

**UNITED NATIONS
ECONOMIC COMMISSION
FOR LATIN AMERICA
AND THE CARIBBEAN —
ECLAC**



Distr.
LIMITED

LC/MEX/L.372
19 April 1999

ORIGINAL: SPANISH

**NICARAGUA: ASSESSMENT OF THE DAMAGE CAUSED
BY HURRICANE MITCH, 1998**

*Implications for economic and social development
and for the environment*

CONTENTS

	<u>Page</u>
PREFACE	1
I. BACKGROUND	3
1. The mission	4
2. Description of the phenomenon and its effects	5
3. Population affected	8
4. Emergency actions	15
II. ASSESSMENT OF THE DAMAGE	19
1. Social sectors	20
2. Infrastructure	31
3. Productive sectors	41
4. Effects on the environment	50
5. Summary of damage	59
III. OVERALL EFFECTS OF THE DAMAGE	63
1. Nicaragua's economic evolution before the disaster	63
2. General economic effects of the disaster	65
IV. GUIDELINES FOR A REHABILITATION AND RECONSTRUCTION PROGRAMME	70
1. Project generation	71
2. Rehabilitation stage	72
3. Reconstruction stage	72
<u>Appendix</u> : Project profiles for the rehabilitation and reconstruction stage	77

PREFACE

This study has been carried out within the framework of the United Nations support for the Central American region following the disaster caused by hurricane Mitch, which struck the region in October 1998. A request for an assessment of its social, environmental and economic impact on Nicaragua was submitted to the Economic Commission for Latin America and the Caribbean (ECLAC) by the government of that country through the United Nations Development Programme (UNDP).

The study presents an overall assessment of the damage, based on sectorial estimates of the direct and indirect effects of the hurricane; it also calculates the macroeconomic and environmental impact, and proposes guidelines for rehabilitation and reconstruction programmes.

National authorities, coordinated by the Central Bank of Nicaragua, UNDP and other United Nations agencies, as well as international institutions and agencies, collaborated in the preparation of the study. Officials and consultants of the Pan American Health Organization (PAHO/WHO) and of the United Nations Children's Fund (UNICEF) joined the mission. This assessment complements the data collected by the Office of the United Nations Disaster Assistance Coordinator (UNDAC) through the Office of the Coordinator for Humanitarian Assistance (OCHA).

The direct and indirect damage was assessed in accordance with the methodology developed by ECLAC over a period of more than 25 years. The results presented are based on the mission's estimates; the study incorporates the information available and the evidence collected in interviews and visits to affected locations. The magnitude of the losses exceeds the nation's capacity to address reconstruction needs on its own, particularly if the aim is also to reduce the impact of similar events in the future, and therefore international cooperation is considered essential.

This appraisal is designed to provide the government and the international community with guidelines for setting national and regional priorities in rehabilitation and reconstruction programmes. A purely economic approach would be very limited, and such programmes should therefore include actions of a social nature that contribute to alleviating the suffering of broad segments of the population who were already living in a situation of poverty and marginalisation before the disaster occurred. Special attention and priority should be placed on including sustainability and increased-governance criteria in making social and productive investments, and on allocating resources to the reconstruction and replacement of infrastructure.

Nicaraguan society and the government face the opportunity of undertaking the reconstruction with renewed values and criteria, embarking at the same time on institutional, legal and structural reforms to reduce economic, social and environmental vulnerability. An important aspect of such reforms will be to strengthen the country's savings, investment and management capacity as part of the reconstruction and transformation.

I. BACKGROUND

Natural disasters, whether climatic, seismic or volcanic, are frequent in Latin America. Annual losses caused by such phenomena in the region have been estimated at more than US\$1.5 billion and almost 6,000 lives.¹ These effects are magnified and aggravated by the structural disparities of societies that place population segments already living in precarious economic and social conditions at greater risk.

Nicaragua has been affected on numerous occasions by natural phenomena. Hurricanes, earthquakes, volcanic eruptions and seaquakes have caused millions of homeless victims, thousands of deaths and billions of dollars in losses. Some of the most notable disasters in the past 25 years are: the Managua earthquake in 1972; the floods of 1982; hurricane Joanna in 1988; the eruption of Cerro Negro volcano in 1992; the seaquake in September 1992; hurricane Cesar in 1996, and El Niño in 1997-1998.² Tropical storms and hurricanes generated from August to November were also added to this list, with their sequels of casualties and extensive damage to the environment.

Hurricane Mitch, which hit the country during the last days of October 1998, is one of the most violent hydrometeorological phenomena to have struck Central America this century, owing to its exceptional force upon reaching the coasts of the region, its diameter, the amount of moisture and rain it carried and the unpredictable path it followed for several days.

Hurricane Mitch's effects on Nicaragua occurred when the country was resuming the path of sustained growth and development after having concluded a long period of violence and armed confrontation which had caused setbacks in Nicaraguan society. It is essential for the country to rehabilitate, rebuild and improve its damaged infrastructure, and offset the loss of goods and services, which will help to mitigate the social effects of the disaster.

The extent of the damage and the enormous efforts required for the recovery point up the need for the country—and the region as a whole—to receive cooperation from the international community. This involves relief from its financial burden, the creation of more favourable conditions for its integration into world trade flows, as well as access to its principal markets. International funds will be needed to complement national efforts—both public and private—to carry out the reconstruction programme. The attached project profiles show the magnitude of the efforts involved and indicate the degree of urgency and the priorities to be set, with the participation of the international community.

¹ See, for example, Roberto Jovel and Ricardo Zapata (1993), *Macroeconomic effects of natural disasters in Latin America and the Caribbean*, a paper presented at the Fortieth North American Meeting of the International Association of Regional Science, Houston, 11-14 November 1993.

² See, for example, CEPAL (1996), *Efectos económicos y sociales del huracán César sobre el desarrollo de Nicaragua en 1996; El maremoto de septiembre de 1992 en Nicaragua y sus efectos sobre el desarrollo, 1992; Impacto económico de la erupción del Volcán de Cerro Negro en Nicaragua, 1992.*

1. The mission

The UNDP requested ECLAC's cooperation in carrying out a project to assess the socio-economic impact of hurricane Mitch on the countries of Central America.³

Two technical teams coordinated by ECLAC were established to carry out the assessment in the four countries most affected; one of the teams was entrusted with the work in Honduras and El Salvador, and the other in Guatemala and Nicaragua. The mission had the full support of the UNDP national offices and representatives of various United Nations agencies, and of three international financial institutions: the Inter-American Development Bank (IDB), the World Bank and the International Monetary Fund (IMF). The Pan American Health Organization (PAHO/WHO), the United Nations Fund for Population Activities (UNFPA), the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the United Nations Children's Fund (UNICEF) all made significant contributions to the work in Nicaragua.

The work was carried out as a contribution to Nicaragua and the United Nations in response to the bilateral and multilateral cooperation initiatives that have been adopted to enable Central America, and Nicaragua in particular, to address the challenges of rehabilitation and reconstruction.

The mission visited Nicaragua from 22 to 28 November. The team was made up of the following ECLAC officials, external consultants and officials of other international organisations:

- Jorge Máttar, coordinator.
- Oscar Zamora, consultant, primary sectors (agriculture, livestock, fisheries, forestry).
- René Hernández, macroeconomic effects and industrial, trade and services sectors.
- Oriel Olivares, consultant, transport infrastructure sector.
- Ruth Urrutia, population affected, education and health sectors, with the support of UNICEF and PAHO/WHO, in the health sector and emergency actions.
- Daniel Bitrán, consultant, housing and health sectors, with the support of PAHO/WHO.
- José Javier Gómez, environment.
- Jaime Baraqui, consultant, design of reconstruction projects.
- Hugo Ventura, energy, water and sanitation sectors.

Additionally, Roberto Jovel and Antonio Tapia worked as consultants who reviewed the assessments and were instrumental in making damage estimates more precise.

The mission followed a previous visit by ECLAC officials in which liaisons with government entities and technical collaboration with various multilateral agencies and the United Nations were established, with the support of the United Nations Resident Coordinator in Nicaragua, and the terms of reference and working methods for the study were agreed upon.

This document contains an independent assessment of the disaster, in order to establish the overall magnitude of direct and indirect damages and the effects on the behaviour of the economy as a whole. It will serve as a basis in drawing up proposals for reconstruction priorities and needs, one of

³ Project RLA/98/020, "Socio-economic impact assessment of natural disasters (hurricane Mitch)".

which should be the explicit incorporation of criteria to mitigate and reduce risks and vulnerability to disasters.

2. Description of the phenomenon and its effects

The hurricane season in the northern hemisphere and the Atlantic Ocean (July to November) was unusually strong in 1998 and caused enormous devastation, loss of life, and economic, social and environmental damage. The concentration of very violent meteorological phenomena between August and October was historic: ⁴ a dozen tropical cyclones were given names during that period and affected densely populated areas throughout the Caribbean basin, including both the island countries ⁵ and the States of the Central American Isthmus. Table 1 shows the dates on which they occurred and their wind velocity. Their effects heighten and form part of other climatic disturbances affecting the region, such as the droughts and floods resulting from the unusually high oscillation of the El Niño phenomenon in the Pacific Ocean, ⁶ all of which have caused major damage throughout Latin America and the Caribbean.

The immediate antecedent to Mitch was a tropical front that formed between 19 and 20 October. It developed into a low pressure zone and, at noon on 21 October, was classified as the thirteenth tropical depression of the season. At that time, it was located in the south-western Caribbean, some 580 kilometres south of Jamaica, with steady 50-km/h winds, moving west-north-west at 15 km/h. On 22 October, the Nicaraguan Institute of Territorial Studies (INETER) issued the first of 40 warnings (in a period of 10 days) on the phenomenon. That same day it was upgraded to a tropical storm (named Mitch), whose centre was located 704 kilometres south-east of the Nicaraguan city of Bluefields, with steady winds of 72 km/h and gusts of more than 90 km/h.

From that time on, it followed an apparently erratic path, varying in intensity and changing direction several times between 23 October and 4 November (see Table 2 and figures 1 and 2). Thus Mitch became the forty-first tropical cyclone to have entered Nicaraguan territory since 1892. ⁷

⁴ National Hurricane Center (NHC) (1998), *Monthly Tropical Weather Summary*, prepared by the US National Weather Service (NWS) and posted on the Internet for October and November 1998.

⁵ For an assessment of the damage caused in the Caribbean islands, see CEPAL (1998), *República Dominicana: Evaluación de los daños ocasionados por el huracán Georges, 1998. Sus implicaciones para el desarrollo del país* (LC/MEX/R.668), 29 October.

⁶ These climatic disturbances have affected Latin American and Caribbean countries, such as Mexico, which has been afflicted by droughts and floods at different times, and the consequences of the El Niño phenomenon have been felt in the Andean countries and Central America. See CEPAL (1998a), *Ecuador: Evaluación de los efectos socioeconómicos del fenómeno El Niño en 1997-1998* (LC/R.1822/Rev.1 and LC/MEX/R.657/Rev.1), 16 July, and CEPAL (1998b), *El fenómeno El Niño en Costa Rica durante 1997-1998. Evaluación de su impacto y necesidades de rehabilitación, mitigación y prevención ante las alteraciones climáticas* (LC/MEX/L.363), 3 November.

⁷ See INETER, *Divulgación de la información meteorológica ante la presentación del Huracán Mitch*, Managua, November 1998.

Table 1

MAIN HURRICANES IN THE ATLANTIC OCEAN, 1998

Name	Dates	Maximum wind velocity (kilometres per hour)
Danielle	24 August-3 September	170
Earl	31 August-3 September	160
Frances	8-13 September	105
Georges	15-29 September	240
Hermine	17-20 September	75
Ivan	20-27 September	145
Jeanne	21-30 September	170
Karl	23-28 September	170
Lisa	5-9 October	120
Mitch	21 October- 4 November	290

Source: ECLAC, based on US National Weather Service (NWS-NHC) data, October and November 1998.

On 24 October the storm was upgraded to hurricane and was situated 600 km east of Puerto Cabezas with maximum steady winds of 160 km/h (category 2 on the Saffir-Simpson scale). On 25 October, Mitch gained strength until it reached force 4, with 215-km/h winds. A low-pressure centre formed simultaneously in the Nicaraguan Pacific and interacted with the Inter-Tropical Convergence Zone, with south-westerly winds which increased humidity levels, causing rainfall on the country's Pacific coast.

On 25 and 26 October the hurricane changed course towards the west, moving at 11 to 13 km/h; its maximum winds reached 285 km/h—force 5, the highest on the Saffir-Simpson scale. The rains continued in the western part of the country and the Pacific coast, and then Mitch changed course to west-north-west. By that time INETER had already issued 19 warnings. On 27 October it was located off the coast of Honduras and its intensity subsided, although in warnings 21, 22 and 23 INETER stated that it was still dangerous.⁸ On the following two days it entered Honduras and remained stationary, becoming a tropical storm. Its slow movement was due to its encounter with an anticyclone in the continental United States, which prevented a possible shift towards the Gulf of Mexico.

The effects of cloud banks associated with the hurricane provoked winds moving south-west to north-west, with very high humidity coming from the Pacific towards Nicaragua; as of 28 October the rains intensified, particularly in the country's western, central and northern regions. Mitch continued to lose intensity as it moved inland. Its maximum wind velocity dropped to 65 km/h on 30 October and on 31 October it was downgraded to a tropical storm as it moved towards Guatemala. On 1 November INETER issued warning number 40; Mitch was becoming weaker, with 45-km/h winds, moving westwards at 13 km/h.

⁸ See INETER, *Notas informativas y avisos emitidos por INETER entre el 21 de octubre y el primero de noviembre de 1998 sobre el huracán Mitch*, Managua, 3 November 1998.

Hurricane Mitch is the third most powerful to have formed in the tropical Atlantic basin, Caribbean Sea and Gulf of Mexico this century.⁹ Although its intensity had dropped by the time it caused intense rains in Nicaragua, its slow progress gave rise to floods, strong currents and landslides, which led to a high death toll, while also causing extensive damage to infrastructure (highways, health care, housing and education), agricultural production and the environment. Rainfall reached record levels, for which the population was totally unprepared. Table 3 shows the rainfall levels generated by hurricanes and tropical storms from 1971 to date. Mitch caused rains that reached maximum levels in 10 of Nicaragua's 16 meteorological stations. The Picacho station in Chinandega recorded 1,600 mm of precipitation during the hurricane, a nation-wide record.

Chart 1 shows the intensity of the rains in different regions of the country and compares rainfall records in October 1998 with the average for previous years. In all stations the values for this month are far above the historic average, and in certain cases they were as much as 3, 4 and 5 times greater.

The severe effects of the rains were magnified by the action of man on the environment, such as deforestation —mainly on high slopes—, intensive land use, and human settlements on hillsides, riverbanks and lakeshores. Moreover, the drainage features that prevail on the Pacific, and the types of plant cover, worsened the damage.

As is often the case in such disasters, the people most affected were the poorest and most marginalised, who tend to build their precarious dwellings precisely in the above mentioned high-risk areas. Once again, this clearly highlights the urgent need to adopt measures to alleviate poverty and marginalisation on the one hand, and to prevent and mitigate disasters on the other.

Basic social infrastructure in the area of health care services and drinking water and sanitation systems, as well as waste collection and treatment, suffered moderate damage. The consequences of this become evident immediately and over the long term, and place the population at risk, especially the most vulnerable segments, such as children and the very poor.

The health care system's reduced response capacity, the increased demand, the damage to infrastructure before and during the hurricane, the lack of equipment and the gradual appearance of water-borne illnesses and diseases transmitted by vectors or stemming from overcrowding, make it essential to adopt emergency measures.

⁹ In terms of wind velocity, the two strongest hurricanes in the region were Camille, in August 1969, and Gilbert, in September 1988. Allen (August 1985) had the same force as Mitch. See INETER, *Características meteorológicas y afectaciones del huracán Mitch en Nicaragua*, Managua, November 1998.

Table 2

PATH AND EVOLUTION OF HURRICANE MITCH

Date (Day and local time)	Wind velocity (Maximum sustained km/hour)	Classification (Saffir-Simpson Scale)	Location			
			Latitude (North)	Longitude (West)	Barometric Pressure (BM)	
23 October,	10 a.m.	95	Tropical storm	12.7	77.9	999
	10 p.m.	95	Tropical storm	13.0	78.1	997
24 October,	10 a.m.	160	2	14.9	77.9	987
	10 p.m.	195	3	15.7	78.4	965
25 October,	12 a.m.	200	3	15.9	78.9	953
	12 p.m.	235	4	16.4	80.3	929
26 October,	12 a.m.	240	4	16.3	82.0	922
	12 p.m.	273	5	17.0	83.2	906
27 October,	12 a.m.	285	5	17.4	84.5	918
	12 p.m.	250	5	16.9	85.4	928
28 October,	12 a.m.	220	4	16.5	85.6	933
	12 p.m.	195	3	16.4	85.6	948
29 October,	12 a.m.	160	2	16.3	86.0	970
	12 p.m.	120	1	15.9	85.6	990
30 October,	12 a.m.	65	Tropical storm	15.3	86.5	997
	12 p.m.	85	Tropical storm	14.0	87.0	1,000
31 October,	8 a.m.	55	Tropical depression	14.5	88.7	1,001
	8 p.m.	55	Tropical depression	14.6	90.5	1,002
1 November,	8 a.m.	45	Tropical depression	14.9	91.6	1,005
3 November,	5 p.m.	70	Tropical storm	20.0	90.6	997
	8 p.m.	65	Tropical storm	20.2	90.2	997
4 November,	12 a.m.	65	Tropical storm	20.3	89.9	997
	2 a.m.	55	Tropical depression	20.8	89.4	998
	8 a.m.	75	Tropical storm	21.8	88.3	998

Source: ECLAC, based on Internet data, <http://dyred.sureste.com>.

Government authorities have therefore decided to place priority on these areas, both during the emergency stage and during the rehabilitation and reconstruction. This ensures that investments will be concentrated in the social sphere, thus enabling the country to turn the disaster into an opportunity for development with social equity.

3. Population affected ¹⁰

a) Profile of Nicaragua's population

Nicaragua's population growth (2.6 per cent a year) is one of the highest in Latin America. A population of 4.45 million inhabitants is estimated for 1998, based on the 1995 census (see Table 4). More than 70 per cent live in conditions in which their basic needs remain unsatisfied, with sharp

¹⁰ This section contains contributions by UNFPA and UNICEF which were included during the ECLAC mission to Nicaragua.

contrasts between urban and rural areas. On average, 44 per cent of the country's poorest people survive on less than one dollar a day. Life expectancy is less than 40 years for 37 per cent of the population, and 34 per cent can neither read nor write.

The country's greatest shortages are concentrated in rural areas; there, 67 per cent of the population live below the poverty line, 74 per cent are illiterate, 78 per cent have no access to running water and 86 per cent of homes lack minimally adequate sanitary facilities.

In Nicaragua, the global fertility rate is 3.9 children per woman, with sharp differences between social groups, and between urban (3.1) and rural (5.4) women. In terms of fertility, it has the highest urban-rural differential of any Latin American country. It also has the region's highest adolescent fertility rate.¹¹ Surveys show that a high percentage of women lack access to birth-control information and to the means to effectively regulate their fertility.

Poverty is therefore more detrimental to women in Nicaragua. Women run 27 per cent of the country's households, which is also a higher figure than for any other country in the region. Employment problems have affected more households run by women (44 per cent of open unemployment) than those run by men (40 per cent).

The combination of poverty, demographic pressure and environment is largely responsible for deforestation and the progressive expansion of agricultural frontiers. The poorest population groups often seek their subsistence in the most fragile ecological areas. Traditional rural-urban migration and rural-rural migration towards agricultural frontiers have led to strong imbalances in the land distribution of human settlements and placed additional pressures on natural resources.

b) The effects of Mitch on the population

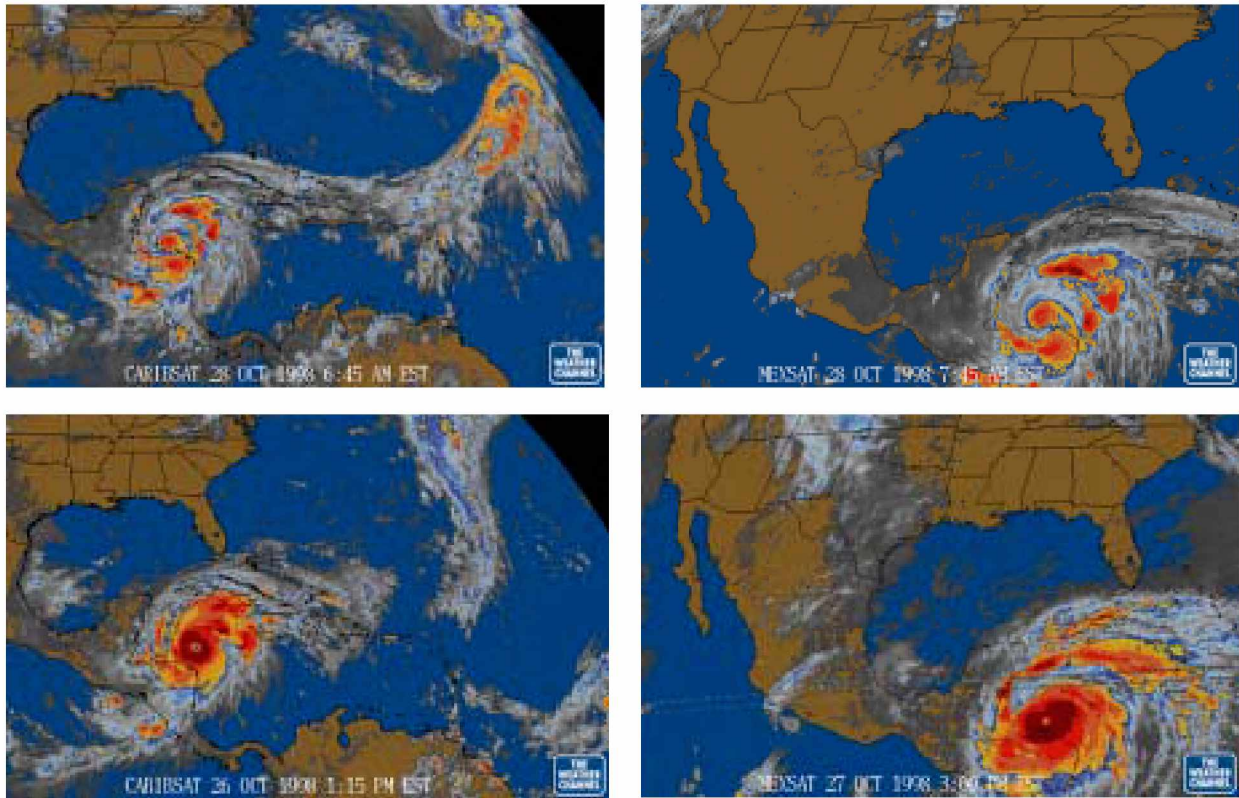
A total of 867,752 people (19 per cent of the population) suffered the consequences of the rains caused by the hurricane. Worst hit was the western part of the country, which suffered the most severe damage ever recorded and mainly affected the most vulnerable sectors of the population. The Social Investment and Emergency Fund (FISE) reported that 48 of the country's 58 poorest municipalities were situated in the most severely damaged departments.

The severity of the damage was caused by the intense rains nationwide, particularly in the Western zone. More than 867,000 people were made homeless due to landslides and floods but the figure was reduced to 368,000 as conditions improved; at the end of November 65,000 people were still in temporary shelters. According to the National Emergency Committee (CNE),¹² primary victims totalled over 4,000: 3,045 dead, 287 wounded and nearly 1,000 missing. León and Chinandega (region II) are the departments with the greatest number of primary victims and homeless. More than 83 per cent of all deaths were reported in region II, due to the avalanche of mud which wiped out the settlements on the slopes of the Casita Volcano.

¹¹ The fertility of adolescent women is 152 per 1,000 births.

¹² See CNE, *Informe Final*, Managua, 23 November 1998.

Figure 1
IMAGES OF THE PATH TAKEN BY HURRICANE MITCH
(Between 26 and 28 October 1998)



Source: The Weather Channel, Internet.

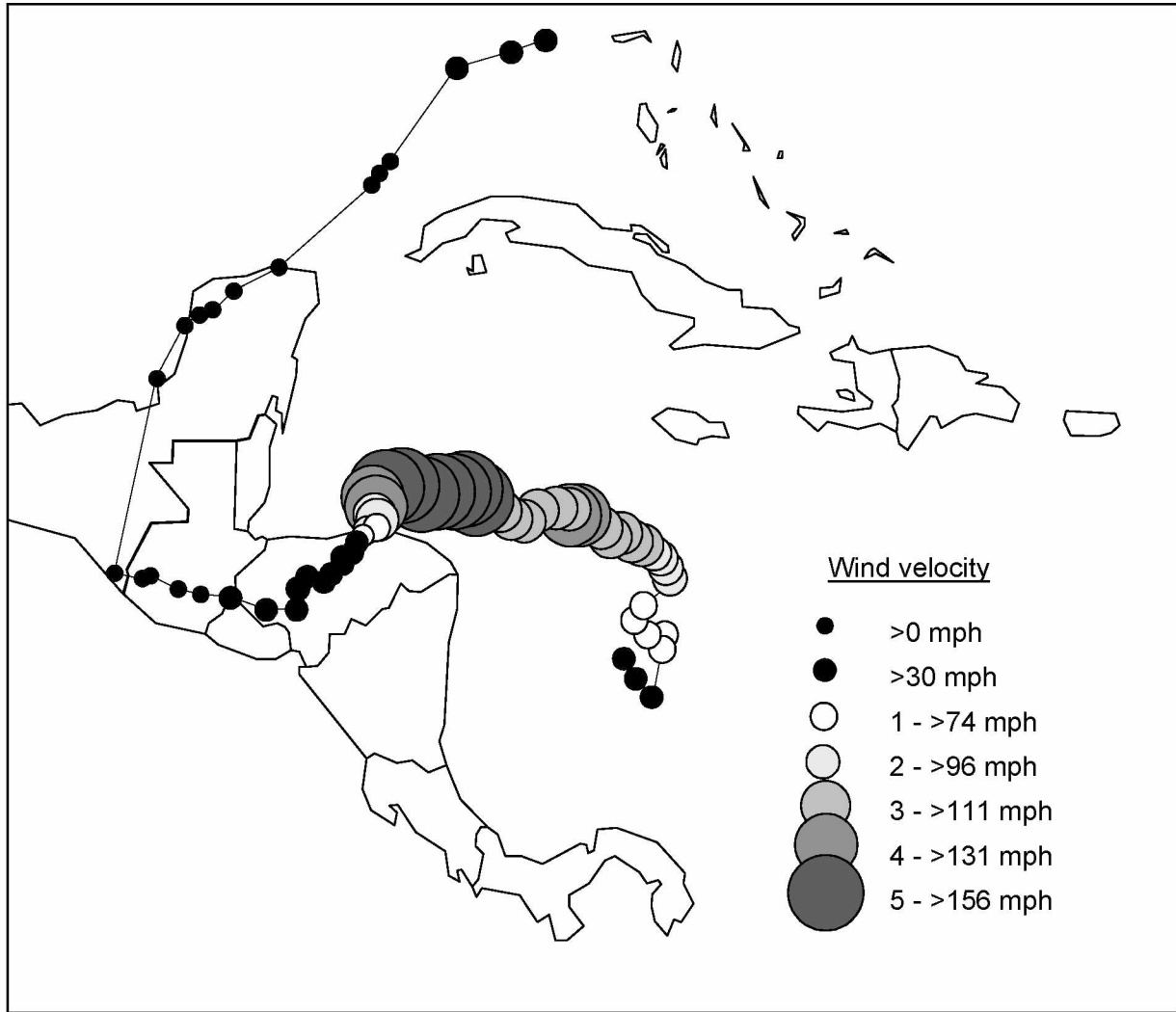


Source: NASA image, taken from the Internet.

Figure 2

ROUTE OF HURRICANE MITCH

(Between 22 October and 5 November 1998)



Source: Johns Hopkins University Applied Physics Laboratory. Copyright 1998 Ray Sterner and Steve Babin.

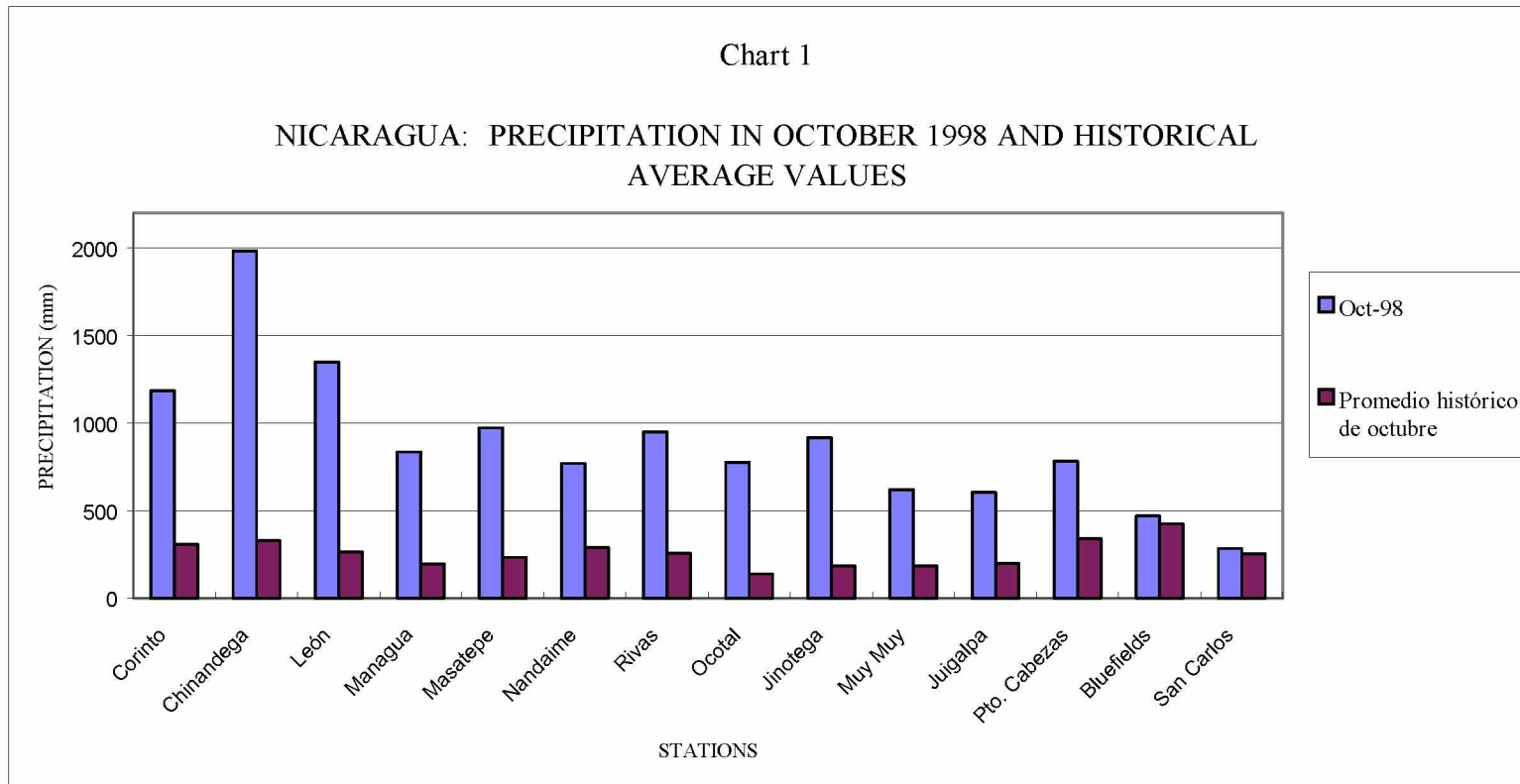
Table 3

NICARAGUA: RAINFALL REGISTERED DURING HURRICANES
AND TROPICAL STORMS, 1971-1988

(Millimetres)

Stations	Event										
	IRENE Sep-71	EDITH Sep-71	FIFI Sep-74	ALLETA May-82	ALLEN Aug-85	JOANNA Oct-88	BRET Aug-93	GERT Sep-93	GORDON Nov-94	CESAR Jul-96	MITCH Oct-98
Picacho (Chinandega)	98	111	368	1,457	52	87	14	447	40	169	1,597
Corinto	200	178	635	896	61	101	71	452	2	175	640
León	-	0	530	1,002	63	210	17	444	17	134	1,111
Managua	155	22	142	403	35	227	117	249	43	179	493
Masatepe	101	87	241	504	34	150	77	223	4	237	657
Nandaime	45	101	226	350	49	215	63	235	9	203	378
Rivas	212	170	197	340	75	186	51	91	1	125	492
Ocotal	29	23	148	162	24	79	13	136	2	66	560
Condega	55	0	124	152	12	-	16	15	5	53	-
Jinotega	106	5	201	243	84	171	51	172	35	126	767
San Isidro B.	63	20	190	330	29	-	22	144	10	80	-
Muy Muy	98	13	68	120	63	129	74	169	4	85	392
Juigalpa	56	47	122	385	29	182	50	66	34	108	383
San Carlos	136	26	47	40	22	108	-	-	0	65	82
Puerto Cabezas	130	17	27	294	144	60	80	93	286	52	272
Bluefields	192	17	1	62	38	-	-	-	-	-	46

Source: ECLAC, based on data provided by the Instituto Nicaragüense de Estudios Territoriales.



In León, 27 per cent of the population were left homeless, as were 20 per cent of the inhabitants of Chinandega. People living in Estelí, Nueva Segovia and Madriz (region I) and the Región Autónoma del Atlántico Norte (RAAN) were also badly affected. Approximately 3 per cent of the total population of Region I and 4 per cent of the inhabitants of RAAN were taken to shelters. The number of homeless (15 and 16 per cent, respectively) is also significant (see Table 5).

An estimated 52 per cent of the victims were children,¹³ many of whom died, drowned or were crushed by falling rubble or carried away by the avalanche. During field visits to schools used as shelters, observers noted dozens of seriously injured children—some were mutilated, some had lost one or both eyes, others were orphaned—who were suffering serious psychological or psychosocial traumas and were not receiving adequate treatment. This situation highlights the need to take disaster prevention and mitigation measures to protect the lives, homes and livelihood of people living in extreme poverty.¹⁴

The following problems have arisen in shelters and are causing concern due to both their immediate effects and the restrictions they will impose on the reconstruction process:

i) Organisation of the homeless. Most shelters have failed to actively organise the homeless, which is basic to their efficient operation and to providing psychological and social rehabilitation so as to prevent disaster victims from resorting to begging.

ii) Local and community organisation. Municipal governments did not have the autonomy needed to operate shelters, and community organisations did not appear to be participating actively in this regard.

iii) Care of children. Most shelters were in schools and were being run by teachers; however, teachers themselves were also affected and only limited attention was being paid to children.

The enormous number of victims and the deficiencies mentioned above caused a major sanitation problem, in addition to difficulties in providing water, food and other essential supplies. The authorities addressed these logistical problems within the framework of the emergency programme, with the aid of international cooperation and civil organisations. In spite of the health authorities' efforts to prevent possible epidemics—such as dengue and malaria, which are endemic in Nicaragua—overcrowding and lack of hygiene in improvised shelters caused the spread of respiratory and diarrhoea-related diseases, outbreaks of haemorrhagic conjunctivitis and even some cases of meningitis and dengue.

According to government sources, approximately 50,000 urban and rural families had to be relocated. Unless their needs are met over the short and medium terms, the result could be disorderly migration to urban centres, squatting and other social problems which could hinder the reconstruction of infrastructure. Until alternative employment sources and means of production are established, the most affected areas will continue to depend on humanitarian aid, which is mainly provided by civil organisations.¹⁵ It is therefore important to strengthen community organisation in municipal councils

¹³ Based on UNICEF estimates. Of a total of 867,752 victims, 450,000 were children.

¹⁴ The Ministries of Education and Health developed a psychological aid programme in conjunction with UNICEF, but it was not yet being widely applied at the end of November.

¹⁵ UNDP, *Valoración de los efectos del huracán Mitch y propuestas para enfrentar la etapa de reconstrucción*, 20 November 1998.

and any other mechanisms that will ensure the flow of aid to the neediest until other alternatives are found.

An added problem is the heightened risk in areas that were mined during the conflict in the 1980s. The floodwaters obliterated safe paths and carried mines to areas previously considered risk-free, such as Muy Muy in the Río Grande valley in Matagalpa.

The most seriously affected population groups were those living in agricultural areas, since their lands were left unusable and roads and bridges were destroyed. The situation has been aggravated by the loss of income sources. The school year was interrupted when schools were taken over as shelters.

The backlog of social problems has become all the more apparent as a result of the hurricane and has highlighted the need for short-term assistance for direct victims, as well as policies to promote socially oriented development strategies. Criteria to reduce vulnerability to disasters must also be taken into account during the reconstruction process.

4. Emergency actions

a) Government actions

At the end of October it became evident that a major hurricane was dangerously close to Nicaragua. However, due to its erratic course and diminished intensity, the population was caught off guard.

The government issued a decree on 30 October 1998 declaring disaster zone status in the hardest-hit areas of the country: Chinandega, León, Estelí, Nueva Segovia, Madriz, Jinotega, Matagalpa, Granada and Rivas. The President formed a National Emergency Committee (CNE) to coordinate aid to those departments. The Committee was dissolved on 23 November when the emergency phase was over.¹⁶

An emergency fund was established and over US\$1 million and 2.25 million córdobas in the form of donations from governments, financial institutions, private enterprise and others had been collected by 19 November. By that date the CNE had distributed over a million tons of food—mainly rice, beans, sugar, oats and maize—and transported 170,500 tons of medicines. The National Electricity Company (ENEL) promptly restored energy to the areas which had suffered outages, principally the departments of Jinotega, Matagalpa, Madriz, Nueva Segovia and Estelí.

The government requested assistance from the international community in dealing with the emergency and in rehabilitation and reconstruction tasks. Financial organisations were requested to negotiate debt-service terms and channel available funds to disaster areas.

Once the emergency phase is over, the people and government of Nicaragua should reach an agreement as to the priorities and scope of the reconstruction phase over the medium and long terms. The country now has an opportunity to repair, expand and improve communications, health, education

¹⁶ See CNE, *Informe Final*, Managua, 24 November 1998.

and housing infrastructure, taking disaster prevention and mitigation into account during the reconstruction. In other words, the government's aim is to transform the country.

Certain institutional aspects should be strengthened in order to take full advantage of available human and material resources in rehabilitation and reconstruction tasks. In this regard, local government participation should be increased to speed up reconstruction work; Nicaragua's experience in community organisation and mobilisation could be of great help in the rehabilitation (in shelters, for example) and reconstruction processes. Finally, it would be advisable to strengthen evaluation, monitoring and control activities in reconstruction and transformation programmes and focus on efficiency, social equity and effectiveness.

b) International aid

The aid received by 23 November totalled US\$15.8 million, 13 million of which were in kind, the rest in cash. Bilateral funds accounted for 79 per cent of the total, and the remainder was contributed by multilateral agencies. Several countries also provided aid in kind (among them Argentina, Chile, Mexico, Panama and the Dominican Republic); the amount has not been quantified, but it was equally appreciated. Civil organisations received just under half the total. Further contributions, mainly in kind and valued at US\$11.5 million, have also been pledged.

i) International organisations. The resident United Nations Coordinator in Nicaragua established a disaster management group to organise the System's actions in dealing with the emergency, in conjunction with the CNE. A working group made up of representatives of United Nations agencies (WFP, UNICEF, UNDP, PAHO/WHO, IMO, UNFPA, FAO) was established to strengthen coordination during the emergency.¹⁷

Financial institutions such as the IDB, the World Bank and CABELI have been making adjustments to their current financing programmes in order to redirect funds to rehabilitation and reconstruction projects. Arrangements are also being made to allocate fresh funds for this purpose.

At the end of the third week of November, US\$3.3 million in aid had been received from United Nations agencies (UNICEF, WFP, PAHO/WHO, UNDP), financial institutions (CABELI, IDB), the OAS and the European Union.

¹⁷ See United Nations Inter-Agency Transitional Appeal for Emergency Relief and Immediate Rehabilitation in El Salvador, Guatemala, Honduras and Nicaragua, November 1998.

Table 4

NICARAGUA: POPULATION AFFECTED BY HURRICANE MITCH

Department	Total population (TP) a/	Affected population			Primary victims b/			
		In shelters c/	Percentage of TP	Homeless d/	Percentage of TP	Dead	Wounded	Missing
Total	4,453,583	65,271	1.47	368,261	8.27	3,045	287	970
Estelí	191,669	7,373	3.85	30,474	15.90			
Nueva Segovia	162,734	5,737	3.53	16,570	10.18			
Madriz	123,884	1,080	0.87	24,647	19.90			
Subtotal Region I	478,287	14,190	2.97	71,691	14.99	51	25	360
León	369,206	4,108	1.11	102,097	27.65			
Chinandega	383,802	22,102	5.76	76,817	20.01			
Subtotal Region II	753,008	26,210	3.48	178,914	23.76	2,856	254	511
Managua	1,256,665	4,518	0.36	16,059	1.28			
Subtotal Region III	1,256,665	4,518	0.36	16,059	1.28			
Granada	170,615	-	-	8,374	4.91			
Rivas	153,901	-	-	13,341	8.67			
Masaya	264,503	-	-	-	-			
Carazo	163,737	-	-	-	-			
Subtotal Region IV	324,516	-	-	21,715	6.69	2	-	-
Chontales	188,507	28	0.01	347	0.18			
Boaco	170,084	610	0.36	2,281	1.34			
Subtotal Region V	358,591	638	0.18	2,628	0.73	7	-	-
Matagalpa	490,280	3,203	0.65	11,674	2.38			
Jinotega	286,672	1,103	0.39	24,351	8.61			
Río San Juan	76,871	-	-	-	-			
Subtotal Region VI	772,952	4,306	0.56	36,025	4.66	123	8	98
N. Atl. Autonomous Reg.	211,200	8,673	4.11	34,493	16.33			
Subtotal Raan	211,200	8,673	4.11	34,493	16.33	-	-	-
S. Atl. Autonomous Reg.	298,364	6,736	2.26	6,736	2.26			
Subtotal Raas	298,364	6,736	2.26	6,736	2.26	6	-	1

Source: ECLAC, based on official figures and own estimates.

a/ Population calculated to December 1998 based on the 1995 Census and an annual growth rate of 2.6 per cent.

b/ Information provided by the national Civil Defence system of the Nicaraguan Army, 12 November 1998.

c/ Severely affected population staying in shelters. Information provided by the national Civil Defence system of the Nicaraguan Army, 12 November 1998.

d/ Includes tertiary victims in affected areas.

Table 5

NICARAGUA: SUMMARY OF AFFECTED POPULATION

	Total a/	Percentage of the total population	Children b/
Affected to some degree	867,752	19	450,000 c/
Partial victims	143,121	3	95,000
Totally destitute	368,315	4	80,000
In shelters on 23/11/98	65,261	1	35,000

Sources: a/ Civil Defence, Nicaraguan Army, and b/ UNICEF.

Note: c/ 51 per cent of the affected population.

ii) Foreign governments. Foreign governments responded promptly to the emergency, contributing in many ways to alleviate the suffering caused by the hurricane. The USAID/ Office of US Foreign Disaster Assistance (OFDA) sent aid both in cash and in kind. This included medicines, food, blankets, water, material for building shelters and helicopters. The estimated value of the USAID/OFDA aid totalled US\$775,000 at the beginning of December.

During his visit to Nicaragua, French President Jacques Chirac announced that France would cancel Nicaragua's US\$72 million debt. It is possible that other countries will follow suit in helping to reduce the debt burden and free up funds urgently needed for reconstruction.

By mid-November, foreign government aid amounted to approximately US\$12.5 million, including aid in kind from several governments, which sent medical personnel, rescue workers, engineers, brigades etc., as well as material aid such as planes, helicopters, medicines, clothing, blankets and temporary shelters.¹⁸

During the emergency, helicopters were a great help in moving the wounded, rescuing people from high-risk areas and transporting food, blankets and clothing. The country's original fleet of six helicopters was increased by 26, which came from Mexico (9), the United States (8), Great Britain (8) and Panama (1).

iii) Civil organisations. In response to the Nicaraguan government's appeal, numerous civil organisations from many different countries sent aid to the victims. Aside from donations, as yet uncalculated, they sent rescue equipment, material for shelters, medicines, drinking water, food, clothing and blankets.

¹⁸ CNE, *Informe final*, op.cit.

II. ASSESSMENT OF THE DAMAGE

This chapter contains an assessment of the damage caused by hurricane Mitch to the following sectors: social (housing, education, health), infrastructure (energy, transport and communications, water and sewerage) and production (agriculture, fisheries, industry and services), and to the environment.

ECLAC methodology was used to calculate direct damages, i.e., those affecting physical infrastructure and the country's capital reserves, and indirect damages, such as the drop in production of goods and services and emergency outlays that would not have been necessary in a normal situation.¹⁹ Direct damages have been assessed on the basis of capital assets prior to the disaster, i.e., taking into account depreciation and normal use of capital goods.²⁰

The loss of crops, either about to be harvested or stored for distribution, is calculated as direct damage; damage to inventories and production under way in the industrial sector is also classified as a direct cost.

The cost of rebuilding damaged assets has also been calculated. If the aim were to return to the situation prior to the hurricane, the value would be the same as the direct cost according to this methodology. However, for the purpose of a reconstruction programme, the assessment should also take into account the value of improved replacement, including disaster prevention and mitigation criteria, such as better technology and quality and more resistant structures. The country now has an opportunity to rebuild on sounder economic, social and environmental bases while simultaneously reducing its historical vulnerability to natural disasters.

The ECLAC mission interviewed representatives of the government, the private sector, international organisations, UNDP and other United Nations agencies. In several occasions, they joined the mission activities and provided information and valuable suggestions for the preparation of this document.

The figures used in this chapter's text and tables were calculated in local currency and in US dollars, based on the exchange rate at the time: 11 córdobas to the dollar.

¹⁹ In this document the terms **damage**, **effect**, and **cost**, both direct and indirect, are used indiscriminately.

²⁰ See CEPAL (1991), *Manual para la estimación de los efectos socioeconómicos de los desastres naturales*, Santiago.

1. Social sectors

a) Housing

The substantial damage to housing affected human lives and had a strong negative effect on the economy. The rains, floods and strong currents caused widespread destruction, particularly in the departments of Estelí, Madriz, Nueva Segovia, Chinandega, León, Managua, Granada, Masaya, Carazo, Boaco, Matagalpa, Jinotega, Waspan and Cruz Rio Grande.

The precarious nature of human settlements and the vulnerability of their location account for the devastating effects of the torrential rains. In fact, many of the houses destroyed were built on land prone to flooding—river banks, lake shores and mountain slopes—as was the case of El Porvenir and Rolando Rodríguez, which were swept away by the avalanche of water, rocks, mud and other debris from the Casita Volcano. In addition to the loss of over 2,000 lives in this area, hundreds of houses disappeared and the precarious social services infrastructure was destroyed; this has been calculated as direct damage.

The hurricane exacerbated the country's already deficient housing situation. According to 1995 estimates, housing shortage comprised 387,600 dwellings (47.7 per cent of the national total), which largely accounts for overcrowding in shantytowns.

Most of the dwellings destroyed in urban areas were masonry and brick structures with tile or zinc roofs; in the countryside they were mainly thatched huts with adobe walls and earthen floors, in most cases lacking electricity and running water. These dwellings usually consist of one room used as a dining room, bedroom, kitchen and storehouse.

Total damages are estimated at almost 2,200 million córdobas, (US\$196 million). Approximately 50,000 dwellings were destroyed and more than 94,000 suffered varying degrees of damage. The cost of the new housing, taking into account relocation, significant improvements in the new dwellings and a minimum of fittings, is estimated at 4,675 million córdobas (US\$425 million; see Table 6).

These calculations were based on an average area of 36 square metres per dwelling destroyed. Construction costs are calculated at US\$60 per m². Consequently, each destroyed building is valued at US\$2,160 or 23,760 córdobas, making a total loss of US\$108 million (1,188 million córdobas). In partially destroyed buildings, damages have been estimated at an average of 20 per cent of the value of the dwelling. The loss of fixtures and fittings is calculated at US\$600 per dwelling, or nearly 30 per cent of the value of the house (Table 6).

Calculations of indirect damage were based on an estimated monthly rent (either paid or assigned) of US\$3 per dwelling (an estimated 10 per cent of the minimum wage). Estimates show that it will take about six months for the inhabitants of destroyed dwellings to move into repaired or new houses.

Finally, shelter expenses were also considered part of the indirect damage; the 65,261 people still living in shelters in late November are expected to remain there for an average of six months at a cost of US\$1 a day.

Housing reconstruction. Most of the 50,000 destroyed houses will have to be rebuilt in risk-free areas. Moreover, the government is planning to bring in major qualitative enhancements for the new dwellings.

Table 6

DAMAGE TO THE HOUSING SECTOR AND COST OF RECONSTRUCTION

	Damage			Cost of reconstruction a/	Imported components
	Direct	Indirect	Total		
Total US\$ (thousands)	182,906	12,650	195,556	425,000	85,000
Total córdobas (thousands)	2,011,966	139,150	2,151,116	4,675,000	935,000
50,000 dwellings destroyed	1,188,000		1,188,000	4,125,000	
94,500 dwellings damaged	449,064		449,064		
Loss of fixtures and fittings in destroyed dwellings	330,000		330,000	550,000	
Loss of fixtures and fittings in damaged dwellings	44,902		44,902		
Loss of rent		9,900	9,900		
Shelter expenses		129,250	129,250		

Source: ECLAC, based on figures from the Nicaraguan Municipal Development Institute (INIFOM), other official sources and own estimates.

a/ Includes the cost of improved housing, cost of land, basic services and basic fixtures and fittings.

The funds needed for the housing reconstruction programme was estimated as follows: the cost of construction was calculated as US\$100 per m², plus US\$25 per m² to cover urbanisation, electricity, water and other services. With an average area of 36 m² per dwelling, each unit would cost US\$4,500, bringing the total to US\$225 million for the 50,000 houses.

Assuming that housing will be built on new sites, the price of the land must be taken into account (this can vary significantly depending on the location). To obtain an approximate cost, average plot size was taken as 100 m², at an average price of US\$3,000. This gives a estimated total cost of US\$375 million (US\$225 million for construction and US\$150 million for the land). If we also assume that each family will need about US\$1,000 for the basics (furniture, beds, stove, television and refrigerator), the total cost of reconstruction would be US\$425 million, or 4,657 million córdobas (Table 6).

Taking into account the country's idle construction capacity, this programme could be carried out in two years at most. The imported components needed for the type of buildings planned would not be very costly, and are estimated at 20 per cent of the value of each unit. This would entail imports of US\$85 million between 1999 and 2000.

The reconstruction process will require support from the international community in coordination with the following sectorial agencies: General Directorate of Housing and City Planning, Ministry of Transport and Infrastructure; Nicaraguan Municipal Development Institute;

Housing Bank; Ministry of Family Affairs; INETER for physical planning; municipal councils; NGOs operating in the sector; and the private sector.

The construction programmes already under way consists of self-help projects in the form of mutual aid in housing complexes and owner-built housing in the case of scattered dwellings.

b) Education ²¹

The education sector suffered considerable damage and lost many of its installations. Chinandega and Managua were the worst-hit departments. By 25 November, 343 schools had been reported damaged, increased to 512 by 10 December (6.7 per cent of the 7,685 country's schools).

In calculating direct costs, 216 schools were considered totally destroyed and 296 partly damaged (roofs, walls, floors etc.). The estimated value of schools destroyed and damaged (direct costs) was based on unit costs for projects in 1998 supplied by the Social Investment and Emergency Fund (FISE), and took into account depreciation. A destroyed classroom was valued at US\$7,649 and a damaged classroom at US\$4,200. A total of 2,500 classrooms were affected —1,080 destroyed and 1,480 damaged— bringing total infrastructure damage to US\$14.65 million. In keeping with FISE unit costs, damage to desks is estimated at estimated US\$1.6 million and destroyed textbooks amount to a similar sum (see Table 7).

The country's historical and cultural heritage suffered little damage. In general, paleontological, archaeological and cultural sites suffered slight damage to infrastructure, such as roofs and walls; museums and cultural vestiges were virtually untouched. The León Viejo archaeological zone suffered slight damage to the entrance, service area and reception booth. The "El Bosque" paleontological site in Pueblo Nuevo underwent damage to roofs and to a suspension bridge.²² The "Huellas de Achualinca" site in Managua already had humidity problems, and a rehabilitation project had already been proposed, with US\$79 million in financing from Japan: the project will now be carried out as soon as possible. The Rubén Darío House and Museum, in Rubén Darío City, was flooded and suffered damage to the walls.²³

In regional terms, available information shows that the worst damage took place in the departments of Chinandega with 31.4 per cent of total damage to infrastructure; Managua (1 and 2) with 27.3 per cent and León with 13.6 per cent; followed by Jinotega and Nueva Segovia. Masaya and Granada suffered less damage (see Table 8).

²¹ This section includes UNESCO viewpoints and proposals.

²² Estimates of these damages are included in the infrastructure section.

²³ La Prensa, 25 November 1998.

Table 7

NICARAGUA: DAMAGE IN THE EDUCATION SECTOR

	Damage			Cost of reconstruction	Imported component
	Total	Direct	Indirect		
Total US\$ (thousands)	21,258	17,627	3,631	36,552	13,338
Total córdobas (thousands)	233,841	193,898	39,943	402,067	146,713
216 totally destroyed schools	90,870	90,870		179,626	62,869
296 partly damaged schools	68,376	68,376		147,693	51,692
Damage to texts and furnishings	34,652	34,652		45,048	20,272
Damage to cultural and recreational facilities	2,585		2,585	29,700	11,880
Acquisition and urbanisation of land to relocate housing	12,058		12,058		
Damage caused by use of schools and other community centres as shelters a/	14,541		14,541		
Higher operating costs in affected schools	10,759		10,759		

Source: ECLAC, based on figures from the Ministry of Education, Culture and Sports, National Coordination Secretariat and own estimates.

a/ 255 schools were turned into shelters.

Apart from damage to infrastructure, the impact of Mitch on the education sector has cultural, political and anthropological implications. The 343 schools affected will place greater pressure on the already deficient coverage and will leave thousands of children and youths without classrooms; the loss of materials and equipment could affect the quality of education. The personal and family losses suffered by 500 teachers would affect their performance, in terms of greater family impoverishment,²⁴ stress, state of mind and aptitude for teaching.

In general, parents who have lost their loved ones and their means of livelihood and economic production will find their dealings with schools affected. Many women teachers in particular will have to shoulder added responsibilities as single mothers and will suffer the consequences of material, psychological and pedagogical upsets to a greater extent.

Moreover, the interruption of school activities in several of the country's departments will have consequences on pupils' overall education, their future performance at higher educational and professional levels, and their employment, all of which are impossible to represent in figures. The interruption of the school year in some areas will widen the educational gap that already exists between children in urban and rural public schools, and between children in public and private schools.

²⁴ The average wage of a qualified teacher in rural areas is approximately US\$90 a month, depending on years of service.

Table 8

NICARAGUA: DAMAGED EDUCATIONAL FACILITIES BY DEPARTMENT

Department	Total b/	Schools destroyed and partially damaged a/			No. of rooms destroyed	Directs costs (thousands of córdobas) c/
		Destroyed	Partially destroyed	Damage to roofs, walls and others		
Total	343	25	88	58	753	117,164
León	37	5	20	12	53	15,986
Rivas	4	-	-	4	-	1,010
Nueva Segovia	31	-	-	-	83	6,984
Chinandega d/	94	7	14	17	293	36,895
Matagalpa	13	1	-	-	12	1,430
Granada	3	-	3	-	-	757
Masaya	5	-	-	5	1	252
Madriz	14	4	-	-	24	3,702
Managua I	75	-	32	-	245	30,038
Managua II	8	-	6	2	-	2,019
Carazo	14	2	1	7	24	4,375
Boaco	7	6	-	1	-	2,777
Estelí	8	-	-	-	18	1,515
Jinotega	30	-	12	10	-	9,424

Source: ECLAC, based on official figures and own estimates.

a/ To 25 November, information for the different municipalities showed no distinction or uniformity in relation to the types of damage reported.

b/ Number of schools officially reported as damaged. The number of schools in the consolidated report on damages by department is high and does not coincide with the sum of the breakdown provided by municipalities.

c/ The direct cost was estimated on the basis of FISE unit prices. An average of five classrooms was estimated for the schools destroyed, and 3.5 for the remainder.

d/ The total number of schools reported as damaged is 94, but only 38 appear in the breakdown of the information. The 293 classrooms are therefore assumed to be equivalent to 56 schools.

The school drop-out rate is therefore likely to increase, since survival concerns will take even more priority over school attendance. In consequence, illiteracy could increase in rural areas and school enrolment could drop. The likelihood of family emigration to cities will increase unemployment and poverty, and the spread of shantytowns and crime.

Lower quality in education and the learning process and reduced income in schools could affect human, cultural, productive and psychological development. Efforts must therefore be redoubled and the community called upon to turn the disaster into an opportunity to attract new funds into the system in order to rehabilitate and rebuild it using a new approach. A school is more than just physical facilities; it should be a focal point to strengthen communities. The idea is to build, improve what was already in existence and view education as an essential factor in the reconstruction process.

c) Health sector

The Ministry of Health is the sector's guiding entity and the main health-care provider. The inchoate Social Security system has an estimated coverage of only 7 per cent of the population, lacks infrastructure of its own and mainly provides services in urban areas. Nicaragua has 971 health care establishments, distributed as follows: ²⁵ 25 hospitals for the critically ill, four hospitals for chronic patients, one multipurpose clinic, 163 Health Care Centres and 778 Health Care Stations.

The Services Network of the National Health System was established through a Ministerial Resolution in 1992. ²⁶ In addition to hospitals and establishments delivering the most advanced health services, the Network has two levels of attention: the Health Care Station and the Health Care Centre. The first is the least complex unit in the Network and addresses basic health problems. The Health Care Centre is the basic administrative unit of the Municipal Services System and provides comprehensive public health care.

There are two kinds of Health Care Stations. Type "A" has full-time medical and nursing personnel, with periodic visits by a health social worker. Premises include an average area of 137 m² and basic equipment. Type "B" has permanent nursing staff, basic medical instruments and inputs, and periodic visits by medical personnel and health social workers, depending on the availability of resources and epidemiological needs. Its facilities are similar to "A" Health Care Stations.

There are three types of Health Care Centres. Type "A" have between 10 and 30 beds for inpatients, with programmes focusing on mothers and children below the age of six, contagious diseases, general morbidity, childbirth and minor surgery. They include a clinical laboratory, pharmacy and other basic services. Surgeons are assigned to them for short periods. Their premises average 900 m². Type "B" Health Care Centres have one physician specialising in general medicine or social service, a dentist, nurses, technicians and health auxiliaries. Their technical and material inputs vary in accordance with their profile and medical complexity. Type "C" are attended by a staff of general physicians who are graduates or performing their social service, a dentist, nurses and auxiliaries.

Hurricane Mitch caused moderate damage to health care infrastructure, but its subsequent effects have placed greater pressure on facilities, highlighting the insufficient supply of medical inputs. In many establishments the lack of adequate maintenance programmes worsened the hurricane's effects.

Natural disasters obviously place extraordinary demands on the health sector, and these are more difficult to meet if the sector's infrastructure has been damaged —as is generally the case— thus affecting its physical capacity and the availability of human resources to deal with added demands.

²⁵ Ministry of Health, Statistics Division, Health Units by SILAIS and municipalities, 1997.

²⁶ Ministry of Health, *Resolución ministerial 106*, December 1992.

The Ministry of Health's Emergency Institutional Committee, which is in charge of planning, executing, supporting and supervising disaster-relief actions, was instructed to deal with the immediate consequences of hurricane Mitch.²⁷

Although damage to hospitals was minimal,²⁸ flooding and landslides caused destruction or major damage to seven Health Care Centres and 250 Health Care Stations, some of which have to be relocated due to their vulnerability (see Table 13). Total losses caused by the hurricane are estimated at US\$53 million, including damage to structures, equipment and installations (direct damage), and indirect costs stemming mainly from campaigns to combat hurricane-related diseases.

Socio-economic conditions and insufficient health care coverage have led to outbreaks of diseases such as cholera, dengue and malaria, which had already shown endemic trends in recent years. The prevalence and incidence of these diseases have been aggravated by the hurricane's effects, such as significant population movements, alteration of hygienic and sanitary conditions (damage to drinking water supply and sewerage systems, among others) and overloading of the capacity of health care services.

Table 9

NICARAGUA: SUMMARY OF DAMAGE TO THE HEALTH SECTOR

	Costs		
	Total	Direct	Indirect
Total (thousands of dollars)	53,090	24,990	28,100
Total (thousands of córdobas)	583,990	274,890	309,100
1. Damage to health care infrastructure	274,890		
Buildings	152,130	152,130	
Equipment	122,760	122,760	
2. Environmental sanitation programme	93,500		93,500
3. Monitoring and control of epidemics	50,160		50,160
4. Higher hospital treatment, outpatient and medical care costs	165,440		
Alleged health care costs	91,300		91,300
Emergency medical inputs	66,000		66,000
Periodically replaced materials	8,140		8,140

Source: ECLAC, based on official figures.

Although heavy rains, landslides and infrastructure losses affected the entire country, damage was mainly concentrated in the north-western area. According to the Local Comprehensive Health Care Systems (SILAIS), the most affected departments were Estelí, León, Matagalpa, Chinandega and Madriz.

²⁷ Ministry of Health, *Análisis de situación de salud relacionada con el huracán Mitch*, Managua, 11 November 1998.

²⁸ Minor damage was reported in only three hospitals: Ocotol, Manolo Morales and César Amador Molina.

The main reported causes of morbidity were acute respiratory infections, acute diarrhoea-related disease, skin diseases, impetigo, conjunctivitis and the resurgence of vector-transmitted diseases such as cholera, dengue and malaria.

The following basic considerations were taken into account on evaluating damages in the sector (see Table 10):

- Estimated average area of a Health Care Centre: 900 m².
- Estimated building cost per m² of a Health Care Centre: US\$300.
- Estimated cost of equipping a Health Care Centre: US\$60,000.
- Average area of a Health Care Station: 137 m².
- Estimated building cost per m² of a Health Care Station: US\$150.
- Estimated cost of equipping a Health Care Station: US\$30,000.
- The first group includes destroyed buildings to be relocated or needing major repairs (damage to 50 per cent or more of their components), with repair costs per m² of 50 per cent of their value. Their infrastructure will take 60 days to rehabilitate.
- The second group includes buildings needing minor repairs (less than 50 per cent of damage to their components), with repair costs per m² of 10 per cent of their value. Their infrastructure will take 30 days to rehabilitate.
- A Health Care Centre attends an average of 120 patients a day, at a cost of US\$5 each in rural areas.
- A Health Care Station attends an average of 50 visits a day at a cost of US\$3 each in rural areas.

i) Damages

1) Total damage. Total damage is estimated at almost 584 million córdobas (US\$53 million), of which 276 million correspond to direct damage and 309 million to indirect damage. Data on the number and area of Health Care Centres and Stations destroyed, damaged, or that need to be relocated, stem from Ministry of Health preliminary assessments and projections. The country's health care infrastructure requires not only reconstruction and rehabilitation because of the effects of hurricane Mitch, but also general improvement to provide more satisfactory coverage.

2) Direct damage. Of an estimated US\$25 million in direct damage, some 14 million corresponds to loss of buildings and 11 million to equipment and installations. Direct costs related to infrastructure and equipment were calculated at an average cost of one square metre of construction for buildings of this type, applying a percentage that, as stated above, depends on the complexity of the repairs required to at least return buildings to their condition prior to the event. The value of specific damage to medical and support equipment has been broken down, and certain average values per Health Care Station or Centre have also been adopted.

3) Indirect damage. Total indirect damage is estimated at US\$28 million, of which 13 million are for environmental sanitation and epidemiological monitoring and control programmes (see Tables 11 and 12).

Table 10

NICARAGUA: DETAILS OF DAMAGE TO INFRASTRUCTURE

Infrastructure	No. of units	Average area (m ²)	Cost of damage (córdobas per m ²)	Thousands of córdobas			
				Cost of damage to building	Average cost of equipment/establishment	Total cost of equipment	Total cost of damages
1. Establishments destroyed, damaged or to be relocated:							
Health Care Centres	22	900	3,300	65,340	660	14,520	79,860
Health Care Stations	250	137	1,650	56,518	330	82,500	139,018
2. Establishments requiring minor repairs:							
Health Care Centres	93	900	330	27,621	165	15,345	42,966
Health Care Stations	118	137	165	2,662	88	10,384	13,046
Total damages to infrastructure				152,141		122,749	274,890
Total damage to infrastructure in thousands of dollars				13,831		11,159	24,990

Source: ECLAC, based on official figures and own estimates.

The primary care infrastructure destroyed or rendered useless, together with dead, injured and handicapped medical and paramedical personnel imply additional operating costs for the national system, mainly for undelivered services, costlier provision of services, unfulfilled medical programmes and higher costs due to preferential attention to vulnerable groups and increased morbidity.

Indirect damage includes estimated costs for certain actions such as ongoing analysis and maintenance of drinking water quality, operation of sewerage and solid and liquid waste disposal systems, and the prevention of outbreaks of epidemics and propagation of latent diseases, including mass and selective immunisations, quarantine, isolation and treatment of patients, domestic sanitary control, etc.

Also included is an assessment of the value of services that Health Care Stations and Centres will be unable to deliver for a period ranging from 30 to 60 days, depending on the complexity of the damage to their infrastructure. The doctor's visits that Centres and Stations will be unable to provide will have to be absorbed by other facilities, thus overloading the network.

Table 11

NICARAGUA: COST OF EPIDEMIOLOGICAL MONITORING AND ENVIRONMENTAL SANITATION

(Thousands of córdobas)

Activity	Cost
Total	143,682
1. Epidemiological monitoring	50,160
Control of vectors and vector-transmitted diseases	28,160
Control of diseases preventable through immunisation	16,500
Four-wheel drive vehicles	5,500
2. Environmental sanitation	93,522
Basic sanitation	72,556
Water quality monitoring	8,360
Prevention of ectoparasites	11,671
Sanitary education	935

Source: See Table 10.

Ministry of Health estimates of the quantities of medicines and medical supplies needed both for the emergency phase and for periodic replacement for a period of six months were also included. These inputs will be used to assist to 800,000 affected persons. The costs amount to an estimated US\$8.3 million (see Table 12).²⁹

²⁹ A preliminary review of the lists of medical inputs drawn up by the Ministry of Health leads to the conclusion that the network had general supply deficiencies even prior to the hurricane.

Table 12

NICARAGUA: COSTS OF HOSPITAL TREATMENT AND OUTPATIENT AND MEDICAL CARE

Classification of facilities according to damage	No. of units	Number of visits/day	Average cost of visit (córdobas)	Interruption days	Total cost (thousands of córdobas)
Total	756	340			91,278
1. Premises destroyed, to be relocated or needing major repairs:	545	170			67,023
Health Care Centres	44	120	55	60	17,424
Health Care Stations	501	50	33	60	49,599
2. Premises requiring minor repairs:	211	170			24,255
Health Care Centres	93	120	55	30	18,414
Health Care Stations	118	50	33	30	5,841

Source: ECLAC, based on Ministry of Health figures and own estimates.

ii) Reconstruction programme. The Ministry of Health presented a reconstruction programme based on its own projections of the magnitude of the damage. The programme will be carried out over two years, beginning in 1999, at a cost of almost US\$65 million (715 million córdobas), and provides for an improvement in the quality of rebuilt or repaired centres. The Health Ministry estimates a construction cost per square metre of US\$460 for Health Care Centres and US\$280 for Health Care Stations. However, using values similar to those used by the IDB for this type of works and equipment, reconstruction and equipping of Health Care Centres and Stations would amount to some US\$44 million, or 484 million córdobas (see Table 18).

iii) Conclusions. The effects of the hurricane have not only caused material and economic damage, but also had a negative impact on health services. At the end of November 1998, reports showed 368,261 victims and more than 3,000 dead.

Demographic changes and their consequent environmental impact have increased the transmission potential of certain diseases; the country was on epidemiological alert even before the disaster occurred. Transmissible diseases such as cholera, malaria and dengue showed endemic trends and were reaching epidemic levels in some regions.

After the disaster, flooding, damming and landslides favoured the creation of new sites prone to the generation of vectors, which has caused increases in cases of leptospirosis, rabies, Chagas' disease and Leishmania, along with acute respiratory infections and diarrhoea-related diseases. This situation has been aggravated by overcrowding in refuges and shelters, by damage to health services infrastructure, mainly at the primary-care level, and by insufficient maintenance in Health Care Centres and Stations.

Therefore, on reconstructing the sector, priority should be placed on epidemiological monitoring and environmental sanitation actions, and on systematic health-care infrastructure maintenance programmes. The process of modernisation and decentralisation should be strengthened as part of the Health Ministry's sectorial reform, with special emphasis on reinforcing primary care.

Table 13

NICARAGUA: COST OF REBUILDING HEALTH CARE INFRASTRUCTURE

Item	Total affected premises	Average area (m ²)	Cost per m ² (córdobas) a/	Unit cost equipment (thousands of córdobas) b/	Total (millions of córdobas)	Component (percentages)	
						Domestic	Imported
Total	483				488.3		
1. Spending on reconstruction of Health Care Centres	115				172.1		
Damaged buildings	93	900	440		36.8	85	15
Destroyed buildings	22	900	440		87.1	85	15
Equipment				1,540	48.2	10	90
2. Spending on reconstruction of Health Care Stations	368				316.1		
Damaged buildings	118	137	330		5.3	85	15
Destroyed buildings	250	137	319		109.2	85	15
Equipment	250	137	319	770	201.6	10	90

Source: ECLAC, based on official figures and own estimates.

a/ Values similar to those used by the IDB.

b/ Replacement values for damaged equipment are equivalent to 10 per cent of the total value.

2. Infrastructure

a) Transport and communications

Hurricane Mitch affected Nicaragua as an atmospheric depression, provoking heavy, sustained rainfall, which led to very high water in rivers, estuaries and ravines, causing severe damage to the country's highway infrastructure. Nicaragua's road system covers 18,447 km and is classified in four categories, as shown in Table 14.

As shown, 45.7 per cent of the system operates only during the dry season, since it lacks drainage works and asphalt surfacing; all-weather roads are built on natural land but do have drainage works and are therefore in operation all year. This points up the fragility of the country's road system.

Table 14

NICARAGUA: CHARACTERISTICS OF THE ROAD SYSTEM

Type of surface	Length (km)	Percentages
Total	18,447	100.0
Paved	1,749	9.5
Primary surfacing	2,149	11.7
All-weather	6,114	33.1
Dry season	8,435	45.7

Source: ECLAC, based on Ministry of Transport and Infrastructure figures and own estimates.

i) Roads and bridges. Damage assessment was based on data furnished by the Ministry of Transport and Infrastructure's Traffic Directorate. The government's first reports described damages to the road infrastructure, and stated that 8,000 km of roads had been destroyed, with 3,800 linear metres of damaged bridges. After processing the information, it was established that 22 of the country's bridges had been destroyed (1,376 m); 49 suffered some kind of structural damage (1,366 m); and 26 only suffered damaged to their access embankments (998 m).

Of 1,749 km of paved roads, 1,104 km or 63 per cent of the system were reported damaged. *A priori*, this figure appears to be overestimated in relation to the net damage caused by hurricane Mitch, although given the advanced state of deterioration of the roads before the disaster, a proportion of the system should be replaced during the reconstruction process.

To calculate the cost of destroyed or collapsed bridges, a current value equal to 50 per cent of their cost of reconstruction was considered. For bridges with partial structural damage, a figure equal to 60 per cent of the previous value was taken, and for bridges with damaged access, the cost of replacement of embankments was calculated at market prices. To determine direct damage to main highways, an average cost per kilometre was defined by setting a percentage of the cost of total reconstruction, since the damages were only sustained at certain points. The reported lengths referring to continuous stretches of road were taken to be accurate, even though the amounts are higher than the damages actually attributable to Mitch. Assessed thus, direct damages to roads and bridges total 1,626 million córdobas (US\$148 million; see Table 15).

As regards bridges, the assessment of indirect damages only takes into account the cost of building provisional crossings at destroyed bridges and the cost of replacing damaged embankments, since losses stemming from suspended traffic were assessed under highway-sector indirect costs. Determining the latter involved calculating the costs caused by suspended transport operations, which depend on the one hand on annual daily average traffic, and on the other, on the type of vehicles involved: cars, lorries or buses. Additional vehicle operation costs due to travel on poorly maintained or unpaved roads while rehabilitation works are carried out must be added to the above. The indirect damages on roads amount to 1,609 million córdobas (US\$146 million, see Table 15).

In determining the cost of rebuilding destroyed bridges, it was considered that their length should be extended and they should be estimated at international unit prices in view of the lack of

information on local unit prices. In highways and roads an investment per kilometre equal to total replacement was estimated, even though the damages resulting from the hurricane were partial; it is generally agreed, however, that road standards should be raised during reconstruction, especially international or Central American highways.

ii) Ports. Minor direct damages were reported in the following ports: Corinto, Sandino, Arlen Siu, San Juan del Sur, San Carlos, Moyogalpa, San Jorge and Cabezas; the most serious incident was the loss of a ferry in Puerto Sandino. Direct damage was estimated to account for 60 per cent of the cost of repairing damage to infrastructure and replacing lost buoys.

Indirect costs were also included, such as the expenses incurred by the National Port Company (ENAP) on lending support to the Emergency Committee to rescue fishing vessels and individuals and transport food, clothes and medicines; ENAP was also requested to estimate the income lost as a result of exonerating harbour and dock fees for foreign ships bringing aid, which docked at several ports, thus hindering service to other commercial vessels. Total damage in the port sector amounted to 2.4 million córdobas (US\$222,000; see Table 15).

iii) Telecommunications. The state-owned Nicaraguan Telecommunications Company assessed its overall damages at US\$13.8 million. This included reconstruction costs, and direct damage was estimated at 80 per cent of that value, since the equipment damaged or lost, although modern, had been in use for some time. Indirect damage, accounted for by the services the company ceased to provide during the emergency, was also calculated. According to the information issued, some 20 per cent of subscribers were disconnected for a period of 10 days. Direct damage was therefore estimated at US\$11.07 million, indirect damage at US\$900,000, and reconstruction costs at US\$13.84 million (Table 15).

Table 15

NICARAGUA: DAMAGE IN TRANSPORT AND COMMUNICATIONS

	Damage			Cost of reconstruction	Imported component
	Total	Direct	Indirect		
Total in dollars (thousands)	306,257	158,993	147,264	310,727	96,167
Total in córdobas (thousands)	3,368,829	1,748,919	1,619,910	3,418,000	1,057,835
Highways and bridges	3,233,972	1,625,173	1,608,799	3,262,501	918,217
Bridges destroyed (22)	79,519	75,163	4,356	227,139	68,142
Bridges damaged (49)	52,354	45,078	7,276	45,078	9,015
Bridges severed (26)	22,154	19,580	2,574	19,580	3,916
Paved roads (1,104 km)	1,655,929	1,215,005	440,924	2,430,010	729,003
Unpaved roads (1,638 km)	1,424,016	270,347	1,153,669	540,694	108,141
Ports	2,441	1,976	465	3,292	2,635
Telecommunications	132,416	121,770	10,646	152,207	136,983

Source: ECLAC, based on figures from the Ministry of Transport and Infrastructure (MTI), National Port Company, Nicaraguan Telecommunications Company (ENITEL) and own estimates.

b) Energy

i) Electricity subsector. The main damages reported in the energy sector concern the electricity industry, where the intense rains, floods and landslides caused severe damage, particularly to hydroelectric plants, lines and distribution networks, transmission lines and transforming substations. The cost of direct and indirect damage amounts to 218.6 million córdobas (US\$19.9 million; see Table 16). All transmission and distribution networks and most power generation plants are state-owned and managed by the Nicaraguan Electric Power Company (ENEL). Following there is a description for each segment of the industry.

1) Distribution. The main damages were reported as of 27 October and continued over the following days; they affected various departments and localities which were left without electricity service. The main causes of breakdowns in lines and distribution networks were erosion and undermined foundations, flooding and undermining of substation yards, collapsed structures, damage to posts, lines, fuses and transformers, and fallen trees and branches on installations.

Distribution networks were partly repaired during the first four weeks of November, and by the end of the month service was almost back to normal, although most of the repairs were provisional. This was the result of a major effort on the part of ENEL personnel, even though the company's inventories were reduced to a minimum in the process, meaning that it will be difficult to deal with future contingencies.

Table 16

NICARAGUA: ESTIMATED DAMAGES IN THE ELECTRICITY SUBSECTOR

	Direct damage	Indirect damage a/	Total damage	Cost of reconstruction b/
Total (millions of dollars)	12,855	7,016	19,871	25,974
Total (millions of córdobas)	141,408	77,171	218,579	285,713
Distribution	47,251	5,891	53,142	67,502
Transmission and transformation	34,364	6,886	41,250	68,728
Generation	59,793	64,394	124,187	149,483

Source: ECLAC, based on Nicaraguan Energy Institute (INE) figures and own estimates.

a/ Indirect costs: in distribution, energy not invoiced; in transmission, energy not delivered in binational connections, and in generation, production cost overruns.

b/ According to ENEL's reconstruction proposal.

By the end of the third week of November most of the country's distribution networks had been assessed; the damage included the destruction of around 2,400 posts, 57,000 lampposts and 400 single-phase transformers, making a total of 328 km of primary and secondary distribution lines that need to be rebuilt. The most affected area is the north-western region, with 93 per cent of the damage to power distribution. The departments that bore the brunt of the destruction are León, Chinandega, Estelí, Matagalpa and Jinotega. Lesser damage was reported in the south-eastern region (Carazo, Masaya and Rivas) and in the metropolitan area (Table 17).

Table 17

NICARAGUA: SUMMARY OF DAMAGES TO ELECTRIC
POWER DISTRIBUTION INFRASTRUCTURE

Region	Lampposts	Posts	Transformers	Lines (km)
Total	5,656	2,398	381	328.4
North-western	4,002	1,967	314	305
South-eastern	926	431	67	23.4
Metropolitan	728	0	0	0

Source: ECLAC, based on INE figures and own estimates.

2) Transmission. The main failures here were caused by soil erosion and landslides resulting from the heavy rainfall and overflowing rivers, which pulled down several high-tension pylons. The country's system has 1,957 km of transmission lines and 61 stations, and the main damaged components were those interconnecting the following substations: Sebaco-Tipitapa; Acahualinca-Nagarote; León I-Santa Bárbara; León I-El Viejo; León I-Chichigalpa-Chinandega; León I-Pavana (interconnection with Honduras); Managua-Santa Bárbara; El Viejo-Villa Nueva-Mina Limón, and Chinandega-El Viejo. In some cases the damage affected only a few pylons but is more extensive in others, affecting a significant percentage of the entire section length. Most of the repairs are temporary and others were carried out using materials loaned by other countries, but these must be returned in due course.

Damages have also been reported in various substations, and are generally related to undermining by floods (in León I and II, Chichigalpa, la Paz, Malpasillo, Matagalpa and Mina Limón). Table 18 shows a summary of damages in distribution lines.

Table 18

NICARAGUA: SUMMARY OF DAMAGES TO POWER
TRANSMISSION LINES

Tension (kV)	Kilometres installed	Kilometres affected	Damage (percentage)
Total	1,917	412	21
230	330.9	76	23
138	906.4	264	29
69	679.8	72	11

Source: ECLAC, based on INE figures and own estimates.

The most important component to break down was the interconnecting link with Honduras (with damage in both countries), since it involved the loss of valuable energy imported by Nicaragua from that country. Fortunately the link with Costa Rica was not damaged and remained in operation, so Nicaragua continued to receive support through energy imports from the two southern countries (Costa Rica and Panama). This is a clear example of the importance of regional interconnections,

which have made it possible to maintain support and cooperation even in difficult situations. It also underscores the importance of rehabilitating the Nicaraguan transmission system, which is a link for energy transactions between Honduras, Costa Rica and Panama. Its rehabilitation does not run counter to the regional interconnection project (SIEPAC),³⁰ which will not begin operating until 2004.

As in distribution, only one part of the rehabilitation costs were considered a direct effect of Mitch, and the reconstruction plans include improvements to various sections of existing transmission lines, some of which have been in service for over 20 years.

3) Generation. The problems found stem from the enormous increase in river flows and silted riverbeds, which limited the capacity of water conveyance works and substantially reduced production in various hydroelectric plants.

The main damages occurred in the dam at the Santa Bárbara hydroelectric plant: the fuse plug was completely destroyed (it worked as designed, as a protection structure), conveyance channels were damaged and some access roads were reported destroyed. The plant ceased operating as a result, and may remain out of order for several months (the time taken to evaluate the exact damage, assess repairs, secure financing, and rebuild), causing considerable indirect costs in substituting the energy no longer produced by that plant.

In the Central America hydroelectric plant damages were reported to the spillway of the Apanas dam, where energy dissipaters and erosion protection slabs were destroyed. Silted intake structures and landslides on the access road to the engine house and other sections of the plant's hydraulic works were reported, as were partial malfunctions in the energy dissipaters of the Asturias spillway, and severe damage in the Wabule and Las Canoas hydroelectric microplants. Roads and bridges were destroyed at the Momotombo geothermal plant, with damage to the evaporation lagoons (which collect waste water) and to equipment in pumping stations, which were flooded. In the Managua thermoelectric plant, the rise in the water level of the Managua lake flooded some installations, but plant operations were not affected.

4) Others. Various types of damage occurred to buildings, control rooms, fences, drains and certain types of equipment in affected substations.

5) Indirect costs. These costs stem from commissioning more expensive plants (thermoelectric) to make up for deficiencies in hydroelectric plants or as an alternative for meeting demand following the loss of some transmission lines. They also include unprogrammed purchases from independent generating companies, additional energy imports from neighbouring countries, loss of subscribers owing to unsupplied power and lower invoicing due to the drop in electricity sales.

³⁰ The Central American Electrical Interconnection System (SIEPAC) envisages the construction of an interconnecting trunk line that will join up the six countries of the Isthmus and will be devoted solely to the Regional Electricity Market. In December 1996 the presidents of the six countries signed a Framework Agreement to implement the initiative. The IDB is the main financial agency in said project.

The costs defrayed by service users due to the lack of electricity have not been included, since they form part of the indirect costs incurred by different sectors of the economy, largely resulting from failures in various services; for example, they include damages to roads and communications.

The highest indirect cost stemmed from the lack of supply of the Santa Bárbara hydroelectric plant, which is likely to be out of service for the whole of 1999, causing an indirect cost to ENEL of around 64.4 million córdobas that year. The assessment was carried out by ENEL's Dispatch Centre and includes all the parameters and assumptions needed for hydrothermal programming (demand projections, fuel prices, plant efficiency, maintenance, launching of new plants, energy prices of independent producers and imports from neighbouring countries).

The second highest indirect costs are the transmission costs generated only in the Nicaragua-Honduras binational interconnection, which was out of operation for about one month. The appraisal has been made by comparing average reported transactions during 1997 with the energy transmitted, at a price of US\$0.045/kWh.

The third item refers to indirect costs arising from lost electricity sales. Consumption is expected to drop by about 5 GWh (average value) during November, is taken to be an indirect cost in view of failures in the distribution system, and will lead to an invoicing loss of 5.9 million córdobas (based on the price of electricity at 1.178 córdobas/kWh, the average price of energy in September 1998). This represents a 3 per cent decrease in electricity consumption in November. Charts 2 and 3 show the rapid recovery of power and electric energy demand during the first 24 days after the hurricane.

The financial costs stemming from an increase in the portfolio recovery period and payment arrears, and increased technical and non-technical losses have not been evaluated. This, coupled with the extraordinary outlays that ENEL has had to make to confront the emergency, will have a strong impact on the company's liquidity and lead to higher operating costs. Moreover, given the magnitude of the damages ENEL faces and the general situation following the hurricane, it would seem more advisable to consider longer terms to carry out the national electricity industry's restructuring and divestment programme.

ii) Hydrocarbons subsector. Fuel is imported by Esso, which owns the local refinery, and the parastate company Petronic, which directly imports diesel and gasoline. Shell and Texaco also have operations in Nicaragua, and the four companies cover the petroleum distribution and marketing market throughout the country. The Nicaraguan Energy Institute (INE), through the General Directorate of Hydrocarbons (DGH), regulates and supervises the subsector.

Chart 2
NICARAGUA: EFFECTS OF HURRICANE MITCH ON ELECTRIC POWER

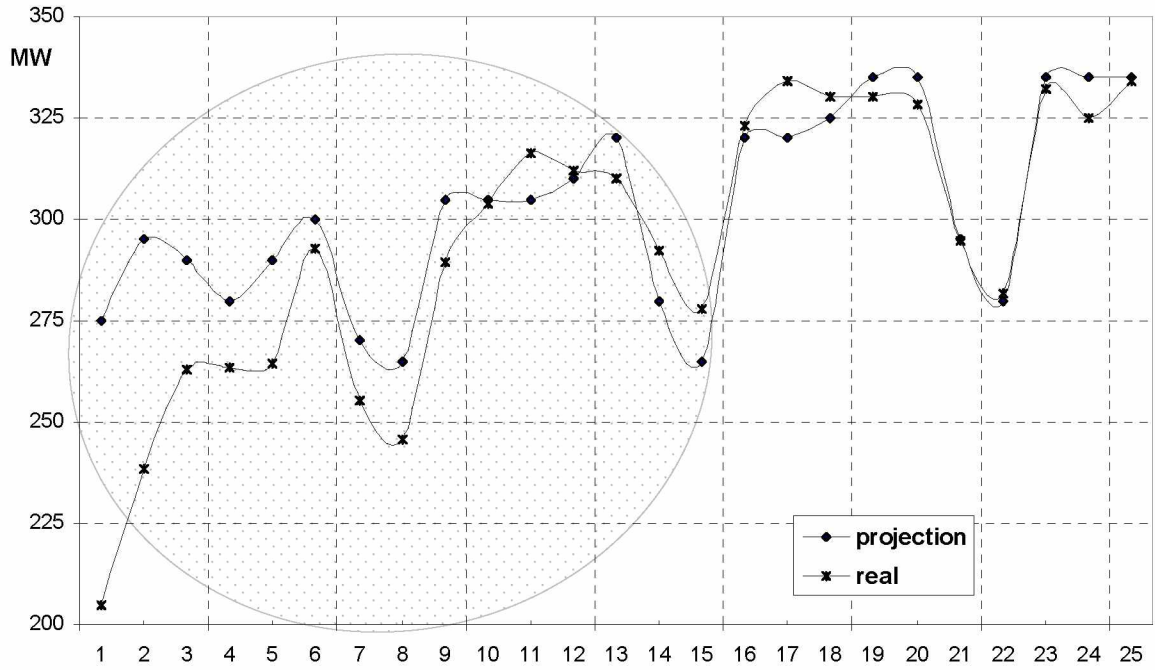
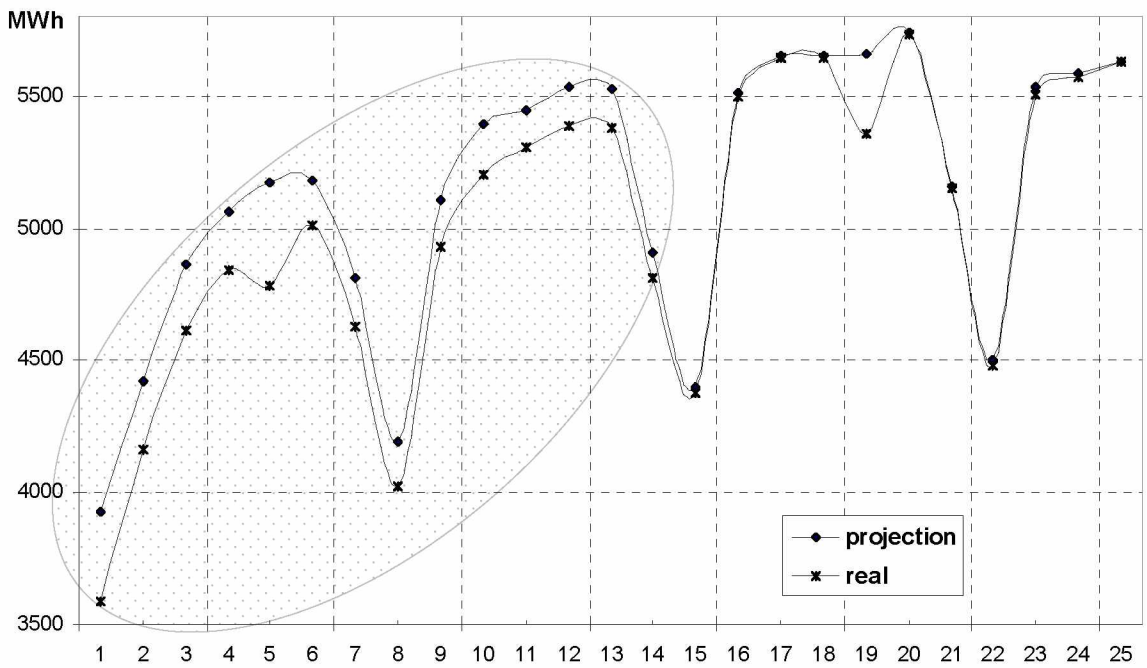


Chart 3
NICARAGUA: EFFECTS OF HURRICANE MITCH ON ELECTRIC ENERGY



According to DGH reports, no damage was sustained in any of the subsector's installations, nor were there any supply shortages. However, there were transport problems in some areas, due to the poor state of roads, but supplies were sufficient to cover demand while action was taken to normalise traffic.

On Sunday 1 November a tanker discharged crude oil for the Esso refinery; although it experienced difficulties in doing so, it was finally able to conclude the operation safely. Apparently ships unloading cargo did not have sufficient information on the intensity of Mitch; this should be borne in mind by the authorities in charge of disaster prevention.

c) Water and sewerage

The water supply and sewerage sector was engaged in a transformation process to improve services by making its systems more streamlined and efficient; however, a vacuum still exists in national regulation of water resources³¹ and the sector has conspicuous management deficiencies, among them poor water quality, deficient control, operative and maintenance systems, high loss ratios, and inappropriate rate and collection systems. The sector now has a pyramid-shaped structure composed of three agencies:

- The National Commission of the Drinking Water and Drainage Sector, responsible for policy-setting, planning and sectorial coordination.
- The Nicaraguan Water Mains and Drainage Institute (INAA), in charge of regulation, application of standards and rates, and customer protection. It regulates and supervises drinking water and drainage services throughout the country.
- The Nicaraguan Water and Sewerage Company (ENACAL), responsible for the delivery, operation and maintenance of drinking water and sewerage services.

ENACAL services cover the entire country, except for the departments of Matagalpa and Jinotega, in which the municipalities are in charge of these services. In rural areas, moreover, such services are often administered by the communities themselves, with the support of ENACAL and non-governmental organisations.

Much of the country's drinking water systems were damaged, so urgent measures had to be taken to rehabilitate them. The heavy rains led to major surface run-offs which damaged homes and wrecked fixtures and fittings, making sanitary systems overflow and flooding drinking-water wells. The danger here lies in imminent health risks from different diseases.

Most of the damage to drinking water and sewerage systems occurred in municipalities in the hardest hit departments, i.e., Matagalpa, Jinotega, León, Chinandega, Rivas, Estelí and Nueva Segovia. The main problems in dealing with the emergency were shortages of funds and difficulties in reaching areas which were left isolated owing to the bad state of roads.

³¹ See UNDP, *Valoración de los efectos del huracán Mitch y propuestas para enfrentar la etapa de reconstrucción*, Managua, November 1998.

According to ENACAL reports, most of the water mains in the northern and western areas of the country suffered severe damage. Seventy-nine water mains systems were reported damaged, including those managed by ENACAL (62), and another 14 in the departments of Matagalpa and Jinotega; all told, around one million inhabitants were affected. Of these services, 65 localities are administered by ENACAL and 14 by municipal authorities in Matagalpa and Jinotega. Damage was also reported to 30 catchment components, 36 pumping stations and some 30 km of pipes which should be replaced. In the rural sector, 230 water supply works were listed as damaged, affecting 75,700 inhabitants.³²

The agencies involved have set themselves the short-term objectives of re-establishing damaged drinking water and sewerage systems, and sanitary and educational actions to prevent and reduce the risk of epidemics in the affected areas. International cooperation in the form of inputs for water purification and transportable treatment plants has been most useful.

By the end of the third week of November the damages in affected heads of departments and municipalities had been evaluated, but many communities in rural areas were still pending. Total direct and indirect damages amount to 154.8 million córdobas (US\$14.1 million), with an estimated 201.2 million córdobas (US\$18.3 million) required for the reconstruction (see Table 19).

Most of the damaged drinking water and sewerage systems are in the provinces. Among the indirect costs, an estimate has been made of the water-purification inputs supplied to localities, as well as those involving water transport by tank trucks and provisional water storage tanks.

Table 19

NICARAGUA: DAMAGE TO DRINKING-WATER SUPPLY, WATER MAINS, SEWERAGE
AND DRAINAGE SYSTEMS

	Damage			Reconstruction costs
	Direct	Indirect	Total	
Total (millions of US\$)	10,996	3,075	14,071	18,293
Total (millions of córdobas)	120,961	33,826	154,786	201,222
Drinking water	98,791	33,826	132,617	172,402
ENACAL a/	34,724	8,681	43,405	56,426
Matagalpa and Jinotega	51,116	21,907	73,022	94,929
Rural sector	12,952	3,238	16,190	21,047
Sewerage system (entire country)	22,169		22,169	28,820

Source: ECLAC, based on INAA and ENACAL figures and own estimates.

a/ ENACAL covers the whole country except Matagalpa and Jinotega departments and several rural communities.

³² See ENACAL's damage reports.

|3. Productive sectors

This section contains estimates of the damage caused by hurricane Mitch in the agricultural and livestock, fisheries, industrial and services sectors. Natural disasters frequently cause serious upheavals, particularly in commodity-producing sectors, and crops are usually the worst affected due to waterlogged soil. Damages to different types of crop depend on several factors which are mentioned further ahead.

As stated above, estimates of direct damage in the agricultural sector include the loss of crops and stored produce as well as losses affecting physical infrastructure and capital goods (tractors, harvesters, etc.). The hurricane's effect on future agricultural production is considered indirect damage, whereas in the industrial sector damaged inventories and unfinished products are calculated as direct damage.

a) Agricultural sector

The agricultural sector is particularly important to Nicaragua's economy. According to figures furnished by the Central Bank,³³ the sector's share of total GDP is about 28 per cent, and it employs 36 per cent of the economically active population. Agricultural products comprise 60 per cent of total exports. Basic grain, sugar and oil-seed crops account for a large percentage of the food supply.

In monetary terms, damage to the agricultural, livestock and fishing sectors is less than in other sectors such as roads and housing, but those affected were mainly inhabitants of rural areas who depend on commodity-producing activities for income, food and foreign exchange.

Damage to agriculture was caused by the torrential rains which destroyed basic grain crops and damaged coffee plantations in the Matagalpa, Jinotega, and Nueva Segovia departments. Chinandega and León suffered heavy losses in export crops, such as bananas, sesame, sugar cane and peanuts. Apart from the damage to crops caused by rain, floods also caused the loss of plantations and farmland. In the Pacific region there was severe damage to banana and sugar cane plantations and basic grain crops. In the north-central region —departments of Nueva Segovia, Estelí, Jinotega, Somoto and Matagalpa— basic grain, tuber, and vegetable crops were destroyed by floods, as were coffee plantations.

In the North Atlantic region, rivers burst their banks, causing severe flooding which damaged all crops. This part of the country is sparsely populated and agricultural activity mainly focuses on the production of basic grains, tubers and bananas for local consumption. Most farmland is situated on river banks, resulting in a high percentage of losses; the region's inhabitants have been left practically without food for an indefinite period as land suffered damages which cannot easily be reversed.

Special mention should be made of landslides. It is difficult to calculate the damage immediately as mountains are isolated and access to the steep slopes where landslides occurred is not easy. Furthermore, it should be noted that apart from their economic and social impact, floods and landslides have also affected the environment. This is partly due to the force of the hurricane and the

³³ See Central Bank of Nicaragua, *Indicadores Económicos*, Office of Economic Studies, September 1998.

torrential rains, but even more to the already deteriorated state of the country's environment. Sowing grass on steep slopes for cattle raising purposes has caused deforestation, which has had negative effects on flora, fauna and water basins, and the control of currents caused by the rains.

The damage to primary sectors caused by hurricane Mitch is not merely economic, but has also affected the quality of life in rural areas and the environment; this should be taken into account in reactivation projects.

i) Crops for domestic consumption. The main crops for domestic consumption are basic grains, oil seeds (soya), tubers (yucca and quequesquipe), bananas and garden produce.

Basic grains are cultivated all over the country, and an estimated 600,000 hectares are sown every year; some 80,000 were affected, nearly all of which were given over to what is known as "late" (*Postrera*) sowing, which takes place in September or October, the crops being harvested between November of the same year and the following January. Sowing takes place twice more in the year: "first" crops are sown between May and June, and harvested between August and October, while "Apante" crops are sown between November and December and harvested between January and March of the following year.

The first sowing period accounts for 70 per cent of the total maize crop, 30 per cent of beans, 20 per cent of sorghum and 90 per cent of upland rice. Irrigated rice is sown in the winter and summer seasons. Practically all these crops had already been harvested, so maize, beans and sorghum losses were not substantial. Approximately 11,000 hectares of upland rice and 2,000 hectares of irrigated rice could not be harvested due to flooding at harvest time, resulting in the loss of a significant part of these crops.

The "late" crop was the worst hit by the hurricane. Losses totalled 37,000 hectares of beans, 14,000 of maize, 8,000 of sorghum 3,500 of soybeans and 2,000 of rice (see Table 20). "Apante" sowing has not yet begun, but farmers have already started to prepare the land. Farmers whose crops were affected will need government support to recoup their losses.

In terms of basic grains, rice production is expected to fall by some 46,000 tons, beans by 37,000 tons, maize by 24,000 tons, sorghum by 20,000 tons and soybeans by 15,000 tons (see Table 21). It should be noted that in the case of maize, beans, sorghum and soybeans, the losses represent farmers' costs for preparing land, seeds, inputs and crops, estimated at 1,000 córdobas for beans and 700 for maize and sorghum. However, since the country will have to face the total loss of the crops to be harvested between November and December, they are considered indirect losses. Along with basic grains, losses were also suffered in other crops for domestic consumption, such as fruit and bananas.

Vegetable crops were also affected: flooded farmland in the departments of Matagalpa and Jinotega caused the loss of over 3,000 hectares of cabbage, carrot, tomato and other vegetable crops. Citrus fruit, mango, avocado and banana plantations were also destroyed. Losses in production for the national market amount to nearly 600 million córdobas, of which 208 million are direct costs and 390 million indirect. These figures also include fruit, vegetable, tuber and banana crops. These last two crops are staples for inhabitants of the Atlantic region.

Table 20

NICARAGUA: SURFACE AREA OF MAIN CROPS
AFFECTED BY HURRICANE MITCH

(Hectares)

Crops	Area cultivated before the hurricane	Area affected by the hurricane
For domestic consumption	613,780	79,170
Rice	80,080	16,030
Beans	191,100	37,100
Maize	270,200	14,700
Sorghum	51,400	7,910
Soybeans	21,000	3,430
For export and industrial use	175,890	18,270
Sesame	15,300	9,170
Banana	2,030	210
Coffee	90,160	1,260
Sugar cane	53,000	5,320
Peanuts	15,400	2,310

Source: ECLAC, based on information by the Ministry of Agriculture, Livestock and Forestry (MAG-FOR).

Table 21

NICARAGUA: ESTIMATED PRODUCTION LOSSES CAUSED BY HURRICANE MITCH
IN THE AGRICULTURAL SECTOR

(Tonnes)

Crops	Anticipated production before the hurricane	Estimated losses
For internal consumption		
Rice	214,218	46,218
Beans	133,132	36,700
Maize	327,090	24,500
Sorghum	109,213	20,013
Soya	46,518	15,404
For export and industrial use		
Sesame	9,139	5,177
Banana	93,960	17,670
Coffee	67,992	4,370
Sugar cane	3,850,789	252,000
Peanuts	43,800	10,314

Source: ECLAC, based on Ministry of Agriculture, Livestock and Forestry (MAG-FOR) information.

Of the 80,000 hectares affected by the hurricane, 63,000 are cultivated by small-scale farmers on plots averaging 1.2 hectares. At least 56,000 small farmers suffered losses, affecting approximately 300,000 people who depend on them and live in conditions of poverty or extreme poverty.

Solidarity is very strong among these population groups, so some farmers who lost their crops are receiving support from family and friends to sow their crops, either on their own land, on land lent to them, or under the sharecropping system. However, it is important to bear in mind that such groups normally lack food, inputs and liquid assets and that their situation has worsened as a result of the hurricane. The Ministry of Agriculture is therefore working on a short-term project designed to meet the needs of those 56,000 farmers, which will involve outlays of some 100 million córdobas.

Irrigated rice and soybean crops are grown by medium-scale farmers and entrepreneurs who are facing financial problems in reactivating production. In some cases farmers had secured loans which they cannot repay due to their losses, and it will be difficult for them to gain access to more credit. Since this situation is endangering agricultural reactivation and the country's food supply, preference should be given to positive credit arrangements designed to meet the financial needs of the farmers.

ii) Export crops. Export crops such as sesame, peanuts, sugar cane and bananas are grown in the departments of Chinandega and León and to a lesser extent in the department of Managua. Coffee is mainly cultivated in Matagalpa and Jinotega. Farmland in the Pacific region was seriously damaged by torrential flood waters and subsequent landslides in cultivated areas; Matagalpa and Jinotega farmlands also suffered landslides and floods.

Some 9,000 hectares of sesame and 2,300 hectares of peanuts were ruined by the rains, with the resulting loss of 5,200 tons of sesame and 10,000 of peanuts. Sugar cane crops were also affected by floods and water currents, which damaged over 5,000 hectares and caused the loss of 250,000 tons (see Tables 20 and 21).

Banana production in Nicaragua is not as important as in Guatemala and Honduras and therefore does not have a significant share in overall production losses; 2,000 hectares are given over to banana plantations and 210 hectares were damaged, leading to the loss of 16,700 tons of fruit. Production is expected to be restored in two years.

More than 1,200 hectares of coffee plantations were lost due to landslides in Matagalpa and Jinotega; 1,000 tons of coffee beans were not harvested as a result. The rains and wind also caused coffee beans to fall off the plants, leading to the loss of another 4,000 tons (see Table 22). The loss of some 3,500 tons during the three-year period from when the plantations are replanted in 1999 to the time the crops are harvested must also be added to those figures. Roads in coffee-producing areas were also badly damaged by the rains; more than 2,000 km are practically impassable, making it difficult and expensive to transport coffee beans. These roads urgently need to be repaired as the harvest season is under way.

The agricultural sector's losses in export crops are valued at 377 million córdobas, the worst affected being sugar cane, coffee and sesame. Of this total, 281 million córdobas are direct losses caused by the immediate effects of the hurricane; US\$ 96 million correspond to indirect losses in coffee and banana crops (see Table 23).

Estimated losses in coffee crops take into account the fact that it takes three years for the affected land to produce coffee after it has been sown. Indirect losses in banana crops are based on one year's production.

The losses caused by Mitch have left farmers in a precarious financial situation. Most had secured bank loans and those who lost all their crops or only harvested part of the expected yields are having difficulty in paying their debts; if this problem is not solved, it will make the country's foreign sector situation all the more difficult. The value of lost exports amounts to US\$54 million, or 7 to 8 per cent of foreign sales. The impact of decreased exports will be mainly felt in 1999.

Table 22

NICARAGUA: AGRICULTURAL SECTOR LOSSES

Crop	Tons	Price (córdobas per ton)	Value	
			Millions of córdobas	Millions of US\$ a/
Crops for domestic consumption				48.0
Rice	46,218	3,000	138.6	12.6
Beans	36,700	7,000	256.9	23.4
Maize	24,500	1,400	34.3	3.1
Sorghum	20,013	2,500	50.0	4.5
Soybeans	15,404	3,150	48.5	4.4
Export crops			485.1	44.1
Sesame	5,177	8,074	41.8	3.8
Plantation			11.0	1.0
Coffee			174.0	15.8
Production	4,370	20,000	87.4	7.9
Plantation			30.0	2.7
Banana			80.5	7.3
Production	16,740	3,500	58.5	5.3
Plantation			22.0	2.0
Peanuts	10,314	8,532	88.0	8.0
Sugar cane	252	-	100.8	9.2

Source: ECLAC, based on MAG-FOR and MEDEPESCA information and own calculations.

a/ At an exchange rate of 11 córdobas per US\$.

iii) Loss of assets. Lost assets refer to coffee and banana plantations and fruit orchards. Sugar cane is not included, as it is normal practice to resow the cane every two or three years and the cost of doing so is taken into account. It is possible that cane will sprout again during the next season in some damaged areas. Also included are loss of machinery and equipment damaged by damp coffee beans, electrical installations on the farms, and tools and equipment carried away by flood waters. The plantations suffered losses estimated at 243 million córdobas. It will cost 22 million córdobas to replace machinery and equipment (see Table 23).

The figure of 250 million córdobas for estimated soil losses refers to the basic grains, vegetables, milk or cattle which will not be produced on the approximately 10,000 hectares of land that were flooded, washed away or silted. The largest areas of farmland affected by flooding are in the Jinotega and Matagalpa departments. In Jinotega the lands surrounding the Apanas reservoir were flooded and, in Matagalpa, land in the municipality of Darío, the Sibaco Valley and San Isidro.

Topsoil was also lost in the Atlantic region and in the departments of Chinandega and Leon, due to landslides caused by rivers and rushing currents which cut channels through the land.

b) The livestock sector

Cattle farming is the livestock sector's most important activity, both for export and to supply national demand for meat, milk and dairy products. Cattle are raised in all areas of the country, particularly in the departments of Matagalpa, the Atlantic region, Boaco, León, Chinandega, Chontales and Rivas. Of these, only Chontales and Rivas escaped major damage from the heavy rains and floods. The worst losses occurred in Matagalpa, Boaco, Chinandega, León and the Atlantic region.

An estimated 50,000 animals died, most of them calves and cows raised for breeding and dairy production. Many were swept away by the flood waters and others died of bronchial or arthritic diseases. Damage was also caused to farm buildings and installations such as fences, pens and stables, and dairy production dropped during the hurricane and for several weeks. Some 2,000 hectares of pastureland were lost due to flooding, although some may be recovered in the near future. Many farmyard pigs and poultry also died, but hog and poultry farms suffered relatively small losses.

The value of losses in the livestock sector totals 170 million córdobas, of which 120 are direct—death of cattle and damage to installations—and 40 million indirect, mainly due to the decrease in dairy production (see Table 23).

Losses to livestock have affected the foreign sector: the value of export meat that never reached the slaughterhouse is expected to amount to 60 million córdobas over the next few years. The long-term effects are even more serious, since smaller herds will mean less milk and fewer calves to supply the national and export markets. Aside from these effects on the economy, the difficult situation of farmers who need to replace their herds must be taken into account. Importing cows and extending financial aid to farmers would help to recover these losses.

Table 23

NICARAGUA: CLASSIFICATION OF LOSSES IN AGRICULTURE,
LIVESTOCK AND FISHERIES CAUSED BY
HURRICANE MITCH

	Damage			Effects on the foreign sector	
	Total	Direct	Indirect	Increased imports	Reduced exports
Total US\$ (millions)	185.2	128.3	56.9	44.1	53.6
Total córdobas (millions)	2,036.8	1,411.0	625.8	485.0	590.00
Agriculture	1,489.7	1,004.2	485.5	400.0	360.0
For domestic consumption	598.2	208.6	389.6	260.0	
Rice	138.6	138.6			
Beans	256.9		256.9		
Maize	34.3		34.3		
Sorghum	50.0		50.0		
Soybeans	48.4		48.4		
Fruit	30.0	30.0			
Vegetables	40.0	40.0			
For export and industrial use	376.5	280.6	95.9		360.0
Sesame	41.8	41.8			
Banana	58.5	20.0	38.5		
Coffee	87.4	30.0	57.4		
Sugar cane	100.8	100.8			
Peanuts	88.0	88.0			
Assets	515.0	515.0		200.0	
Plantations	243.0	243.0			
Land	250.0	250.0			
Machinery	22.0	22.0			
Livestock	170.0	110.0	60.0		60.0
Cattle	150.0	100.0	50.0		
Others	20.0	10.0	10.0		
Fisheries	377.1	296.8	80.3	85.0	
Shrimp	177.1	96.8	80.3		170.0
Assets	200.0	200.0			

Source: ECLAC, based on Ministry of Agriculture, Livestock and Forestry figures and own estimates.

c) Fisheries

In the departments of Leon and Chinandega shrimp production is based on shrimp farms. Fishing cooperatives and companies were affected by the floods and currents resulting from the hurricane. Some 3,700 hectares of shrimp farms were damaged, with losses to infrastructure and production.

All facilities on 530 hectares were completely destroyed and will have to be rebuilt. About 2,300 hectares suffered partial losses valued at 186 million córdobas. Fishermen also lost small-scale fishing boats used for trawling.

Production losses totalled 4.7 million pounds, 2.5 million of which would have been exported this year, and 23 million pounds between January and May 1999. Their value is calculated at 177 million córdobas (see Table 23).

The extent of the damage, its effect on the foreign sector and the financial situation of cooperatives and contractors highlight the need for financial solutions. These should take into account producers' lost income which makes it difficult to pay back loans secured prior to the disaster.

d) Industry, commerce and tourism

Although the hurricane caused some damage to industry, commerce and tourism, losses are relatively small compared to those suffered by the agricultural, livestock and fisheries sectors.

Damage to these sectors has been estimated using a combination of sources and calculations, consisting of a Ministry of Development, Industry and Commerce (MIFIC) report,³⁴ interviews with government and trade union representatives carried out by members of the mission, and the mission's own estimates, which were obtained by linking agricultural and livestock losses—described in the above paragraphs—with those suffered by industry and commerce.

i) Manufacturing sector. Infrastructure and factories pertaining to the different branches of this industry were affected by the torrential rains, flooding and avalanches of mud. More serious, however, is the loss of production, since it has more far-reaching effects than the temporary suspension of activities while repairs are carried out.

Agroindustry suffered considerable damage to infrastructure, particularly installations and machinery, but the effect on production was the most serious consequence of the disaster. Owing to agricultural and livestock losses—described in the preceding section—, large quantities of produce, meat, dairy foods and fishery products could not be processed.

As figures for the above were not available, a direct estimate was made by multiplying the volume of commodities lost by the difference between the unit prices paid to producers and wholesalers. It was assumed that this difference represents the agroindustrial sector's added value.

The total damage to this sector was thus calculated at 537 million córdobas, (US\$48.8 million), which includes 39.6 million córdobas in direct damages and 497.2 million córdobas in indirect damages or future production losses this year and next (see Table 24).

Damage to the **forestry** sector was relatively slight, affecting installations, nurseries and cut and processed timber. It also suffered income losses for the period it will take to repair damaged facilities and reforest. Total damages to this sector are estimated at 214.5 million córdobas (US\$19.5 million), of which 97.9 million are direct losses and 116.6 million indirect, due to lost income (see Table 24).

³⁴ See Ministry of Development, Industry and Commerce (MIFIC), *Impacto del huracán Mitch en capital invertido y producción*, Managua, November 1998.

The **chemical** sector suffered minor damage valued at slightly more than 5.3 million córdobas.

In summary, damage in the manufacturing sector totalled 1,054.9 million córdobas (US\$95.9 million) of which 156.2 million are direct damage to property, and 898.7 million indirect losses in production (see Table 24).

ii) **Mining.** The metal-mining branch suffered damage to gold and silver mines and the non-metallic branch damage to lime, gypsum, cement and sand extraction facilities. Some income was also lost while installations were being repaired. Total damage to this sector is estimated at 298.1 million córdobas (US\$ 27.1 million), of which 17.6 million are for direct damage to property and 280.5 million for indirect damage stemming from production losses (see Table 24).

Table 24

NICARAGUA: DAMAGE TO THE INDUSTRIAL SECTOR

(Thousands of córdobas)

Sector and subsector	Damage			Effect on foreign sector (millions)	
	Total	Direct	Indirect	Increased imports	Reduced exports
Total dollars	183,767	17,028	166,739	225	77
Total córdobas	2,021,437	187,308	1,834,129	2,475	770
Manufacturing	757,097	138,028	619,069	1,375	770
Agroindustry	536,723	39,743	496,980		
Forestry	215,039	98,120	116,919		
Chemicals	5,335	165	5,170		
Mining	297,990	17,930	280,060	1,100	
Commerce	71,500	5,500	66,000		
Tourism	894,850	25,850	869,000		

Source: ECLAC, based on official figures and own calculations.

iii) **Commercial sector.** Small and medium businesses in towns located in areas affected by the hurricane suffered damage to infrastructure and stock. Moreover, sales have dropped owing to the general decrease in economic activities in the worst-hit regions, but not due to lack of agricultural commodities since these are being replaced with imported goods.

Damage to small and medium-sized business infrastructure has been calculated under the heading of housing, as these businesses were usually run from their owners' homes. However, they did suffer loss of stock and temporary reductions in sales. Stock was calculated as being one twenty-fourth of the total annual sales of the small-business sector in the affected zone; the drop in sales was estimated as one tenth of the normal annual amount.

Total damage to this sector is calculated at 71.5 million córdobas (US\$6.5 million). Direct damage due to loss of stock was valued at 5.5 million córdobas and sales reduction at 66 million (see Table 24).

iv) Tourism sector. Tourism infrastructure in the departments of Chiltepe, Ometepe and the country's northern area was affected by strong winds and floods. However, the most serious effect is the indirect damage resulting from cancelled reservations as news of the disaster spread. Total damages to the tourism sector are calculated at 895.4 million córdobas (US\$81.4 million). Direct damage to the sector's infrastructure is estimated at 26.4 million and indirect damage due to loss of income amounts to another 869 million (see Table 24).

In short, these estimates show that the total damages in the industrial, commercial and tourism sectors is approximately 2,021.8 million córdobas (US\$ 183.8 million), of which 187 million correspond to direct damage to infrastructure, equipment and stock, and 1,833.7 million refer to indirect damages stemming from lost income (see Table 24).

4. Effects on the environment

a) Definitions and methods used in the environmental assessment

Natural disasters can cause moderate or serious damage to the environment, or even the total deterioration of a natural heritage that provides society with environmental benefits. Quantifying the environmental impact of natural disasters on this heritage on the basis of relative indicators or in monetary terms is a relatively recent practice. This type of assessment has been applied, for example, in analysing the impact of El Niño (1997-1998) on Costa Rica (ECLAC, October 1998) and of hurricane Georges on the Dominican Republic (ECLAC, November 1998).

The theory is that natural habitats or ecosystems are generally in a state of ecological balance; natural phenomena involving high energy dissipation are normal, although they may only occur once in several years or decades and affect geographical areas at random; these processes are believed to shape biosphere physiography over time. Their main impact is therefore on an ecosystem's sensitivity, depending on its geophysical characteristics and its environmental conditions, and its vulnerability to neighbouring regions with human settlements, particularly if such settlements lack appropriate preventive land-use measures and planned, sustainable management of natural resources.

This diagnosis is based on the average value of environmental services provided by forests in terms of carbon fixation, water protection and production, biodiversity, ecosystems and scenic quality. These values are relative, since economic assessment of the effects of damage on the natural environment still requires further studies. Preliminary assessment of the damage was based on a rapid field study (by land and by air as far as possible) and on studies of photographs and films, in addition to other information provided by technicians, specialists and Nicaraguan government authorities, local NGOs such as the Humboldt Centre and FUNCOD, and technicians from international missions that participated in measures to address the emergency and optimise the country's recovery (UNDP, PAHO, World Bank, and UNICEF, among others).

The alterations caused by hurricane Mitch on Nicaraguan natural environment are measured as direct impact in this study, since they specifically altered natural assets through losses or serious damage, in just a few hours (by the hurricane's wind impact) or several days (by the persistent rains). Impacts are classified as primary and secondary; the primary impact is caused by the storm's *in situ* energy dissipation, whereas the secondary impact refers to subsequent, cumulative dissipation, such as the major flooding that occurred in densely populated alluvial valleys and near the rivers that run through them.

Two types of hurricane impact were defined:

i) Immediate or primary direct impact (PDI) on the environment: harmful or noxious impact of a large-scale natural phenomenon, which occur during the event itself and have a direct effect on the state of natural assets as they were when the disaster began. Examples include strong winds that knock down, twist and defoliate plants, disturb fauna, and produce large waves and groundswell; landslides and large-scale erosion of topsoil caused by heavy, sustained rainfall on mountain slopes (erosion is particularly strong when trees have fallen); and immediate erosion of beaches or coastal damage stemming from intense waves or from groundswell.

ii) Secondary direct impact (SDI) on the environment: in addition to their local impact, the direct effects can also have an impact on the vicinity and areas some distance away from where a disaster initially broke out; these may be felt immediately, in a few hours or even days later, with explicit damage caused in areas rendered vulnerable by human activities. Examples include landslides, the formation of gullies and ravines left barren by waterlogging of the topsoil after losing its original vegetation, large sedimentary deposits in river beds and estuaries, sedimentary deposits on beaches and reefs, the formation of river islands that subsequently flood, drowning animal species, and floods and avalanches, among others. These effects may be intensified by other factors resulting from primary direct damage, such as rivers dragging vegetation uprooted by gusts or sustained winds, mud and accumulated rubble from cave-ins and landslides.

iii) Indirect impacts (II) on the environment: these stem from the action of weather phenomena involving major energy dissipation, and their effects depend on the type and extent of primary and secondary direct impacts, both of which indirectly affect the condition of natural assets when the disaster struck. These consequences can arise as soon as the direct impact takes place, or may appear and continue over a period of days, months or even years. One example is the disappearance of nutrients in an aquatic system, thus causing changes in the food chain; another is the disappearance of seed, fruits or flowers, the food source of birds and mammals, owing to the lack of a habitat, such as a forest. Although a tree can regenerate and sprout new leaves when it has lost its branches in hurricane winds, it will take longer to flower and produce fruit. Additionally, the lack of natural insect predators, such as bats, when they have been driven from an area, owing to the lack of a forest habitat, encourages the proliferation of insects that could be harmful to crops adjacent to the forest or to riverbanks. The lost habitat could also have been producing pollinating insects or insects generally beneficial to the agricultural environment of neighbouring man-made surroundings.

b) Impacts on the environment prior to 1998: occurrence of natural disasters and impacts caused by man

A combination of human activities and unplanned settlements (a direct cause) and of relatively high population growth, (an intensifying or magnifying factor), have made the environment increasingly vulnerable to natural phenomena, leading to major disasters. These conditions, coupled with the country's geophysical and topographical characteristics, have made Nicaragua highly vulnerable to intense weather phenomena, particularly in the Central and Pacific regions, the most densely populated and most affected by hurricane Mitch.

Human activities that have a particularly strong impact on vulnerability are the disorderly expansion of the agricultural frontier based on felling and burning natural forests, and the expansion of pasturelands for extensive livestock-raising. The following practices also increase vulnerability to natural phenomena: agricultural production on mountain slopes (without soil conservation), in stream beds and river terraces (including primary activities), the opening of roads and the construction of highway, urban or other types of infrastructure, without taking into account environmental protection and land-use management measures (for agriculture and urban settlements).

In 1995 the area covered by forests in Nicaragua was 5.5 million hectares and the annual deforestation rate is estimated at 151,000 ha (Central American Commission on Environment and Development, 1998). In the summer of 1998 alone, a total of 15,196 forest fires were recorded, affecting more than 530,000 hectares of forest. The use of forestry management plans is still very limited. The areas most afflicted by hurricane Mitch were considered environmentally critical zones. From the institutional point of view, juridical uncertainty regarding the right of use of natural resources should be considered one of the factors that discourages soil conservation practices and contributes to deforestation.

In this context, future increases in population density will inexorably lead to extensive, indiscriminate territorial occupation, with all the infrastructure and human activities this entails, which will unquestionably increase vulnerability to natural disasters, unless alternative land use and resource-management approaches are taken (see the section on population affected in chapter I). The situation must also therefore be addressed from the standpoint of population, land-use policies and regulations, nature conservation and environmental education, among others.

c) Direct impact on the environment of hurricane Mitch

Official information on environmental damage was very limited when this report was written. Both the Ministry of the Environment and Natural Resources (MARENA) and the Agriculture and Forestry Ministry continued to collect information. Data on protected areas was especially scarce, since institutions are present in only eight of the 73 areas. The main source of information were MARENA preliminary reports on areas where access was possible and one helicopter flight over the most affected areas. The damage suffered by Nicaragua's natural assets was mainly due to the extremely heavy rainfall, which in some areas reached 1,600 mm in just four days. Wind impact was therefore insignificant.

i) Ocean impact

Coastal ecosystems. Deposits of debris, consisting mainly of branches, trunks, refuse and dead animals swept downstream by rivers have accumulated in estuaries in the Pacific region, especially north of the Tamarindo River. Coastal currents tend to carry fresh water loaded with sediment from inland floods further into the sea, burying benthic marine ecosystems entirely. This type of problem was detected in black conch and brine shrimp breeding grounds in the area where the waters meet in the Gulf of Fonseca and Estero Real River. MARENA informed that some mangrove swamps were affected by silt deposits and erosion. The intense rains swept away beaches where sea turtles lay their eggs during their reproductive season. Moreover, the Chiquito River split Juan Venado island (protected area), leaving a gap about 500 metres wide.

ii) Impact of rain. The consequences of hurricane Mitch had direct impacts (rather of a secondary nature) on soil, forests, water resources and fauna. Special mention should be made of the avalanche of water mixed with sediment from the Casita Volcano, which caused almost 80 per cent of the deaths in Nicaragua.

1) Casita Volcano.³⁵ On 30 October an avalanche of loose boulders from the crater formed a natural dam on the slopes, and its subsequent collapse gave rise to a wave of water and mud that destroyed several villages (mainly El Porvenir and Rolando Rodríguez), killing more than 2,000 people. The Casita volcano is located in the Maribios mountain range, which stretches from the north coast of Lake Managua to the environs of the city of Chinandega. Casita forms part of the San Cristóbal volcanic complex, which was declared a protected area. The main source of the avalanche was located 200 metres south-west of the volcano's peak. The main rupture occurred along a 500-metre-wide segment of a fault that divides the peak. A boulder 20 metres thick, 60 metres high and 150 metres long came loose and then slid down along the contour of the fault.

A volume of approximately 200,000 cubic metres was estimated for the first block of rocks that came loose. Large quantities of rock and debris from the avalanche formed hills at a distance of between 2 and 3 km from the summit. Subsequently this natural dam broke open, generating a wave that was three metres high when it reached El Porvenir. Almost all the vegetation and soil were swept away by the wall of water. The width of the wave on the upper reaches was approximately 1,500 m. This disaster was brought about by two coinciding events: extraordinarily intense rains caused by Mitch, and the avalanche. The villages that no longer exist today, El Porvenir and Rolando Rodríguez, were established some decades earlier in a geological high-risk area.

2) Soil Resources. Soil loss (washing away of the fertile layer) occurred mainly in the upper and middle parts of several river basins as a result of concentrated erosion, landslides and flooding of areas near riverbanks. The most affected areas were: León-Chinandega plains, the upper reaches of the Tuna, Grande de Matagalpa, Coco, Estelí, San Pedro Norte, Achuapa, El Sauce and Viejo rivers and the middle part of the Coco river basin. Studies will have to be carried out to determine the volume of soil swept away during the storm, which is enormous in areas affected by human activities.

³⁵ Based on Nicaraguan Institute of Territorial Studies (INETER), *Reporte sobre la avalancha y el flujo de agua con sedimentos en el volcán Casita, Nicaragua, disparados por el huracán Mitch*, Managua, 14 November 1998.

3) Water resources. Various types of effects on water resources were registered:

– Water pollution due to: a) spillage of toxic chemical compounds from gold mining operations (León) and industries such as chrome from tanneries in Condega and Lake Managua; b) washing away of agrochemicals used in agriculture; c) flooding of sewerage systems, septic tanks and latrines; d) decomposing animal corpses and refuse. Assessing the negative effects of these pollutants is no easy matter, since the enormous volumes of water have a great dissolving capacity.

– The increase in water turbidity, which reduces penetration of sunlight and the concentration of oxygen dissolved in water, and lower water conveyance capacity can have negative effects on aquatic ecosystems.

– The dragging of sediments led to alterations in river channels; to the appearance (or reappearance) of new bodies of water (Tipitapa River), and in general to landscape changes.

4) Forestry resources and protected areas. Considerable damage was registered in forests situated on the banks of affected rivers. No information is available on protected areas except, as already mentioned, on Juan Venado Island and the Casita Volcano. Natural acid rain fell some time after the heavy rains on Volcán Masaya National Park, causing defoliation in the surrounding forests.

5) Fauna. Animal life has been affected by alterations and loss of habitat, although it is impossible to identify and assess these effects. Dead specimens of land-based species such as iguana, garrobo (tropical lizard) and racoon have been found in areas such as Juan Venado Island. The main cause is the formation of river islands that are subsequently swept away by high waters, particularly in lowland valleys.

d) Indirect impact of Mitch on the environment

Since only two weeks have passed between the hurricane and this study, the effects that damage to plants, fallen fruit in forests and loss of foliage may have had on birds and mammals is still unknown; in fact, virtually nothing is known about the food sources (seeds, fruits, etc.) of various species.

This study also places emphasis on including the environmental value lost in rivers, since they are highly productive ecosystems that extend throughout the country's farmlands. Other effects on important and valuable aspects of these habitats could be occurring or will occur, and should be studied. Research conducted in Guanacaste National Park, Costa Rica, has shown that the environmental services provided by protected areas to singlecrop farming are highly beneficial.

Other possible indirect sequels are related to the displacement of entire communities directly affected by Mitch. "Migration from the most impoverished areas will exert greater pressure on sanitation services in urban areas and could lead to increased growth of settlements, with a consequent reduction in lands available for seepage and an increase in rapid concentration of water during rain spells" (UNDP, Nicaragua). The invasion of new lands by small farmers who lost their fields, especially near protected areas, should also be borne in mind.

e) Calculation of environmental damage

In addition to covering agriculture, health, housing and other sectors, an economic assessment of the damage caused by hurricane Mitch should also consider the effects on natural assets of the loss of benefits provided by natural areas. “Environmental services” are benefits derived from natural ecosystems, such as timber, the genetic bank, medicinal plants and biodiversity in general, carbon fixing, oxygen production, soil protection, water production, and scenic and recreational areas; it is becoming widely accepted that such services should be paid for, since they are necessary for sustainable development now and in the future.

This is a new market or export product that is being used to fund environmental conservation and sustainable development; for instance in the Central American region, Guatemala and Costa Rica are marking important progress in the area of carbon sequestration.

Four types of environmental services are considered in this assessment: i) reduction of greenhouse gas emissions; ii) protection of water for urban, rural or hydroelectric purposes; iii) protection of biodiversity as a valuable genetic resource for future development and global stability, sustainable scientific and pharmaceutical uses, and genetic research and improvement; and iv) protection of ecosystems, lifeforms and natural scenic beauty for scientific, touristic and environmental education purposes. Some countries are issuing forestry conservation bonds as an important means of maintaining these services and ensuring ongoing production, thereby compensating the owners of environmental resources for the use of environmental services that benefit society. These bonds are for a minimum of 20 years and are a recent instrument since they were not previously available on the stock market.

One way of appraising the environmental damage caused by Mitch is to estimate the environmental benefits provided by an ecosystem in complete balance. Reference is made to the studies used by ECLAC (1998) to assess the environmental damage from the effects of El Niño (based on Carranza *et al.*, 1996 and Echeverría *et al.*, 1997), and to recent assessments carried out in the Dominican Republic (ECLAC, November 1998).

Table 25 shows an estimate of the forested area destroyed by hurricane Mitch. Riverbank forests, being the most affected, and forests in protected areas were taken into account, all of them located in the western triangle, which was the area with the greatest impact. Damage to other resources (soil, bodies of water) has not been assessed.

Table 26 shows the average values of environmental services for each type of forest. The values for Nicaragua are considered similar to those of tropical latifoliate forests.

Table 27 shows damage to the natural heritage in annual terms and over a period of 20 years. Although total recovery time has not been established in many cases, approximate figures have been included; the estimated recovery period ranges from 15 to 20 years. The overall cost of damage throughout the period is around US\$8.5 million. It should be stressed that this estimate is based on incomplete preliminary information; moreover, it does not take into account the value of lost soil resources and other unassessed damage (to water resources, fauna). Costs do not include an annual discount for differentiated carbon absorption.

River and riverbank systems and should also be assessed, since they were greatly affected throughout the country by high flows. Estimates indicate that 1,700 kilometres of river systems, 30 per cent of which have been altered by human interference (fragmentation, destruction, logging, etc.), were affected.

i) Carbon dioxide fixation. CO₂ absorption from the atmosphere through photosynthesis is a crucial link in the biogeochemical carbon and oxygen cycle. This process of accumulation as organic plant matter helps to prevent carbon dioxide levels from rising while simultaneously producing oxygen, for which highly industrialised countries are willing to pay to compensate for their own gas emissions. The loss of environmental services from the organic dysfunction of forests lost or washed away (in the alluvial gullies of medium and high sub-basins) is taken into account in the calculations; such carbon will return to the atmosphere through rotting or burning, since it cannot be made use of except in certain cases.

Table 25

NICARAGUA: FOREST RESOURCES DESTROYED BY RAIN AND FLOODS CAUSED BY HURRICANE MITCH

Type of area (extension) d/	Direct impact a/ and percentage of trees blown down, destroyed or swept away	Observations
Areas protected or in the process of protection b/ (1,917 km ²)	Minimum (M-L), 2	Summits and slopes protected by plant cover suffered no damage; damage on the Casita Volcano could have been far greater, although this is difficult to determine.
Riverside forests (51 km ²) c/	Very severe (L), 70	Damage due to overflows, rock deposits, boulders, sand and silt.

a/ As defined in this study. Minimum=Minor impact, Very severe=Major damage due to flooding;

(M) = Damage with recovery over the medium term, (L)=Damage with recovery over the long term.

b/ Shown on the Mapa del Sistema Nacional de Áreas Protegidas de Nicaragua (SINAP). Protected areas situated in Nicaragua's Central and Pacific Regions, limited to the west by the isohyet of rainfall accumulated between 21 and 31 October 1998, equivalent to 400 mm.

c/ ECLAC estimate based on INITER, Mapa de Cuencas Hidrográficas de la República de Nicaragua and Mapa de Isohietas durante la afectación del huracán Mitch. The affected area is considered the part of the western sector that registered more than 400 mm of cumulative rainfall between 21 and 31 October 1998.

Table 26

ENVIRONMENTAL FORESTRY SERVICES: AVERAGE VALUES

(Dollars per hectare per year)

Environmental service a/	Primary forest b/	Secondary forest b/
Total	58	41.76
Carbon fixing	38	29.26
Water protection	5	2.50
Biodiversity protection	10	7.50
Ecosystem protection	5	2.50

Source: ECLAC, based on estimates.

a/ Based on: Echeverría *et al.*, 1996, Carranza *et al.*, 1995.

b/ Values for Costa Rica.

Table 27

NICARAGUA: DAMAGE CAUSED BY HURRICANE MITCH TO ENVIRONMENTAL SERVICES IN FORESTED AREAS, 1998

Type of area (percentage of average damage)	Affected area (km ²)	Equivalent total damage (km ²) a/	Cost (thousands of córdobas)					Annual total	Total (thousands of córdobas) d/
			CO ₂ capture	Water protection	Biodiversity	Ecosystem protection			
Total	1,968	74.0	281.1	36.9	73.8	36.9	428.7		
Areas protected and earmarked for protection (2 per cent) b/	1,917	38.3	1,600	210	420	210	2,441	48,818	
Riverside forests (70 per cent) c/	51	35.7	1,492	196	392	196	2,275	45,496	
Total			3,092	406	812	406	4,716	94,314	

a/ The area equal to total destruction based on actual area and percentage of trees fallen or swept away was calculated for each area.

b/ Shown on the Mapa del Sistema Nacional de Áreas Protegidas de Nicaragua (SINAP). Protected areas situated in Nicaragua's Central and Pacific regions, limited to the west by the isohyet of rainfall accumulated between 21 and 31 October 1998, equivalent to 40 mm.

c/ The level of human interference in riverside forest is estimated at 30 per cent and does not include the lowest part of the lower river basin and estuary, in view of the enormity of the flooding and the high degree of vulnerability in those stretches. The system is initially estimated at 1,700 km, and 30 m of riverside forest have been considered for the entire length.

A value of US\$38 per hectare/year has been given to dense and logged forest; in other places, carbon fixation in brush areas and swamps has a low value (US\$0.76, which hardly merits consideration), although they are obviously rich in biodiversity (insects, birds, etc.).

ii) Water protection. The qualitative and quantitative protection of forests has different repercussions on their water cycle, depending on physiography, land quality, amount of incoming and outgoing water, seasonal flows, erosion, sedimentation, nutrient flows, etc. The value of brush areas is negligible.

iii) Biodiversity protection. Biodiversity provides innumerable benefits for science, recreation, the pharmaceutical industry, pollinating species, insect and pest control, genetic heritage, etc. The time taken for the environment to recover from damage to biodiversity is still not known precisely.

iv) Protection of ecosystems and natural scenic beauty. This category covers numerous subjects: biocenosis protection, ecological processes, corridors, recreation, tourism, etc., and is closely associated with the previous section.

The last important factor in this calculation concerns the intrinsic value of an ecosystem, since it is what provides environmental services. Damaged forests are considered a lost service, at least in the amount that will no longer be earned until the ecosystem returns to full production.

f) Short-term projection

If human activities that make use of the environment are carried out without taking into account their possible adverse consequences on natural resources, they will almost certainly affect the stability or sustainability of natural resources by making them more susceptible to alteration and destruction when the environment suffers the impact of a natural disaster. In other words, human technological activities can easily worsen the effects of natural disasters. Moreover, if human settlements are not planned, do not take into consideration land-use management, prevailing biophysical factors and the risk involved in settling in high-risk areas, vulnerability increases in direct proportion to the lack of foresight.

For example, a basin that has been placed under strain through construction, road building, extensive farming, logging in natural forests, etc. will be unable to absorb exceptional, prolonged amounts of rainfall as well as it would under conditions of controlled and planned use. Water flows will be lower than their natural minimum during the dry season and rise excessively when it rains, even when there are no extraordinary weather patterns. If the dry season lasts longer than usual, groundwater storage will be insufficient; conversely, when there are large amounts of rainfall, the water flowing through the destabilised basin will be excessive. Either situation can be disastrous.

Another example is excessive population growth, a factor that heightens the impact of any disaster when a human settlement is located in an unstable area that can be devastated by the effects of exceptional natural phenomena. Here the consequences of a natural impact are multiplied by man's alteration of environmental conditions, by the precarious living conditions of victims (such as poorly constructed housing built on slopes subject to landslides), and by causes stemming from a lack of foresight, management and social betterment.

Urban planning, land-use management, land conservation measures, environmental restoration, structural prevention measures for roads, bridges, reservoirs and other works, and any other technical measures designed to change or improve a natural setting within a framework of sound and respectful use of the environment and the laws of nature are certain to improve the quality of life through sustainable development. These aims require scientific research, databases on natural phenomena and early-detection measures whenever possible, as well as continuous education to create awareness of environmental management in society and provide an orderly response to natural disasters. These actions are in fact long-term preventive measures and will help to streamline efforts and improve coordination during the initial stages of an emergency, particularly if the country has good warning and civil-defence mechanisms.

Measures taken during the reconstruction stage following a natural disaster should be added to everyday conservation activities, so as to achieve an optimum approach to sustainable development.

Government and international agencies have stated the need for a change of attitude in dealing with natural disasters, focusing on disaster prevention, reduction of vulnerability and early warning. The International Decade for Natural Disaster Reduction (thus declared for the nineties by the United Nations General Assembly) has undertaken the task of incorporating multidisciplinary approaches in order to gain further understanding of the actions needed to deal with these phenomena and reduce negative effects through prevention.

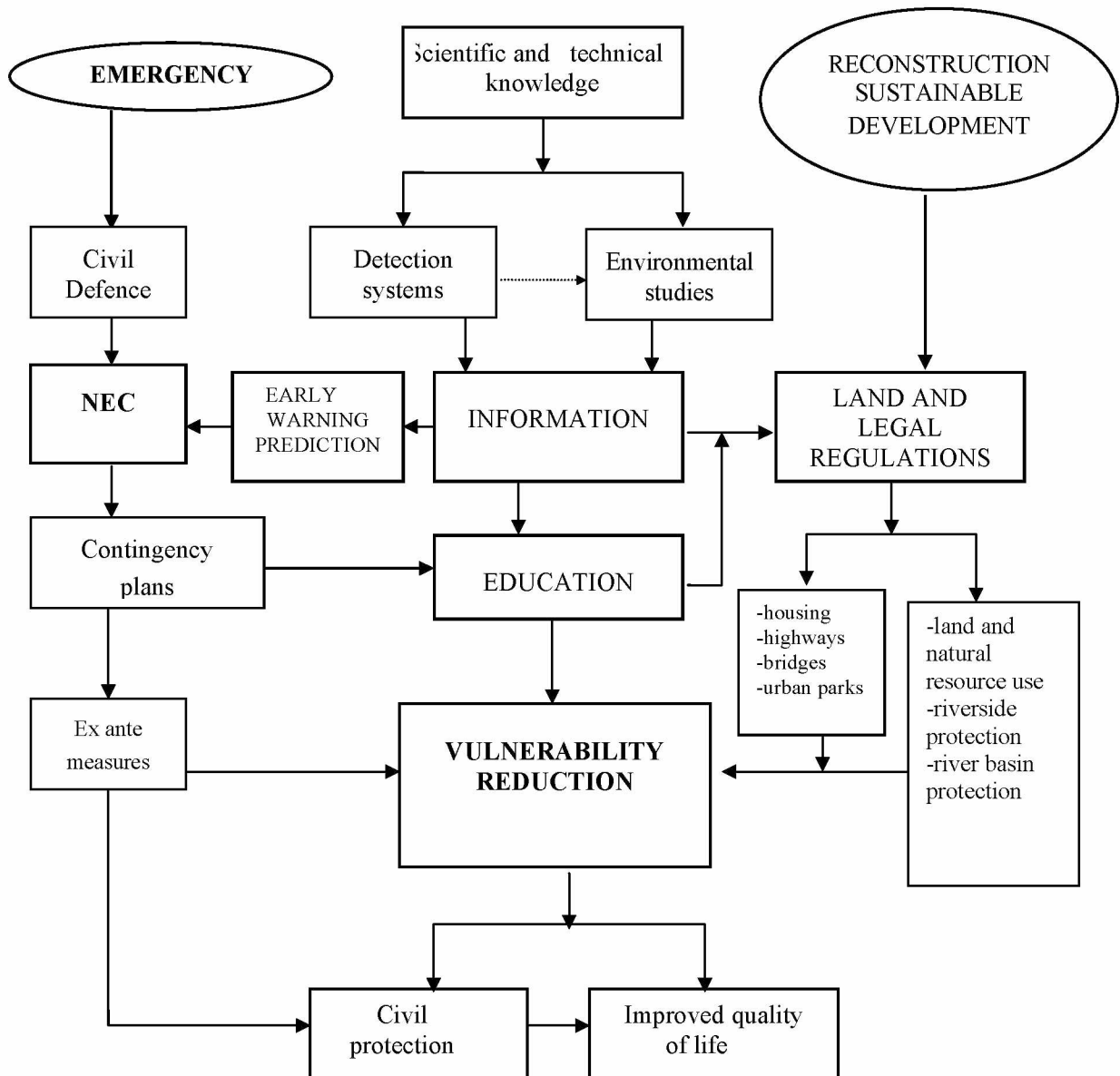
5. Summary of damage

In keeping with the calculations presented in the preceding sections, it is estimated that hurricane Mitch caused total damages amounting to US\$988 million, of which 562 million correspond to direct damage. The overall amount is equivalent to 45 per cent of Nicaragua's GDP. Partial or total damage to infrastructure should be rebuilt or repaired as soon as possible to prevent the country's economic-growth and social-development capacity from encountering stumbling blocks in the medium term. As previously stated, the reconstruction should be undertaken from the standpoint of improvement and disaster prevention and mitigation.

Damage in social sectors accounts for 27 per cent of total damages, infrastructure 34 per cent and the productive sectors 37 per cent; the remainder corresponds to environmental damage. In the productive sectors, most of the damage was to the primary sector, mainly agriculture, which in addition has a strong impact on the country's balance of payments due to a larger amount of imports and lower exports of around US\$98.5 million during the 1998-1999 biennium.

Figure 3

POSITIVE LINKAGE FOR INFORMATION, REACTION AND DEVELOPMENT PROCESSES TO REDUCE VULNERABILITY AND PROMOTE SUSTAINABLE DEVELOPMENT



Losses in the infrastructure sector (US\$340 million) can basically be explained by damaged roads and bridges. Although damages to the social sectors are relatively minor, the unmeasured effects on the welfare of people who lost their homes, livelihood, etc. must be taken into account, i.e., in qualitative terms, the harm caused to the social sectors has a special significance which should be borne in mind upon embarking on the rehabilitation and reconstruction of the country.

Table 28 includes a column on the cost of reconstruction according to Nicaraguan government estimates.³⁶ In addition to the sectors for which ECLAC prepared damage assessments, certain complementary activities not taken into account in ECLAC estimates were also included, since the government considers them essential to the country's reconstruction and transformation. This process will extend over a period of five years, but the greatest efforts will be made in 1999 and 2000 in view of the urgency of undertaking the reconstruction as quickly as possible.³⁷ In fact, of the total financing needs, which amount to US\$1.3365 billion, almost half is expected to be applied in the first two years.

In regard to housing, an investment of US\$154.4 million has been calculated, which is lower than ECLAC estimates, since the government programme envisages a component of owner-built housing which substantially lowers costs in comparison with market prices. Priority action is required in rural and semi-urban areas in the northern, western and Atlantic regions of the country. An estimated US\$43.3 million dollars is needed in the education sector to rehabilitate 512 damaged or destroyed schools. This figure includes replacement of furnishings, textbooks and teachers' housing, among other outlays. The process of rehabilitating and rebuilding affected health care units involves an investment of US\$35.4 million, which includes equipping a hospital and health care centres and stations, as well as campaigns to monitor and control epidemics, and environmental and food security. The proposal is for these actions to be carried out in 1999-2000.

In the infrastructure sectors the hurricane's most serious effects were concentrated in highways and bridges, and therefore substantial amounts of resources are required to put them into service and improve them, since Mitch worsened the deterioration that already existed in some highways and unpaved roads. An estimated total of US\$464.8 million is needed to rehabilitate and rebuild 1,299 km of paved highways and 4,396 km of unpaved roads. Priority will be given to sections of the Pan American highway and trunk roads serving important cities. A total of US\$55.7 million has been estimated to repair 1,900 linear metres of damaged bridges. It should be pointed out that infrastructure investment projects also include complementary costs amounting to US\$283 million which correspond to investments to maintain the road system with the same safety and quality characteristics as the rebuilt highways.

Reconstruction of damages to the productive sectors —the most affected being agriculture— involves investments of US\$196.5 million dollars, which includes stock and production losses.

The government's inventory of financial requirements includes a five-year forest rehabilitation plan (US\$39.6 million) for sustainable forest management and development,

³⁶ These estimates do not necessarily coincide with those presented in previous sections, since in certain cases the government includes complementary projects with the idea not only of replacing or rehabilitating what has been damaged, but also of doing so in such a way that assets are significantly improved in terms of sustainability, prevention and mitigation.

³⁷ For a description of financing needs and the methodology used to calculate reconstruction and transformation costs, see Government of Nicaragua, *Inventario preliminar de los requerimientos para la reconstrucción y transformación del país 1999-2000*, Managua, 10 December 1998.

reforestation of watersheds, development of agroforestry and grazing systems in livestock-raising areas, and recovery of watersheds for irrigation, energy development and drinking-water supply.

A complementary social program aims to generate 20,000 jobs for six months to support rehabilitation and reconstruction tasks, which would involve an outlay of US\$4.4 million dollars. Investment funds amounting to US\$727,000 have been envisaged for the Nicaraguan Institute of Territorial Studies (INETER) to improve working conditions and equipment in meteorological, hydrometric and geophysical stations, and finally, a total of US\$12.5 million would be spent on projects headed by the Municipal Development Institute (INIFOM) to rehabilitate bridges, roads, streets, parks, children's diners and other works.

The appendix contains project profiles that include a time-frame for the reconstruction efforts, which is important in that this relates to the country's capacity to absorb and manage resources.

Table 28

NICARAGUA: SUMMARY OF DAMAGES AND COST OF RECONSTRUCTION

(Millions of dollars)

	Direct damage	Indirect damage	Total damage	Cost of reconstruction a/	Imported component
Total	562.4	425.3	987.7	1,336.5	
Social sectors	225.5	44.4	269.9	233.1	
Housing	182.9	12.7	195.6	154.4	85.0
Health	25.0	28.1	53.1	35.4	23.7
Education	17.6	3.6	21.3	43.3	13.3
Infrastructure	182.9	157.3	340.2	867.3	
Transport and communications	159.0	147.2	306.3	832.2	96.2
Water and sanitation	11.0	3.1	14.1	9.1	
Electricity	12.9	7.0	19.9	26.0	
Productive sectors	145.4	223.6	369.0	196.5	
Agriculture and fisheries	128.3	56.9	185.2	183.3	
Manufacturing b/	14.2	81.7	95.9	3.5	
Commerce, restaurants, hotels	2.9	85.0	87.9	9.7	
Environment	8.6	...	8.6	39.6 c/	

Source: Tables 6 to 27 and Government of Nicaragua, *Inventario preliminar de requerimientos de la reconstrucción y transformación del país 1999-2000*, Managua, 10 December 1998.

a/ These costs are calculated on the basis of Nicaraguan government estimates through the Central Bank.

b/ Includes mining.

c/ Includes reforestation and watershed-management projects and development of agroforestry systems, among others.

III. OVERALL EFFECTS OF THE DAMAGE

1. Nicaragua's economic evolution before the disaster

a) The situation in 1997

In 1997 GDP grew by 5 per cent, the highest growth rate this decade.³⁸ Open unemployment fell and average annual inflation dropped to 9.2 per cent, at the cost of an increase in the balance-of-payments current account deficit, which can in turn be accounted for by a larger cumulative deficit in the trade balance of goods.

GDP growth was based on an increase in commodity production (7.2 per cent) and in basic services (5.4 per cent). Industrial GDP rose at a rate of 3.1 per cent, lower than the GDP growth rate. The construction sector has been the main beneficiary of foreign investment and capital repatriation. The most important economic policy achievement in 1997 was a return to single-digit inflation, with an average rate of 9.2 per cent and a December-December variation of 7.3 per cent. The commodity trade deficit rose 45.4 per cent due to faster growth in imports (23.6 per cent) than in exports (11.3 per cent).

One of the most important events of 1997 was the signing of the second Enhanced Structural Adjustment Finance Programme (ESAF) with the IMF, designed to directly support the balance of payments. The signing of the ESAF is a precondition for status as a Highly Indebted Poor Country (HIPC), in line with the World Bank and IMF initiative.³⁹

b) Economic activity in 1998

Despite the trend towards reactivation, the economy is expected to end 1998 with GDP growth of 4 to 4.5 per cent (the Bank of Nicaragua's estimate is 3.6 per cent), down from the 6 per cent rate forecast by the authorities at the beginning of the year. However, the year-end growth rate will depend on a combination of factors, including the reactivation of sectors like construction, the execution and absorption capacity of national institutions, and the prompt recovery and reactivation of the farming sector.

The reduced growth rate is largely attributable to the impact of hurricane Mitch, considered the worst natural disaster in the country's history. In this context, inflation practically doubled to 15 per cent due to the initial effects of adverse weather conditions in the first half of the year and later because of the impact of the natural disaster in the last two months.

³⁸ See ECLAC (1998), *Nicaragua: Evolución económica durante 1997* (LC/MEX/L.349), July 10.

³⁹ Ibid.

Public finances became much healthier, thanks to higher tax revenue and austerity in current and capital spending. This was not particularly affected by the extra spending in the last two months. Foreign investment continued to flow into the country, shoring up the process of re-monetization and the increase in monetary aggregates, especially foreign currency deposits. The exchange rate maintained its slippage as announced, and the córdoba therefore depreciated in real terms due to the rise in inflation.⁴⁰

To sum up, economic trends towards the end of October were as follows: the farming sector was expected to grow an estimated 3.4 per cent, down from 8.9 per cent the previous year, mainly due to agricultural losses in the last quarter. Losses in harvests of annual crops (bananas, sesame, soybeans, peanuts and tobacco) account for around 43 per cent of all agricultural losses; basic grains (rice, beans, maize, and sorghum), 29.6 per cent; coffee and sugar cane 13 per cent, and other agricultural products (fruits and vegetables) 14.4 per cent. Growth in farmed shrimp was down from 11 to 1.5 per cent, with major damage to this industry's capital assets.⁴¹

Industrial activity grew by only 1.8 per cent, below the 2.8 per cent expected, partly due to the supply problems in agricultural and fisheries inputs that affected food processing. Construction grew an estimated 6.6 per cent, partly thanks to the jump recorded in September and partly due to the reconstruction work in the last two months.

Services grew by 3.3 per cent, lower than the 4.1 per cent forecast for the year as a whole. This was due to lost infrastructure, mainly roads, agricultural and industrial facilities, and interrupted power generation and telecommunications.

c) Outlook for 1999

If sufficient funds are raised in the short term to return the hectares planted to September 1998 levels, the economy could grow by as much as 5.1 per cent in 1999. This assessment does not include a formal reconstruction effort, for that depends on existing execution capacity, the economy's overall absorption level, and the level of international aid.

If conditions are favourable, primary activities could expand by 8.3 per cent, driven mainly by the reactivation in agriculture, where output could grow by 12 per cent. This expansion could have a positive impact on the growth of secondary activities (forecast at 4 per cent), particularly in construction and industrial output (especially food processing). Tertiary activities are expected to increase their growth rate by 3.6 per cent due to the reactivation of trade, transport and communications and the recovery in the energy sector (see Table 29).

⁴⁰ See ECLAC, *Nicaragua: Balance preliminar de la economía, 1998*.

⁴¹ Ibid.

Table 29

NICARAGUA: ECONOMIC OUTLOOK 1998-1999

(Growth rates)

Variables	1998		1999	
	Before Mitch	After Mitch	Before Mitch	After Mitch
Gross domestic product	6.0	4-4.5	5.7	5.1
Primary activities	9.6	3.4-4.0	7.7	8.3
Agriculture	14.8	6.0-7.0	9.8	12.4
Livestock-raising	-1.8	-1.8	3.2	3.2
Fisheries	11.0	1.5	3.5	-12.1
Forestry	3.3	3.3	2.5	2.5
Secondary activities	5.4	4.4	6.5	4.1-5.0
Manufacturing industry	2.8	1.8	3.8	1.3-2.0
Construction	6.6	6.6	10.7	10.7-12.5
Mining	47.5	44.1	30.2	20.7
Tertiary activities	4.1	3.3	3.8	3.6
Trade	5.6	4.5	5.6	5.2
General government	0.4	0.4	-2.1	-2.1
Transport and communications	5.6	4.5	5.6	5.2
Banks and insurance	4.6	4.6	4.8	4.0
Energy and drinking water	1.5	1.0	2.0	2.0
Housing	4.2	2.5	4.6	4.6
Other services	4.6	3.9	4.6	4.4
Average inflation		12.5		12.4
Cumulative inflation		15.0		10.0
Gap to be financed in the balance of payments (in dollars)	Donations and loans: 30 million Adjustment in reserves: 20 million Total 50 million		Donations and loans: 95 million. Private-sector capital inflows (insurance): 25 million. Adjustment in reserves: 30 million TOTAL 150 million	

Source: ECLAC, based on official figures and own calculations.

2. General economic effects of the disaster

On the macroeconomic level, hurricane Mitch affected the behaviour of the main aggregate variables and the productive sector's performance. According to different sectorial assessments, infrastructure and the agricultural sector absorbed most of the damage.

On the supply side, the disaster had a negative effect on the export sector. However, international donations and inflows of private funds from abroad helped to finance a large current account deficit. The balance-of-payments gap to be financed can thus be expected to widen in 1999 and 2000, and reach seven GDP percentage points. Likewise, a shortage of basic grains, price rises and higher rural unemployment were reported.

On the demand side, imminent increases in public spending to cover reconstruction activities and the contraction of tax revenue due to companies' destruction or closure, push up the non-financial public sector deficit, reduce debt servicing capacity and hamper economic reactivation.

a) The effects on economic growth

Economic growth in 1998 will probably register between 4 and 4.5 per cent, due to the combined effect of the reactivation of the agricultural export sector and the performance of manufacturing, construction and mining. The hurricane's most marked effects will be reflected economically in 1999 and 2000.

According to Bank of Nicaragua estimates, expected 1999 GDP growth prior to the disaster was 5.7 per cent; now, with the effects of Mitch, forecasts stand at 5.1 per cent, with an anticipated contraction in fisheries, manufacturing, and mining.

b) Effects on public finances

Based on the 1997 tax reform and greater efficiency in tax management, the central government's deficit should drop from 1.5 per cent to an estimated 0.14 per cent of GDP, in spite of an unforeseen spending increase as a result of the wage rise in the health sector and the postponement of planned sales of state-owned companies. No significant effects on public finances are expected in 1998 from hurricane Mitch.

The government's fiscal programme sought to increase public spending and improve public sector efficiency by modernising State institutions and accelerating the privatisation of public utilities, such as electricity and telecommunications. Public finances are also expected to improve as a result of the reform of the banking sector, including state banks, which is already under way. However, as stated above, public-spending levels could rise following new demands in the reconstruction process in 1999, along with a temporary reduction in tax revenue due to lower economic activity, and the 1999 deficit could grow.

c) Effects on the balance of payments

In 1998 the current account deficit fell from US\$814 to 805 million, due mainly to the reduction in interest paid and the increase in remittances from abroad. Although foreign donations and investment continued to grow (US\$200 and 184 million, respectively), the current account deficit was partly financed with international reserves.

The trade deficit in goods grew by US\$110 million (16.5 per cent more than in 1997) due to a reduction in exports (13 per cent) and a slight increase in imports (1.4 per cent). Exports of goods reached US\$612.7 million, compared to 704 million in 1997, due to the significant drop (41 per cent) in non-traditional exports, which in 1997 accounted for more than 50 per cent of all exports despite the growth of traditional exports, mainly coffee, shrimp, lobster, and molasses.

Imports, on the other hand, totalled US\$1.4792 billion, a moderate increase over the previous year. Consumer imports grew, especially durables (14.3 per cent), as did capital goods (3 per cent). In contrast, imports of intermediate goods fell by almost 5 per cent as a result of lower outlays on oil (-26 per cent), since purchases of raw materials for industry and construction actually increased.

The outlook for 1998, after the hurricane, reveals a gap in the balance of payments of around US\$50 million; 30 million will be financed with donations and loans and the remaining 20 million with adjustments in reserves. In 1999 the gap could triple, reaching US\$150 million, 95 million of which would be financed with loans and donations, 25 million with private-sector capital inflows (through insurance), and the remaining 30 million from adjustments in reserves. For 2000, the gap in the balance of payments could increase to US\$155 million, of which an estimated 35 million could be financed from capital inflows; and the remainder from an as yet unidentified financing source. Table 30 shows the different scenarios for 1998-2000 before and after the disaster.

d) Effects on other variables

Exchange policy was maintained in 1998 with a daily slippage against the dollar and a 12 per cent devaluation in nominal terms. The government had announced a reduction in slippage to 8 per cent a year. This was not possible, however, due to increased inflation and the fall in exports, and the consequent loss of foreign currency. In any case, Mitch did not alter the course of the exchange policy. For 1999, a nominal devaluation of between 10 and 11 per cent could be expected.

Nicaragua met its foreign debt servicing obligations in 1998. In late September the debt stood at US\$6,491 million dollars, comprised as follows: 1,219 million with the Paris Club; 212 million with commercial banks; 1,084 with Eastern Europe; 2,033 with Latin America and other governments; 1,811 million with multilateral financial agencies; and 132 million with suppliers. Given Nicaragua's level of indebtedness, which could increase on account of new loans from international financial agencies for the reconstruction, it is essential to design new mechanisms to renegotiate existing debt and support the HIPC scheme.

e) Consequences for monetary and financial policy

A restrictive monetary policy was adopted to neutralise the considerable increase in bank liquidity, due to capital inflows from abroad. Nevertheless, the increase was lower than in 1997; liquidity grew mainly as a result of an increase in foreign-currency deposits, now more than 65 per cent of the money supply.

Table 30

NICARAGUA: SUMMARY OF THE BALANCE OF PAYMENTS, 1998-2000

(Millions of dollars)

Item	1998		1999			2000		
	Before Mitch	After Mitch	Before Mitch	After Mitch	Before Mitch	After Mitch	Mitch	
Current account	-611	-661	-555	-706	-589		-744	
Goods	-568	-637	-554	-765	-624		-786	
Exports	667	617	685	601	750		675	
Imports	-1,235	-1,254	-1,239	-1,366	-1,374		-1,461	
Services and remittances (net)	-43	-24	-1	59	35		42	
Capital account	495	525	540	559	519		554	
Official capital (net)	305	335	303	297	325		325	
Private capital	190	190	237	262	194		229	
Overall balance	-116	-136	-15	-147	-70		-190	
Net international reserves	-30	-10	-115	-85	-60		-60	
IMF, net (proposed)	22	22	64	112	39		55	
Reprogramming	145	146	131	131	129		129	
Gap to be financed after Mitch		50		149			155	
Identified financing		50		49			35	
Private sector		0		25			35	
Official capital		30		-6			0	
Change in reserves		20		30			0	
Unidentified financing		0		100			120	

Source: IMF and ECLAC, based on official figures and own calculations.

The issuing of Negotiable Investment Certificates (CENIS) in 1998 made it possible to control the amounts sold and reduce the discount rate, leading to a slight fall in interest rates. Up to September, borrowing rates for local-currency deposits hovered around 13 per cent and lending rates were approximately 21 per cent. For foreign-currency deposits, borrowing rates fell slightly from 9.9 to 9.3 per cent and lending rates from 22 to 21.7 per cent in the same period.

One possible consequence of the hurricane could be an increase in due portfolios owing to the impact on production and the inability of some businessmen to meet their financial costs.

f) Effects on inflation, pay, and employment

The inflation rate climbed to almost 15 per cent, after expectations of around 10 per cent most of the year. First, the El Niño phenomenon led to shortages of farm produce, which raised inflation in the first half of the year. Then the effects of hurricane Mitch led to a sharp upturn in inflation during the first half of November as a result of price increases for agricultural products. In 1999 average inflation can be expected to register between 12 and 13 per cent, with accumulated inflation at 10 per cent.

Wage policy remained unchanged from the year before, so nominal average wages practically stood still; consequently, average real wages dropped.

By the end of 1998 the open unemployment rate is expected to rise sharply, although this could be partly offset by initial rehabilitation and reconstruction work. However, to date there are no reliable assessments. Rural unemployment could have serious implications for the success of social policy.

IV. GUIDELINES FOR A REHABILITATION AND RECONSTRUCTION PROGRAMME

Although different emphasis is required in each country depending the type of damage and the vulnerability existing prior to the disaster, the devastating consequences of hurricane Mitch in Central America call for the adoption of new rehabilitation and reconstruction criteria to prevent the inhabitants of the region from being as exposed to damages as they were in this case.

It will be important to set priorities and consider the time frame and the necessary changes to design, construction and land use regulations in keeping with the situation in each country. In any event, reconstruction should be carried out on the basis of a significant qualitative improvement over the previous circumstances. Another fundamental factor regarding the viability of any reconstruction process is a country's internal capacity to conduct the process and programme it so that national capacity is not exceeded. Each country must decide on the time frame and priority of its actions and strike a balance between the urgent task of replacing what has been lost and its capacity to accomplish such works.

Once the emergency phase is over, rehabilitation and reconstruction programmes must be established in order to restore the facilities, assets and services damaged or destroyed by the devastating effects of the hurricane in each country. The content, priorities and scope of such programmes must necessarily be a national, sovereign decision of each country and respond as much to the magnitude of the damages as to a country's pre-existing conditions and economic and social policy criteria. Its foreign debt commitments and stabilisation policies must also be taken into account on determining the content, scope and scheduling of the programmes.

On addressing this topic, it is important to compile and analyse extensive background data so as to draw up investment and management programmes that will make optimum use of available resources while following the country's economic and social development objectives.

One factor to be borne in mind at this stage is that reconstruction cannot be carried out by a country on its own; it requires international cooperation. Each country's rehabilitation and reconstruction programme must therefore be structured in line with the international community's offers, which are due to take shape within the framework of the special Advisory Group convened by the IDB; after an initial session in December 1998, the Group will meet again to establish the bases for cooperation in reconstruction work. This section was included in this report to provide an idea of the investment projects deemed pertinent for repair and reconstruction, but are merely profiles at this stage. The list of projects neither replaces nor runs counter to the proposals submitted by national authorities to the Advisory Group. In many cases the proposals encompass more than just actions to tackle the damage caused by the hurricane, since each country's development strategy must also establish bases for sustained, less vulnerable development with growth, including components to reduce vulnerability to natural disasters and promote a more effective, competitive integration into a globalise world.

Consequently, rather than focusing on a national strategy —which, as stated above, must be devised by each country— the purpose of the following sections is to develop the guiding principles

behind the generation of projects and the basic guidelines to be followed on preparing rehabilitation and reconstruction plans and programmes. We believe this could be of assistance to national authorities on defining their strategy, which should be devised on the basis of consensus-reaching with society, particularly civil society, economic players, academic and non-governmental organisations and local authorities, among others.

1. Project generation

The main aims of the proposed projects are to attend to victims of the disaster, rebuild and improve destroyed and damaged assets, re-establish productive and export processes, and in general help to reactivate the process of economic and social development.

The initiatives presented here are a list of investment projects currently being developed as profiles to provide basic information on their aims, scope, expected results, activities and tasks to be carried out, investment to be made, expected financing, and the special characteristics of each project.

Each profile will subsequently be analysed in depth in order to draw up definitive projects and prioritise them so as to design repair and reconstruction programmes. This will make it possible firstly to improve the living conditions of disaster victims and recover the material and economic losses stemming from hurricane Mitch's devastating effects; secondly to enhance the design standards in use prior to the disaster, and thirdly to carry out works and establish mechanisms to control and mitigate the enormous damage caused by hurricanes and floods.

It should be mentioned in that regard that the main physical damage caused by the hurricane—aside from its tragic aftermath of death and suffering—was to infrastructure and agriculture and livestock production facilities. The after-effects are not limited to such losses, however, since the initial damages unleashed a multiplier effect with serious economic and social consequences; rural and semiurban population groups lost their housing, livelihoods and access to public services, and were subjected to other equally serious hardships stemming from environmental and sanitary crises, in addition to food shortages.

As a result, many victims that were already poor prior to the hurricane were left in conditions of extreme poverty. Government and international community support should therefore focus on addressing the problems described above and in preceding chapters.

To carry out the projects efficiently—once they have been definitively assessed and ranked—it will be essential to develop execution programmes so as to bring resources into line with needs. It would first be advisable to draw up a rehabilitation programme to deal with the emergency situations facing disaster victims, followed by a reconstruction programme to overcome economic and social adversities, restore and improve infrastructure and production facilities, and prevent or reduce the effects of similar events.

2. Rehabilitation stage

This initial phase will focus on normalising the living conditions of victims—while also reactivating the economy—by meeting their vital needs and delivering basic services. The victims' food, health

care and employment needs must take priority, and should be met expeditiously through the following actions:

- a) **Provision of food.**
- b) Provision of potable water.
- c) Medical attention to the wounded.
- d) Control and thorough prevention of diseases, particularly contagious diseases.
- e) Housing repair.
- f) Establishment, albeit provisional, of sanitation services.
- g) Generation of productive jobs.
- h) Provisional repair of access roads to affected areas.
- i) Supply of seeds and basic inputs to affected small and medium-scale farmers, along with financial support and soft loans.
- j) Repair of different types of infrastructure.

The suggested rehabilitation programme should be implemented as swiftly as possible, partly to meet vital and basic needs that are an ethical imperative, and partly due to the need to control and check the spread of diseases and epidemics in order to prevent hardships from becoming more acute. It is important to remember that the rainy season begins in April, so the rehabilitation programme must be concluded by that time.

Timely implementation of the above actions will bring the victims' living conditions back to relative normality and help to reactivate the country's economy.

3. Reconstruction stage

This is the most crucial stage in economic and social terms, since it will lead to the full re-establishment of normal living conditions and the country's economic and social development momentum prior to hurricane Mitch.

This phase will bring about the implementation of specific projects —duly assessed, ranked, and coordinated— in line with available resources, i.e., fully programmed and provided for in the reconstruction programme, which should be worked out as soon as possible.

The main aim of the reconstruction stage and the projects thereof is to effectively overcome the direct and indirect problems stemming from the hurricane, although hurricane-prevention infrastructure and management deficiencies and flaws will also have to be addressed. For instance, the effects of the hurricane showed that a number of structures were unsafe and that other types of

infrastructure, such as roads, bridges, hospitals, potable water systems, schools, etc. were inappropriately located; there is also an absence of watershed, infrastructure and environmental management schemes, and a lack of natural disaster prevention and control facilities —particularly for floods— to manage and mitigate their after-effects.

Moreover, on designing the reconstruction programme it will be important to take into account macroeconomic principles so as to prevent the undesirable consequences of overly ambitious reconstruction programmes. These include inflation, divergences in the exchange rate or in the supply and demand of certain resources such as labour and building materials, or undesired, disorderly migration.

There follows a summary of the basic considerations that should guide the process of designing the reconstruction programme.

a) Restoring lost support infrastructure

This mainly implies building the infrastructure needed to conduct economic and social activities, and includes roads and bridges, potable water and sewerage systems, power networks, and other lesser works.

It should be borne in mind that current conditions call for new approaches in designing infrastructure works. The aim is not merely to replace the facilities in existence prior to the floods, but to take advantage of the opportunity to modernise infrastructure by building it to meet current and future demand, incorporating recent technological developments, and constructing on sites that will minimise the after-effects of future disasters; the idea is to construct modern, adequate, efficient and safe structures.

For example, numerous bridges are located in places where they can be swept away by high water flows; this risk can be reduced by building them on higher ground, which in turn means rerouting roads. Similarly, many works in existence prior to the hurricane were built many years ago and were defectively laid out, whereas recent technological developments have reduced costs, thus providing the possibility of building works of much greater magnitude. Moreover, many facilities in existence prior to the hurricane already lacked the capacity to meet current demand.

It will also be important to establish alternate routes to prevent similar events from paralysing regions left inaccessible, or from leaving productive areas without access to the capital or export-shipping ports. In short, the country's highway system needs to be expanded.

b) Replacing lost social infrastructure

This guideline is similar to the one above and focuses on providing the population with basic services and facilities such as housing, hospitals and schools. As above, improving design and capacity will be an important consideration, particularly as regards hospital and school services.

Ironically, natural disasters often damage or destroy the facilities needed to deal with emergency situations, and this must be taken into account in the reconstruction programme. New hospitals should be built in safe, risk-free locations, since their services are essential in emergency situations. Schools must be made safe for the same reason, since they are often turned into shelters for disaster victims.

It is a known fact that many facilities were already overburdened prior to the hurricane, so it will be necessary to increase their capacity. Technological improvements must also be made, particularly in hospitals.

The main consideration in regard to the housing sector is to extend support to the most disadvantaged groups by securing them relocation and housing to meet their basic needs. This can be achieved through donations, material contributions, "work for food" programmes, and other such mechanisms. Less needy groups can be given support in the form of soft loans.

c) Re-establishing agricultural activities

The hurricane led to the partial or total loss of many agricultural assets; much cropland (bananas, sugar cane, palm, pineapple, grains, etc.) became unusable. Earth dikes, feeder roads and farm roads were seriously damaged by overflowing rivers, mud and debris such as large rocks, tree trunks and sand. Many rivers are full of silt, stones, trees and other material swept along by the current, and large deposits have formed where rivers meet the ocean. The living standards of farmers have also deteriorated significantly, since many lost their livelihood and housing.

Investment should therefore focus on reclaiming farmland and restoring production infrastructure —irrigation and drainage systems, fruit packaging and canning facilities, etc.— and on facilitating fruit crops.

d) Food support

One of the most severe consequences of the hurricane is that many subsistence farmers lost their crops, and their land will remain unproductive for many years. This group lost their housing, livelihood and income. Semiurban and low-income population groups are in a similar position, since they also lost their homes and jobs. It is therefore imperative to support them, especially by satisfying their basic needs.

As suggested above, "work for food" plans could be put into practice in view of funding shortages and the need for efficiency and equity. People working to improve their housing or fields could thus be given food in exchange for work performed in their own benefit.

e) Generating productive jobs

This is a very important social consideration, since one of the worst indirect consequences of the hurricane was the loss of thousands of jobs.

The main idea is to create efficient jobs in productive activities, among them the construction of support infrastructure, community facilities and housing, and agricultural jobs.

Programming of construction works and of work in general should therefore focus on making intensive use of unemployed workers, in accordance with their skills.

f) Control of epidemic risks

The aim here is to make every effort to provide medical care to infected patients and check the spread of diseases. Cases of cholera, malaria, rabies, hepatitis and classic dengue, among others, have been reported in most disaster areas, so there is risk that contagious diseases will spread.

g) Waterbasin management and environmental conservation

There are some initiatives related to this issue aiming to the rational and efficient usage of existing natural resources and to environmental management works. Thus, there is a need for improving the information network, strengthening the protected areas system, adopting proper management and sustainable development techniques on the country's waterbasins, strengthening those institutions in charge of sanitation and urban solid waste management services, controlling environmental pollution, promoting reforestation in wide areas and training public servants and farmers on reforestation methods and advantages.

h) Flood control and prevention

The countries of Central America have been suffering the consequences of natural disasters for many years. However, the frequency and intensity of such disasters have increased to an alarming degree in recent years, and the material damage and victims are higher every time.

In the past large sums were not invested in disaster prevention, partly because statistical records showed disasters to be relatively infrequent, so prevention measures were not considered a worthwhile investment.

The situation today has obviously changed, since hurricanes are more frequent (Joan, Georges, Cesar, and Mitch among them), as are forest fires, the effects of El Niño, etc. It would therefore be advisable to carry out an in-depth study of this complex subject so as to design policies to prevent natural disasters, particularly floods.

A fundamental aim would be to ensure that prevention policies contain appropriate guidelines to regulate and manage a country's natural resources.

Another would be to identify socially beneficial investment options to prevent or reduce the costly consequences of natural disasters. Studies should focus on the type, location and scale of infrastructure designed for that purpose.

In keeping with that approach, it will be important to conduct studies in the following fields: identifying which areas are prone to disasters (floods, landslides, droughts, fires and earthquakes), establishing land use management measures to prevent settlements and construction on land frequently subject to the effects of natural disasters, designing infrastructure to control the forces of nature (drainage, river dikes, dams, etc.), establishing appropriate design and layout criteria for civil works threatened by river overflows and floods (road routing, bridges, potable water and sewerage systems, public services works , etc.), restructuring and extending the highway system to provide alternative routes, etc.

It is worth noting that reservoir construction is becoming increasingly easier to justify, partly because natural disasters are occurring more frequently, and partly because reservoirs can be used for several purposes by different sectors. For example, a flood-prevention reservoir can also be used for irrigation during the dry season, and for interannual regulation of the El Niño and La Niña phenomena, among others. Moreover, since natural disasters are becoming more frequent and more intense, they are leading to ever higher losses, so one of the benefits of multipurpose infrastructure works is that they reduce building costs.

i) Strengthening national emergency or civil defence committees

In view of the recurrence of disasters and the experience gained as a result of hurricane Mitch, it will be essential to strengthen national emergency and civil defence institutions, not only by increasing their budgets but also by adapting their regulatory frameworks whenever necessary. These institutions should also establish regional links and an effective network for early warning and cooperation purposes; existing regional institutions as CEPREDENAC could extend support in this regard.

Appendix

PROJECT PROFILES FOR THE REHABILITATION AND
RECONSTRUCTION STAGE

Table 1

NICARAGUA: LIST OF PROJECTS

Sector	Title of project	Investment required (Millions of dollars)
1. Farming		
1.1	Reactivation of basic grain cultivation by small-scale farmers	36.0
1.2	Recovery of livestock raising	20.0
1.3	Recovery of banana farming	1.5
1.4	Reactivation of fruit and sustainable agricultural restructuring	45.0
1.5	Reactivation of fisheries	20.0
1.6	Training on reforestation for government officials, technicians and farmers	33.0
1.7	Pilot reforestation programme	3.0
1.8	Reactivation of coffee	20.0
1.9	Reconstruction of irrigation and drainage systems	33.0
1.10	National reforestation and forestry management programme	30.0
	Sectorial subtotal	241.5
2. Technical assistance		
2.1	Strengthening the management capacity of government officials in executing construction projects	0.3
2.2	Design of disaster-prevention policies and identification of investments	1.0
2.3	Programming of works	0.1
	Sectorial subtotal	1.4
3. Education		
3.1	Reconstruction of damaged schools	24.0
3.2	Repair, extension and improvement of damaged education facilities	16.2
3.3	Equipment recovery and natural disaster preparedness training	2.0
3.4	Recovery and restoration of cultural and recreational centres	1.3
3.5	Recovery of textbooks and furnishings	1.7
	Sectorial subtotal	45.2

/Cont.

Table 1 (Cont.)

Sector	Title of project	Investment required (Millions of dollars)
4. Emergency		
4.1	Resettlement of victims	10.0
4.2	Emergency food assistance for affected families	7.0
4.3	Emergency epidemiological control	10.0
4.4	Emergency vector-control plan for affected communities	2.6
4.5	Traffic rehabilitation on main paved and unpaved roads	20.0
	Sectorial subtotal	49.6
5. Energy		
5.1	Reconstruction of electricity transmission system	2.5
5.2	Rebuilding and extending of electric power distribution systems	7.3
5.3	Rehabilitation of electric power plants	13.6
	Sectorial subtotal	23.4
6. Industry, trade and tourism		
6.1	Rehabilitation and rebuilding of industrial, tourism and business infrastructure	45.0
6.2	Recovery of working capital of businessmen in trade and industry	10.0
	Sectorial subtotal	55.0
7. Environment		
7.1	Study to modernize and strengthen INETER	0.4
7.2	Rehabilitation and strengthening of INETER's hydrometeorological networks	3.0
7.3	Improvement of the National Natural-Resource Information System	0.3
7.4	Strengthening of the National System of Protected Areas	3.0
7.5	Environmental management and sustainable development of river basins	60.0
7.6	Installation of real-time networks	0.6
	Sectorial subtotal	67.3

/Cont.

Table 1 (Cont.)

Sector	Title of project	Investment required (Millions of dollars)
8. Health		
8.1	Reconstruction, rehabilitation and upgrading of primary care infrastructure	27.0
8.2	Hospital preparations to confront natural disasters	2.5
8.3	Development of the health sector's disaster prevention and mitigation capacity	0.7
8.4	Maintenance plan for vector control in affected localities	15.7
	Sectorial subtotal	45.9
9. Sanitation		
9.1	Strengthening of control and monitoring of drinking water quality	1.1
9.2	Sewer rehabilitation and maintenance	2.6
9.3	Rehabilitation of drinking water systems in urban and rural areas	15.6
9.4	Sanitary waste disposal in urban marginalized and rural areas	7.6
9.5	Development of the sector's natural-disaster prevention and mitigation capacity	0.6
	Sectorial subtotal	27.5
10. Transport		
10.1	Engineering studies to rebuild destroyed bridges	0.5
10.2	Engineering studies to rehabilitate damaged paved roads	4.0
10.3	Engineering studies to rehabilitate unpaved roads	1.0
10.4	Engineering studies to rehabilitate partly damaged bridges	0.2
10.5	Reconstruction of unpaved roads	45.0
10.6	Rehabilitation of partly damaged bridges	4.0
10.7	Reconstruction of destroyed road bridges	20.0
10.8	Reconstruction of damaged paved highways	200.0
10.9	Planning and feasibility studies to expand the main highway system and feeder roads	2.5
10.10	Feasibility studies to widen, improve and rebuild the Central American highway	0.9
	Sectorial subtotal	278.1

/Cont.

Table 1 (Cont.)

Sector	Title of project	Investment required (Millions of dollars)
11. Housing		
11.1	Basic studies for the construction of low-cost housing	0.5
11.2	Preliminary studies to repair damaged low-cost housing units	1.0
11.3	Construction of 50,000 destroyed dwellings	300.0
11.4	Repair and improve 94,500 damaged dwellings	56.7
	Sectorial subtotal	358.2
	TOTAL	1,193.1

Nicaragua	No. 1.1																						
Reactivation of basic grain cultivation by small-scale farmers																							
Sector: FARMING	Subsector: BASIC GRAINS																						
<p>Background: Around 60,000 subsistence farmers and small farmers lost their harvests and their income. Many also lost their land.</p>																							
<p>Project objectives: To restart normal farming; covers grains, vegetables, bananas and tubers.</p>																							
<p>Tentative duration: 12 months Estimated starting date: December 1998</p>	<p>National agency in charge: Ministry of Agriculture, Livestock and Forestry.</p>																						
<p>Description of activities and tasks: Procurement of financing and organization of farmer cooperatives and associations that can select beneficiaries and aid distribution. Assignment of land where applicable.</p>																							
<p>Expected results: Small and medium-sized farming will recover output.</p>																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">Total investment required (US\$):</td> <td style="text-align: right;">36,000,000</td> </tr> <tr> <td>• Labour (72,000 person/months)</td> <td style="text-align: right;">21,600,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">7,200,000</td> </tr> <tr> <td>• Imported inputs:</td> <td style="text-align: right;">7,200,000</td> </tr> <tr> <td>Financing (US\$)</td> <td></td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">10,800,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">12,600,000</td> </tr> <tr> <td>• Donation:</td> <td style="text-align: right;">12,600,000</td> </tr> <tr> <td>Potential financing sources:</td> <td></td> </tr> <tr> <td colspan="2">External credit: IDB and CABEL.</td> </tr> <tr> <td colspan="2">Donor: European international agencies.</td> </tr> </table>	Total investment required (US\$):	36,000,000	• Labour (72,000 person/months)	21,600,000	• Domestic inputs:	7,200,000	• Imported inputs:	7,200,000	Financing (US\$)		• Local:	10,800,000	• Foreign:	12,600,000	• Donation:	12,600,000	Potential financing sources:		External credit: IDB and CABEL.		Donor: European international agencies.		<p>Special observations:</p>
Total investment required (US\$):	36,000,000																						
• Labour (72,000 person/months)	21,600,000																						
• Domestic inputs:	7,200,000																						
• Imported inputs:	7,200,000																						
Financing (US\$)																							
• Local:	10,800,000																						
• Foreign:	12,600,000																						
• Donation:	12,600,000																						
Potential financing sources:																							
External credit: IDB and CABEL.																							
Donor: European international agencies.																							

Nicaragua	No. 1.2
Recovery of livestock raising	
Sector: FARMING	Subsector: CATTLE RAISING
Background: 50,000 heads were lost to Mitch, of which 20,000 were beef and dairy cattle.	
Project objectives: Recover the subsector's productive capacity.	

Tentative duration: 24 months Estimated starting date: January 1999	National agency in charge: Ministry of Agriculture, Livestock and Forestry.
--	--

Description of activities and tasks: Purchase of 20,000 breeding cows (local or imported) and distribution among affected cattle farmers through long-term financing; reconstruction of cattle management infrastructure.

Expected results: Recovery of the sector's productive capacity, exports and domestic meat and dairy supplies.
--

Total investment required (US\$): 20,000,000 <ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ Financing (US\$) <ul style="list-style-type: none"> • Local: 4,000,000 • Foreign: 16,000,000 • Donation: _____ Potential financing sources: External credit: National financial system, IDB and CABEL. Donor:	Special observations:
--	------------------------------

Nicaragua	No. 1.3																						
Recovery of banana farming																							
Sector: FARMING	Subsector: EXPORT																						
Background: Banana farmers in the department of León lost 200 hectares of plantations to flooding. The crop was lost and farmers will be unable to repay their loans.																							
Project objectives: Recover plantations, generate employment and re-establish banana exports to enable farmers to pay their current loans.																							
Tentative duration: 12 months Estimated starting date: December 1998	National agency in charge: Agribusiness.																						
Description of activities and tasks: Procurement of long-term financing responsive to farmers' current limitations (grace-periods, low interest rates).																							
Expected results: Recovery of production; 500 permanent, productive jobs; recovery of banana exports.																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Total investment required (US\$):</td> <td style="text-align: right;">1,500,000</td> </tr> <tr> <td>• Labour (2,000 person/months)</td> <td style="text-align: right;">600,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">450,000</td> </tr> <tr> <td>• Imported inputs: _____</td> <td style="text-align: right;">450,000</td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">500,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">1,000,000</td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit: IBRD and IDB.</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	1,500,000	• Labour (2,000 person/months)	600,000	• Domestic inputs:	450,000	• Imported inputs: _____	450,000	Financing (US\$)		• Local:	500,000	• Foreign:	1,000,000	• Donation: _____		Potential financing sources:		External credit: IBRD and IDB.		Donor:		Special observations:
Total investment required (US\$):	1,500,000																						
• Labour (2,000 person/months)	600,000																						
• Domestic inputs:	450,000																						
• Imported inputs: _____	450,000																						
Financing (US\$)																							
• Local:	500,000																						
• Foreign:	1,000,000																						
• Donation: _____																							
Potential financing sources:																							
External credit: IBRD and IDB.																							
Donor:																							

Nicaragua	No. 1.4																						
Reactivation of fruit and sustainable agricultural restructuring																							
Sector: FARMING	Subsector: FRUIT																						
Background: Around 5,000 hectares of fruit trees were lost to Mitch.																							
Project objectives: Replant affected areas with fruit trees to protect the environment.																							
Tentative duration: 24 months Estimated starting date: May 1999	National agency in charge: Businessmen, farmers and CONADE.																						
Description of activities and tasks: Plant 5,000 hectares with different fruit species (citrus, mangoes, tamarind, and nuts).																							
Expected results: Environmental protection and improved farmers' income.																							
<table border="1"> <tr> <td>Total investment required (US\$):</td> <td style="text-align: right;">45,000,000</td> </tr> <tr> <td>• Labour (60,000 person/months)</td> <td style="text-align: right;">18,000,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">13,500,000</td> </tr> <tr> <td>• Imported inputs: _____</td> <td style="text-align: right;">13,500,000</td> </tr> <tr> <td>Financing (US\$)</td> <td></td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">18,000,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">27,000,000</td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td>Potential financing sources:</td> <td></td> </tr> <tr> <td>External credit: IBRD, IDB, CABEL and national private banks.</td> <td></td> </tr> <tr> <td>Donor:</td> <td></td> </tr> </table>	Total investment required (US\$):	45,000,000	• Labour (60,000 person/months)	18,000,000	• Domestic inputs:	13,500,000	• Imported inputs: _____	13,500,000	Financing (US\$)		• Local:	18,000,000	• Foreign:	27,000,000	• Donation: _____		Potential financing sources:		External credit: IBRD, IDB, CABEL and national private banks.		Donor:		<p>Special observations: Financing must be complemented by international agreements to eliminate fruit import restrictions or at least guarantee conditions on a par with favoured countries.</p> <p>As exporting becomes easier, businessmen will be more able to repay their loans.</p>
Total investment required (US\$):	45,000,000																						
• Labour (60,000 person/months)	18,000,000																						
• Domestic inputs:	13,500,000																						
• Imported inputs: _____	13,500,000																						
Financing (US\$)																							
• Local:	18,000,000																						
• Foreign:	27,000,000																						
• Donation: _____																							
Potential financing sources:																							
External credit: IBRD, IDB, CABEL and national private banks.																							
Donor:																							

- Labour
(60,000 person/months) 18,000,000
- Domestic inputs: 13,500,000
- Imported inputs: _____ 13,500,000

- Local: 18,000,000
- Foreign: 27,000,000
- Donation: _____

Nicaragua	No. 1.5																						
Reactivation of fisheries																							
Sector: FARMING	Subsector: SHRIMP																						
<p>Background: On the Pacific region, shrimp farming lost infrastructure and small-scale fishing suffered equipment losses.</p>																							
<p>Project objectives: Recover output capacity, generate jobs and recover exports.</p>																							
<p>Tentative duration: 12 months Estimated starting date: November 1998</p>	<p>National agency in charge: Fishing companies and cooperatives.</p>																						
<p>Description of activities and tasks: Re-establishment of income and exports, employment generation, and recovery of output in shrimp farming.</p>																							
<p>Expected results: Replacement of shrimp farming infrastructure, and small-scale fishing vessels and equipment.</p>																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Total investment required (US\$):</td> <td style="text-align: right;">20,000,000</td> </tr> <tr> <td>• Labour (17,000 person/months)</td> <td style="text-align: right;">5,000,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">5,000,000</td> </tr> <tr> <td>• Imported inputs: _____</td> <td style="text-align: right;">10,000,000</td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">10,000,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">5,000,000</td> </tr> <tr> <td>• Donation: _____</td> <td style="text-align: right;">5,000,000</td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit: CABEL</td> </tr> <tr> <td colspan="2">Donor: International development agencies.</td> </tr> </table>	Total investment required (US\$):	20,000,000	• Labour (17,000 person/months)	5,000,000	• Domestic inputs:	5,000,000	• Imported inputs: _____	10,000,000	Financing (US\$)		• Local:	10,000,000	• Foreign:	5,000,000	• Donation: _____	5,000,000	Potential financing sources:		External credit: CABEL		Donor: International development agencies.		<p>Special observations: Fishermen need soft financing, grace periods and restructured terms.</p>
Total investment required (US\$):	20,000,000																						
• Labour (17,000 person/months)	5,000,000																						
• Domestic inputs:	5,000,000																						
• Imported inputs: _____	10,000,000																						
Financing (US\$)																							
• Local:	10,000,000																						
• Foreign:	5,000,000																						
• Donation: _____	5,000,000																						
Potential financing sources:																							
External credit: CABEL																							
Donor: International development agencies.																							

Nicaragua	No. 1.6		
Training on reforestation for government officials, technicians and farmers			
Sector: FARMING	Subsector: FORESTRY		
<p>Background: Farmers have been using land that should be reserved for forests. This has had serious environmental consequences that were highlighted by hurricane Mitch.</p> <p>Farmers are unaware of the importance of reforesting forest areas, and lack the required technological knowledge.</p> <p>As a reference, in the past when exports of agricultural products were being promoted, those interested were offered training and technology transfers.</p> <p>Project objectives: Create awareness among public officials, agricultural technicians, and especially farmers, of the need for and importance of reforestation; transfers of technical knowledge in planting of timber-yielding, forestry pasture, and fruit-bearing species to allow natural regeneration of forests.</p>			
<p>Tentative duration: Ongoing</p> <p>Estimated starting date: 1999</p>	<p>National agency in charge: Government and NGOs, farmer's associations and cooperatives.</p>		
<p>Description of activities and tasks: Creation of training and technology-transfer facilities; acquisition of financial and technological resources; promotion of initiative among farmers, and holding of corresponding courses over a ten-year period.</p>			
<p>Expected results: Training and creating awareness among the people involved.</p>			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Total investment required (US\$): 33,000,000</p> <ul style="list-style-type: none"> • Labour (person/months) • Infrastructure: 3,000,000 • <u>Technology transfer and training:</u> 1,000,000 <p>Financing (US\$)</p> <ul style="list-style-type: none"> • Local: • Foreign: • <u>Donation:</u> <p>Potential financing sources:</p> <p>External credit:</p> <p>Donor: Donations by governments and international institutions.</p> </td> <td style="width: 50%; vertical-align: top;"> <p>Special observations: It would not be appropriate to reforest and improve the environment if priority is not first given to meeting the needs of the farmers involved.</p> </td> </tr> </table>		<p>Total investment required (US\$): 33,000,000</p> <ul style="list-style-type: none"> • Labour (person/months) • Infrastructure: 3,000,000 • <u>Technology transfer and training:</u> 1,000,000 <p>Financing (US\$)</p> <ul style="list-style-type: none"> • Local: • Foreign: • <u>Donation:</u> <p>Potential financing sources:</p> <p>External credit:</p> <p>Donor: Donations by governments and international institutions.</p>	<p>Special observations: It would not be appropriate to reforest and improve the environment if priority is not first given to meeting the needs of the farmers involved.</p>
<p>Total investment required (US\$): 33,000,000</p> <ul style="list-style-type: none"> • Labour (person/months) • Infrastructure: 3,000,000 • <u>Technology transfer and training:</u> 1,000,000 <p>Financing (US\$)</p> <ul style="list-style-type: none"> • Local: • Foreign: • <u>Donation:</u> <p>Potential financing sources:</p> <p>External credit:</p> <p>Donor: Donations by governments and international institutions.</p>	<p>Special observations: It would not be appropriate to reforest and improve the environment if priority is not first given to meeting the needs of the farmers involved.</p>		

Nicaragua	No. 1.7
Pilot reforestation programme	
Sector: FARMING	Subsector: FORESTRY
Background: At least one million hectares used for farming must be reclaimed for forestry.	
Project objectives: Reforestation beginning with a 5,000-hectare nationwide pilot programme.	

Tentative duration: 24 months Estimated starting date: May 1999	National agency in charge: Government, NGOs, farmer associations and cooperatives, and CONADE.
--	---

Description of activities and tasks: Plant 2,000 hectares with timber-yielding, firewood, grazing and fruit species, and permit natural regeneration of 3,000 hectares that protect river basins.

Expected results: 5,000 hectares of forest; improved environmental conditions. A basis for extending the programme.
--

Total investment required (US\$): 3,000,000	Special observations:
<ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ 	
Financing (US\$)	
<ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ 	
Potential financing sources: Under study.	
External credit:	
Donor:	

Nicaragua**No. 1.8****Reactivation of coffee****Sector: FARMING****Subsector: COFFEE**

Background: 1,200 hectares were lost to the hurricane. Farmers face economic difficulties and cannot repay loans.

Project objectives: Recover plantations, jobs and exports, and restructure small and medium-sized farms.

Tentative duration: 36 months

Estimated starting date: May 1999

National agency in charge: Coffee farmers.

Description of activities and tasks: Procurement of suitable financing, planting and management of coffee for three years, restructuring of farms.

Expected results: Recovery of coffee plantations and exports, and job creation.

Total investment required (US\$): 20,000,000

- Labour (35,000 person/months) 10,000,000
- Domestic inputs: 5,000,000
- Imported inputs: 5,000,000

Financing (US\$)

- Local: 5,000,000
- Foreign: 15,000,000
- Donation: _____

Potential financing sources:

External credit: CABEL.

Donor:

Special observations:

Nicaragua	No. 1.9																						
Reconstruction of irrigation and drainage systems																							
Sector: FARMING	Subsector: IRRIGATION AND DRAINAGE																						
Background: Systems were damaged on the Pacific and in the department of Matagalpa. New channels were formed and rivers became silted.																							
Project objectives: Replace infrastructure and repair existing systems.																							
Tentative duration: 24 months Estimated starting date: 1999	National agency in charge: Ministry of Agriculture, Livestock and Forestry.																						
Description of activities and tasks: Design and reconstruction of irrigation and drainage systems.																							
Expected results: Irrigation systems to support farming in various areas.																							
<table border="1"> <tr> <td>Total investment required (US\$):</td> <td style="text-align: right;">33,000,000</td> </tr> <tr> <td>• Labour (99,000 person/months)</td> <td style="text-align: right;">9,900,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">16,500,000</td> </tr> <tr> <td>• Imported inputs: _____</td> <td style="text-align: right;">6,600,000</td> </tr> <tr> <td>Financing (US\$)</td> <td></td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">6,000,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">27,000,000</td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td>Potential financing sources:</td> <td></td> </tr> <tr> <td>External credit: IDB, IBRD and CABEL.</td> <td></td> </tr> <tr> <td>Donor:</td> <td></td> </tr> </table>	Total investment required (US\$):	33,000,000	• Labour (99,000 person/months)	9,900,000	• Domestic inputs:	16,500,000	• Imported inputs: _____	6,600,000	Financing (US\$)		• Local:	6,000,000	• Foreign:	27,000,000	• Donation: _____		Potential financing sources:		External credit: IDB, IBRD and CABEL.		Donor:		Special observations:
Total investment required (US\$):	33,000,000																						
• Labour (99,000 person/months)	9,900,000																						
• Domestic inputs:	16,500,000																						
• Imported inputs: _____	6,600,000																						
Financing (US\$)																							
• Local:	6,000,000																						
• Foreign:	27,000,000																						
• Donation: _____																							
Potential financing sources:																							
External credit: IDB, IBRD and CABEL.																							
Donor:																							

- Labour
(99,000 person/months)
- Domestic inputs:
- Imported inputs: _____

Financing (US\$)

- Local:
- Foreign:
- Donation: _____

Potential financing sources:

External credit: IDB, IBRD and CABEL.

Donor:

Special observations:

Nicaragua	No. 1.10																						
National reforestation and forestry management programme																							
Sector: FARMING	Subsector: FORESTRY																						
<p>Background: Forests lost to farming and livestock raising must be recovered to protect the environment and prevent further damage from natural disasters.</p>																							
<p>Project objectives: Protection of 50,000 hectares of river basins and reforestation and management of 150,000 hectares.</p>																							
<p>Tentative duration: 60 months Estimated starting date: May 1999</p>	<p>National agency in charge: MAGFOR and CONADE.</p>																						
<p>Description of activities and tasks: Planting of timber-yielding species to protect river basins natural regeneration, assistance for natural regeneration, technical assistance for farmers and livestock raisers.</p>																							
<p>Expected results: 200,000 reforested hectares.</p>																							
<table border="1"> <tr> <td>Total investment required (US\$):</td> <td style="text-align: right;">30,000,000</td> </tr> <tr> <td>• Labour (50,000 person/months)</td> <td style="text-align: right;">25,000,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">4,000,000</td> </tr> <tr> <td>• Imported inputs: _____</td> <td style="text-align: right;">1,000,000</td> </tr> <tr> <td>Financing (US\$)</td> <td></td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">5,000,000</td> </tr> <tr> <td>• Foreign:</td> <td></td> </tr> <tr> <td>• Donation: _____</td> <td style="text-align: right;">25,000,000</td> </tr> <tr> <td>Potential financing sources:</td> <td></td> </tr> <tr> <td>External credit:</td> <td></td> </tr> <tr> <td>Donor: Under negotiation.</td> <td></td> </tr> </table>	Total investment required (US\$):	30,000,000	• Labour (50,000 person/months)	25,000,000	• Domestic inputs:	4,000,000	• Imported inputs: _____	1,000,000	Financing (US\$)		• Local:	5,000,000	• Foreign:		• Donation: _____	25,000,000	Potential financing sources:		External credit:		Donor: Under negotiation.		<p>Special observations:</p>
Total investment required (US\$):	30,000,000																						
• Labour (50,000 person/months)	25,000,000																						
• Domestic inputs:	4,000,000																						
• Imported inputs: _____	1,000,000																						
Financing (US\$)																							
• Local:	5,000,000																						
• Foreign:																							
• Donation: _____	25,000,000																						
Potential financing sources:																							
External credit:																							
Donor: Under negotiation.																							

Nicaragua**No. 2.1****Strengthening the management capacity of government officials in executing construction projects****Sector: TECHNICAL ASSISTANCE****Subsector: BILATERAL COOPERATION**

Background: The reconstruction process will require a large number of local and foreign human resources to manage financial, human and material resources in executing works.

Project objectives: Train personnel in building project management methods [housing, highways, hospitals and schools).

Tentative duration: 6 months**Estimated starting date: June 1999**

National agency in charge: Public and private institutions in the field.

Description of activities and tasks: Development of a training programme, either *in situ* or abroad, to train approximately 100 engineers and economists.

Expected results: There will be enough trained professionals to cover the needs of the reconstruction programme.

Total investment required (US\$): 300,000

- Labour
(person/months)

- Domestic inputs:

- Imported inputs: _____

Financing (US\$)

- Local:

- Foreign:

- Donation: _____ 300,000

Potential financing sources:

External credit:

Donor: Autonomous Technological Institute of Monterrey, Mexico

Special observations: The cooperation of the aforementioned donor has been requested.

Nicaragua	No. 2.2
Design of disaster-prevention policies and identification of investments	
Sector: TECHNICAL ASSISTANCE	Subsector:
<p>Background: Nicaragua and the rest of Central America have suffered the adverse consequences of various types of natural disasters for years. The recurrence and intensity of these phenomena has been increasing in recent years, and material and personal damages are becoming alarmingly progressive and cumulative.</p> <p>No major disaster-prevention investments were made in the past, partly because disasters were statistically infrequent, making prevention investment insufficiently profitable. The situation has changed, since hurricanes (Joan, Georges, Cesar, Mitch, etc.), forest fires and the El Niño phenomenon are occurring frequently.</p> <p>Efforts and resources must therefore be invested in a formal and exhaustive study of this complex subject-matter, so as to establish well-grounded data for subsequent policy setting.</p> <p>Project objectives: Carry out studies to design an appropriate natural-disaster prevention policy, especially for floods. An important aim is to provide authorities with criteria and guidelines for natural-resource management and regulation. Another is to identify socially profitable investment options to prevent or reduce the negative and costly effects of natural disasters. Studies will focus on the identification, location and sizing of various infrastructure works.</p>	
Tentative duration: 24 months	National agency in charge: UNDP.
Estimated starting date:	
<p>Description of activities and tasks:</p> <ul style="list-style-type: none"> • -Identification of critical areas (floods, mudslides, droughts, fires and earthquakes); • Sound land-use management to prevent settlements, irregular or otherwise, on land subject to the effects of natural disasters; • Preliminary design of infrastructure works to control the forces of nature, such as drainage works, river levées, dams, etc.; • Design criteria for civil works often threatened by floods (road routing, bridges, drinking water and sewerage systems, public service facilities, etc.); • Formulation of proposals to rebuild the highway system and extend it to provide alternative links, especially between the country's central region and the coast. <p>As extreme weather becomes more frequent reservoirs must be built that can also be used for irrigation in the dry season or in years of drought and to regulate inter-annual phenomena (such as El Niño and La Niña). The intensity of such phenomena is increasing and becoming more frequent so investment in prevention infrastructure will be easier to justify in that it will offset natural-disaster losses.</p>	

Expected results: Expert studies for use in adopting a disaster-prevention policy.

Total investment required (US\$): 1,000,000

- Labour
(person/months)

- Domestic inputs:

- Imported inputs: _____

Financing (US\$)

- Local:

- Foreign:

- Donation: _____

Potential financing sources:

External credit:

Donor:

Special observations: Resources must first be assigned to scaling and describing the scope of the project, following the corresponding terms of reference. This prior stage should take around two months, and once it is completed, it will be easier to determine the amount of pre-investment required. This project is of regional scope, because some river basins extend to two or more countries.

Nicaragua	No. 2.3
Programming of works	
Sector: TECHNICAL ASSISTANCE	Subsector:
<p>Background: The process of rebuilding and repairing damaged assets is based on the prior execution of various urgently needed works, so this document contains numerous building-project proposals. However, there is a shortage of certain goods and inputs, such as building materials, machinery and equipment, and skilled labour. Works must therefore be programmed accordingly, on the basis of available resources.</p> <p>The disaster has paralysed many productive activities, leading to high levels of unemployment, so programming must be brought into line with available resources.</p> <p>Project objectives: Programming of works to be executed, giving priority to labour-intensive activities as far as possible; this mainly applies to construction and agricultural activities.</p>	
Tentative duration: 6 months	National agency in charge: UNDP.
<p>Description of activities and tasks: Studies to make efficient use of labour, by sector and skills.</p>	
<p>Expected results: Technical data for efficient labour use in programming of works.</p>	
<p>Total investment required (US\$): 100,000</p> <ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ <p>Financing (US\$)</p> <ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ <p>Potential financing sources:</p> <p>External credit:</p> <p>Donor:</p>	<p>Special observations: This project is of regional scope, since unemployment could lead to undesired migration.</p>

Nicaragua

No. 3.1

Reconstruction of damaged schools

Sector: EDUCATION

Subsector: INFRASTRUCTURE AND EQUIPMENT

Background: Approximately 200 mostly rural schools (1,000 classrooms) were destroyed and must be rebuilt immediately. Educational infrastructure was already insufficient and inadequate prior to Mitch and this should be taken into account in reconstruction.

Project objectives: Rebuild schools and extend and improve infrastructure. Provide schools with texts, furnishings and education materials. Ensure new facilities can be used as shelters when necessary.

Tentative duration: 36 months

Estimated starting date: April 1999

National agency in charge: Ministry of Education, Culture and Sport.

Description of activities and tasks: Study and obtain suitable sites, design infrastructure, build schools with intensive use of unemployed labour, and equip them.

Expected results: Modern schools.

Total investment required (US\$):	24,000,000
• Labour (48,000 person/months)	9,600,000
• Domestic inputs:	7,200,000
• Imported inputs:	7,200,000

Financing (US\$)

- Local:
- Foreign:
- Donation:

Potential financing sources:

External credit: To be defined.
Donor: To be defined.

Special observations:

Nicaragua

No. 3.2

Repair, extension and improvement of damaged education facilities

Sector: EDUCATION

Subsector: INFRASTRUCTURE AND EQUIPMENT

Background: 343 schools in different departments must be refurbished. Before the hurricane, educational infrastructure was inadequate and the situation must be corrected.

Project objectives: To repair schools and extend and improve infrastructure. Provide schools with texts, furniture and education materials.

Tentative duration: 24 months

Estimated starting date: January 1999

National agency in charge: Ministry of Education, Culture and Sport and FISE.

Description of activities and tasks: Carry out improvement works with the intensive use of unemployed labour.

Expected results: Adequate educational infrastructure.

Total investment required (US\$):	16,200,000
• Labour (30,000 person/months)	6,000,000
• Domestic inputs:	5,100,000
• Imported inputs:	5,100,000

Financing (US\$)

- Local:
- Foreign:
- Donation:

Potential financing sources:

External credit: To be defined.
Donor: To be defined.

Special observations:

Nicaragua**No. 3.3****Equipment recovery and natural disaster preparedness training****Sector: EDUCATION****Subsector: EQUIPMENT AND TRAINING****Background:** School textbooks and equipment must be replaced.

In various disasters the rural and suburban population have lacked disaster preparedness, so it is important to provide the required training.

Project objectives: Furnish schools with textbooks and equipment, and incorporate disaster preparedness into curricula.

Tentative duration: 24 months**Estimated starting date: January 1999****National agency in charge:** FISE.

Description of activities and tasks: Make necessary purchases and change curricula.

Expected results: Disaster preparedness.

Total investment required (US\$): 2,000,000

- Labour
(person/months)

- Domestic inputs:

- Imported inputs: _____

Financing (US\$)

- Local:

- Foreign:

- Donation: _____

Potential financing sources:

External credit: To be defined.

Donor: To be defined.

Special observations:

Nicaragua**No. 3.4****Recovery and restoration of cultural and recreational centres****Sector: EDUCATION****Subsector: EQUIPMENT****Background:** These premises also suffered damage from flooding and landslides.**Project objectives:** Re-establish cultural and historical assets.

Tentative duration: 6 months
Estimated starting date: December
1998

National agency in charge: Ministry of Education,
 Culture and Sport and FISE.

Description of activities and tasks: Restoration work.**Expected results:** Cultural assets in a suitable condition.**Total investment required (US\$):** 1,300,000

- Labour
 (person/months)

- Domestic inputs:

- Imported inputs: _____

Financing (US\$)

- Local: 300,000

- Foreign: 500,000

- Donation: _____ 500,000

Potential financing sources:

External credit: To be defined.

Donor: To be defined.

Special observations:

Nicaragua**No. 3.5****Recovery of textbooks and furnishings****Sector: EDUCATION****Subsector: EQUIPMENT****Background:** Education equipment and materials were damaged or destroyed along with facilities.**Project objectives:** Provide schools with teaching materials and furnishings.

Tentative duration: 6 months
Estimated starting date: December 1998

National agency in charge: Ministry of Education, Culture and Sport and FISE.

Description of activities and tasks: Acquire furniture and textbooks and distribute them accordingly.**Expected results:** Properly equipped schools.**Total investment required (US\$):** 1,700,000

- Labour
(person/months)
- Domestic inputs:
- Imported inputs: _____

Financing (US\$)

- Local: 500,000
- Foreign: 600,000
- Donation: _____ 600,000

Potential financing sources: Under negotiation.

External credit: Under negotiation.

Donor: Under negotiation.

Special observations:

Nicaragua	No. 4.1
Resettlement of victims	
Sector: EMERGENCY	Subsector: SETTLEMENTS
<p>Background: 800,000 people, most of them already living in poverty, were left homeless by the hurricane. Many lived in the country's five northern municipalities and in León and Chinandega.</p>	
<p>Project objectives: Improve victims' living conditions and prevent migration from rural areas to cities and abroad by resettling the homeless on the basis of comprehensive actions to provide them with acceptable, sustainable living conditions; promote equal access and opportunities to men and women project beneficiaries.</p>	
<p>Tentative duration: 36 months Estimated starting date: January 1999</p>	<p>National agency in charge: International Organization for Migration</p>
<p>Description of activities and tasks: Carry out studies and actions to resettle affected groups, including labour training, technical and financial support, employment opportunities in productive, full-time activities, support men's and women's community organizations, and the most vulnerable groups, particularly the elderly and the handicapped.</p>	
<p>Expected results: Labour training and employment for project beneficiaries, and reincorporation into communities.</p>	
<p>Total investment required (US\$): 10,000,000</p> <ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ <p>Financing (US\$)</p> <ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ <p>Potential financing sources: External credit: Donor: Under study.</p>	<p>Special observations: Due to its social content, this project should secure financing through donations in order to expand coverage.</p>

Nicaragua**No. 4.2****Emergency food assistance for affected families****Sector: EMERGENCY****Subsector: FOOD**

Background: Numerous rural families devoted to subsistence farming lost their crops and livelihood, as did semi-urban families who lost their homes and jobs. Both groups are in high-risk situations due to their lack of food security, among other threats.

Project objectives: Provide food rations to 130,000 individuals on the basis of "work for food" programmes.

Tentative duration: 6 months**Estimated starting date: January 1999**

National agency in charge: Ministry of Health and others as yet undefined.

Description of activities and tasks: The agencies in charge will provide food rations to selected groups, who in turn will rehabilitate their housing and basic social infrastructure, and productive capacities in the case of rural groups.

Expected results: This initiative will provide adequate food rations during the reconstruction period, while accelerating and reducing the cost of social and productive infrastructure works —related to low-income social groups— and providing temporary jobs.

Total investment required (US\$): 7,000,000

- Labour
(person/months)

- Domestic inputs:

- Imported inputs: _____

Financing (US\$)

- Local:

- Foreign:

- Donation: _____ 7,000,000

Potential financing sources:

External credit:

Donor: UN World Food Programme

Special observations:

Nicaragua	No. 4.3
Emergency epidemiological control	
Sector: EMERGENCY	Subsector: HEALTH
Background: Cases of cholera, malaria, rabies, hepatitis and dengue have been reported and are increasing the risk of spreading contagious diseases.	
Project objectives: Provide medical treatment to infected patients and contain contagious diseases.	
Tentative duration: 3 months Estimated starting date: Immediate	National agency in charge: Health Ministry.
Description of activities and tasks: Bury the dead in accordance with health regulations, incinerate dead animals, vaccinate the population, and treat and monitor the sick.	
Expected results: Curing of patients and containment of contagious diseases.	
Total investment required (US\$): 10,000,000 <ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ Financing (US\$) <ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ 10,000,000 Potential financing sources: External credit: Donor: In process.	Special observations:

Nicaragua**No. 4.4****Emergency vector-control plan for affected communities****Sector: EMERGENCY****Subsector:**

Background: The devastating damage in northern Nicaragua and on the Pacific is still being assessed. Official preliminary figures (Civil Defence) for 7 November: 807,480 people affected, 1,849 dead, 228 injured and 1,287 missing. Most victims are in the departments of Chinandega, León, Estelí, Granada, Matagalpa and Jinotega.

Project objectives: Reduce the negative impact on health in localities in Matagalpa and Jinotega. Improve health conditions in the face of vector-transmitted diseases in the departments with the highest epidemical potential. Reduce the transmission risk of vectorial diseases (malaria, dengue and leptospirosis) in these departments. Educate the population regarding handling of solid and liquid waste as a potential breeding ground for vectors.

Tentative duration: 2 months**Estimated starting date: January 1999****National agency in charge:** PAHO/WHOO, Health Ministry and SILAIS.

Description of activities and tasks: Carry out two prevention cycles: spray cipermetrine and BTI with portable and LECO pumps in malaria-prone areas; selective spraying with etophenprox in areas with a high risk of malaria falciparum, and distribution of rat poison in areas with a high risk of leptospirosis.

Expected results: Prevent groups living in high-risk areas from being exposed to the above diseases.

Total investment required (US\$):	2,600,000
• Labour (200 person/months)	80,000
• Domestic inputs:	210,000
• Imported inputs:	2,310,000
Financing (US\$)	
• Local:	200,000
• Foreign:	
• Donation:	2,400,000
Potential financing sources:	
External credit:	
Donor: European countries.	

Special observations: The project will be executed with technical assistance from PAHO/WHOO.

Nicaragua

No. 4.5

Traffic rehabilitation on main paved and unpaved roads

Sector: EMERGENCY

Subsector: ROADS

Background: Numerous breaks on roads stopped traffic flow, so machinery and equipment had to be mobilized to different areas to re-establish the flow of vehicles provisionally.

Project objectives: Execute minor works to re-establish traffic flow as expeditiously as possible, thus diminishing transport costs.

Tentative duration: 2 months
Estimated starting date: November 1998

National agency in charge: Ministry of Transport and Infrastructure (MTI).

Description of activities and tasks: Clear landslides, replace approaches to bridges, provide provisional passages, rebuild damaged embankments, and generally re-establish transport flows wherever necessary.

Expected results: Re-establish normal movement of vehicles.

Total investment required (US\$):	20,000,000
• Labour (10,000 person/months)	2,000,000
• Domestic inputs:	10,000,000
• Imported inputs: _____	8,000,000
Financing (US\$)	
• Local:	4,000,000
• Foreign:	16,000,000
• Donation: _____	
Potential financing sources:	
External credit: IBRD.	
Donor:	

Special observations:

Nicaragua

No. 5.1

Reconstruction of electricity transmission system

Sector: ENERGY

Subsector: ELECTRICITY

Background: Many transmission lines and transformer substations were affected by the hurricane. Much damage has been caused to 230, 138 and 69 kV voltage lines, mostly by landslides that damaged structures and by flooding in some substations. Temporary repairs have been carried out, but the system remains highly vulnerable and service is unreliable. The interconnection of 230 kV lines has been damaged and affects intra-regional electricity service.

Project objectives: Make definitive repairs to damaged sections of two 230 kV transmission lines, four 138 kV lines and five 69 kV lines.

Tentative duration: 12 months

Estimated starting date: January 1999

National agency in charge: Nicaraguan Electricity Company (ENEL)

Description of activities and tasks: Determine necessary materials, prepare bidding documents and programme works, call for bids and award contracts, purchase materials and execute works.

Expected results: Rebuilt, strengthened electric-power networks, improved reliability of electric-power supplies in Nicaragua and intra-regional electricity transactions (between Honduras, Nicaragua, Costa Rica and Panama), restocked ENEL inventories and the company's capacity to repair failures in transmission systems.

Total investment required (US\$):	2,510,000
• Labour (2,500 person/months)	500,000
• Domestic inputs:	880,000
• Imported inputs:	1,130,000
Financing (US\$)	
• Local:	500,000
• Foreign:	1,510,000
• Donation:	500,000
Potential financing sources:	
External credit: IDB and CABEL.	
Donor: Scandinavian countries.	

Special observations: The project must be carried out in conjunction with other ENEL programmes, particularly the Electricity Sector Support Programme financed by the IDB, which is mainly aimed at electricity transmission works.

Nicaragua**No. 5.2****Rebuilding and extending of electric power distribution systems****Sector: ENERGY****Subsector: ELECTRICITY**

Background: Primary distribution lines and secondary distribution networks have been affected by landslides, which damaged structures. The system only covered 55 per cent of the population on average before the hurricane, although electrification is lower in rural areas. Additional funds are needed to rebuild damaged networks and prevent a further backlog in electrification, and therefore in other social and productive sectors.

Project objectives: Rebuild and replace some 328 km of primary distribution lines, 2,400 posts, 57,000 lampposts and 400 transformers in affected departments and regions, ensure electric power service to aid the development of productive activities in the interior, and ensure ENEL can increase its coverage nationwide.

Tentative duration: 18 months**Estimated starting date: January 1999****National agency in charge:** Nicaraguan Electricity Company (ENEL).

Description of activities and tasks: Select plots by regions for works and structures, design and calculate works, prepare bidding documents and programme ENEL works, call for and award bids, purchase materials and execute ENEL works.

Expected results: Rebuilt and strengthened distribution systems, improved conditions for supplying electricity to affected departments, restocked ENEL inventories, and improved ENEL capacity to provide service to new users and extend its electricity networks.

Total investment required (US\$):	7,300,000
• Labour (6,000 person/months)	1,200,000
• Domestic inputs:	4,100,000
• Imported inputs:	2,000,000
Financing (US\$)	
• Local:	1,200,000
• Foreign:	6,100,600
• Donation:	
Potential financing sources:	
External credit: IDB and CABEL.	
Donor:	

Special observations:

Nicaragua	No. 5.3																						
Rehabilitation of electric power plants																							
Sector: ENERGY	Subsector: ELECTRICITY																						
<p>Background: Four hydroelectric stations were affected by the hurricane, the worst being Santa Bárbara, where a fuse plug was totally destroyed, with damage to the spillway, water conveyance works, access roads and the engine house; the plant is therefore out of service. The dam, spillway and water conveyance channel at the Centroamérica hydroelectric plant were damaged, with silting problems at the Wabule and Las Canoas microcentrals, and damaged equipment at the Momotombo geothermal plant; access roads in all these plants also sustained damages. Auxiliary equipment was damaged by flooding at the Managua steam generation plant.</p> <p>Project objectives: Rehabilitate the Santa Bárbara plant and repair the Centroamérica, Wabule, Las Canoas, Momotombo and Managua plants.</p>																							
<p>Tentative duration: 12 months Estimated starting date: January 1999</p>	<p>National agency in charge: Nicaraguan Electricity Company (ENEL).</p>																						
<p>Description of activities and tasks: Carry out an expert appraisal of works, including redesign in some cases, quantify necessary works and materials, programme works, bid or contract repairs, and execute works.</p>																							
<p>Expected results: Fully operational plants, with improved reliability and operating conditions, and reduced operating costs once plants are working at full capacity.</p>																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Total investment required (US\$):</td> <td style="text-align: right;">13,600,000</td> </tr> <tr> <td>• Labour (17,000 person/months)</td> <td style="text-align: right;">3,400,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">6,900,000</td> </tr> <tr> <td>• Imported inputs:</td> <td style="text-align: right;">3,300,000</td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">3,600,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">10,000,000</td> </tr> <tr> <td>• Donation:</td> <td></td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit: IDB, CABEL and Scandinavian countries.</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	13,600,000	• Labour (17,000 person/months)	3,400,000	• Domestic inputs:	6,900,000	• Imported inputs:	3,300,000	Financing (US\$)		• Local:	3,600,000	• Foreign:	10,000,000	• Donation:		Potential financing sources:		External credit: IDB, CABEL and Scandinavian countries.		Donor:		<p>Special observations: The IDB has reprogrammed and redefined a loan to cover the cost of some of the work. A consulting firm has been hired to design major reconstruction work using funds donated by Norway. Bridge financing is urgently needed to begin repairs while insurance is collected to cover some of the damage.</p>
Total investment required (US\$):	13,600,000																						
• Labour (17,000 person/months)	3,400,000																						
• Domestic inputs:	6,900,000																						
• Imported inputs:	3,300,000																						
Financing (US\$)																							
• Local:	3,600,000																						
• Foreign:	10,000,000																						
• Donation:																							
Potential financing sources:																							
External credit: IDB, CABEL and Scandinavian countries.																							
Donor:																							

- Labour
(17,000 person/months) 3,400,000
- Domestic inputs: 6,900,000
- Imported inputs: 3,300,000

Financing (US\$)

- Local: 3,600,000
- Foreign: 10,000,000
- Donation:

Potential financing sources:

External credit: IDB, CABEL and Scandinavian countries.

Donor:

Nicaragua**No. 6.1****Rehabilitation and rebuilding of industrial, tourism and business infrastructure****Sector: INDUSTRY, TRADE AND TOURISM****Subsector:**

Background: Numerous industrial, agroindustrial and commercial enterprises were damaged, with partial or total losses of infrastructure, equipment, furnishings and stocks. Some large, medium and small-scale companies will therefore be unable to produce, meet their financial obligations or retain their staff.

Project objectives: Help affected businessmen to re-establish their assets and infrastructure through soft loans (low interest rates and long terms).

Tentative duration: 12 months**Estimated starting date: January 1999****National agency in charge:** Government, private banks and entrepreneurs.

Description of activities and tasks: Secure financing, design financing plans, identify beneficiaries, grant corresponding loans and execute repair and construction work.

Expected results: Re-establishment of business activities, incentives for productive and commercial activities and recovery of employment sources.

Total investment required (US\$):	45,000,000
• Labour (100,000 person/months)	15,000,000
• Domestic inputs:	15,000,000
• Imported inputs:	15,000,000
Financing (US\$)	
• Local:	9,000,000
• Foreign:	36,000,000
• Donation:	
Potential financing sources: National private banks with refinancing from international banks.	
External credit: Under study.	
Donor:	

Special observations: Investment outlays refer to execution of construction works.

Nicaragua**No. 6.2****Recovery of working capital of businessmen in trade and industry****Sector: INDUSTRY AND TRADE****Subsector:**

Background: Many installations were damaged or destroyed, with total or partial loss of infrastructure, equipment, furnishings and stock.

Industrial and business activities have therefore been suspended, leading to a loss of working capital; some businessmen are unable to meet their financial obligations, retain their staff or re-establish their previous production levels due to the lack of financial resources.

Project objectives: Support affected entrepreneurs so that they can re-establish their working capital through soft loans.

Tentative duration: 12 months**Estimated starting date: Late 1999****National agency in charge:** Government, private banks and entrepreneurs.

Description of activities and tasks: Raise funds, design financing schemes, identify beneficiaries and extend loans.

Expected results: Re-establishment of industrial and commercial activities.

Total investment required (US\$): 10,000,000

- Labour
(person/months)

- Domestic inputs:

- Imported inputs: _____

Financing (US\$)

- Local: 2,000,000

- Foreign: 8,000,000

- Donation: _____

Potential financing sources: National private banks with refinancing from international banks.

External credit: Under study.

Donor:

Special observations:

Nicaragua	No. 7.1																		
Study to modernise and strengthen INETER																			
Sector: ENVIRONMENT	Subsector:																		
<p>Background: The Nicaraguan Institute of Territorial Studies (INETER) covers various specialized scientific and technological fields, such as geodesy, cartography, land registry, meteorology, surface hydrology, hydrogeology, hydrography, geophysics, seismology, vulcanology, geography, land management, political and administrative boundaries and disaster prevention. INETER's manifold activities require a responsive administrative framework which is not currently available; funds are limited, making it difficult for it to perform its services adequately.</p> <p>Project objectives: A study to modernize INETER, including administrative aspects, assessment of current resources, a proposal for a new administrative model and an institutional strengthening plan.</p>																			
<p>Tentative duration: 5 months</p> <p>Estimated starting date: January 1999</p>	<p>National agency in charge: INETER and Ministry responsible.</p>																		
<p>Description of activities and tasks: Make an diagnosis of INETER, including its capacity to perform disaster-alert actions, study proposals for new administrative systems, including institutional resources, budget and partial self-financing schemes, and human resources policy; and draw up a strengthening plan.</p>																			
<p>Expected results: A proposal to modernize INETER, making it easier to raise funds and donations for the project.</p>																			
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Total investment required (US\$):</td> <td style="text-align: right;">400,000</td> </tr> <tr> <td colspan="2"> <ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ </td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">50,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">350,000</td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit:</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	400,000	<ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ 		Financing (US\$)		• Local:	50,000	• Foreign:	350,000	• Donation: _____		Potential financing sources:		External credit:		Donor:		<p>Special observations:</p>
Total investment required (US\$):	400,000																		
<ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ 																			
Financing (US\$)																			
• Local:	50,000																		
• Foreign:	350,000																		
• Donation: _____																			
Potential financing sources:																			
External credit:																			
Donor:																			

Nicaragua**No. 7.2**

Rehabilitation and strengthening of INETER's hydrometeorological networks

Sector: ENVIRONMENT**Subsector:**

Background: INETER's hydrological and meteorological networks were severely affected by the hurricane. Damage was reported in 400 hydrometric, 12 climatological and two main hydrometeorological stations, and 27 of 54 hydrological stations disappeared. Plans to expand and modernize INETER's networks already existed, since many stations were no longer effective due to length of service and in some cases, lack of maintenance.

Project objectives: Rehabilitate damaged stations to make the network fully operational again in the short term; expand, modernize and develop the hydrometeorological network, seismic-fault monitoring and air-pollution control systems.

Tentative duration: 24 months

Estimated starting date: January 1999

National agency in charge: INETER.

Description of activities and tasks: Programme station repairs according to priority and geographical location; establish a programme to expand, modernize and develop the network, seismic-fault monitoring and air-pollution control systems; purchase equipment and repair and rehabilitate stations.

Expected results: Re-establishment of damaged stations; expansion and modernization of network, seismic-fault monitoring and air-pollution control systems, and trained personnel to manage and maintain the new network.

Total investment required (US\$): 3,000,000

- Labour
(person/months)

- Domestic inputs:

- Imported inputs: _____

Financing (US\$)

- Local: 400,000

- Foreign: 2,600,000

- Donation: _____

Potential financing sources:

External credit:

a) For the meteorological network, possible WMO cooperation. b) For the hydrologic network, possible donations and funding from the Finnish and Danish governments.

c) For the geophysical network, possible donation and funding from the US and Swiss governments.

Donor:

Special observations:

Nicaragua**No. 7.3****Improvement of the National Natural-Resource Information System****Sector: ENVIRONMENT****Subsector:**

Background: Information on the most important natural assets from the standpoint of provision of environmental services (water resources, plant cover, biodiversity) is largely outdated, and data gathering is not systematic, although the country has a number of professionals specialising in teledetection and geographical information systems, processing of satellite images, etc.

Project objectives: Compile information for timely decision-making on natural assets.

Tentative duration: 10 years**Estimated starting date: January 1999****National agency in charge:** INETER and Ministry of the Environment and Natural Resources.

Description of activities and tasks: Acquire satellite images; process satellite and terrestrial data; create a geographical information system to integrate such data in reference to population, protected areas, etc., and periodically update databases.

Expected results: Maps showing plant cover, animal life, river basins and water replenishment areas, erosion-prone areas, etc.

Total investment required (US\$): 250,000

- Labour
(person/months)
- Domestic inputs:
- Imported inputs: _____

Financing (US\$)

- Local:
- Foreign:
- Donation: _____

Potential financing sources:

External credit: Government and international cooperation.

Donor:

Special observations:

Nicaragua	No. 7.4
Strengthening of the National System of Protected Areas	
Sector: ENVIRONMENT AND NATURAL RESOURCES	Subsector: MANAGEMENT
<p>Background: Protected areas are threatened by large-scale expansion of agricultural frontiers, livestock-raising and singlecrop farming, increased poverty and population pressure. Lack of funds hampers management and control of protected areas. Of 74 protected areas, only 11 have management plans and are institutionally supervised. Lack of staff is a major problem —Nicaragua has one worker per 21,000 ha (the second lowest rate after Belize). Only eight protected areas have management plans.</p> <p>The possibility of incorporating NGOs into planning and management of protected areas has been considered. The concept of bioregion should also be adopted in management plans. One bioregion to be considered extends from Cosigüina Volcano to the Momotombo Volcanic Complex, an area comprising six natural reserves.</p>	
<p>Project objectives: Promote conservation of protected areas by increasing institutional presence and launching management plans.</p>	
<p>Tentative duration: 3 years Estimated starting date: July 1999</p>	<p>National agency in charge: Ministry of the Environment and Natural Resources (MARENA).</p>
<p>Description of activities and tasks: Carry out bioregion boundary studies, with technical assistance; basic studies for biological-diversity conservation and sustainable human development (ecological assessment, ecological-economic zoning, delimitation of critical areas, land tenure studies, socio-economic and gender situation) with the participation of the population involved, and draft master plans for protected areas and biological corridors.</p>	
<p>Expected results: Master plans for 10 protected areas and their biological corridors.</p>	
<p>Total investment required (US\$): 3,000,000</p> <ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ <p>Financing (US\$)</p> <ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ <p>Potential financing sources:</p> <p>External credit: Governments, development banks, international funds such as GEF, and NGOs.</p> <p>Donor:</p>	<p>Special observations:</p>

Nicaragua**No. 7.5****Environmental management and sustainable development of river basins****Sector: ENVIRONMENT****Subsector:**

Background: Many of the country's river basins suffered erosion and loss of plant cover, thus altering water cycles and severely silting rivers and watercourses.

This affects aquifer replenishment, puts water supply at risk and also modifies water cycles and other environmental parameters (carbon fixing, protection of biological diversity, etc.) The loss of plant cover has also worsened watershed deterioration.

Project objectives: Define a national strategy on the use of water resources and for sustainable natural resource management to protect vulnerable areas and strengthen environmental management, while also improving the utilization of these resources and hence the quality of life of the affected population.

Tentative duration: 5 years**Estimated starting date: July 1999****National agency in charge:** Ministry of Agriculture.

Description of activities and tasks: Carry out research on water and forestry resources in each watershed under study, and request international technical assistance to strengthen the institutions in charge of the project execution and outcome assessment.

New plantations will be established on approximately 100,000 hectares, and natural regeneration systems, fire protection and conservation plans will be established for their management. Around 10,000 people will be trained in fire fighting and control.

Expected results: Comprehensive river basin management plans, including protection of existing forests and ravaged forest lands through natural regeneration, reforestation and agroforestry systems. Establishment of plantations on 100,000 hectares, with 10,000 trained personnel.

Total investment required (US\$): 60,000,000

- Labour
(person/months)

- Domestic inputs:

- Imported inputs: _____

Financing (US\$)

- Local:

- Foreign:

- Donation: _____

Potential financing sources:

External credit: IBRD and BID.

Donor:

Special observations: This project will be carried out over a five-year period and complements other initiatives reforestation and river basin management initiatives; the project is of regional scope.

Nicaragua	No. 7.6														
Installation of real-time networks															
Sector: ENVIRONMENT	Subsector:														
<p>Background: Central American and Caribbean countries have suffered the consequences of natural disasters for many years, but disasters are now occurring more frequently. A large part of the physical infrastructure is destroyed in each case, in addition to the tragic toll of human lives and victims. Production stockpiles are also destroyed, leading to considerable economic losses and the elimination of productive jobs.</p> <p>Despite recent progress made in economic, social and technological activities, hurricane Mitch pointed up the need for increased efforts and resources on the part of the countries involved, and the international community, in the field of meteorological forecasting and precautions in Latin America.</p> <p>Project objectives: Specify, design and install early-warning networks on adverse meteorological conditions in the most vulnerable Central American and Caribbean countries in order to improve the timeliness and quality of information to prevent and mitigate the effects of potential natural disasters.</p>															
Tentative duration: <hr style="width: 50%; margin: 0 auto;"/> Estimated starting date: December 1998	National agency in charge: INETER.														
<p>Description of activities and tasks: Evaluate the current condition of the region's hydrological and meteorological networks; determine minimum geographical and strategic coverage needs by country as regards number and type of stations; acquire and install automatic stations to measure parameters by satellite; acquire and install in each country a receiving station to gather data from automatic measuring stations, and train personnel in management and maintenance.</p>															
<p>Expected results: An effective early-warning system to facilitate decision-making to protect the exposed population. Each country will also have the information needed to evaluate situations of regional or trans-border scope, such as flood control and dam management.</p>															
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Total investment required (US\$):</td> <td style="text-align: right; vertical-align: top;">600,000</td> </tr> <tr> <td colspan="2"> <ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ </td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td colspan="2"> <ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ </td> </tr> <tr> <td colspan="2">Potential financing sources: Under study.</td> </tr> <tr> <td colspan="2">External credit:</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	600,000	<ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ 		Financing (US\$)		<ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ 		Potential financing sources: Under study.		External credit:		Donor:		<p>Special observations: 1) Funds should be earmarked for this initiative, since its benefits will be significantly greater than the small investment required to establish the system. 2) The project will have technical assistance from the World Meteorological Organization.</p>
Total investment required (US\$):	600,000														
<ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ 															
Financing (US\$)															
<ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ 															
Potential financing sources: Under study.															
External credit:															
Donor:															

Nicaragua**No. 8.1****Reconstruction, rehabilitation and upgrading of primary care infrastructure****Sector: HEALTH****Subsector: HOSPITAL ESTABLISHMENTS**

Background: Primary care infrastructure sustained considerable hurricane damage, which added to the regular deterioration already apparent in these facilities.

Facilities were also insufficient to attend to the population.

Project objectives: Reduce existing deficiencies by building seven health care centres and 25 health stations, repairing 130 centres and 594 stations, and establishing preventive maintenance programmes. The new installations will involve improvements and extensions.

Tentative duration: 24 months

Estimated starting date: March 1999

National agency in charge: Ministry of Health.

Description of activities and tasks: Detailed evaluation of damage in each facility under study; design of blueprints and building and equipment plans, based on national and international disaster-prevention standards; setting of priorities and programming of works; construction and repair; acquisition and installation of equipment; development of maintenance training programmes; design and application of maintenance routines.

Expected results: 163 health care centres and 778 stations will be able to provide assistance to the population and will be resistant to the impact of storms like Mitch; improved capacity and technology.

Total investment required (US\$): 27,000,000

- Labour
(25,000 person/months) 5,000,000
- Domestic inputs: 9,000,000
- Imported inputs: 13,000,000

Financing (US\$)

- Local:
- Foreign:
- Donation:

Potential financing sources:

External credit:
Donor:

Special observations:

Nicaragua	No. 8.2														
Hospital preparations to confront natural disasters															
Sector: HEALTH	Subsector: PREVENTION														
<p>Background: Nicaragua has been confronted with various natural disasters, whose frequency is increasing each year. Much infrastructure is damaged or destroyed on every occasion. Ironically, many health care facilities in hard-hit areas are unable to provide treatment because they have also been affected, some very severely.</p>															
<p>Project objectives: Incorporate the sector's plans into the National Emergency and Disaster Management Programme; strengthen referral and counter-referral networks for emergencies and disasters, and draw up institutional emergency plans for hospitals and health care facilities.</p>															
<p>Tentative duration: 24 months Estimated starting date: July 1999</p>	<p>National agency in charge: Ministry of Health.</p>														
<p>Description of activities and tasks: Assess the vulnerability of the 971 health care facilities and take short-term corrective measures; draw up institutional plans for intra and extra-hospital emergencies in keeping with the vulnerability of the installations; analyse and reorganize the response capacity of hospitals, centres and stations in keeping with the sector's modernization and decentralization process so as to adjust referral and counter-referral networks accordingly.</p>															
<p>Expected results: Emergency plans in health care facilities.</p>															
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Total investment required (US\$):</td> <td style="text-align: right;">2,500,000</td> </tr> <tr> <td colspan="2"> <ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ </td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td colspan="2"> <ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ </td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit:</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	2,500,000	<ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ 		Financing (US\$)		<ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ 		Potential financing sources:		External credit:		Donor:		<p>Special observations:</p>
Total investment required (US\$):	2,500,000														
<ul style="list-style-type: none"> • Labour (person/months) • Domestic inputs: • Imported inputs: _____ 															
Financing (US\$)															
<ul style="list-style-type: none"> • Local: • Foreign: • Donation: _____ 															
Potential financing sources:															
External credit:															
Donor:															

Nicaragua**No. 8.3****Development of the health sector's disaster prevention and mitigation capacity****Sector:** HEALTH**Subsector:**

Background: Nicaragua has been affected by different natural phenomena that have led to loss of life, damage to property and large-scale economic losses.

Project objectives: Strengthen and consolidate the health sector's national, departmental and local structure to deal with emergencies and disasters; strengthen national and departmental institutions' coordination and operational mechanisms; define priorities and vulnerable areas and draw up plans to address future disasters.

Tentative duration: 24 months**Estimated starting date:** January 1999**National agency in charge:** Ministry of Health and Civil Defence.

Description of activities and tasks: Develop institutional, organizational and legal instruments to strengthen the disaster prevention and mitigation system; evaluate previous disasters to establish potential risks and vulnerability; formulate prevention and mitigation plans; strengthen the health sector's operative and response capacity at all levels; draw up contingency plans, and train health sector personnel at all levels.

Expected results: New health-sector organizational and legal structure strengthened in disaster prevention and management; risk and vulnerability assessment; increased operative and response capacity, and national, departmental and local plans will be developed and broadcast.

Total investment required (US\$):	700,000
• Labour (430 person/months)	86,000
• Domestic inputs:	244,000
• Imported inputs:	370,000
Financing (US\$)	
• Local:	364,000
• Foreign:	
• Donation:	336,000

Potential financing sources:

External credit:

Donor: European countries.

Special observations: The project will have technical assistance from PAHO.

Nicaragua**No. 8.4****Maintenance plan for vector control in affected localities****Sector:** HEALTH**Subsector:**

Background: Mitch's devastating effects in the Pacific and northern regions are still being assessed. Preliminary Civil Defence figures (7 November) indicate an estimated 807,480 persons affected, 1,849 dead, 228 injured and 1,287 missing. The largest number of victims in proportion to the population were reported in Chinandega, León, Estelí, Granada, Matagalpa and Jinotega.

Project objectives: Reduce the negative impact on health in localities in Matagalpa and Jinotega. Improve health conditions in the face of vector-transmitted diseases in the departments with the highest epidemic potential. Reduce the transmission risk of vectorial diseases (malaria, dengue and leptospirosis) in these departments. Educate the population regarding handling of solid and liquid waste as a potential breeding ground for vectors.

Tentative duration: 1 year**Estimated starting date:** January 1999**National agency in charge:** PAHO/WHO, MINSA, SILAIS.

Description of activities and tasks: Carry out two eradication cycles; fumigate with cipermetrine and BTI using portable and LECO pumps in areas with the highest risk of malaria; carry out selective spraying in areas with a high risk of malaria falciparum; spread rat poison in areas with a high risk of leptospirosis.

Expected results: Prevent groups living in high-risk areas from being exposed to these diseases.

Total investment required (US\$):	15,660,000
• Labour (person/months)	480,000
• Domestic inputs:	1,280,000
• Imported inputs:	13,900,000
Financing (US\$)	
• Local:	5,660,000
• Foreign:	
• Donation:	10,000,000
Potential financing sources:	
External credit:	
Donor: European countries.	

Special observations: The project will have advisory assistance from PAHO/WHO. This project is of regional scope to prevent the spread of vectors across borders.

Nicaragua**No. 9.1****Strengthening of control and monitoring of drinking water quality****Sector: DRINKING WATER AND SANITATION****Subsector: DRINKING WATER**

Background: Sewers overflowed and latrines and septic tanks became waterlogged as a result of flooding. This poses a high risk of contamination of surface and underground sources of water for human consumption. In view of the prevalence of cholera and leptospirosis in various regions, water must be disinfected to ensure its microbiological quality.

Project objectives: Protect the health of 1.5 million people in high-risk areas by ensuring drinking water quality, thereby diminishing morbidity and mortality rates due to waterborne diseases.

Tentative duration: 12 months
Estimated starting date: December 1999

National agency in charge: Ministry of Health and ENACAL.

Description of activities and tasks: Update ENACAL's water quality control programme; update the Health Ministry's water quality monitoring programme; reformulate the water quality control programme in urban and rural areas by prioritizing microbiological monitoring; organize production and distribution of disinfectants through sanitary education and community mobilization; training in the use of water disinfectants; supply hypochlorite-producing, disinfection and water quality control equipment.

Expected results: Improved drinking water quality for 1.5 million people; monitoring of water quality; promotion of hygiene among the population and community participation in disinfection and drinking water control and monitoring programmes, and disinfection of drinking water.

Total investment required (US\$):	1,070,000
• Labour (person/months)	70,000
• Domestic inputs:	400,000
• Imported inputs:	600,000

Financing (US\$)

• Local:	
• Foreign:	320,000
• Donation:	750,000

Potential financing sources:

External credit:

Donor: European countries.

Special observations: The project will have technical assistance from PAHO/WHO.

Nicaragua**No. 9.2****Sewer rehabilitation and maintenance****Sector: DRINKING WATER AND
SANITATION****Subsector: SANITATION**

Background: Flooding damaged sewer systems in nine cities, thus increasing the risk of contaminated water. In view of the outbreaks of cholera and leptospirosis in various regions, sewerage systems must be rehabilitated.

Project objectives: Rehabilitate sewerage systems damaged by floods, improve the quality of sewerage services in nine cities affected by the hurricane, and clean and maintain existing sewer systems.

Tentative duration: 6 months**Estimated starting date: January 1999****National agency in charge:** ENACAL and municipal authorities.

Description of activities and tasks: Clean-up and maintenance of wells, trunk sewers and outfalls in city sewerage systems; acquire suction-pressure engines, rotorooters and pumps and rehabilitate manholes, trunk sewers and outfalls.

Expected results: Sewerage systems in nine affected cities will recover functionality, and all existing systems will be reviewed and restored.

Total investment required (US\$):	2,550,000
• Labour (person/months)	25,000
• Domestic inputs:	1,275,000
• Imported inputs:	1,250,000
Financing (US\$)	
• Local:	
• Foreign:	1,300,000
• Donation:	1,250,000
Potential financing sources:	
External credit: European countries.	
Donor: Under study.	

Special observations: A request for donation of a vector (suction-pressure engine), rotorooters, drainage pumps and complementary sewer maintenance equipment has already been submitted.

Nicaragua**No. 9.3****Rehabilitation of drinking water systems in urban and rural areas****Sector: SANITATION****Subsector: DRINKING WATER**

Background: Basic social infrastructure was severely damaged and urgently requires rehabilitation, due to the high risk of an increase in diseases such as cholera and leptospirosis.

Project objectives: Rehabilitate and restore drinking water systems affected by the hurricane and ensure quality in drinking water served to affected population.

Tentative duration: 18 months**Estimated starting date: January 1999****National agency in charge:** ENACAL and municipal authorities.

Description of activities and tasks: Draw up a rehabilitation programme for damaged drinking water systems; prepare specific designs; contract for works and execute them.

Expected results: Reconstruction of 79 urban and 230 rural drinking water systems which supplied 998,274 inhabitants in 11 departments, and satisfactory service in quantity and quality for 79 urban and 230 rural localities with damaged water mains.

Total investment required (US\$):	15,557,000
• Labour (15,000 person/months)	3,000,000
• Domestic inputs:	6,557,000
• Imported inputs:	6,000,000
Financing (US\$)	
• Local:	3,000,000
• Foreign:	6,557,000
• Donation:	6,000,000
Potential financing sources:	
External credit: European countries.	
Donor: Under study.	

Special observations:

Nicaragua	No. 9.4																						
Sanitary waste disposal in urban marginalized and rural areas																							
Sector: SANITATION	Subsector: SEWERAGE																						
<p>Background: Flooding waterlogged latrines and septic tanks, which must be replaced urgently due to the high risk of waterborne diseases and water, air and soil pollution.</p>																							
<p>Project objectives: Improve health and sanitary conditions for affected population by building individual sanitary disposal systems through community participation.</p>																							
<p>Tentative duration: 12 months</p> <p>Estimated starting date: January 1999</p>	<p>National agency in charge: Ministry of Health and municipal authorities.</p>																						
<p>Description of activities and tasks: Define the execution programme; train communities in technical aspects; determine the best solutions in communities; secure funding; execute works with community participation, and develop sanitary and environmental education programmes.</p>																							
<p>Expected results: <i>In situ</i> or cistern-flush waste disposal systems for 37,200 families, benefitting 223,000 inhabitants who will also have bath-houses with sullage filters and 37,200 laundry sinks. Improved personal hygiene through intensive community sanitary and environmental education programmes.</p>																							
<table border="1"> <tr> <td>Total investment required (US\$):</td> <td style="text-align: right;">7,600,000</td> </tr> <tr> <td>• Labour (12,500 person/months)</td> <td style="text-align: right;">2,500,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">3,100,000</td> </tr> <tr> <td>• Imported inputs:</td> <td style="text-align: right;">2,000,000</td> </tr> <tr> <td>Financing (US\$)</td> <td></td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">2,500,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">3,100,000</td> </tr> <tr> <td>• Donation:</td> <td style="text-align: right;">2,000,000</td> </tr> <tr> <td>Potential financing sources:</td> <td></td> </tr> <tr> <td colspan="2">External credit: European countries.</td> </tr> <tr> <td colspan="2">Donor: Under study.</td> </tr> </table>	Total investment required (US\$):	7,600,000	• Labour (12,500 person/months)	2,500,000	• Domestic inputs:	3,100,000	• Imported inputs:	2,000,000	Financing (US\$)		• Local:	2,500,000	• Foreign:	3,100,000	• Donation:	2,000,000	Potential financing sources:		External credit: European countries.		Donor: Under study.		<p>Special observations:</p>
Total investment required (US\$):	7,600,000																						
• Labour (12,500 person/months)	2,500,000																						
• Domestic inputs:	3,100,000																						
• Imported inputs:	2,000,000																						
Financing (US\$)																							
• Local:	2,500,000																						
• Foreign:	3,100,000																						
• Donation:	2,000,000																						
Potential financing sources:																							
External credit: European countries.																							
Donor: Under study.																							

- Labour
(12,500 person/months) 2,500,000
- Domestic inputs: 3,100,000
- Imported inputs: 2,000,000

- Local: 2,500,000
- Foreign: 3,100,000
- Donation: 2,000,000

Nicaragua**No. 9.5****Development of the sector's natural-disaster prevention and mitigation capacity****Sector: SANITATION****Subsector: EMERGENCIES****Background:** Drinking water and sewerage services were severely damaged by the hurricane.

Project objectives: Strengthen and consolidate the sanitation sector's national, departmental and local emergency measures; strengthen coordination mechanisms in national and departmental institutions; define priorities and vulnerable areas and prepare emergency plans as a sectorial contribution to the national disaster-preparedness programme; provide community training in plumbing, inspection and basic maintenance of drinking water and sewerage systems.

Tentative duration: 24 months**Estimated starting date: July 1999**

National agency in charge: ENACAL and municipal authorities, and coordination with MINSA and Civil Defence.

Description of activities and tasks: Assess the human and material resources and the administrative structure of drinking water and sewerage services institutions, including those provided for in the new regulations; evaluate past disasters to establish potential risks, vulnerability and institutional response capacity; review design standards in main installations; estimate the actions and investments needed to strengthen institutions (training of human resources, investment in equipment and communications, etc.); develop organizational and legal instruments to strengthen the disaster prevention and mitigation system; develop a communication and information system to follow up on main drinking water and sewerage installations and service centres, and formulate prevention and mitigation plans, including coordination with other institutions (MINSA, Civil Defence, etc.).

Expected results: Strengthened organizational and legal framework of institutions in charge of drinking water and sanitation services to ensure effective disaster prevention and response; awareness of risks and vulnerability; increased operative and response capacity, and well-publicized national, departmental and local plans.

Total investment required (US\$):	600,000
• Labour (person/months)	172,000
• Domestic inputs:	128,000
• Imported inputs:	300,000
Financing (US\$)	
• Local:	128,000
• Foreign:	
• Donation:	472,000
Potential financing sources:	
External credit: European countries.	
Donor: Under study.	

Special observations: The project will have technical assistance from WHO.

Nicaragua	No. 10.1																						
Engineering studies to rebuild destroyed bridges																							
Sector: TRANSPORT	Subsector: HIGHWAYS																						
<p>Background: Flooding destroyed 22 bridges in the country's road system, hindering access to highways leading to consumption centres. Traffic on available road sections has also been hindered.</p>																							
<p>Project objectives: Prepare technical information for bids to rebuild destroyed bridges.</p>																							
<p>Tentative duration: 3 months Estimated starting date: December 1998</p>	<p>National agency in charge: Ministry of Transport and Infrastructure (MTI).</p>																						
<p>Description of activities and tasks: Conduct topographical, geological, hydrological and structural studies for the new bridges, placing emphasis on the need to reduce vulnerability to high waters and floods.</p>																							
<p>Expected results: Comprehensive, updated and efficace technical information to rehabilitate and improve the country's road system.</p>																							
<table border="1"> <tr> <td>Total investment required (US\$):</td> <td style="text-align: right;">500,000</td> </tr> <tr> <td>• Labour (person/months)</td> <td></td> </tr> <tr> <td>• Domestic inputs:</td> <td></td> </tr> <tr> <td>• Imported inputs: _____</td> <td></td> </tr> <tr> <td>Financing (US\$)</td> <td></td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">100,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">400,000</td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td>Potential financing sources:</td> <td></td> </tr> <tr> <td>External credit: IBRD.</td> <td></td> </tr> <tr> <td>Donor:</td> <td></td> </tr> </table>	Total investment required (US\$):	500,000	• Labour (person/months)		• Domestic inputs:		• Imported inputs: _____		Financing (US\$)		• Local:	100,000	• Foreign:	400,000	• Donation: _____		Potential financing sources:		External credit: IBRD.		Donor:		<p>Special observations:</p>
Total investment required (US\$):	500,000																						
• Labour (person/months)																							
• Domestic inputs:																							
• Imported inputs: _____																							
Financing (US\$)																							
• Local:	100,000																						
• Foreign:	400,000																						
• Donation: _____																							
Potential financing sources:																							
External credit: IBRD.																							
Donor:																							

Nicaragua	No. 10.2																						
Engineering studies to rehabilitate damaged paved roads																							
Sector: TRANSPORT	Subsector: HIGHWAYS																						
<p>Background: The magnitude of the damage to the country's main paved highways makes it necessary to study the best alternatives for their repair.</p>																							
<p>Project objectives: Prepare the technical information needed to invite tenders to rebuild affected highway sections.</p>																							
<p style="text-align: center;">Tentative duration: 2 months</p> <p style="text-align: center;">Estimated starting date: December 1998</p>	<p>National agency in charge: Ministry of Transport and Infrastructure (MTI).</p>																						
<p>Description of activities and tasks: Conduct topographical studies, geometric design, structural road surfacing design, and design of drainage works to define reconstruction projects for damaged sections.</p>																							
<p>Expected results: Technical information to contract for reconstruction work.</p>																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%;">Total investment required (US\$):</td> <td style="text-align: right;">4,000,000</td> </tr> <tr> <td>• Labour (person/months)</td> <td></td> </tr> <tr> <td>• Domestic inputs:</td> <td></td> </tr> <tr> <td>• Imported inputs: _____</td> <td></td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">800,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">3,200,000</td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit: IBRD.</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	4,000,000	• Labour (person/months)		• Domestic inputs:		• Imported inputs: _____		Financing (US\$)		• Local:	800,000	• Foreign:	3,200,000	• Donation: _____		Potential financing sources:		External credit: IBRD.		Donor:		<p>Special observations:</p>
Total investment required (US\$):	4,000,000																						
• Labour (person/months)																							
• Domestic inputs:																							
• Imported inputs: _____																							
Financing (US\$)																							
• Local:	800,000																						
• Foreign:	3,200,000																						
• Donation: _____																							
Potential financing sources:																							
External credit: IBRD.																							
Donor:																							

Nicaragua**No. 10.3****Engineering studies to rehabilitate unpaved roads****Sector: TRANSPORT****Subsector: HIGHWAYS**

Background: Unpaved roads suffered severe damage, making it impossible for farm produce to reach consumption centres, and isolating various localities.

Project objectives: Prepare technical information to contract for reconstruction work, considering changes in routing where applicable, in order to prevent future damage.

Tentative duration: 3 months
Estimated starting date: December 1998

National agency in charge: Ministry of Transport and Infrastructure (MTI).

Description of activities and tasks: Conduct topographical and hydrological studies to prepare alternative routing proposals and define new road characteristics.

Expected results: Technical information to invite tenders to rebuild unpaved roads, avoiding repetition of past errors.

Total investment required (US\$): 1,000,000

- Labour
(person/months)

- Domestic inputs:

- Imported inputs: _____

Financing (US\$)

- Local: 200,000

- Foreign: 800,000

- Donation: _____

Potential financing sources:

External credit: BIRF.

Donor:

Special observations:

Nicaragua	No. 10.4																						
Engineering studies to rehabilitate partly damaged bridges																							
Sector: TRANSPORT	Subsector: HIGHWAYS																						
<p>Background: 49 bridges on paved and gravel roads were partly destroyed. Undamaged parts of the structures can be used, so they should be studied separately.</p>																							
<p>Project objectives: Prepare technical information to invite tenders to rebuild partly damaged bridges.</p>																							
<p style="text-align: center;">Tentative duration: 3 months</p> <p style="text-align: center;">Estimated starting date: December 1998</p>	<p>National agency in charge: Ministry of Transport and Infrastructure (MTI).</p>																						
<p>Description of activities and tasks: Prepare technical information to invite bids to rehabilitate partly damaged bridges.</p>																							
<p>Expected results: Topographical and structural studies to restore bridges, endeavouring to make the best possible use of undamaged parts.</p>																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 70%;">Total investment required (US\$):</td> <td style="text-align: right;">200,000</td> </tr> <tr> <td>• Labour (person/months)</td> <td></td> </tr> <tr> <td>• Domestic inputs:</td> <td></td> </tr> <tr> <td>• Imported inputs: _____</td> <td></td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">40,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">160,000</td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit: IBRD.</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	200,000	• Labour (person/months)		• Domestic inputs:		• Imported inputs: _____		Financing (US\$)		• Local:	40,000	• Foreign:	160,000	• Donation: _____		Potential financing sources:		External credit: IBRD.		Donor:		<p>Special observations:</p>
Total investment required (US\$):	200,000																						
• Labour (person/months)																							
• Domestic inputs:																							
• Imported inputs: _____																							
Financing (US\$)																							
• Local:	40,000																						
• Foreign:	160,000																						
• Donation: _____																							
Potential financing sources:																							
External credit: IBRD.																							
Donor:																							

Nicaragua	No. 10.5																						
Reconstruction of unpaved roads																							
Sector: TRANSPORT	Subsector: HIGHWAYS																						
Background: 200 secondary unpaved roads were totally or partly destroyed, thus preventing or hampering normal transport to and from affected zones.																							
Project objectives: Re-establish some 1,600 kilometres of rural roads with appropriate designs and layouts.																							
Tentative duration: 18 months Estimated starting date: March 1999	National agency in charge: Ministry of Transport and Infrastructure (MTI).																						
Description of activities and tasks: Restoration of road edges; earthworks, construction of drains and laying of gravel pavement.																							
Expected results: Scheduled works will re-establish traffic, which in turn will facilitate agricultural produce distribution thus normalizing productive and social activities.																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 45%;">Total investment required (US\$):</td> <td style="text-align: right;">45,000,000</td> </tr> <tr> <td>• Labour (45,000 person/months)</td> <td style="text-align: right;">9,000,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">27,000,000</td> </tr> <tr> <td>• Imported inputs: _____</td> <td style="text-align: right;">9,000,000</td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">9,000,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">36,000,000</td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit: IBRD, IDB and CABEL.</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	45,000,000	• Labour (45,000 person/months)	9,000,000	• Domestic inputs:	27,000,000	• Imported inputs: _____	9,000,000	Financing (US\$)		• Local:	9,000,000	• Foreign:	36,000,000	• Donation: _____		Potential financing sources:		External credit: IBRD, IDB and CABEL.		Donor:		<p>Special observations: This project is complementary to the rebuilding and rehabilitation of bridges on damaged roads. The new routing under study will not necessarily coincide with former routes, to avoid possible risks.</p>
Total investment required (US\$):	45,000,000																						
• Labour (45,000 person/months)	9,000,000																						
• Domestic inputs:	27,000,000																						
• Imported inputs: _____	9,000,000																						
Financing (US\$)																							
• Local:	9,000,000																						
• Foreign:	36,000,000																						
• Donation: _____																							
Potential financing sources:																							
External credit: IBRD, IDB and CABEL.																							
Donor:																							

- Labour
(45,000 person/months) 9,000,000
- Domestic inputs: 27,000,000
- Imported inputs: _____ 9,000,000

Financing (US\$)

- Local: 9,000,000
- Foreign: 36,000,000
- Donation: _____

Potential financing sources:

External credit: IBRD, IDB and CABEL.

Donor:

Nicaragua	No. 10.6																						
Rehabilitation of partly damaged bridges																							
Sector: TRANSPORT	Subsector: BRIDGES																						
<p>Background: The enormous damages to highway infrastructure and lack of resources make it recommendable to study the technical feasibility of making use of structures that are not seriously damaged.</p>																							
<p>Project objectives: Complement the bridge rebuilding project described previously.</p>																							
<p style="text-align: center;">Tentative duration: 12 months</p> <p style="text-align: center;">Estimated starting date: March 1999</p>	<p>National agency in charge: Ministry of Transport and Infrastructure (MTI).</p>																						
<p>Description of activities and tasks: Rehabilitate 49 partly damaged bridges in keeping with the results of the proposed engineering study.</p>																							
<p>Expected results: Operative highway infrastructure.</p>																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Total investment required (US\$):</td> <td style="text-align: right;">4,000,000</td> </tr> <tr> <td>• Labour (6,000 person/months)</td> <td style="text-align: right;">1,200,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">800,000</td> </tr> <tr> <td>• Imported inputs: _____</td> <td style="text-align: right;">2,000,000</td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">800,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">3,200,000</td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit: IDB, IBRD and CABEL.</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	4,000,000	• Labour (6,000 person/months)	1,200,000	• Domestic inputs:	800,000	• Imported inputs: _____	2,000,000	Financing (US\$)		• Local:	800,000	• Foreign:	3,200,000	• Donation: _____		Potential financing sources:		External credit: IDB, IBRD and CABEL.		Donor:		<p>Special observations:</p>
Total investment required (US\$):	4,000,000																						
• Labour (6,000 person/months)	1,200,000																						
• Domestic inputs:	800,000																						
• Imported inputs: _____	2,000,000																						
Financing (US\$)																							
• Local:	800,000																						
• Foreign:	3,200,000																						
• Donation: _____																							
Potential financing sources:																							
External credit: IDB, IBRD and CABEL.																							
Donor:																							

- Labour
(6,000 person/months) 1,200,000
- Domestic inputs: 800,000
- Imported inputs: _____ 2,000,000

Financing (US\$)

- Local: 800,000
- Foreign: 3,200,000
- Donation: _____

Potential financing sources:

External credit: IDB, IBRD and CABEL.

Donor:

Special observations:

Nicaragua	No. 10.7																						
Reconstruction of destroyed road bridges																							
Sector: TRANSPORT	Subsector: HIGHWAYS																						
<p>Background: As indicated in the Study Project, the hurricane destroyed 22 bridges on different roads, cutting off or obstructing traffic.</p>																							
<p>Project objectives: Re-establish regular traffic with operating costs in line with road standards.</p>																							
<p>Tentative duration: 18 months Estimated starting date: March 1999</p>	<p>National agency in charge: Ministry of Transport and Infrastructure (MTI).</p>																						
<p>Description of activities and tasks: Rebuild destroyed bridges following the designs resulting from engineering studies.</p>																							
<p>Expected results: Normal use of roads.</p>																							
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Total investment required (US\$):</td> <td style="text-align: right;">20,000,000</td> </tr> <tr> <td>• Labour (30,000 person/months)</td> <td style="text-align: right;">6,000,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">6,000,000</td> </tr> <tr> <td>• Imported inputs: _____</td> <td style="text-align: right;">8,000,000</td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">4,000,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">16,000,000</td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit: IBRD, IDB and CABEL.</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	20,000,000	• Labour (30,000 person/months)	6,000,000	• Domestic inputs:	6,000,000	• Imported inputs: _____	8,000,000	Financing (US\$)		• Local:	4,000,000	• Foreign:	16,000,000	• Donation: _____		Potential financing sources:		External credit: IBRD, IDB and CABEL.		Donor:		<p>Special observations:</p>
Total investment required (US\$):	20,000,000																						
• Labour (30,000 person/months)	6,000,000																						
• Domestic inputs:	6,000,000																						
• Imported inputs: _____	8,000,000																						
Financing (US\$)																							
• Local:	4,000,000																						
• Foreign:	16,000,000																						
• Donation: _____																							
Potential financing sources:																							
External credit: IBRD, IDB and CABEL.																							
Donor:																							

- Labour
(30,000 person/months) 6,000,000
- Domestic inputs: 6,000,000
- Imported inputs: _____ 8,000,000

Financing (US\$)

- Local: 4,000,000
- Foreign: 16,000,000
- Donation: _____

Potential financing sources:

External credit: IBRD, IDB and CABEL.

Donor:

Special observations:

Nicaragua**No. 10.8****Reconstruction of damaged paved highways****Sector: TRANSPORT****Subsector: HIGHWAYS**

Background: Damages were so severe that a reconstruction plan for paved highways must be drawn up, while raising existing standards.

Project objectives: Ensure that roads meet current overland transport demands.

Tentative duration: 24 months

Estimated starting date: March 1999

National agency in charge: Ministry of Transport and Infrastructure (MTI).

Description of activities and tasks: Works will consist of improved routing, recovery of roadbeds, repaving of deteriorated stretches and reconstruction of complementary works such as drainage and road safety measures.

Expected results: Clear, safe highways.

Total investment required (US\$): 200,000,000

- Labour (150,000 person/months) 30,000,000
- Domestic inputs: 50,000,000
- Imported inputs: 120,000,000

Financing (US\$)

- Local: 40,000,000
- Foreign: 160,000,000
- Donation: _____

Potential financing sources:

External credit: IBRD, IDB and CABEL.

Donor:

Special observations:

Nicaragua**No. 10.9****Planning and feasibility studies to expand the main highway system and feeder roads****Sector: TRANSPORT****Subsector: PRE-INVESTMENT**

Background: Main highways were obstructed as a result of the hurricane, making it difficult and costly to link places of origin with destinations; indirect costs to the sector were estimated at more than US\$200 million.

The Nicaraguan highway network is incomplete, i.e., there is a shortage of road links between cities, the capital and ports. Secondary and tertiary networks are also incomplete, and lack sufficient feeder roads to the highway system.

Ironically, a similar amount could have been used to significantly expand the country's road capacity.

Project objectives: Study highway linkage alternatives between the country's main urban and productive centres and identify the best ways of completing the highway system and its feeder roads.

Tentative duration: 12 months**Estimated starting date: March 1999****National agency in charge:** Ministry of Communications, Transport, Public Works and Housing.

Description of activities and tasks: Develop an extensive highway planning study (traffic engineering, demand, projections, alternative routes, etc.) and conduct project feasibility studies.

Expected results: Technical and economic information for well-founded decision-making on the most cost-effective projects to be executed in the short and medium terms.

Total investment required (US\$):

900,000

- Labour
(person/months)
- Domestic inputs:
- Imported inputs: _____

Financing (US\$)

- Local:
- Foreign:
- Donation: _____

Potential financing sources:

External credit: IDB, IBRD and CABEL.

Donor:

Special observations: 1) Judging by the insufficiencies of the highway system, the study is likely to offer profitable and attractive investments amounting to some US\$200-300 million.
2) This initiative has been included in the government's Reconstruction Plan, and programmed resources within the above range have been envisaged.
3) Projects for a further several hundred million dollars to improve and expand the secondary and tertiary (summer only) systems are also under study.

Nicaragua**No. 10.10****Feasibility studies to widen, improve and rebuild the Central American highway****Sector: TRANSPORT****Subsector: PRE-INVESTMENT**

Background: Several stretches of the Nicaraguan section of the Central American highway were destroyed or damaged. This has hindered integration, trade and production, hampered economic and social development and raised transport costs between Central American countries.

CABEI donated US\$7.5 million to these countries in order to finance studies to prevent obstructions on the international highway.

Project objectives: Provide technical information to support reconstruction decisions by Nicaragua and CABEI; widening and improvement of national segments of the Central American highway.

Tentative duration: 12 months**Estimated starting date: January 1999****National agency in charge:** Ministry of Communications, Transport, Public Works and Housing.

Description of activities and tasks: Conduct feasibility studies on the best international linkage options, then evaluate and design them. These studies will seek to rectify routing and layout limitations and widen, improve and modernize the current highway.

Expected results: Technical information to select, programme and execute the necessary roadwork.

Total investment required (US\$): 2,500,000

- Labour
(person/months)
- Domestic inputs:
- Imported inputs: _____

Financing (US\$)

- Local:
- Foreign:
- Donation: _____

Potential financing sources:

External credit:
Donor: CABEI

Special observations: Execution of the works suggested by these studies will probably require an investment of US\$120-150 million. The government envisages a similar figure in its reconstruction programme. The project is obviously regional.

Nicaragua	No. 11.1																										
Basic studies for the construction of low-cost housing																											
Sector: HOUSING	Subsector: PRE-INVESTMENT																										
Background: The extensive destruction of housing was due above all to unsuitable location of human settlements in urban and rural areas.																											
Project objectives: Re-establish destroyed housing units and relocate them in less vulnerable sites.																											
Tentative duration: 12 months <hr/> Estimated starting date: March 1999	National agency in charge: General Directorate of Housing and City Planning of the Ministry of Transport and Infrastructure, Nicaraguan Municipal Development Institute and Nicaraguan Land-Use Planning Institute.																										
Description of activities and tasks: Assess the vulnerability of current human settlements; identify suitable sites for new housing; take institutional and legal steps to be able to use the selected sites; conduct engineering and architectural studies to define housing design, ensuring the use of domestic inputs and labour as far as possible.																											
Expected results: Architectural and site information for construction companies and the government to make building plans for 50,000 low-cost housing units.																											
<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Total investment required (US\$):</td> <td style="text-align: right;">500,000</td> </tr> <tr> <td>• Labour (person/months)</td> <td></td> </tr> <tr> <td>• Domestic inputs:</td> <td></td> </tr> <tr> <td>• Imported inputs:</td> <td></td> </tr> <tr> <td colspan="2"><hr/></td> </tr> <tr> <td colspan="2">Financing (US\$)</td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">100,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">400,000</td> </tr> <tr> <td>• Donation:</td> <td></td> </tr> <tr> <td colspan="2"><hr/></td> </tr> <tr> <td colspan="2">Potential financing sources:</td> </tr> <tr> <td colspan="2">External credit: IBRD, IDB and HABITAT.</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	500,000	• Labour (person/months)		• Domestic inputs:		• Imported inputs:		<hr/>		Financing (US\$)		• Local:	100,000	• Foreign:	400,000	• Donation:		<hr/>		Potential financing sources:		External credit: IBRD, IDB and HABITAT.		Donor:		Special observations: The international community and financial agencies should place priority on this project and, if possible, provide donations in view of the precariousness of existing settlements.
Total investment required (US\$):	500,000																										
• Labour (person/months)																											
• Domestic inputs:																											
• Imported inputs:																											
<hr/>																											
Financing (US\$)																											
• Local:	100,000																										
• Foreign:	400,000																										
• Donation:																											
<hr/>																											
Potential financing sources:																											
External credit: IBRD, IDB and HABITAT.																											
Donor:																											

Nicaragua	No. 11.2																						
Preliminary studies to repair damaged low-cost housing units																							
Sector: HOUSING	Subsector: PRE-INVESTMENT																						
<p>Background: The hurricane damaged around 100,000 low-cost dwellings; repairs require official, systematic support.</p>																							
<p>Project objectives: Step up repair work, bearing structural standards in mind to make housing less vulnerable to disasters.</p>																							
<p>Tentative duration: 12 months</p> <hr/> <p>Estimated starting date: March 1999</p>	<p>National agency in charge: General Directorate of Housing and City Planning of the Ministry of Transport and Infrastructure, Nicaraguan Municipal Development Institute and Nicaraguan Land-Use Planning Institute.</p>																						
<p>Description of activities and tasks: Analyse damaged housing; provide incentives to construction companies; seek soft financing from national financial agencies and execute the repairs.</p>																							
<p>Expected results: Specialized background information to repair housing and make it less vulnerable.</p>																							
<table border="1"> <tr> <td>Total investment required (US\$):</td> <td style="text-align: right;">1,000,000</td> </tr> <tr> <td>• Labour (person/months)</td> <td></td> </tr> <tr> <td>• Domestic inputs:</td> <td></td> </tr> <tr> <td>• Imported inputs: _____</td> <td></td> </tr> <tr> <td>Financing (US\$)</td> <td></td> </tr> <tr> <td>• Local:</td> <td></td> </tr> <tr> <td>• Foreign:</td> <td></td> </tr> <tr> <td>• Donation: _____</td> <td></td> </tr> <tr> <td>Potential financing sources:</td> <td></td> </tr> <tr> <td>External credit:</td> <td></td> </tr> <tr> <td>Donor: Under study.</td> <td></td> </tr> </table>	Total investment required (US\$):	1,000,000	• Labour (person/months)		• Domestic inputs:		• Imported inputs: _____		Financing (US\$)		• Local:		• Foreign:		• Donation: _____		Potential financing sources:		External credit:		Donor: Under study.		<p>Special observations:</p>
Total investment required (US\$):	1,000,000																						
• Labour (person/months)																							
• Domestic inputs:																							
• Imported inputs: _____																							
Financing (US\$)																							
• Local:																							
• Foreign:																							
• Donation: _____																							
Potential financing sources:																							
External credit:																							
Donor: Under study.																							

Nicaragua	No. 11.3																						
Construction of 50,000 destroyed dwellings																							
Sector: HOUSING	Subsector: HUMAN SETTLEMENTS																						
Background: An estimated 50,000 housing units located on particularly vulnerable sites were destroyed.																							
Project objectives: Rebuild housing using locally made, more disaster-resistant building materials, based on intensive use of unemployed labour. Build larger, better quality housing units in safe, urbanized locations.																							
Tentative duration: 24 months <hr/> Estimated starting date: March 1999	National agency in charge: General Directorate of Housing and City Planning of the Ministry of Transport and Infrastructure, Nicaraguan Municipal Development Institute, Housing Bank and Ministry of the Family.																						
Description of activities and tasks: Promote private-sector participation in construction and develop affordable financing formulas for low-income groups; make maximum use of the country's prefabricated housing capacity and build the housing units.																							
Expected results: 25,000 more housing units a year than those built under normal conditions.																							
<table border="1"> <tr> <td>Total investment required (US\$):</td> <td style="text-align: right;">300,000,000</td> </tr> <tr> <td>• Labour (1,330,000 person/months)</td> <td style="text-align: right;">100,000,000</td> </tr> <tr> <td>• Domestic inputs:</td> <td style="text-align: right;">140,000,000</td> </tr> <tr> <td>• Imported inputs:</td> <td style="text-align: right;">60,000,000</td> </tr> <tr> <td>Financing (US\$)</td> <td></td> </tr> <tr> <td>• Local:</td> <td style="text-align: right;">90,000,000</td> </tr> <tr> <td>• Foreign:</td> <td style="text-align: right;">210,000,000</td> </tr> <tr> <td>• Donation:</td> <td></td> </tr> <tr> <td>Potential financing sources:</td> <td></td> </tr> <tr> <td colspan="2">External credit: IBRD, IDB, bilateral financing and national private banks.</td> </tr> <tr> <td colspan="2">Donor:</td> </tr> </table>	Total investment required (US\$):	300,000,000	• Labour (1,330,000 person/months)	100,000,000	• Domestic inputs:	140,000,000	• Imported inputs:	60,000,000	Financing (US\$)		• Local:	90,000,000	• Foreign:	210,000,000	• Donation:		Potential financing sources:		External credit: IBRD, IDB, bilateral financing and national private banks.		Donor:		Special observations: External credit should include soft terms.
Total investment required (US\$):	300,000,000																						
• Labour (1,330,000 person/months)	100,000,000																						
• Domestic inputs:	140,000,000																						
• Imported inputs:	60,000,000																						
Financing (US\$)																							
• Local:	90,000,000																						
• Foreign:	210,000,000																						
• Donation:																							
Potential financing sources:																							
External credit: IBRD, IDB, bilateral financing and national private banks.																							
Donor:																							

Total investment required (US\$):	300,000,000
• Labour (1,330,000 person/months)	100,000,000
• Domestic inputs:	140,000,000
• Imported inputs:	60,000,000
Financing (US\$)	
• Local:	90,000,000
• Foreign:	210,000,000
• Donation:	

Nicaragua	No. 11.4																						
Repair and improve 94,500 damaged dwellings																							
Sector: HOUSING	Subsector: HUMAN SETTLEMENTS																						
Background: 94,500 housing units were damaged for the same reasons stated previously.																							
Project objectives: Repair and improve damaged housing using self-help construction methods.																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center; padding: 5px;">Tentative duration: 12 months</td> <td style="padding: 5px;">National agency in charge: Ministry of the Family and FISE.</td> </tr> <tr> <td style="text-align: center; padding: 5px;">Estimated starting date: January 1999</td> <td></td> </tr> </table>	Tentative duration: 12 months	National agency in charge: Ministry of the Family and FISE.	Estimated starting date: January 1999																				
Tentative duration: 12 months	National agency in charge: Ministry of the Family and FISE.																						
Estimated starting date: January 1999																							
Description of activities and tasks: Train beneficiaries in construction techniques; acquire materials and repair damages; thereafter, families will be responsible for completing construction work, using durable materials and making extensions in accordance with their own resources.																							
Expected results: 94,500 repaired housing units.																							
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px;">Total investment required (US\$):</td> <td style="text-align: right; padding: 5px;">56,700,000</td> </tr> <tr> <td style="padding: 5px;">• Labour (300,000 person/months)</td> <td style="text-align: right; padding: 5px;">22,700,000</td> </tr> <tr> <td style="padding: 5px;">• Domestic inputs:</td> <td style="text-align: right; padding: 5px;">20,000,000</td> </tr> <tr> <td style="padding: 5px;">• Imported inputs: _____</td> <td style="text-align: right; padding: 5px;">14,000,000</td> </tr> <tr> <td colspan="2" style="padding: 5px;">Financing (US\$)</td> </tr> <tr> <td style="padding: 5px;">• Local:</td> <td style="text-align: right; padding: 5px;">17,000,000</td> </tr> <tr> <td style="padding: 5px;">• Foreign:</td> <td style="text-align: right; padding: 5px;">39,700,000</td> </tr> <tr> <td style="padding: 5px;">• Donation: _____</td> <td></td> </tr> <tr> <td colspan="2" style="padding: 5px;">Potential financing sources:</td> </tr> <tr> <td colspan="2" style="padding: 5px;">External credit: IBRD, IDB, bilateral financing and national private banks.</td> </tr> <tr> <td colspan="2" style="padding: 5px;">Donor:</td> </tr> </table>	Total investment required (US\$):	56,700,000	• Labour (300,000 person/months)	22,700,000	• Domestic inputs:	20,000,000	• Imported inputs: _____	14,000,000	Financing (US\$)		• Local:	17,000,000	• Foreign:	39,700,000	• Donation: _____		Potential financing sources:		External credit: IBRD, IDB, bilateral financing and national private banks.		Donor:		Special observations: External credit should include soft terms.
Total investment required (US\$):	56,700,000																						
• Labour (300,000 person/months)	22,700,000																						
• Domestic inputs:	20,000,000																						
• Imported inputs: _____	14,000,000																						
Financing (US\$)																							
• Local:	17,000,000																						
• Foreign:	39,700,000																						
• Donation: _____																							
Potential financing sources:																							
External credit: IBRD, IDB, bilateral financing and national private banks.																							
Donor:																							

- Labour
(300,000 person/months) 22,700,000
- Domestic inputs: 20,000,000
- Imported inputs: _____ 14,000,000

Financing (US\$)

- Local: 17,000,000
- Foreign: 39,700,000
- Donation: _____

Potential financing sources:

External credit: IBRD, IDB, bilateral financing and national private banks.

Donor:

Special observations: External credit should include soft terms.