Niño impacts throughout the country, as well as the size of the assistance program.

In Ecuador, the USAID Mission decided to help the Ecuadorean government through its Economic Support Fund program (local currency), and the provision of technical advice. As the decision was made not to renew the MEC's contract, his functions were transferred to the Mission's Project Official, Patricio Maldonado. Maldonado, who has an in-depth knowledge of the Mission's portfolio, could identify specific response measures, to be implemented by USAID, OFDA, the Ministry of Health and the Ministry of Housing.

5. Forest Fires

ENSO simultaneously created both an excess and deficit of rains. A number of different 'deficit' situations occurred, such as drought in Bolivia and fires in areas where a number of variables come into play, including organic mass, temperature, moisture, and propitious winds. In the Brazilian state of Roraima, a forest fire that covered to 9,254 Km2[29] (925,470 hectares) was reported in March in the Amazon region. This fire destroyed the theory that there was little probability of fire in the Amazon jungle because of its high moisture and type of vegetation. It also showed the powerful influence of ENSO's extreme climatic variations on ecosystems, as well as the tragic impact of the "slash and burn" agriculture.

A few weeks after the fire in Roraima, the mass media began reporting an outbreak of fires in Central America. Fires occurred in the following countries: a) Mexico - 506,946 hectares affected;[30] b) Guatemala - 400,000 hectares affected;[31] Nicaragua - 804,000 hectares affected;[32] c) Honduras - 51,511 hectares affected;[33] and d) Costa Rica - 40,000 hectares affected.[34] Fires were reported as early as January, with the largest number occurring during May and June 1998. Visibility was reduced and air quality deteriorated in the affected countries due to the presence of smoke and ash. Smoke extended into the south and mid-western areas of the United States. Due to the severity of the conditions, drastic measures were taken to limit the outdoor activities of children and adults with respiratory problems.

During late June-early July, the state of Florida recorded the largest number of fires in its history, effectively destroyed 200,000 hectares.[35] Community volunteers, relief groups, military forces and the use of sophisticated land and air equipment were not sufficient to control these fires, which were finally extinguished by rain.

Over the past seven years Luisa Alfaro, a Costa Rican fire management specialist and OFDA/LAC instructor, has been developing a training program on forest fires. During the 1998 fires, this course material was adapted and applied rapidly. The course outlines the materials and equipment needed for fire control, which facilitated the purchase and distribution of appropriate materials to Mexico and the various Central American countries.

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[29] OCHAGVA-UN, Situation Report 98/0184, 09 Apr 1998.
[30] USAID/BHR/OFDA Situation Report #20: Mexico & Central America – Fires, 25 Jun 1998.
[31] USAID/BHR/OFDA Situation Report #12: Mexico & Central America – Fires, 08 Jun 1998.
[32] USAID/BHR/OFDA Situation Report #12: Mexico & Central America – Fires, 08 Jun 1998.
[33] USAID/BHR/OFDA Situation Report #12: Mexico & Central America – Fires, 08 Jun 1998.
[34] USAID/BHR/OFDA Situation Report #18: Mexico & Central America – Fires, 18 Jun 1998.
[35] CNN, 7 julio de 1998.

Currently, OFDA offers a basic course in Forest Fire Prevention and Control, which lasts for six days and is designed for Brigade Chiefs. A three-day version of this course, called the Forest Firefighter Course, has been developed for illiterate personnel. Given the characteristics of the target audience, the material is primarily graphs and tables, with limited texts. Special emphasis has been placed on personal safety. A one-day seminar is being developed for lower level fire fighters, as well as an “training for trainers” course, which gives sustainability to the program.

6. Institutional Impact Assessment

Since August 1997, new structures in Colombia, Ecuador, Peru, Bolivia and Chile have been developed to deal with the situation caused by ENSO, supplanting the traditional civil defense or emergency management agencies. Without exception, their creation has caused conflicts and communication and coordination problems. International cooperation, promotion, and financing agencies have had to work with newly-created administrative entities, which basically have no experience. Some of these entities have already gone through multiple changes, especially in Ecuador and Peru.

This is not a new situation – the region has a history of sidelining the institutions created for emergency response when large-scale disasters occur. Politicians temporarily appoint trusted associates to deal with the situation, as disasters tend to become politicized rapidly. The following people were made responsible for ENSO management in their country: a) in Peru, the President of the Cabinet; b) in Ecuador the Vice President of the Republic; c) in Bolivia, the Minister of Defense; and d) in Argentina, the presidential candidate for the governing party.

These developments are significant for OFDA. For more than 10 years OFDA/LAC has implemented a training program for emergency and disaster management directed toward first response agencies such as health, education, and coordination organizations. During the current event, these agencies have been displaced or limited in their functions. However, once the ENSO is over, it is expected that the agencies will return to dealing with daily emergencies. OFDA has invited Dr. Richard Olson of Florida International University to study the causes and characteristics of the institutional impact of the ENSO 97/98.

7. Pan American Climate Information System (PACIS)

7.1 Background

The 1997-1998 El Niño experience in Latin America and the Caribbean has demonstrated the value of climate information. Based on this recent experience, a group of institutions concerned with climate impacts, risk management, research and forecasting have proposed the establishment of an integrated set of activities that would advance the production, dissemination and application of climate forecast information. These activities, in conjunction with human resource development and focused global change research, would constitute the PACIS.

An initial meeting of a small international group of experts to discuss the need and potential for establishing a PACIS was held in early April 1998 in San José, Costa Rica. The meeting recommended the establishment of a formal mechanism to produce, analyze, disseminate and apply seasonal to inter-annual climate forecast information. In addition, several activities were suggested as tools that can be used to advance the PACIS:

1) the creation of a steering group composed of stakeholders;
2) an evaluation of existing forecasting capabilities;
3) the organization of systematic regional climate outlook fora;
4) the holding of national meetings to discuss climate forecast productions and potential risk management applications;
5) the design and implementation of training activities; and
6) the advancement of integrated, multi-disciplinary research.

Lastly, the meeting concluded that the PACIS initiative could benefit by high-level visibility, such as that provided by the April 1998 Summit of the Americas.

7.2 Mandate and Authority - April, 1998

Recognizing the regional interest in, and need for PACIS, the U.S. Secretary of Commerce, William M. Daley, and the Chilean Minister of the Interior, Carlos Figueroa, signed a Statement of Intent to further the recommendations of the April Meeting of Experts, and launch the PACIS in partnership with other countries.

To this end, the U.S. and Chile offered to organize a regional meeting to design and launch PACIS in 1998. A Planning Committee (PC) was formed, initially of Chilean and U.S. representatives, along with a representative of the International Decade for Natural Disaster Reduction (IDNDR). At a June 1998 planning meeting in Santiago, Chile, these representatives agreed to establish a broader PC to plan the PACIS Design Workshop. The multilateral PC, which would meet for the first time in August 1998 in San José, Costa Rica, was charged with developing plans for a regional workshop to design and launch PACIS, and with facilitating the interest and participation of agencies with activities relevant to its objectives and functions. The PC will be dissolved and a permanent organization will be created at the conclusion of the March 1999 workshop.

7.3 Composition of the Planning Committee

The Planning Committee (PC) consists of representatives of the following institutions:

National Emergency Office of Chile (ONEMI)

Meteorological Bureau of Chile (DMC)

Hydrographic and Oceanographic Service of Chile (SHOA)

International Research Institute (IRI) for Climate Prediction

Inter-American Institute for Global Change Research (IAI)

International Decade for Natural Disaster Reduction (IDNDR)

World Meteorological Organization (WMO)

World Bank/Inter-American Development Bank

Office of Foreign Disaster Assistance, Agency for International Development (USAID/OFDA)

Office of Global Programs, National Oceanic and Atmospheric Administration, Department of Commerce (DOC/NOAA/OGP)

Economic Commission for Latin America and Caribbean (ECLAC)

Regional Water Resource Committee and Regional Center of Prevention of NaturalDisasters in Central America (CEPREDENAC)

National Meteorological Institute of Costa Rica

7.4 Potential Structure and Functions of PACIS

The PACIS organizing principles are as follows:

Multi-lateral, including countries and sectors

Risk management focus

Organization by sub-regions

New institutional arrangements, not new institutions

Open, systematic exchange of data, information, and experience

Establishment of a long-term mechanism for generating, disseminating andinterpreting regional climate forecast information

"Bottom-up" approach, utilizing existing frameworks to achieve political will

Enhance capacity building and training

Physical and socio-economic research

Tailoring regional climate information to users needs

PACIS has two principal components:

- The production of global and regional forecasts; and
- The use of forecast information by climate sensitive sectors, such as:

- Basic services and infrastructure (e.g., water, energy, and transport)
- Health (medical services, sanitation, infectious diseases)
- Productive infrastructure (agriculture, fisheries, livestock)
- Environment (forests, watersheds, and bio-diversity)
- Disaster Management

Other essential elements of PACIS are human resource development, research into physical and socio-economic processes related to climate variability, and communications.

The need to identify regional organizations dedicated to the use of climate information – such as CEDERA, CEPREDENAC, CPPS (ERFEN), and soon MERCOSUR – was recognized. The main idea is not to create a new organization, but to use existing structures and organizations. With regards to users, specific products will be determined later.

8. Cooperation with World Bank, Inter-American Development Bank and Pan American Health Organization.

The ENSO 97/98 created a special opportunity for fostering an integrated approach among financing and development agencies in the Latin America and Caribbean Region.

Intentionally, and for the first time, the World Bank, Inter-American Development Bank (IADB), and the Andean Development Corporation (ADC), met together to study the probable ENSO impact in a specific country - Ecuador. The USAID/Ecuador Mission requested OFDA to participate as an expert agency and Dr. Juan Pablo Sarmiento was sent as OFDA's representative. From September 29 - October 3, 1997), a collaborative effort was made to define financing policies for other countries exposed to the climatic phenomenon in the region.

As a result of this meeting, a workshop on El Niño was held in Washington on June 11, 1998, that was sponsored by the World Bank and the PAHO.

Despite the interest of the WB, IADB, and the ADC in the subject, a more pro-active approach needs to be taken in dealing with disasters. A policy should be established that defines procedures that include risk variables in all investments and development proposals that are promoted in the region.

Regarding the health aspects, OFDA and PAHO held information-sharing meetings geared toward decision-making. A collaborative initiative was undertaken to record the impact of the ENSO 97/98 in the region. The results will be published by PAHO.

9. Coordination with other International Institutions

The United Nations, including the Office for the Coordination of Humanitarian Affairs (OCHA) and the UN Development Program (UNDP), played a special role during the ENSO 97/98 event. It is also important to mention the role played by PAHO, and to a lesser extent by the WMO and the IDNDR. That being said, the levels of coordination between these agencies depended more on their interest and convocation capacity at the country level, rather than a coherent and comprehensive regional policy.

Another multilateral agency participating in the ENSO response was the European Union (EU), which coordinated directly with the affected governments and NGOs. However, the EU did not coordinate with OFDA or other agencies at the national or regional level.

The bilateral cooperation agencies of Canada, Japan, France, England, Switzerland, and Germany also contributed to the emergency response. However, there was no efficient channel of coordination between agencies, nor did grantees set up coordination mechanisms, as they tended to prefer independent meetings with donors.

10. OFDA Response in Figures[36]

1. Situations that generated an OFDA/LAC response during the ENSO 97-98 event.

Andean countries: Ecuador, Peru and Bolivia

The dramatic El Niño impacts – flooding and mudslides produced by torrential rains, etc. – began in Ecuador in late October, in Peru in late December, and to a lesser extent, in Bolivia in February. As noted earlier, the main El Niño threat to Bolivia was, and continues to be, drought.

2/3/98 – Peru – Floods

The immediate precursor to issuing the disaster declaration in Peru was the surprise flooding of Ica on two occasions in late January. The first airlift on February 5 was followed by a series on February 27-28, after the flooding of the northern cities of Chiclayo, Trujillo and Chimbote (details below).

5/5/98 – Ecuador – Floods

Coastal areas of Ecuador experienced numerous flooding episodes beginning in late October 1997. The USAID Mission made funding available for several emergency initiatives, but a disaster declaration was not made until May, following devastating rains that isolated Manabi province.

Bolivia

While a disaster was not declared in Bolivia due to El Niño (there was one declared following the Aiquile earthquake), the MEC, OFDA advisors and consultants regularly monitored the situation of a slow onset drought.

4/7/98 – Brazil – Fire

Prolonged drought and fires in Roraima State combined to produce a critical situation for local populations and indigenous people in particular, prompting the declaration of disaster.

Argentina/Paraguay

4/30/98 – Paraguay – Floods / 5/8/98 – Argentina – Floods

Paraguay and the northeastern section of Argentina experienced large-scale flooding in late April/early May due to two factors: a) unprecedented rainfall in flooded areas culminating in late April; and b) torrential rains in southern Brazil which lead to river levels several meters above normal.

[36] Prepared by Julie Leonard, MEC-Perú Dec/1998.

Mexico and Central America

Six disasters were declared between the May 15-22, following the outbreak and rapid spread of forest fires throughout Mexico and the Central American countries. The fires were a result of/caused by exceptionally dry/drought conditions associated with El Niño, and exacerbated by field clearing techniques (slash and burn) of local farmers. In Mexico, it is estimated that 13,459 fires burned nearly 500,000 hectares; in Guatemala, there were more than 2,000 fires raging at the peak of the emergency; in Honduras, 1,856 fires consumed 51,511 hectares; in El Salvador, there were close to 1,140 fires; in Nicaragua, more than 13,000 fires were estimated to have destroyed over 800,000 hectares; and in Costa Rica a total of 40,000 hectares of parkland forests are estimated to have burned.

2. Technical Assistance provided by OFDA/LAC.

Andean Countries

Peru

	Days
Julie Leonard, Mission ENSO Coordinator, 1/9/98 – 11/20/98 11/30-12/11/98	
Juan Pablo Sarmiento, OFDA/LAC Regional ENSO Coordinator, 2/2-8, 3/xx-xx, 7/xx-xx	
Rene Carrillo, OFDA/LAC Regional Advisor, 2/2/98-2/5/98	4 days
Alejandro James, OFDA/LAC Regional Advisor, 2/9-21, 2/25-3/13	30 days
Kathi McNeil, OFDA/LAC, 2/18-27/98	10 days
Ricardo Herrera, OFDA/LAC, 2/25-3/5	8 days

Ecuador

Mike Hacker, Mission ENSO Coordinator, 12/xx – 4/xx	
Patricio Maldonado, Mission ENSO Coordinator	
Juan Pablo Sarmiento, OFDA/LAC Regional ENSO Coordinator	
Rene Carrillo, OFDA/LAC Regional Advisor	2 days
Alejandro James, OFDA/LAC Regional Advisor, 11/11-15/97	4 days

Bolivia

Salvatore Pinzino, Mission ENSO Coordinator, 1/5/98 - ??
Juan Pablo Sarmiento, OFDA/LAC Regional ENSO Coordinator

Mexico and Central America

Mexico

Seven-member joint assessment team May 16 for:

- assessing land and air logistics coordination;
- identification of criteria for selecting and suppressing priority fires;
- determination of resources available and needed; and
- effect on local populations.

Rene Carrillo, OFDA/LAC Regional Advisor	17 days

Guatemala

Alejandro James, USAID/OFDA Regional Advisor, 5/21-6/6, 6/14-20	24 days
Jay Perkins, USFS, 5/21	
Dennis Trujillo, USFS, 5/21	
Luisa Alfaro, OFDA/LAC Fire Management Specialist, 5/26-6/1	7 days

Honduras

Assessment team composed of DOD, USFS and U.S. fire and rescue personnel, 5/27	
Kathi McNeil, OFDA/LAC, 5/28	1 day
Luisa Alfaro, OFDA/LAC Fire Management Specialist, 6/2-6	5 days

El Salvador

Ricardo Herrera, OFDA/LAC, 5/22-25	4 days
Luisa Alfaro, OFDA/LAC Fire Management Specialist, 6/7-10	4 days

Nicaragua

Luisa Alfaro, OFDA/LAC Fire Management Specialist, 5/18-25, 6/10-19	18 days

Argentina

Rene Carrillo, OFDA/LAC Regional Advisor, May 1998	12 days
Alejandro James, OFDA/LAC Regional Advisor, 5/10-18	9 days
Jorge Grande, OFDA/LAC Consultant	
Carlos Cordova, OFDA/LAC Consultant	

Paraguay

Rene Carrillo, OFDA/LAC Regional Advisor	7 days
Marcelo Garcia, Hydrologist, University of Illinois	7 days
USFS personnel	7 days
Alejandro James, OFDA/LAC Regional Advisor, 5/2-9	8 days

3. Economic assistance: Changes that arose in relation to initial definition and end use of resources

Andean Countries

Peru

A total of $3,011,133 in economic assistance was provided along the following lines:

- $25,000 – disaster declaration: funds to INDECI for the purchase of blankets and tents
- $20,000 – charter air transport to assist assessment and evaluations by USAID/OFDA personnel
- $1,918,500 – grants to CARITAS ($1,368,500), ADRA/OFASA ($350,000) and CARE ($200,000) for logistics, transport and purchase of local relief supplies – including construction materials – to complement airlift of plastic sheeting, etc.
- $385,376 – grant to CARE for an integrated emergency response program for 20 communities (150 families each) in Piura affected by El Niño rains and flooding. Grant consists of the provision of family housing and water protection kits; technical assistance for improving housing and sanitary conditions; and the development of an information system for reporting damages and coordinating emergency responses.
- $ 665,757 – cost of relief supplies and two airlifts (materials detailed below).

Changes:

1. As the cost of construction materials dropped appreciably between February and June, and as in-kind donations from other donations obviated the need for grantees to spend on original line-items, both CARITAS and ADRA/OFASA requested and received approval for the use of funds for the construction of latrines and wells.
2. CARE grant for integrated disaster response: in the original plan, $60,000 was to be used for the purchase of mattresses. However, as mattresses were distributed by the regional government, CARE requested and received approval to use these funds, plus savings in other line items, to buy seeds and small animals so that people could start recovering their lost livelihoods.

Ecuador

- $25,000 disaster declaration: used for the local purchase of chlorine for water treatment and for repairing water filtration and delivery systems
- $50,000 – used for disaster assessments, the local purchase of chlorine, and transport and installation of water purification equipment to provide potable water for up to 200 communities
- unspecified amount for airlift of OFDA supplies (water jugs and bladders)

<u>Mexico and Central America</u>

In all, a total of $8,195,907 was made available for fire suppression efforts in Mexico and Central America, as outlined below.

Mexico

- $5,000,000 – grant: support to U.S. Forest Service (USFS) for fire suppression in Mexico and the region, including:
  - specialized firefighting operations – one heavylift helicopter and one fixed-wing aircraft with infrared fire detection capabilities
  - firefighting and safety equipment for up to 3,000 firefighters

  - communications equipment for firefighting teams in the field
  - USFS firefighting specialists to provide technical assistance
  - two portable MARK III pumps with kits
  - four small water pumps with 4,000 feet of hose
  - rejuvenating a bilateral USG/Government of Mexico (GOM) training/technical cooperation program in firefighting
  - support for fire suppression efforts in Central American countries.

- $2,689,907 – grant: to the GOM to support the operations of five medium-duty helicopters equipped with fixed and portable tanks, cargo nets, swivels, and long lines (Includes the $25,000 attached to the disaster declaration).

Guatemala

A total of $506,000, breakdown as follows:
- $ 25,000 – disaster declaration: purchase of firefighting equipment.
- $476,000 – 4 U.S. Department of Defense (DOD) helicopters, 180 hours of flight time for reconnaisance, transport of food, firefighters, and water drops
- $ 5,000 – fuel for aerial assessment missions

Honduras
- tools, equipment and training, charged to the $5 million noted above

El Salvador
- firefighting tools and equipment, as above

Nicaragua
- tools and equipment, as above

Costa Rica
- tools and equipment, as above

<u>Brazil, Argentina, Paraguay</u>

Brazil
- $25,000 – disaster declaration: local purchase and distribution of basic food items

Argentina

Disaster declaration and supplies, but no funds: see below

Paraguay

- $25,000 – disaster declaration: through the Paraguayan Red Cross for the local purchase of mattresses and blankets for 3,860 people in 18 rural villages

4. Relief supplies

Country	Water Jugs	Bladders	Rolls of Plastic	Chainsaws	Blankets
Peru		**15**	**1890**	**1**	
Ecuador	**5,000**	**20**			
Argentina			**1000**		**10,000**

11. Lessons Learned

11.1 Facts

- There have been important scientific advances that make it possible to improve our understanding of the processes related to extreme climatic events such as ENSO.

- For the ENSO 97/98, there was an early warning system (detailed in part 2.1 above): the first notification of the ENSO phenomenon was given at the end of 1996. Its occurrence was confirmed in June-July 1997, and in September-October of the same year there was clear evidence of the event.

- There is background (ENSO 82/83) on the impact of the extreme climate variations.

- There is a considerable level of awareness about disaster management in Latin America, which has created a certain level of commitment from national governments whose exposure to risk requires decisive intervention in this area.

- The capacity to predict extreme climatic events is directed toward the present (preparedness and response activities), rather than the future (prevention and mitigation). Thus, it comes as no surprise that there were relatively few actions undertaken in the field of prevention and mitigation (risk management). The time period in which governments acted was significantly short and their actions focused on preparation and response (disaster management).

- Much of the infrastructure damage that occurred during the ENSO 97/98 corresponded to public works and projects financed with WB and the IADB resources that had not taken variable climate risk into account at the design stage.

- The USAID Missions in Bolivia and Peru lost valuable time looking for mechanisms for selecting and contracting the MEC.

- One of the incomplete tasks during the current ENSO was the review of the Missions' portfolio. Now that the ENSO has passed, some questions persist:
  - Were the Missions' projects affected, and to what degree?
  - How could current projects contribute to the process of recovery of the affected areas?
  - How could prevention and mitigation activities be promoted at the Mission level, based on current or future projects?

- The works in Ecuador, Peru and Bolivia are highly sustainable, making it possible to link emergency response and regular Mission development activities. In Ecuador, it was possible to strengthen activities in the areas of clean water and health education which are promoted by PAHO and other local health agencies. In Peru, the larger part of grant activities focused on relief, while activities such as food security, and latrine and well construction (in relocated communities) were add-ons.

- The fires in Mexico and Central America provided an opportunity to implement a long-term strategy to control forest fires based on training, organization, and the provision of equipment and basic tools.

- Communication between OFDA/Washington and OFDA/LAC was fluid, which facilitated rapid responses to needs detected during the emergency.

11.2 Recommendations

Recommendations for the Missions

- USAID Missions in countries exposed to extreme climate variations such as ENSO should have pre-defined criteria on risks and climate issues for applying to their programs and regular projects.

- The Missions should expedite the hiring of personnel to deal with these types of situations.

- The Missions should have protocols that allow the incorporation of affected areas into internal programs (the portfolio) when there is a disaster.

Recommendations for OFDA

- Consolidate the ENSO documentation center network, focusing on social, environmental, economic, and political sectors.

- Promote and support the consolidation of the PACIS.

- Develop a strategy to provide training and technical assistance at the highest levels of public administration with an emphasis on large-scale disasters.

- Establish a data bank of professionals and technicians who can be contracted in emergencies or disasters.

- Systematize OFDA response experiences for the purpose of standardizing training activities and procedures, but which are adaptable to different situations.

- Promote the inclusion of climate and risk variables in national, regional and local development plans.

- Work with national governments to establish early warning systems that are based on seasonal and inter-annual climate forecasts.