

II. DESCRIPTION OF THE DAMAGE

1. Social sectors

a) Housing

The preliminary information available as of the date of the visit to the country, ²³ only partially confirmed by fieldwork carried out by experts from the Social Fund for Housing (FOSOFI), indicates approximately 35,000 homes destroyed and 50,000 partly affected with damage ranging from 10 per cent to 50 per cent. To date no information is available on the degree to which the housing stock of transnational banana companies was affected.

The hurricane made landfall in Honduras in the Islas de la Bahía archipelago and the north coast, and remained stationary with disastrous results on Guanaja island and the departments of Colón and Atlántida. Torrential rains caused rivers to flood throughout the country, with the worst water and mud flood levels this century. The flooding of the Cangrejal river in the department of Atlántida caused enormous destruction and damage to the buildings along its banks; the huge swell destroyed housing and hotel infrastructure on the Atlantic coastline in Colón and Atlántida. The flooding of the Aguán river, and especially its turbulent current, had a violent impact on most of the communities in the Aguán valley, where for a long time inhabitants had no basic services such as drinking water, electricity and telephones. The waters of the flooded Chamalecón poured into the department of Cortés, had a major impact on downtown La Lima, and buried the suburbs of San Pedro Sula under mud. The flooding of the Frío river in the central department of Comayagua destroyed and damaged houses and entire districts. In the capital, Tegucigalpa, the combined force of the swollen waters of the Grande de Choluteca and Chiquito rivers caused flooding and destruction in the city centre, in buildings located along their path, even in central areas and well-established neighbourhoods. In some cases, when the river left its natural bed, it undermined the slopes, causing mudslides and the partial and total collapse of housing in residential districts.

According to a preliminary document issued by the College of Architects of Honduras, the affected areas in Tegucigalpa were basically those damaged in previous disasters, along with new areas affected by the torrential rains, which widened riverbeds and gullies and caused landslides along the El Picacho and El Berrinche geological faults.

The damaged areas were classified as follows:

- i) Collapses and landslides: Reparto Arriba and El Chile neighbourhoods, and the Soto, Nueva Esperanza, and Los Pinos districts.
- ii) Flooded rivers and gullies along the Choluteca riverbed: Loarque, Río Grande, Satélite, San José de la Vega, Las Brisas, Betanía, El Prado, Humuya, and Maradiaga districts, the La

²³ In the week from 16 to 20 November, the ECLAC mission had not concluded and communities that had yet to be included remained inaccessible.

Bolsa neighbourhood, from 1st to 4th Avenue in Comayagüela, the market area (San Isidro, Colón, Alvarez and Las Américas), El Jazmín, Barrio Abajo, El Chile neighbourhoods, the Soto district, and Miramesí.

- iii) Along the Chiquito riverbed: the San Rafael and La Hoya neighbourhoods.
- iv) Along the Guacerique riverbed: the Lomas de Tiloarque, República de Venezuela, and Nueva Esperanza districts, and the Villa and Guacerique neighbourhoods.²⁴

Estimates based on direct observation coincide with the College's assessment of severe damage to urban infrastructure in 70 per cent of the areas affected, caused by the impact of river water, total flooding and silting; 25 per cent with minor damage due to partial flooding of rivers and torrents of rainwater discharging directly into rivers, and 5 per cent with minimal damage such as collapsed walls and the accumulation of debris and dirt.

Significant losses were reported in the southern region, where the flooding of the Choluteca and Nacaome rivers swept away houses on the riverbanks in the Departments of Choluteca and Valle. In Choluteca City the river rose and flooded entire districts and neighbourhoods.

The scale of the damage and destruction of rural housing is considered severe in the areas that suffered from flooding and torrential rains. Nothing stood in the way of the destructive force of these catastrophic events because the materials used in housing construction are mainly adobe, wood, and scrap.²⁵ In Tegucigalpa, a large proportion of the housing destroyed was low-cost; these houses were located in settlements built in high-risk areas on the floodplains of rivers, and on slopes and gullies near rivers.

Field visits and interviews revealed that a large number of houses and buildings built with solid materials were totally destroyed in residential areas near the river due to landslides and the force of the flooding. In the flooded areas of the most central and oldest parts of the city, houses built in adobe or plaited cane and mud were totally destroyed but brick and breeze block constructions, although partially destroyed with collapsed walls and roofs, can be repaired.

Tegucigalpa has seen the same pattern of urban growth as in other Latin American cities, with unsuitable land use and a lack of town-planning and building regulations. Along with population growth and urban poverty, this has increased the pressure on the urban environment and exposed a large proportion of the population to enormous risk as never before.

The 1997 Continuing Survey of Households places the housing stock at around 1,100,000 houses.²⁶ Housing sector institutions (FOSOFI) estimate a total deficit of 700,000 houses, including both qualitative and quantitative shortfalls.

²⁴ College of Architects of Honduras, Plan de emergencia de desarrollo urbano para Tegucigalpa y Comayagüela, November, 1998.

²⁵ These materials are used in 82 per cent of houses in rural areas. Bureau of Statistics and Censuses, Encuesta permanente de los hogares y de la población, Tegucigalpa, September 1997.

²⁶ Ibid.

The high housing shortage in Honduras, a feature common to the region, is due to public social-sector spending cuts during the eighties, especially in the housing sector, and very low investment in housing for low-income sectors in the nineties. Public spending on housing fell from 3 per cent in 1982-1989 to 1.9 per cent in 1990-1995.²⁷

In Honduras this is reflected in a large qualitative shortfall. The low-income population has no other option but owner-built housing, using low-cost and low-quality materials, and building in higher-risk urban and rural areas such as floodplains and gullies.

i) Estimate of damage. Based on information provided by COSOVI and other agencies such as COPECO, CODEM, CODER, Ingeniería Comercial, the Municipal Association of Honduras and certain local governments, provisional estimates (fieldwork is still providing more accurate figures) show that 35,000 houses were completely destroyed, with partial damage to another 50,000 housing units.

These houses were located in both urban residential areas and rural parts of the country and their construction and quality varied widely. When the fieldwork finishes, the figures on housing in the rural sector will undoubtedly be significantly higher, once housing that cannot currently be assessed because of the lack of communication is included.

Despite the above, the total value of the damage to the sector is estimated at 4,646 million lempiras (US\$344 million). This includes 2,984 million lempiras in direct damages, the cost of houses completely or partially destroyed and the value of furniture and household goods damaged by water or lost altogether. The figure also includes indirect damage amounting to another 1,662 million lempiras: the cost of temporary shelters for the homeless, the cost of relocating houses in places free of the risk of new flooding, the removal of debris, the reconnection of water, electricity and other services, and the estimated loss of rent from houses rendered uninhabitable (see Table 4).

Despite the previous estimate, which includes both the loss of housing and some indirect losses already mentioned, the cost of repair and reconstruction in the sector will be higher, because of new factors such as inflation. The cost of repair and reconstruction is estimated to amount to at least 6,545 million lempiras (US\$484.8 million), as detailed in Table 5. Moreover, the repair and reconstruction programme will have a negative effect on the country's foreign sector, because equipment and building materials not produced locally will have to be imported at a cost of US\$76.1 million (see Table 5).

²⁷ ECLAC, "Evolución del gasto público social en América Latina: 1980-1995", Cuadernos de la CEPAL No. 80 (LSG/1949-P), Santiago, Chile, July 1996.

Table 4

HONDURAS: ESTIMATED DAMAGE IN THE HOUSING SECTOR

(Millions of lempiras)

Item	Total damage	Direct damage	Indirect damage
National total	4,645.7	2,983.8	1,661.9
Dwellings destroyed	830.0	830.0	-
Dwellings damaged	1,755.0	1,755.0	-
Furniture and household goods	398.8	398.8	-
Temporary shelters	302.4	-	302.4
Relocation of dwellings	496.8	-	496.8
Removal of debris	206.8	-	206.8
Reconnection of services	41.5	-	41.5
Loss of rent from dwellings	614.4	-	614.4

Source: ECLAC estimates, based on provisional information from FOVOSI, the Central Bank and other official sources.

Table 5

HONDURAS: ESTIMATED REPAIR AND RECONSTRUCTION COSTS IN THE HOUSING SECTOR

(Millions of lempiras)

Item	Total cost	Cost of repair	Cost of reconstruction	Effect on foreign sector
National total	6,545.2	3,591.4	2,953.8	1,027.1
Reconstruction of housing	2,457.0	-	2,457.0	491.4
Repair of housing	2,376.0	2,376.0	-	237.6
Furniture and household goods	664.7	664.7	-	212.7
Temporary shelters	302.4	302.4	-	15.0
Relocation of dwellings	496.8	-	496.8	49.7
Removal of debris	206.8	206.8	-	20.7
Reconnection of services	41.5	41.5	-	...

Source: ECLAC estimates.

The repair costs mentioned below for returning to normality refer only to the short term and include:

1) The cost of repairing damaged dwellings totals 2,376 million lempiras, at an average of 35,000 lempiras per unit, weighted by the type of material for the type of housing and the severity of the damage. This amount includes a percentage for labour costs.

2) Cost of temporary shelters. This assessment was based on the need to build emergency housing progressively (as mentioned above) for approximately 18,000 families, assuming that middle-income families will find a provisional housing solution by renting in the private sector and will not occupy the temporary shelters.

3) Replacement of losses in family household equipment and furniture, with an imported component covering domestic electric appliances.

4) Cost of removing debris and materials, and reconnecting public services.

The costs of rebuilding the 35,000 dwellings destroyed were calculated by weighing types of housing for the middle and lower-income sectors in urban, suburban and rural areas. Costs range between 130,000, 80,000 and 34,000 lempiras per housing unit. The figures per unit include building materials, the price of land and basic infrastructure, labour and 10 per cent for unforeseen expenses. It was assumed that a large percentage of the dwellings for lower-income sectors in rural and suburban areas would be built by their owners, or through community participation and mutual assistance.

The amount needed for reconstruction could be lowered if the housing units available on the market (some completed, others 80 per cent built) were used. Information provided by savings and loans associations, banks specialising in the financing of housing (CAHDEAP), the National Public Employees Retirement and Pensions Institute (INJUPEMP) and other institutions shows that some 15,000 dwellings in Honduras have not been put on the market because of low income levels and high interest rates on loans. These institutions are now offering this housing, requesting subsidies of 30 per cent to 40 per cent of the price, depending on whether they are targeted at middle or middle to lower-income sectors. They are also offering 20 to 30-year mortgages, with an interest rate of around 12 per cent and a six-month grace period.

The costs of building materials for repair and reconstruction were assessed on the basis of domestically produced materials: bricks, blocks and cement, and also traditional materials manufactured with improved techniques, such as industrialised and improved adobe. This could be an area in which alternative economic activity could be promoted (for example, work for food) for population groups that have lost their livelihoods in the affected areas.

ii) Reconstruction. Despite the exceptional force of the natural catastrophe that struck Honduras, its impact on the housing sector and its nation-wide effects would have been less severe but for certain structural weaknesses in types of construction and their location.

Most of the damaged housing was situated on floodplains. In rural areas this is because farmers have to live near their fields, and flooding is an implicit and well-known risk in such settlements. In these cases, the exceptional flood levels and the speed at which rivers rose caused

flooding and damage on an unprecedented scale. Construction with inappropriate materials, such as adobe, palm and thatch, cannot withstand flooding.

In the urban sector of Tegucigalpa and Comayagüela, the situation was different. Damage in the capital affected poor, irregular settlements in high-risk areas, and also middle-income urban areas located on slopes near riverbeds. The high cost of land in the capital ²⁸ has led middle and middle to lower-income families from the formal sector to build their houses in less expensive areas at greater environmental risk.

The country's long-standing housing shortage in both urban and rural areas and the deficient basic services have been aggravated by the effects of the hurricane and exceed the institutional and financial capacity of the agencies responsible for the sector.

The situation requires close institutional coordination between national and local institutions, the private sector, NGOs, and civil organisations. Such coordination should be based on "a comprehensive approach to emergency, rehabilitation and reconstruction actions focusing on development". ²⁹

During the first stage of the emergency FOSovi acted as a promoter in drawing up a "Joint and concerted plan to restore and rebuild the housing sector and human settlements", with the committed participation of private and public institutions and NGOs. The "Emergency Committee" designed the plan and put forward a proposal to create a National Housing-Sector Reconstruction Commission, made up of representatives of FOSovi, SOPTRAVI, FONAPROVI, AMHON, RAP, CICH, CAH, CIMEQH, CAHDEAP, the Disasters Commission and the Housing Committee of the National Congress, BCH, INJUPEMP, INPREMA and other welfare agencies, as well as specialised NGOs. The idea is for FOSovi and SOPTRAVI to coordinate all the agencies and necessary actions for the emergency, restoration and reconstruction stages.

The Plan's working mechanisms must be established and put into effect in the short term. Immediate measures, including the following actions, are a priority:

- 1) Issuing an Executive Decree to create a National Housing-Sector Reconstruction Commission under the Presidency of the Republic, with the power and autonomy to implement the Plan's actions.
- 2) Issuing a Legislative Decree granting the Commission temporary authority to expedite town-planning and housing construction permits and procedures (in accordance with the Law mentioned in point 3).
- 3) Enactment of the Decree-Law on Uninhabitable Areas issued in December.
- 4) Formulation of environmental management plans (catchment areas, water, waste, and others).

²⁸ As much as 40 per cent of the total cost of a house.

²⁹ UNCHS/Habitat, *Propuesta preliminar para la atención de la energía en Centroamérica*, undated.

- 5) Preparation of national and municipal land regulation plans (high-risk areas, land-use and building regulations).
- 6) Agreement between State and private-sector financial institutions to manage and channel funds in the most favourable conditions for affected families.
- 7) Establishment of conditions (loans, subsidies, personal savings) and mechanisms for access to financing, both for rehabilitation and reconstruction programmes, based on lending policies that ensure priority access for women heads of households and low-income families.
- 8) Active incorporation of professional associations, councils and community organisations into the plan's programmes and actions.
- 9) Ongoing coordination with the municipal sector through AMHON.
- 10) The public sector should guide, regulate and supervise the execution of actions. Direct execution should be left to the national and international private sector, i.e., the building sector and NGOs.
- 11) Distribution of materials for housing repair and provision of technical assistance and training to families in building techniques. Universities and professional associations could play a central role in such training.
- 12) Implementation and strengthening of housing projects by NGOs and cooperatives; implementation of housing and basic services improvement programmes; support for programmes aimed at the middle-income strata.
- 13) Promotion of local production of building materials and creation of stocks of building materials.
- 14) Quantification of available stocks in the housing sector and municipal availability of land.
- 15) Institutional strengthening and training of additional human resources in government housing-sector agencies.

b) Health care

The institutional health care network in Honduras suffered considerable damage to facilities and equipment, severely affecting the delivery of its already insufficient services at a time of extraordinary demand. The inability to meet the surge in demand as a result of the emergency situation was obvious, although the massive international aid effort helped to offset it, at least partially. As in other countries, in Honduras a wide range of health services is available to people of varying means: Ministry of Health centres open to all, of particular importance in rural areas; Honduran Social Security Institute (IHSS) centres, which only provide services to those with IHSS insurance—around one fifth of the population, mainly in cities—and private sector centres, both profit and non-profit, such as churches and national and foreign NGOs that provide services in poor

areas, where a significant role is also played by an extensive informal subsystem. Hurricane Mitch inflicted damage on all of them, some suffering only minor losses and others, the total destruction of their facilities and equipment, not to mention the effects on staff, resulting in different degrees of disarray (see Table 6).

Table 6

HONDURAS: PUBLIC HEALTH CENTRES
DAMAGED BY HURRICANE MITCH

(Number of centres)

	Total	Damaged	Percentage
Total	1,091	123	11.3
Césares a/	763	82	10.7
Césamos b/	278	33	11.9
C.M.I. c/	21	2	9.5
Hospitals d/	29	6	20.7

Source: Ministry of Health.

a/ Rural health centres with one nurse.

b/ Rural health centres with one doctor.

c/ Maternal and child care clinics.

d/ Includes two IHSS hospitals in metropolitan Tegucigalpa.

The cost of the direct damage to facilities, furnishings and equipment obviously varies in each case, from slight damage needing only repair work to massive damage requiring total replacement. The Hospital Médico Quirúrgico in Tegucigalpa—the largest in the IHSS—suffered enormous damage in the basement and first two floors. Not only were support services such as laundry, kitchen, and store rendered useless, but also the pathology, emergency, clinical laboratory, blood bank, X-ray, pharmacy, orthopaedics, and ear, nose and throat departments and others were also rendered inoperative. Emergency actions included transferring some services to the Maternal and Child Care Unit—with the ensuing costs—in order to treat emergencies in certain specialities.³⁰ Direct damage to IHSS physical infrastructure throughout the institute's facilities is estimated at approximately 80 million lempiras, with the loss of equipment at 90 million lempiras (totalling some US\$12.6 million).

Not only were surgical facilities damaged, however; small Health Ministry units and some of its larger ones, amounting to 11 per cent of the total, also suffered. In all, direct damage to buildings is estimated at 48 million lempiras, with loss of furnishings, equipment and medicines at 80 million (totalling around US\$9.5 million). As in other sectors, region 3 (San Pedro Sula, La Lima, Choloma, El Progreso) and region 4 (especially Choluteca) were the most affected.

³⁰ The flooding of the Choluteca river has affected this building repeatedly. After Mitch, an expert structural appraisal is required to assess whether it can continue to provide services in its current location or whether it should be moved to a new site. Preliminary estimates indicate that relocating the hospital and providing new equipment would cost almost 630 million lempiras (US\$46 million).

There are more than 320 private-sector facilities throughout Honduras, including profit (280) and non-profit (40) clinics and hospitals, as well as private practices and other clinics and minor centres. No information is available on the damage suffered by such facilities due to their geographical dispersion; however, a reasonable estimate would put the cumulative damage to physical infrastructure and loss of furnishings and equipment at around 47 million lempiras (US\$3.5 million).

The national total for the direct costs of hurricane Mitch, in total or partial loss of buildings and medical equipment, furnishings, etc. stands at 345 million lempiras, a little over US\$25 million (see Table 7).

Spending on reconstruction, assuming facilities and equipment are to be modernised, could reach more than 900 million lempiras —approximately US\$67 million—, with an imported component of US\$35 million, due mainly to the need to import medical equipment. The figure could be much higher —around US\$100 million— if the IHSS's Hospital Médico Quirúrgico is to be completely rebuilt outside the disaster area.

The emergency exerted enormous pressure on a health care system with a response capacity already diminished not only by the loss of facilities, but also by the lack of available staff, in both the formal and the informal sectors. The informal sector was particularly hard-hit in poor communities. The additional demand meant that medical care had to be provided to the large numbers of injured, and emergency preventive measures had to be taken to avoid epidemics in a country where malaria and dengue are endemic and cases of cholera frequent. The people housed in shelters —10 per cent of the country's inhabitants, if not more— posed a particularly delicate challenge for the health authorities in both senses (curative and preventive), which could not have been met without massive, decisive support from the international community. As is often the case in such situations, respiratory diseases, diarrhoea, conjunctivitis and skin conditions have been the most frequent problems and have resulted in an extraordinary demand for services, which will continue for some weeks until the greatest risk of epidemics is over.

In preventive medicine and water purification, PAHO provided a strategic service by mobilising its human and financial resources, efficiently complemented by the health authorities and grass-roots organisations. UNICEF contributions were also significant in distributing drinking water and efforts to rebuild the social fabric. WFP supported these actions with food aid, largely donated by the United States. A long list of supportive governments³¹ offered aid in human capital, drugs and equipment. Because they were donations, the actual amounts are difficult to quantify, but they made up for shortfalls in the Honduran health care system in facing an emergency with so many people affected. In addition, large-scale and rapid aid was provided by civil humanitarian associations, both local and foreign. These contributions covered a substantial portion of the indirect expenses faced by the national health care system (see estimates in Table 7).

³¹ Mexico, Cuba, Japan and Spain were quick to respond, as were many other countries.

Table 7

HONDURAS: DAMAGE IN THE HEALTH SECTOR *a/*

(Thousands of lempiras)

Item	Damage			Reconstruction costs	Imported component
	Total	Direct	Indirect		
Total	840,448	345,498	494,950	903,185	468,547
Partial or total destruction of health infrastructure	148,298	148,298		370,745	159,732
Loss of equipment and furnishings	197,200	197,200		532,440	308,815
Extra spending on drugs during and after the emergency	162,000		162,000		
Transfer, treatment and recovery of victims	13,500		13,500		
Spending on community education	2,700		2,700		
Spending on preventive actions, vaccines, pest control and disease vectors	40,500		40,500		
Epidemiological monitoring and control	27,000		27,000		
Increased cost of inpatient, outpatient and medical care	6,250		6,250		
Higher cost of medical care due to increased morbidity	108,000		108,000		
Cost attributable to reduced delivery capacity <i>b/</i>	135,000		135,000		

Source: ECLAC, based on Ministry of Health, IHSS and PAHO figures.

a/ Includes estimated costs for the public health care and social security systems, the private sector (profit and non-profit), and the informal sector.

b/ Includes the effects of the drop in IHSS contributions forecast for 1998 and 1999 on the delivery of health care services, and the effects of lack of coordination in the informal sector.

Corpse disposal and dissemination of preventive measures are also components, albeit minor ones, of these costs. Another is the inability of institutions to offer medical services due to suspended operations and the difficulty of re-establishing them in the short term. This situation is expected to worsen considerably in the months to come, due partly to the expected decrease in IHSS revenue resulting from lower numbers of beneficiaries as unemployment levels rise. Another cause for concern is disarray in the informal health care services used by a large segment of the poor population—73 per cent of Honduran homes—in a country with such severe deficiencies.³²

Total indirect costs were estimated at almost 495 million lempiras (approximately US\$37 million). These costs have been partly covered by international cooperation, in the form of emergency aid in kind and in specialised personnel.

³² As an example, child mortality is 35 per 1000 live births, exceeded in the Latin American and Caribbean region only by Haiti (77), Nicaragua (44) and Guatemala (40).

The total for direct and indirect costs amounts to 840 million lempiras, more than US\$62 million.

One final clarification in the area of health care concerns damage to water and sewage systems, detailed further ahead in the chapter on basic infrastructure. The correlation between the quality of these services and the risk of epidemiological outbreaks of diseases transmitted by vectors or by infection becomes even stronger in the overcrowding that prevail in shelters. In other words, there is a threat of certain diseases re-emerging. Although this in itself cannot be considered “damage”, without adequate preventive investment there could be a major economic impact.³³ In Honduras, the total lack of dengue prevention measures could affect its 6.2 million inhabitants with huge economic and social costs: incomplete prevention could easily lead to curative costs ranging anywhere between US\$10 and 20 million.

c) **Education**

The education sector was severely affected by the hurricane, with damage to around 20 per cent of schools. According to available information, in 1996 Honduras had almost 10,000 classrooms in public schools. Of these, more than 2,000 suffered damage of some kind. Kitchens (123), storerooms (105), bathrooms (701 sanitary modules) and latrines (1,439) were also damaged. Of the total mentioned above, 16 per cent covers public pre-school facilities. A similar percentage should be added for pre-school centres in the private sector since this sector receives a quarter of all pupils at that level. The rest are primary and secondary schools.

Geographically, the information available suggests the greatest damage was concentrated in the departments of Colón (23 per cent), Francisco Morazán (22 per cent) and Cortés (12.5 per cent), followed by Choluteca, Comayagua and Yoro. Although the number of classrooms affected in Francisco Morazán appears lower, the damage was much more severe and the reconstruction effort will be greater. On the other hand, damage to schools was almost insignificant in the departments of Copán, Lempira, La Paz, Ocotepeque and Intibucá. Table 8 shows preliminary figures for the damage in each department.

In higher education, facilities were damaged or destroyed at the National School of Forestry Sciences, the National School of Agriculture, and the National Autonomous University of Honduras. This includes damage to buildings and crops, biological reserves, and irrigation, water, electricity and telephone systems.

In addition, damage and destruction of equipment, furnishings and educational material at all levels of education amount to relatively large sums, and global estimates have been made of damage and replacement costs.

³³ For example, an exhaustive study showed that in the 1994 dengue epidemic, the cost per patient in Nicaragua was US\$50 (in Cuba comparable costs were almost 5 times greater).

Table 8

HONDURAS: DAMAGE IN PUBLIC SCHOOLS, BY DEPARTMENT

(November 19, 1998) a/

	Classrooms	Classrooms destroyed	Classrooms damaged	Total classrooms affected
Total	20,492	1,333	1,572	1,930
Atlántida		0	58	58
Colón		102	474	576
Comayagua	1,357		118	118
Copán	944	2	30	32
Cortés	2,655	69	146	215
Choluteca	1,601	0	307	307
El Paraíso	1,398	0	15	15
Francisco Morazán	3,172	118	21	139
Gracias a Dios	260	3	80	83
Intibucá	995	0	0	0
Islas de la Bahía	582	129	32	54
La Paz	311	868	14	14
Lempira	916	0	30	30
Ocotepeque	436	0	3	3
Olancho	1,742	27	0	27
Santa Bárbara	1,554	15		15
Valle	907	0	33	33
Yoro	1,662	0	211	211

Source: Education Ministry Directorates.

a/ Government figures give a slightly different total: 767 classrooms destroyed and 1,678 damaged, putting the total at 2,465 classrooms in 1,151 schools.

The facilities, furnishings and equipment of sports and cultural institutions were also damaged or destroyed. These include the facilities and equipment of La Isla sports complex in Tegucigalpa-Comayagüela, the National Music Conservatory, the Marimba School, the Banda de los Supremos Poderes and numerous sports fields throughout the country.

The Ministry of Education's headquarters suffered extensive damage and will require relocation to a flood-free site. In addition, equipment, furnishings, material and the sector's electronic filing and records system were damaged or destroyed, and their replacement will involve considerable cost and effort.

As is normal in such situations, a large number of schools throughout the country were used as temporary shelters for evacuees and the homeless. The hurricane hit with only one month left in the school year, so the government decided to declare the end of the 1998 cycle to prevent further

interrupted classes and curricula owing to the use of schools as shelters. However, using educational facilities as emergency shelters has led to inevitable damage, with the corresponding repair costs.

Total costs in education are estimated at 446 million lempiras (US\$33 million). From pre-school to higher education, this figure includes direct damage to infrastructure, furnishings and materials, cultural and sports facilities and equipment, as well as the total of 362 million lempiras for the Ministry of Education building and equipment. Total costs also include indirect costs of a further 84 million lempiras, incurred from the use of schools as temporary shelters and the need to relocate some schools to flood-free areas in the future (see Table 9).

Although the estimated total cost is high, it should be recalled that the cost of reconstruction will be even greater since unit costs for reconstruction will be higher than those of the original construction. The total cost of reconstruction for the sector will reach 552 million lempiras (see Table 9).

Table 9

HONDURAS: DAMAGE IN THE EDUCATION SECTOR

(Millions of lempiras)

Item	Total damage	Direct damage	Indirect damage	Cost of reconstruction	Effect on balance of payments
<u>National total</u>	<u>446.4</u>	<u>362.4</u>	<u>84.0</u>	<u>551.8</u>	<u>207.6</u>
Pre-school to secondary education	200.0	200.0	-	287.0	100.5
Higher education	23.8	23.8	-	32.0	11.2
Equipment, furnishings and educational material	40.0	40.0	-	56.0	39.2
Sports and cultural facilities	13.6	13.6	-	42.8	18.3
Ministry of Education	85.0	85.0	-	100.0	35.0
Use of schools as shelters	50.0	-	50.0	-	-
Relocation of schools to safe places	34.0	-	34.0	34.0	3.4

Source: ECLAC estimates based on official information.

Much of the equipment, furnishings and materials needed for reconstruction are not produced locally, so this will have a negative effect on the balance of payments of around US\$15.4 million (Table 9).

The estimated cost of reconstruction for Honduras is huge. Beyond this, however, there are incalculable losses in an educational system which, despite its weaknesses and shortfalls, had made enormous efforts in recent years to extend its coverage, particularly at the secondary and pre-school levels. The human impact of the tragedy on both teachers and students and its significance for Honduran education in general should be added to the damage quantified herein. The discouragement

and demoralisation caused by a tragedy on this scale could have a much higher cost than the figures presented here.

It is therefore essential for the Honduran authorities and people, together with aid agencies and the international community, to take advantage of this natural disaster to overcome the structural crisis that has afflicted the Honduran educational system for decades. Different international agencies —IDB, the World Bank, UNDP, UNICEF and UNESCO— have all stressed the central role education can play in promoting not only greater social integration and an improved quality of life, but also more rapid economic growth to generate the resources needed to make investment in education financially sound and sustainable. Today Honduras provides an opportunity to turn the reconstruction costs identified here into an investment in building for the future.

2. Infrastructure

Infrastructure was affected by floods and, in general, by the very heavy rainfall caused by the hurricane virtually throughout the country. The damage affected infrastructure and transport, communications, electric power, water and sewerage services, and irrigation and drainage systems.

a) Transport and communications

i) Roads. The hurricane caused enormous damage to the national road system, particularly to concrete bridge structures; this in turn led to considerable damage to wearing surfaces and roadbeds.

The country has two main types of landscape, which made it easier to classify the damage; one comprises the northern slopes of mountains in the coastal north, while the other is hilly to mountainous and makes up the rest of the country.

The damages in the first category were caused by the high speed of flooded rivers and by the fact that most of the damaged structures are located in places where there is a change in gradient between mountains and valleys. These gradient changes help to diminish water velocity and therefore its drag capacity, so large amounts of material were deposited in front of or underneath structures, thus silting river beds and forcing the water to pass over roads and other structures. The lack of closed buttresses or simply the non-existence of buttresses on approaches to bridges aggravated the damage in this sector. In other cases bridge spans were too short, and approaches were increased in order to reduce initial investment. This situation —a frequent occurrence— made river runoffs widen, destroying the approaches. In some instances water velocity increased to such an extent on passing under a bridge that its foundations were undermined and its buttresses sank.

In the hilly and mountainous sector the main damage was caused by material swept along by floodwater, such as stones, sand and trees, which silted river beds and drains. Water levels therefore rose above the roads, engulfing them, eroding banks downstream and affecting road surfaces as the erosion advanced. As a result, in many roads on mountain slopes relatively small gullies frequently caused damages beginning some 50 metres upstream from the road and ending 100 metres downstream. The cost of repairing such damages is very high and has no bearing on the original cost of construction.

As can be imagined, there is a direct correlation between the high cost of the damages sustained by road infrastructure and the environmental deterioration that existed prior to the hurricane. On reconstructing it will therefore be essential to include environmental restoration measures as a part of the technical solution.

The impact on the highway and road system—including main and feeder roads and local roads—is severe and has had a significant effect on communications and overland transport. Specifically, 9,198 linear metres of bridges made of solid materials were partly or wholly destroyed, and 2,045 linear metres of approaches were lost (see Table 10, which lists the damages to different types of roads). In addition to road damages, there were also vehicle losses caused by high water levels and floods.

The emergency work undertaken to solve the most pressing overland communication needs included building paved fords and setting up provisional Bailey-type bridges; this has at least provided access in order to perform the most urgent assistance and transport tasks.

Moreover, the magnitude of infrastructure damage in the sector has led to a significant increase in passenger and freight-transport costs and to longer travel times. These indirect damages, arising from a disaster and affecting economic flows, include higher operating costs for vehicles travelling on deteriorated surfaces and an added cost to passengers stemming from longer travel times. This situation is expected to continue for approximately four years, which is the period required for the sector to return to normality; indirect damages therefore comprise a high percentage of the total estimated amount required to re-establish overland transport.

The total damage sustained by the country's overland transport as a result of the hurricane amounts to 7,090 million lempiras or US\$525 million. This includes direct damages to the road system and the vehicle stock in the amount of 3,194 million lempiras, and indirect damages, which will continue throughout the reconstruction period, amounting to an additional 3,896 million (see Table 11).

Table 10

HONDURAS: DAMAGE TO ROADS

Road		Length (km)	Percentage damaged (to be rebuilt)	Cost (millions of lempiras) a/
<u>Paved highways</u>				
Carretera del Norte CA-5				
San Pedro Sula-Puerto Cortés	(CH)	44	20	47.52
San Pedro Sula-Tegucigalpa	(PA)	240	35	210.00
Puerto Cortés-Frontera con Guatemala	(PA)	64.6		215.29
<u>Southern zone</u>				
Tegucigalpa – Choluteca, CA-5	(PA)	137	60	197.28
Júcaro Galán – El Amatillo, CA-1	(PA)	40		-
Choluteca – El Espino, CA-1	(PA)	64	40	61.44
Choluteca – Guasaule, CA-3	(PA)	44	5	5.50
<u>Atlantic Coast</u>				
San Pedro Sula-El Progreso	(CH)	28	15	23.52
Santa Rita-Yoro	(PA)	100	60	92.40
El Progreso-Tela-La Ceiba	(PA)	200	40	216.00
La Ceiba-Sabá	(PA)	78	50	66.30
Sabá-Tocoa-Corocito-Bonito Corocito-Puerto				
Castilla-Trujillo	(PA)	92.7	70	110.33
Sabá-Olanchito	(PA)	28	60	28.56
La Barca-El Progreso	(PA)	37		20.74
<u>Eastern zone</u>				
Tegucigalpa-Juticalpa	(PA)	168	20	33.60
Juticalpa-Catacamas	(PA)	42	40	16.80
Tegucigalpa-Danlí	(PA)	97	3	48.87
Danlí-Las Manos	(PA)	30	33	20.00
<u>Others</u>				
Paved secondary roads	(PA)	278		87.66
Unpaved secondary	(NP)	2,164		162.30
Unpaved local roads	(NP)	9,579.3		663.45
Roads in coffee-growing areas	(NP)	200	25	6.00
Bridges				551.92
Total				<u>3,193.55</u>

Source: ECLAC estimates based on official figures.

Note: PA = Hard-top paving; CH = Hydraulic concrete; NP = Unpaved.

a/ Estimated unit costs:

Reconstruction of paved roads using hard-top paving: 3 million lempiras/km.

Reconstruction of paved roads using hydraulic concrete: 6 million lempiras/km.

Reconstruction of unpaved roads: 2 million lempiras/km.

Exchange rate used: US\$1 = 13.5 lempiras (November 1998).

However, reconstruction costs will be much higher than the cost of direct damage, not only because replacement of lost or damaged assets will involve higher unit costs than their current worth, but also because new works will have to be designed based on flood susceptibility reduction criteria. The cost of reconstruction is estimated at 5,557 million lempiras (US\$411.6 million), to be disbursed over four years (Table 11).

In addition, the country's balance of payments will be affected in this reconstruction period as a result of imports of construction equipment, machinery and materials, and fuels that are not produced locally. According to estimates, the volume of imports will reach US\$350 million dollars (Table 11).

Table 11

HONDURAS: DAMAGE IN THE TRANSPORT AND COMMUNICATIONS SECTOR

(Millions of lempiras)

Item	Total damage	Direct damage	Indirect damage	Cost of reconstruction	Effect on the balance of payments
<u>National total</u>	<u>7,818.0</u>	<u>3,818.5</u>	<u>3,999.5</u>	<u>6,324</u>	<u>5,321.0</u>
<u>Overland transport</u>	<u>7,089.6</u>	<u>3,193.6</u>	<u>3,896.0</u>	<u>5,557</u>	<u>4,735.7</u>
Main roads		1,722.2	...	2,670	
Paved secondary roads		87.7	...	146	
Unpaved secondary roads		162.3	...	324	1,898.5
Local roads		669.5	...	1,013	
Bridges		551.9	...	690	
Increased transport costs		-	3,535.6	-	2,847.2
Emergency repair work		-	360.4	-	-
Other reconstruction items a/		-	-	714	-
<u>Airports</u>	<u>41.5</u>	<u>34.7</u>	<u>6.8</u>	<u>35</u>	<u>37.6</u>
Communications and control equipment		31.3	-	-	31.3
Civil works		3.4	-	-	0.3
Loss of operation		-	6.8	-	6.0
<u>Ports</u>	<u>35.8</u>	<u>26.3</u>	<u>9.5</u>	<u>48</u>	<u>10.5</u>
Equipment		4.3	-	...	...
Civil works		22.0	-	...	...
Loss of operation		-	9.5	-	...
<u>Communications</u>	<u>651.1</u>	<u>563.9</u>	<u>87.2</u>	<u>684</u>	<u>537.2</u>
Telephone		433.6	-	...	...
Civil works		130.3	-	...	...
Loss of operation		-	87.2	-	...

Source: ECLAC estimates based on official information.

a/ Includes the cost of designing and supervising works, and a component for future flood protection.

ii) Airports. The hurricane caused damage to air traffic communications and control equipment. To date, airport runways, taxi-ways and aprons have shown no signs of damage and their drainage systems worked well. Other airport facilities suffered minor damage.

Nevertheless, there were periods when airports were unusable, causing indirect economic losses in the form of unsold tickets and freight not carried during the period when the San Pedro Sula facilities were closed.

The air traffic communications and control equipment urgently requires replacement to prevent the airport operating under severely limited conditions that could lead to more closures in the event of bad weather in the future.

The total amount for damage under the heading of airports has been estimated at 41.5 million lempiras (US\$3.1 million). The direct damage to communications and physical infrastructure was calculated at 34.7 million lempiras, whereas losses due to the temporary suspension of air operations will add another 6.8 million. Replacing lost assets and passenger and freight losses will have a negative effect on the balance of payments of approximately US\$2.8 million (Table 11).

iii) Ports. The country's port infrastructure in general suffered no major damage. However, some minor facilities were affected to varying degrees. The worst damage involved broken rock embankments, silting, and damage to onboard drinking water systems and stores. Other equipment —radio-communications, lighthouses, buoys and others— suffered considerable damage and most of it will have to be replaced.

The total cost of damage under this heading has been estimated at 36 million lempiras (US\$2.7 million), of which 26 million is for damage to the subsector's equipment and physical infrastructure, and 10 million for operating losses due to the temporary suspension of port operations. However, the cost of the reconstruction of infrastructure and the replacement of equipment will total 48 million lempiras (US\$ 3.6 million dollars) and will involve imports of equipment and materials totalling US\$800,000, with the consequent impact on the balance of payments (Table 11).

iv) Communications. Damage in this subsector was mainly to the telephone service, with two main types of losses, both of them on a large scale: damage to the multipair and fibre-optic cable networks, which as of the date of the mission had been mostly returned to provisional service, and equipment and civil works at telephone company facilities. The greatest impact was at "La Vega" in Tegucigalpa, a 10,000-line switchboard. There were also relatively large losses in minor equipment and spare parts and damage to the stores where they were kept. Out of a national total of 237,291 lines, 26,341 were temporarily out of order (11 per cent).

In other communications services —radiopagers, community repeaters, the trunk system, data transmission and switching, mobile phones, radio transmission, television and the COCESNA (air traffic services outside the positive control area)— damage was limited. It is worth noting that cellular telephone companies saw spectacular increases in their invoices as a result of inoperable traditional telephone lines and the need for direct, immediate communication with the authorities.

Total damage to this subsector is estimated at 651 million lempiras (US\$48 million), 564 million for direct damage to equipment and physical facilities and 87 million for indirect damage due to the temporary loss of service and lost billing. Replacing equipment and making repairs to infrastructure will involve higher prices totalling an estimated 684 million lempiras, to which imports (mainly equipment) valued at US\$39.8 million must be added, with the consequent effect on the balance of payments.

However, insurance payments will go some way towards covering the net losses of companies that operate in the subsector, and reinsurance with foreign insurers will partly offset the effect on the balance of payments.

v) Railways. According to the national railway authorities, there was no major damage. The repairs needed can be included in periodic maintenance work, which the company is already carrying out with its own personnel and resources. The network should be fully operational in six weeks. Direct and indirect damage for this sector is therefore not included.

vi) Summary. In the transport and communications sector, the total damage is estimated at 7,818 million lempiras (US\$579 million). Of this, 91 per cent (7,090 million) is for highway transport, undoubtedly the worst affected. Direct damage to assets—including both infrastructure and equipment—is estimated at 3,818 million lempiras. The remaining 4,000 million lempiras cover indirect damage and include increased transport costs and income lost due to the lack of normal services during the repair and reconstruction period. Reconstruction costs will amount to 6,324 million lempiras (US\$468 million) due to the increase in the unit costs of works and equipment. The need to import goods and services will lead to a balance-of-payments shortfall estimated at US\$394 million over the reconstruction period (Table 11).

b) Energy

The energy sector suffered damage to electricity generation, transmission and distribution, and under the heading of fuel.

i) Electricity. The landslides and flooding caused by the heavy and continuous rains seriously affected the electrical system as a whole throughout the country, especially where distribution networks and generating plants are concerned. Although it made the damage worse, wind was not a primary cause.

Electricity generation is managed by six companies. The state-owned ENEE³⁴ is responsible for 66.4 per cent of the system's total capacity, and five private companies³⁵ generate the remainder. Power generating capacity was reduced temporarily by 50.1 MW, 6.7 per cent of the total installed capacity which includes private power companies. The affected stations were: the El Nispero (22.5 MW), Santa María del Real (1.8 MW) and Amapala (1.8 MW) hydroelectric power stations, all run by the ENEE, and the privately-owned La Ceiba fuel-powered station (24 MW). The El Nispero power station was out of service because the Palaja river filled the plant's outlet with mud (now

³⁴ National Electric Power Company.

³⁵ The private companies and their installed capacities are: EMCE (84 MW), ELCOSA (80 MW), CEMCOL (22.5 MW), LAEISZ (22.5 MW) and LUFASA (39.5 MW).

cleaned); Santa María del Real remains out of service due to damage to pressure piping; La Ceiba suffered minor flood damage and is once more ready for operation; the Amapala power station suffered damage to its electrical system and a short circuit in the generator that was operating. The civil works at the Cañaveral and Francisco Morazán hydroelectric power stations were also damaged due to silting at the dams, access roads, berms and banks; these need immediate attention to avoid unscheduled plant stoppages and high repair costs in the future.

The transmission network was mainly affected by landslides and flooding that partly or totally destroyed 15.6 kilometres of 69 kV lines, 11.8 kilometres of 138 kV lines and 2.8 kilometres of 230 kV lines (3.5 per cent, 1.5 per cent and 0.4 per cent of installed capacity, respectively). The sections where damage was reported are: Morazán-Yoro, Bijao-Alsthom, Sta. Fe-La Leona, Suyapa-Zamorano, Zamorano-Danlí and Guaimaca-Juticalpa in 69 kV lines; Tela-La Ceiba, Isletas-Bonito Oriental, Circunvalación-Progreso, Santa Marta-Progreso, Bermejo-Sulzer, Piedras Azules-Santa Fe and Cañaveral-Piedras Azules in 138 kV lines; Suyapa-Pavana and Pavana-Los Prados in 230 kV lines; and approximately 14 kilometres of damaged 34.5 kV subtransmission lines in Níspero-Mochito and Pavana-Santa Lucía.

The Bijao, Santa Marta, Bella Vista and Choluteca substations suffered flood damage, and the Térmica Sulzer substation had switch damage caused by the hurricane-force winds. All these facilities are now in service, except the Choluteca substation which was completely buried under mud.

More than 385 kilometres of 13.8 kV single, two and three-phase distribution lines, or 6.7 per cent of installed capacity, were left unserviceable. The worst affected areas were Central (94 kilometres), Atlantic (85 kilometres), South-East (72 kilometres) and Choluteca San Lorenzo (67 kilometres). This amount will increase substantially when figures are available for the damage in areas that remain inaccessible due to floods or poor road conditions. The ENEE's operating divisions serve the following departments: North-West, Cortés, Santa Bárbara, Copán, Ocotepeque, and Lempira; Atlantic, Atlántida, Colón, and Utila island; Center South, Francisco Morazán, Comayagua, Intibucá, La Paz, Olancho, El Paraíso, Valle, and Choluteca; South Valle de Choluteca, and East Paraíso. It should be noted that damage to the distribution networks was probably worsened by their physical condition prior to Mitch's arrival, since a large part had already reached the end of its service life or was about to do so, and more than 70 per cent was in only regular or poor condition, as reported by the ENEE itself.

The fact that the floodwaters of the Comayagüela river caused the total loss of the billing system (software and hardware) is extremely important, although the records themselves survived since they were located elsewhere. Improper land use exacerbated the flooding because buildings had been placed in the riverbed, and the construction of protecting walls reduced the riverbed's area. Damage was further heightened by the deforestation of the catchment area. In Choluteca, floods caused the loss of office equipment and furnishings, radio-communication equipment and stored inventory.

The loss of electricity was mainly due to damage to transmission and distribution networks, and service has not been fully restored. Nevertheless, transmission and distribution networks had been partly or provisionally restored less than one month after the hurricane, returning supplies to a level of approximately 550 MW, 91.7 per cent of the demand before the arrival of Mitch. It is also worth mentioning that despite the precarious conditions of the network, the electrical system did not collapse totally across the country as a result of the hurricane, as can be seen from output figures for

the period from October 17 to November 18. The minimum demand recorded in the period was 281 MW on November 1.

The drop in energy consumption has led to a reduction in the amounts billed from October possibly until January, when distribution networks are expected to be fully operational. It should be recalled that losses in the system in relation to the power generated fluctuate between 20 per cent and 24 per cent, putting the power company in a difficult financial situation that must be addressed if the costs of repairs and of the investments needed to expand and maintain the system are to be met.

Total damage in the electricity subsector is estimated at 226 million lempiras (US\$17 million). Of this, only 78 million are for direct damage to the production, transmission and distribution infrastructure, whereas 148 million account for indirect losses due to lost electricity sales. However, the higher unit costs of replacements and the need for measures to minimise the risk of damage in future flooding mean that reconstruction costs will reach 295 million lempiras (US\$22 million). In turn, this will have a negative impact on the balance of payments because equipment and materials will have to be imported at a cost of US\$4.4 million (see Table 12).

Table 12

HONDURAS: DAMAGE IN THE ENERGY SECTOR

(Millions of lempiras)

Item	Total damage	Direct damage	Indirect damage	Cost of reconstruction	Effect on the balance of payments
<u>Total</u>	<u>383.6</u>	<u>133.9</u>	<u>249.7</u>	<u>355</u>	<u>93.1</u>
<u>Electricity</u>	<u>225.6</u>	<u>77.9</u>	<u>147.7</u>	<u>295</u>	<u>59.7</u>
Generation works	29.7	25.0	4.7	76	17.5
Transmission networks	27.0	14.9	12.1	59	11.9
Substations	0.6	0.6	-	14	0.5
Distribution networks	84.7	35.3	49.4	141	28.2
Marketing	83.0	1.5	81.5	3	1.3
Buildings and other items	0.6	0.6	-	1	0.3
<u>Fuel</u>	<u>158.0</u>	<u>56.0</u>	<u>102.0</u>	<u>60</u>	<u>33.4</u>
Marketing companies	59.6	55.6	4.0	59	33.4
Import companies	98.4	0.4	98.0	1	...

Source: ECLAC estimates, based on official information.

ii) Fuel. The fuel subsector is run by private companies: Texaco, Shell and the DIPPSA group (in charge of Esso facilities). Although Texaco has a refinery in Honduras, it has been out of service for some time, and the country imports all oil by-products. Importers have a certain number of service stations where they retail their products, and they also make direct sales to special customers; all other distribution is carried out through independent service stations, the owners or concessionaires of which are mostly affiliated to ADIPE (Oil Distributors' Association).

Damage assessment to the service stations run by ADIPE-affiliated distributors remains incomplete. Figures are available for service stations in La Libertad, Comayagua, Choluteca, La Lima/Cortés, the Lima to San Pedro Sula highway, and Tegucigalpa. Data are being gathered for San Pedro Sula, Tela, Ceiba, Puerto Cortés, Nacaome, Juticalpa, Danlí/Jamastrán, Santa Rosa de Copán and Tocoa. Large-scale damage has, however, been reported in a Choluteca substation, in La Lima and in Tegucigalpa.

Oil importing companies have reported minor damage to their facilities, even in places that were hardest hit by the hurricane, such as Puerto Cortés in the Atlantic area. The only importer to report direct damage was the DIPPSA group: the floodwaters affected some of a pipeline's support foundations and a steel mesh fence owned by its Petrosur affiliate. Nevertheless, the importers reported losses due to a fall in sales, increased storage costs due to inventories held before the arrival of the hurricane, and increased transport costs due to a fall in import volumes.

It should be noted that losses from the fall in sales include a reduction in the consumption of fuel oil No. 2 (diesel oil) and fuel oil No. 6 (bunker C) for power generation. Hydroelectric power stations are making up for that loss, taking advantage of their full reservoirs and the extraordinary run-off levels in catchment areas, resulting from the hurricane. This is one benefit of the hurricane, albeit a limited one, because hydroelectric production costs are lower than those incurred in thermal power stations.

The total damage suffered by the fuel subsector is estimated at 158 million lempiras (US\$12 million), consisting of 56 million in direct costs and indirect costs of 102 million. The cost of reconstruction will reach 60 million lempiras because of the higher unit costs of replaced parts, and imported goods will cost US\$2.5 million, with the consequent impact on the balance of payments (Table 12).

iii) Summary. Total damage in the energy sector amounts to 384 million lempiras (US\$28.4 million). Direct damage to the infrastructure of companies in the sector accounts for 134 million and the remaining 250 million cover indirect damage stemming from lower power and fuel sales. However, reconstruction will require investments totalling 355 million because the cost of replacing lost assets is higher than their current value. The imported inputs needed for reconstruction will amount to US\$7 million (Table 12).

c) **Water and sewerage** ³⁶

Landslides and floods caused by the hurricane damaged drinking water and sewer systems in urban and rural areas. ³⁷

The type of damage to the urban mains water systems includes, among others, damage to electrical networks, equipment and systems, water mains at river crossings, intakes and pumping stations, wells, access roads, and main and secondary distribution networks.

In the metropolitan area, including the cities of Tegucigalpa and Comayagüela, the mains system supplies an estimated 850,000 inhabitants. This system comprises a network of 1,500 kilometres of primary and secondary mains of different diameters, 55 storage tanks, three water treatment plants and four supply sources (La Concepción and Los Laureles reservoirs, and sources in the North-West (Picacho System and the Sabacuante and Tatumbra rivers). Before the passage of the hurricane, the network of water mains and sewers had a 15 per cent shortfall, and was also losing a lot of water through leakage, a problem aggravated by the extent of the damage caused by flooding and swollen rivers.

The primary mains —with large diameter and capacity— were destroyed and washed away at 15 different river crossings, and similar damage was found in locations near riverbeds and landslide areas, especially in the Loarque, Satélite, La Maradiaga, La Granja, 1st Ave. in Comayagüela, Edén, Colonia Soto, El Chile, El Porvenir, Tres de Mayo, El Bosque districts.

Twenty-three kilometres of primary mains of different diameters will have to be replaced. The sections affected in the secondary networks have yet to be accurately identified. Damage to the San Juancito-Picacho pipe and to various reservoirs that feed the Picacho system, and the partial destruction of the Los Laureles outlet and the Sabacuante and Tatumbra reservoirs, is hindering restoration of the service, although reservoirs are completely full and treatment plants operational. In addition, the precarious state of the water network constitutes an ongoing risk because the already damaged sewer system cannot operate properly due to the lack of water.

The hurricane also worsened the water supply in the capital and required emergency measures to reduce the risk of epidemics, such as distribution of water in tank trucks for dry sectors, and increased use of chlorine for bacteriological control and flocculators to reduce water turbidity.

To gain an idea of the scale of the damage to the water supply, it should be recalled that at the beginning of November, the service was completely inoperative. By the end of the month, thanks to emergency repairs, only 40 per cent of the population remained without water. The water company's finances have obviously suffered and will continue to do so for some time until the damage is

³⁶ This section was prepared on the basis not only of information provided by national water authorities, but also of a report, *Efectos del huracán Mitch en los sistemas de agua potable y saneamiento en Centroamérica*, drafted by CAPRE in November 1998.

³⁷ Drinking water and sewerage services are administered by the Independent Water Mains and Drains Service (SANAA) in Tegucigalpa and Comayagüela; SANAA also manages water mains in 46 localities (cities and main towns in urban and rural areas) where sewer systems are managed by municipalities. In the largest cities outside the capital, such as Choluteca, Puerto Cortés and San Pedro Sula, the water mains and sewer systems are managed directly by municipal authorities.

repaired—even if only provisionally—and it can begin billing people for the service again. Furthermore, it lost the equipment and programs needed for accounting and billing purposes.

A similar situation occurred in other medium-sized cities such as San Pedro Sula. In Choluteca, supply and pumping systems were damaged, as was the distribution network. In La Ceiba the storage reservoirs and water mains system were severely damaged, and the current service is highly precarious. In El Progreso the main gravity-operated collection system, and the pumping, piping and mains systems suffered major damage. In the case of San Marcos de Colón, the system was damaged at the intake, and the sand remover, pipelines, certain wells, and pumping equipment were mud-covered. The purification plant is out of service for the same reason.

Many small and medium-sized cities suffered severe damage to their water mains: Comayagua, Puerto Cortés, Catacamas, Trujillo, Tocoa, and the Islas de la Bahía to mention but a few. There are still no accurate figures for the damage undergone by these systems nor for the time required to restore service. As in Tegucigalpa, the companies that serve these localities are in a complicated financial situation, due to the need to provide their users with a minimum of drinking water at very high costs and also because of lost revenue resulting from the lack of service.

The situation of the sewer systems is even more complicated, because the waters have yet to recede to their normal levels, so their exact condition is unknown. However, the damage caused by mud and silt problems in the pipes is equally serious, and relatively long repair and rehabilitation periods will be required. In addition, with the lower than normal levels of discharges, there is insufficient flow in the systems to maintain minimal cleaning and the removal of sediments. The combination of an absence or insufficiency of drinking water and the need for effective sanitary waste disposal poses major health problems for the inhabitants of the cities affected by the hurricane.

Sanitary problems are similar in rural areas. Major damage to the infrastructure of around 1,600 small rural systems managed by SANAA has been identified so far. These systems are not meeting the needs of the local population. In addition, the many wells used by the rural population have filled with mud or silt, and the same situation prevails where sanitary latrines and septic tanks are concerned. Just as there are no reliable data for the entire rural population affected, there is a lack of information on the damage to these water and sewerage systems, but the figures must be high in view of the amount of land covered by the floodwaters and avalanches of mud and other materials. However, initial estimates of the effects on the rural sector have been drawn up and provide some idea of the extent of the damage and the reconstruction effort in the sector.

The total damage to the water and sewerage sector has been estimated at 781 million lempiras (US\$58 million). Of these, 687 million are for direct damage to the assets both of the sector's companies and of the families living in isolated parts of the countryside. The remaining 95 million are indirect damage resulting from lost revenue and the increase in companies' operating expenses. Given the higher unit costs involved in replacing lost or damaged assets and the need for adequate protection against the risk of floods in the future, reconstruction will require much larger investments, estimated at 2,648 million lempiras (US\$196 million), in addition to imports of equipment and materials estimated at US\$28 million (see Table 13).

Table 13

HONDURAS: DAMAGE IN THE WATER AND SEWERAGE SECTOR

(Millions of lempiras)

Item	Total damage	Direct damage	Indirect damage	Cost of reconstruction	Effect on the balance of payments
<u>Total</u>	<u>781.3</u>	<u>686.6</u>	<u>94.8</u>	<u>2,648</u>	<u>374.1</u>
<u>Urban mains</u>	<u>544.0</u>	<u>459.2</u>	<u>84.8</u>	<u>2,249</u>	<u>321.2</u>
Tegucigalpa	297.4	283.8	13.6	1,342	198.7
San Pedro Sula	31.8	31.8	-	64	28.2
Choluteca	8.5	8.5	-	14	6.0
Other medium-sized cities	117.1	94.6	22.5	627	65.9
Purification plants	40.5	40.5	-	202	28.4
Lost revenue	42.8	-	42.8	-	-
Higher operating expenses	5.9	-	5.9	-	-
<u>Sewers</u>	<u>150.0</u>	<u>150.0</u>	-	<u>150</u>	<u>15.0</u>
<u>Rural systems</u>	<u>87.3</u>	<u>77.3</u>	<u>10.0</u>	<u>249</u>	<u>37.9</u>
Community water systems	49.8	39.8	10.0	199	27.9
Wells and isolated septic tanks	37.5	37.5	-	50	10.0

Source: ECLAC estimates based on official information.

3. Irrigation and drainage

Irrigation systems and natural drainage were seriously affected by the overflowing rivers, floods, landslides and silting caused by the hurricane.

Existing irrigation districts can be divided into two types on the basis of the ownership system: those owned by the state, which are gravity irrigation systems that have been in service for more than 40 years, and privately owned ones, which are generally more technically advanced (drip and sprinkler irrigation, among others).

State-owned irrigation and drainage systems are managed by private companies that have signed agreements with Ministry of Agriculture and Livestock (SAG) authorities. Rates vary according to each district and there are no metres; amounts are calculated by cost per hectare and frequency of use, although certain rates are structured by charges per hectare per year plus a fee per hectare and the number of times the system is used. Charges per hectare and frequency of use vary between 12 and 34 lempiras, depending on the rate structure.

SAG has identified and quantified the damage to the irrigation systems in San Juan de Flores, San Sebastián, Salguapa, Marale II and Flores, where canals and concrete structures have sustained damage, causing erosion and silting. Indirect damage includes loss of income from interrupted

service. SAG is making every effort to restore irrigation systems in time for the sowing season, scheduled for November and not expected to be delayed beyond December.

Damage estimates are incomplete, since some sites remain inaccessible. Rehabilitation tasks will involve intensive use of labour, particularly in cleaning and rebuilding canals and other masonry structures. Reconstruction work should also take into account measures to reduce the vulnerability of irrigation systems, most of which have been in use for more than 30 years.

Private irrigation systems have been affected by sedimentation, erosion and silting, especially drainage canals, which are essential to the high-value crops that depend on those systems. However, such systems have a very short service life and therefore depreciate rapidly. The only information available from SAG was on the Tela Railroad Company, which manages around 6,000 of the 50,000 hectares that use privately owned irrigation systems. Damage to other private systems has been calculated in gross terms, taking into account their characteristics and the extent and type of damage.

Estimates indicate that total damage to state-owned and private irrigation systems amounts to 77 million lempiras (US\$5.7 million), 94 per cent of which corresponds to the private sector. Direct damage to irrigation and drainage systems accounts for 74 million, and almost 3 million more for income lost from inoperable state-owned systems. It should be noted that a high percentage of crops were lost owing to damaged systems; the total is not included here since it is quantified in the section on agriculture. Furthermore, the unit costs of replacing the systems—including reinforcement to prevent similar damage in the future—will be higher than their current value, so that 283 million lempiras (US\$21 million) will be needed to rebuild them. Such investment, falling mainly on the private sector, will amount to an estimated US\$4.5 million, since irrigation equipment will have to be imported, with the consequent effect on the balance of payments (see Table 14.)

Significant damage was sustained by natural drainage systems and has exacerbated the environmental deterioration caused by the erosion and deforestation that has affected practically all areas of the country in recent decades. The torrential rains caused major river flooding, landslides on some slopes and rapid erosion of exposed topsoil. The result was that riverbeds—especially the Aguán, Leán, Sula and Choluteca rivers—accumulated large amounts of silt, stones, trees and other debris, blocking their flow.

Large amounts of sediment have also accumulated in river estuaries. Since this is the low-water season, the situation poses no threat at present. But when the 1999 rainy season arrives, silted estuaries could block natural river drainage, causing a rise in river water levels and new flooding on plains, worsening the actual consequences of the hurricane.³⁸

³⁸ A similar situation occurred in the aftermath of hurricane Fifi in 1974; the main rivers draining into the Atlantic Ocean had to be dredged.

Table 14

HONDURAS: DAMAGE TO IRRIGATION AND DRAINAGE SYSTEMS

(Millions of lempiras)

Area	Total damage	Direct damage	Indirect damage	Reconstruction cost	Effect on the balance of payments
<u>Total</u>	<u>333.3</u>	<u>330.6</u>	<u>2.7</u>	<u>539</u>	<u>240.5</u>
<u>State-owned irrigation and drainage districts</u>	<u>3.9</u>	<u>1.2</u>	<u>2.7</u>	<u>11</u>	<u>2.2</u>
San Juan de Flores	3.3	1.0	2.3	10	2.0
San Sebastián	0.1	...	0.1	...	...
Selguapa	0.1	...	0.1	...	...
Marale II	0.2	0.1	0.1	1	0.2
Other state-owned systems	0.1	0.1	...	...	...
<u>Private irrigation and drainage systems</u>	<u>73.4</u>	<u>73.4</u>	-	<u>272</u>	<u>58.7</u>
Tela Railroad Company	48.4	48.4	-	172	38.7
Other private systems	25.0	25.0	-	100	20.0
<u>Natural drainage systems</u>	<u>256.0</u>	<u>256.0</u>	-	<u>256</u>	<u>179.6</u>
Silted and sedimented riverbeds	121.0	121.0	-	121	...
Sedimentation in estuaries	135.0	135.0	-	135	...

Source: ECLAC estimates, based on official information.

It is essential to begin desalting these riverbeds and dredging estuaries before the rainy season arrives. The cost is high, since it will require the use of heavy machinery not usually available in the country. The amount has been estimated indirectly, using the cost of cleaning riverbeds and dredging estuaries, which does not solve the underlying problem of progressive environmental deterioration. An estimated 256 million lempiras or US\$19 million will be needed to carry out the work, which will mean importing heavy machinery at a cost of US\$13 million, with the consequent impact on the balance of payments (Table 14).

4. Productive sectors

The country's productive sectors were affected by the heavy rain and flooding when their infrastructure was inundated, their production interrupted or their stocks lost. The cost of raw materials will increase owing to problems stemming from stoppages or transport difficulties. Such problems will arise not only this year, but also in 1999 and beyond, until normal production and transport are re-established.

a) Agriculture, livestock, fisheries and forestry

In terms of the amount of damage, production based on natural resources (excluding minerals) was the most affected sector. In contrast with other natural disasters of similar intensity,³⁹ the floods caused by the persistent rain and the overflowing of rivers not only engulfed the Atlantic coast and the Aguán and Sula valleys, but were also experienced in almost the entire country. Flooding from the Choluteca river, which caused devastation in the capital, gained increasing force until it flowed into the Pacific, dragging machinery, tools and livestock and flooding farmlands, which waterlogged fields and destroyed crops.

The extent of the flooded area and the high water level, combined with the mud and debris, led to initial estimated losses of 70 per cent of all crops and shrimp harvests. Less than a month after the hurricane, further information shows smaller losses for some items, although the direct and indirect damage in the sector amounts to a significant figure for the Honduran economy, with serious repercussions on agribusiness and, above all, on the thousands of families working the land or employed as farm workers.

The force of the hurricane destroyed agricultural, livestock and fisheries infrastructure and washed away topsoil, which will take a long time to recover in some areas; loss of topsoil accounts for nearly one-third of the direct damage to agriculture. The data for certain subsectors remain incomplete, since some farmlands were still flooded and access to others was difficult. In view of these limitations, damage assessment, including the deterioration of infrastructure and equipment, is preliminary. The section on communications describes the damage to secondary and feeder roads providing access to farmlands, which hinders outgoing transport of harvests and produce and increases costs.

i) Agriculture. This subsector was the hardest hit, in both domestic production and practically all export crops, which generate earnings of around US\$600 million a year and are a major source of employment. The hurricane also damaged farmlands and plantations over a vast area, causing losses four times greater than current production losses.

1) Domestic crops. The hurricane coincided with the end of the harvest of some crops and the sowing of others, so that product availability will decrease next year. If conditions are favourable for replanting in order to take advantage of soil humidity, losses could be reduced. The magnitude of crop losses is shown in Table 15.

An estimated one-third of the first and most important maize crop in the 1998-1999 agricultural cycle had already been harvested by the time the hurricane hit, while the area still to be harvested yielded 350,000 tonnes less, equivalent to a loss of 609 million lempiras⁴⁰ (see Table 17). Excess humidity resulted in additional costs, since it prevented machinery from going in to collect the harvest, which was gathered by hand. This amount is included as indirect damage. Furthermore, poor

³⁹ See ECLAC, *Informe sobre los daños y repercusiones del huracán Fifi en la economía hondureña* (E/CEPAL/AC.67/2/Rev.1), October 1974, and *Honduras: Evaluación de los daños causados por las inundaciones en la zona norte del país* (LC/MEX/R.276), 1991.

⁴⁰ Since the harvest was ready to be sold, the loss was calculated according to the price paid to farmers.

road conditions hampered transportation of the harvest to grain collection and drying centres, thus deteriorating its quality.

The first bean harvest had also been collected, and the following crop, which covers 75 per cent of national bean production, had been planted. Losses in the area sown are estimated at 30 per cent, which will reduce bean availability in 1999 by approximately 9,000 tonnes and will require additional imports to offset the loss. It is quite likely that replanting will be possible, although not in all the affected area. Direct damages amounting to 67 million lempiras include lost production from the first crop, as well as investment in sowing damaged areas. Indirect damages account for the crop that would have been harvested.

Table 15
HONDURAS: ESTIMATED PRODUCTION LOSSES IN MAIN CROPS
AS A RESULT OF HURRICANE MITCH

(Thousands of tonnes)

Product	Production prior to the hurricane	Estimated production after the hurricane	Production lost	Ratio between loss and expected production (%)
<u>Basic grains</u>				
Paddy rice	64.8	56.1	8.8	14
Beans	95.1	89.9	5.2	6
Maize	607.1	252.2	354.9	58
Sorghum	94.2	71.8	22.4	24
<u>Industrial and export crops</u>				
Bananas	872	766 a/	739 b/	85
Sugar cane	3,397	1,360	2,037	60
Coffee	153	126	27	18
Melon	203	144	59	29
African palm	576	415	161	28

Source: ECLAC estimates based on official information and data from the production sectors.

a/ In 1998.

b/ For the last months of 1998 and the 1999 crop.

The situation for rice was similar: production dropped 8,800 tonnes as a result of damage from the hurricane and excess humidity which hindered the growth of crops on approximately 700 hectares due to be harvested next year. Direct damage amounting to 30 million lempiras includes lost production and investment. Indirect damage in the form of lower crop yields amount to 5.5 million lempiras.

Sorghum losses were higher than rice and bean losses, mainly because only one tenth of the crop had been harvested, so the loss amounts to almost one fourth of total annual production. Since part of the area sown for the next cycle was damaged, supply is expected to decrease by 10,000 tonnes.

An expected drop in the supply of basic grains led to shortages on the market, which were exacerbated by difficulties in transporting goods because of the damaged highways and farm access roads. To prevent price increases, the government reached an agreement with farmers and traders to freeze prices temporarily. To meet industrial and consumer demand, the government also considered the possibility of establishing a zero tariff on some basic grain imports operating in a price band with a variable tariff of almost 35 per cent. However, when communications were re-established, it became evident that supplies were sufficient in the short term, but that grain imports totalling 560 million lempiras would be required for next year.

Support programmes in keeping with farmers' socio-economic levels will have to be designed in order to offset their losses. Priorities in the sector's rehabilitation and reconstruction programme should include restoration of damaged farm areas, recovery and distribution of plant breeding material, plant and animal health monitoring measures, access to funds under easy terms to promote reactivation and, in more global terms, watershed management and rebuilding of infrastructure.

Table 16

HONDURAS: AREA OF MAIN EXPORT CROPS AFFECTED
BY HURRICANE MITCH

(Hectares)

Export crop	Production area before the hurricane	Area affected by the hurricane	Percentage
Total	292,000	83,760	29
Bananas	22,000	16,000	73
Coffee	194,000	38,800	20
Sugar cane	44,300	22,000	50
African palm	32,000	8,960	28

Source: ECLAC estimates based on official information and data from production sectors.

2) Industrial and export crops. As in the rest of agriculture, industrial and export crops suffered considerable direct damage amounting to almost 1,800 million lempiras. Moreover, since most are perennial crops which will have to be replanted in many areas, losses will not only affect production during the current cycle, but will also continue throughout the time it will take for new plantations to reach maturity (between two and seven years, depending on the crop). Losses thus amount to 6,000 million lempiras in assets, plus the indirect damage caused by the lack of production over several years (see Table 17).

Significant losses were reported for bananas, since almost all plantations are located in two of the areas most severely affected by floods. The Tela Railroad Company (Chiquita Brands) and the Standard Fruit Company lost part or all of their plantations, as did independent producers, particularly cooperatives. The former reported damage of between 50 per cent and 60 per cent of its plantations, while the latter (which normally hires about 10,000 workers) lost 80 per cent. Independent producers

had very high losses on some 6,000 hectares, of which only a small proportion can now be harvested for the domestic market and for consumption by farmhands and members of cooperatives.

Overflowing rivers and floods kept plants under water for a long time, affecting not only the current crop, but also crops in years to come, since plantations were destroyed. Although new plants could begin producing in one year, the time required to clear and level fields should be taken into account. This year's crop losses (466 million lempiras) are for the November-December crop, whereas indirect damage refers to production lost until the plantations recover in two years' time. Infrastructure and plantation losses, totalling 3,500 million lempiras, on approximately 16,000 hectares are listed under the heading of assets.

Losses in coffee—the country's main export—amounted to 500,000 quintals, with a further 105,000 reserve quintals ruined when warehouses were flooded. Another 7,000 hectares were affected by landslides, as were many access roads to plantations. Over 100 coffee-processing facilities were swept away by swollen rivers or rendered unusable by flooding, which also caused significant damage to access roads and many bridges. Crop production losses are estimated at 629 million lempiras, while future production will be reduced due to the number of coffee bushes lost. There will also be a drop in exports during this cycle and the next.

Sugar cane losses were high in areas rendered useless by flooding, silting, mud, sand and stones. Although sugar cane is relatively resistant to excess water, it is difficult or impossible to harvest, either mechanically or by hand, when it is covered by mud. Furthermore, the inevitable postponement of the harvest will diminish sugar cane yields. If this situation continues too long, it will no longer be economically viable to harvest the crop. It should be noted that damage to some mills and industrial facilities (the machinery in one of them was covered by water and mud) will make the delay even greater and the situation more critical. It is therefore estimated that 50 per cent of the planted area has been lost and that the value of the crop that cannot be harvested during the present cycle amounts to 387 million lempiras. Extensive areas will have to be replanted to ensure the recovery of sugar cane plantations, which is why the investment lost in plantations has also been taken into account. Next year the sugar cane harvest will also be lower, so foreign exchange income from sugar exports will be reduced by some 85 million lempiras for the next two years.

African palm losses have affected the cooperatives established following the agrarian reform, as well as independent producers and large enterprises. The most recently planted area sustained significant damage, since two to three year-old plants, which are the most vulnerable, were partially covered by mud. This affected the heart of the plants, which died as a result; adult plantations were better able to withstand the effects of the hurricane and the tropical storm. Nurseries and other plantation-related infrastructure were also significantly affected. The damage sustained by plantations serves as a basis for calculating lost production this year (143 million lempiras). This situation will continue over the next few years until the damaged plantations recover.

In melon production, which is concentrated in the department of Choluteca, 12,000 hectares had been set aside for planting to take advantage of the market opportunity offered by the winter months. When the hurricane struck, 3,600 hectares had just been sown or were being prepared for sowing, and 80 per cent were lost; the direct damage led to the loss of 32 million lempiras in investment. In contrast, the indirect damage refers to the hectares that failed to be sown, resulting in lower exports in 1998 and 1999. Action was rapidly taken to recover the market, but only 7,000 hectares were set aside due to the total loss of fertile soil in some of the farms in the area, which were

covered with large amounts of sand and stones deposited by the river. These farms are included in the loss of agricultural assets, as are the substantial investments that will have to be made to recover some of the affected areas. Infrastructure was also seriously damaged, with more than 50 refrigerated transport containers destroyed; this item is included in the transport section.

Citrus fruits on the Atlantic coast were also seriously damaged. Fortunately, grapefruit exports to Europe had concluded on 15 October; so direct damage mainly affected oranges and grapefruit for domestic consumption. Production in the coming cycles will be lower because of the damage sustained by fruit trees; indirect damage is therefore estimated at 400 million lempiras. The greatest losses in assets were in the region of Aguán, where an estimated 1,750 hectares of grapefruit covered by sand and debris were completely lost, and approximately 7,000 hectares of young orange groves were waterlogged for several days and will have to be replanted.

3) Loss of assets. One of the most serious effects of the hurricane at present and in the long term has been the loss of assets, including facilities and, above all, investments in crops and the productive capacity of the land that lost its plant cover. The water swept away agricultural lands, leaving debris in its path.

Until a detailed survey is made, it is estimated that the area in which land loss can be considered total, owing to the difficulty of recovering it, amounts to approximately 10,000 hectares located mainly in the fertile lowlands near rivers. These areas were left covered with stones. Sand sedimentation could be removed at a high cost, but crop profitability might warrant such an investment; such deposits cover an area of 750 hectares in the south. However, the high cost of clearing and levelling all the land that was covered by sand and debris should be taken into account.

In cases where silting could be beneficial, owing to deposits that improve soil quality, it will take several agricultural cycles before the land can be used. On mountain slopes, considerable soil loss was caused by mudslides and landslides on approximately 7,000 hectares of coffee plantations, and recovery will take many years.

In all, soil loss is estimated at 5,200 million lempiras, or the amount of net income lost (Table 17). Losses in plantations and facilities amount to 6,300 million lempiras and account for 50 per cent of total damage to agriculture. It should be borne in mind that new material for planting certain crops must be recovered or produced in some regions.

Since arable land in valleys sustained serious damage, appropriate management of slope agriculture has become all the more important, not only as a source of supply and income for much of the rural population, but also as part of a comprehensive approach to sustainable development in the forestry, agriculture and livestock sectors.

ii) Livestock. The beef and dairy herd has been reduced by approximately 50,000 head valued at some 225 million lempiras. Information on livestock-raising areas was still partial, owing to difficulties in gaining access to such areas. Although livestock-raising is carried out in the highlands, the losses occurred among cattle grazing in the lowlands. Adverse weather conditions resulted in animal weight reduction, causing a loss estimated at 900 million lempiras.

Table 17

HONDURAS: LOSSES IN AGRICULTURE, LIVESTOCK, FORESTRY AND
FISHERIES CAUSED BY HURRICANE MITCH

(Millions of lempiras)

Sector and subsector	Total damage	Direct damage	Indirect damage	Impact on the external	
				Increase in imports	Reduction in exports
<u>Total</u>	<u>27,424.5</u>	<u>16,554.2</u>	<u>10,870.3</u>	<u>561.2</u>	<u>5,864.2</u>
Agriculture (1+2)	23,256.3	14,105.3	9,151.1	561.2	5,492.9
1. <u>Assets</u>	<u>11,535.2</u>	<u>11,535.2</u>			
Land	5,214.4	5,214.4			
Plantations, facilities	6,320.8	6,320.8			
2. <u>Production</u>	<u>11,721.2</u>	<u>2,570.1</u>	<u>9,151.1</u>		
Domestic consumption	901.5	772.8	128.4		
Rice	36.4	30.9	5.5	19.3	
Beans	156.5	66.8	89.7	104.2	
Maize	611.6	609.1	2.5	383.5	
Sorghum	97.0	66.1	30.9	54.3	
Exports	10,819.7	1,797.3	9,022.4		
Bananas	6,548.9	466.5	6,082.4		4,276.8
Coffee	854.9	629.2	225.7		600.3
Sugar cane	747.2	387.0	360.2		85.5
Citrus fruits	440.2	30.0	410.2		25.0
Melon	473.6	31.7	441.9		530.2
African palm	862.9	143.8	719.1		
Pineapple	177.0	11.0	166.0		...
Others	715.0	98.0	617.0		
Livestock (1+2)	3,492.5	1,886.0	1,606.5		0.0
1. <u>Assets</u>	<u>2,755.4</u>	<u>1,763.1</u>	<u>992.3</u>		
Cattle	1,217.3	225.0	992.3		
Poultry	738.1	738.1			
Facilities	500.0	500.0			
Pastureland	300.0	300.0			
2. <u>Production</u>	<u>737.1</u>	<u>122.9</u>	<u>614.3</u>		
Dairy	737.1	122.9	614.3		
Forestry	46.0	27.0	19.0		
Fisheries (1+2)	629.7	536.0	93.7		371.3
1. <u>Assets</u>	<u>119.0</u>	<u>119.0</u>			
Fisheries	14.4	14.4			
Ponds	104.6	104.6			
2. <u>Production</u>	<u>510.7</u>	<u>417.0</u>	<u>93.7</u>		
Fisheries	139.4	120.0	19.4		
Shrimp ponds	371.3	297.0	74.3		371.3

Source: ECLAC estimates based on official information and data from productive sectors.

On the Atlantic coast, where dairy production is concentrated, the supply of raw materials to industry dropped during the first week as a result of flooding on farms and adverse transport conditions. The losses sustained on those days will cause lower milk production for several months. Direct damage is estimated at 120 million lempiras, while the subsequent impact of lower production will result in higher indirect damage, owing to the time required for recovery.

Damage to poultry production amounted to approximately 740 million lempiras from the loss of 60 per cent of poultry stocks. The damage to dairy farm facilities and fences, calculated at 500 million lempiras, will have to be repaired. Flooded grasslands will eventually recover, but improving pasturelands will once again require investment. According to information provided by the unions, 70,000 hectares have been affected, at a loss of 300 million lempiras.

The public sector lost animal health control facilities and laboratories to produce and record genetic material. Under the prevailing conditions, the sector's response and international support in preventing diseases were very timely. Reconstruction will have to include recovery of the lost installed capacity.

iii) Fisheries. Fishing on the Atlantic coast and shrimp production in ponds in the Gulf of Fonseca have become very profitable in Honduras. The hurricane affected these two zones, causing damage to both small-scale and industrial fishing fleets. Owing to the type of shrimp-farm investments in the south, it would seem that the economic impact was more serious in that area. A total of 13,700 hectares were flooded in Choluteca and Valle, and during the first few days following the hurricane, estimates indicated an almost total destruction of infrastructure and the loss of at least two of the 2.5 annual shrimp harvests. Once the water level dropped, the damage was clearly not as great as was originally believed, but still considerable. Pond and packaging facilities, as well as investment in larvae to restock ponds, suffered damages amounting to 100 million lempiras. In production, direct damage is estimated at 300 million lempiras—a harvest of 3,200 tonnes of shrimp—, plus indirect costs from the partial loss of the first 1999 harvest.

Coastal fishing had losses of 140 million lempiras, although information on losses in the 365-vessel fish, lobster and conch fishing fleet could not be confirmed.

iv) Forestry. Timber production is an important activity, with export earnings of US\$20 million. Sawmills are believed to have suffered no major damage from the hurricane, although some machines were affected by the water. Damage to roads is more of a problem, since it is hindering access to logging camps. Sawn lumber is, however, available for reconstruction purposes.

One of the most significant losses in the sector is lumber from trees blown down by the hurricane, amounting to 100,000 cubic metres of pine. The most seriously affected areas are in the Sierra de Agalta in the eastern part of Olancho, in the western part of the same department and in Yoro. Losses amount to 27 million lempiras, based on the average price per cubic metre. If the sales price offsets the cost of extraction, which is hindered by road conditions and remote locations, part of the costs could be recovered. Collecting this timber would have other benefits, such as eliminating potential sources of fire in the dry season and forest pollution.

In Atlántida, 25,000 additional cubic metres of timber from latifoliate trees were reportedly lost, and forestry plantations throughout the country were also damaged.

b) Industry

The industrial sector reported damage to infrastructure, machinery and production caused by rain, floods and landslides, in addition to losses stemming from high rates of absenteeism for several weeks following the disaster. The damage affected both in-bond assembly (maquiladoras) for the overseas market and national industry, which is aimed at the domestic and Central American markets.

Considerable damage was sustained by large and small industries based in Tegucigalpa, including deterioration of installations, loss of some stock and suspended production. Agribusinesses in the northern and central part of the country were also affected, mainly by the damage to agricultural production. Agribusiness losses are also due to problems with support and infrastructure services —water, electricity, transport— and worker absenteeism.

Losses in the agribusiness sector were estimated on the basis of the drop in agricultural production referred to above, which will last for a minimum of two years, the time it will take for production to return to normal.

In regard to maquiladoras, six companies located in the Parque Continental (North zone), reported damage to infrastructure and machinery, and one in-bond plant in La Ceiba was totally destroyed. No damage was reported, however, in the largest maquiladora centre located in Choloma, between San Pedro Sula and Puerto Cortés. Although there were some material damages, the main impact was worker absenteeism which, only in the week between 26 October and 1 November, caused a drop in production and exports of US\$42 million. Nevertheless, in the first two weeks of November, these losses had decreased to US\$30 million per week, and production and exports are now almost back to normal.

Total damage in the industrial sector is estimated at 5,094 million lempiras, or US\$376.6 million. Of that sum, 213 million lempiras account for direct damage to the sector's assets, i.e., buildings and machinery. The remaining 4,871 million cover production losses, in both agribusiness and maquiladoras. Reconstruction of the sector will require an investment estimated at 852 million lempiras (US\$63 million), since facilities will have to be replaced at unit costs higher than their current value, including works to reduce or eliminate vulnerability to floods in the future. This will have a negative impact on the balance of payments, estimated at US\$125 million (see Table 18), stemming from damages and reconstruction in the sector, since maquiladora production cannot be exported at present, and reconstruction equipment and material must be imported.

Table 18

HONDURAS: DAMAGE TO INDUSTRY AND TRADE

(Millions of lempiras)

Item	Total damage	Direct damage	Indirect damage	Cost of reconstruction	Effect on the balance of payments
<u>Total</u>	<u>7,912</u>	<u>1,219</u>	<u>6,693</u>	<u>4,052</u>	<u>2,810.8</u>
Industrial sector	5,084	213	4,871	852	1,690.8
<u>National industry</u>	<u>3,546</u>	<u>25</u>	<u>3,521</u>	<u>100</u>	<u>40.0</u>
Infrastructure	25	25	-	100	40.0
Drop in agribusiness production	3,321	-	3,321	-	...
Drop in other industrial production	200	-	200	-	...
<u>Maquiladoras</u>	<u>1,538</u>	<u>188</u>	<u>1,350</u>	<u>752</u>	<u>2,810.8</u>
Infrastructure	188	188	-	752	1,690.8
Drop in production	1,350	-	1,350	-	<u>40.0</u>
<u>Trade sector</u>	<u>2,828</u>	<u>1,006</u>	<u>1,822</u>	<u>3,200</u>	<u>40.0</u>
Infrastructure and stocks	1,006	1,006	-	3,200	...
Lost sales	1,822	-	1,822	-	...

Source: ECLAC estimates based on official information.

c) Trade

The trade sector—including tourism—was seriously affected by the hurricane, which also destroyed part of Tegucigalpa, where much of the nation's commerce is located.

Central Bank data, interviews with entrepreneurs and ECLAC estimates show that infrastructure and stocks were significantly affected, and that sales have dropped and are likely to remain low for several months, owing to the reduction in industrial activity, problems in the transport and communications sector, and the reduced purchasing power of the population. Agricultural losses are expected to be offset by the marketing of imported produce.

No significant damage to infrastructure was reported in the tourism sector. The island of Guanaja was seriously affected ecologically by the loss of pines, and socially by the destruction of housing. The island of Roatán and the Maya ruins in Copán were unaffected by the hurricane. However, many tourists planning to visit the country cancelled their trips, and this will undoubtedly have an adverse effect on revenue between November 1998 and March 1999. Tourism authorities are therefore launching campaigns abroad to offset any concerns potential visitors may have regarding health, pest and disease problems.

Total damage to the trade sector—including tourism—is estimated at 2,828 million lempiras, or US\$210 million. This figure includes 1,006 million lempiras in direct damage to facilities, and indirect damages of an additional 1,822 million, which represents the downturn in sales over an estimated period of five months. An investment of 3,200 million lempiras (US\$238 million) will be required to rebuild infrastructure, due to current replacement and reconstruction unit costs and the need to reduce the vulnerability of commercial establishments to floods. This will have an impact on the country's balance of payments, since material and equipment valued at US\$83 million will have to be imported (Table 18.)

5. Environmental impact assessment

a) Definitions and methods used in 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 in Honduras 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 preliminary information provided by technicians, specialists and government authorities, local NOGs, international cooperation programmes (GTZ, AID, etc.) and international missions that are taking part in actions to address the emergency and optimise the country's recovery.

The damage caused by hurricane Mitch (which turned into a tropical storm on entering Honduras) is measured as direct impact in this study, since it specifically altered natural assets through losses or serious damage in a few hours. 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. This refers to the 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 riverbeds 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: hydrometeorological events and impacts caused by man

Honduras has suffered the consequences of destructive natural phenomena throughout its history. The tropical storms and hurricanes that form cyclically from August to November cause high death tolls and enormous damage to plains, forests and coasts, landslides in mountains and floods in valleys. Most storms reach the Caribbean coast from the north and from the east.

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 Honduras highly

vulnerable to intense weather phenomena, particularly around Tegucigalpa, Comayagua and San Pedro, in the most densely populated central area.

Human intervention in the environment ranges from the opening up of naturally forested but marginally productive lands —such as mountain slopes— and cultivation in stream beds and river terraces, to the opening of roads and the construction of urban and other road infrastructure, without taking into account environmental protection and land-use management measures (for agriculture and urban settlements), which are essential to reducing vulnerability and establishing a harmonious relationship between man and the environment. Unfortunately, such areas are generally the most sensitive to the forces of nature.

That situation poses the need for soundly planned reconstruction. The Honduran press has expressed many pertinent opinions on important, widespread post-disaster concepts. For example, one article states that: “A destructive, profit-seeking approach to nature due to poverty or an excessive desire to recover investments as soon as possible must give way to a relationship of harmony with nature within a framework of sustainable human development” (Díaz-Arrivillaga, E., *El Heraldo, Opinión*, page 3, 19 November 1998).

Although efforts have been made to stop uncontrolled deforestation and implement management plans for natural forests —which are still extensive—, there is a need to establish an approach requiring the efforts of Honduran society as a whole. Greater population density is inevitably leading to extensive, indiscriminate land use, with all the infrastructure and human activities it entails, and this will unquestionably increase vulnerability to natural disasters, unless alternative urbanisation and resource-management approaches are taken.

This situation calls for preventive measures on all fronts, since rapid population growth continues and is increasing vulnerability. In 1997, the population was 5.9 million inhabitants, with the highest growth rate in the Americas (2.9 per cent). At the current rate, the population doubles every 25 years (SERNA/PRODESAMH, 1998, page 28). The annual rate was a little over 3 per cent from the 1950s to the 1980s and resulted in unprecedented population growth. The situation must 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 was very limited when this report was written. The prolonged stage of emergency has made it difficult to assess damage to the environment. Flights over the main forested areas show that trees blown down are not a significant factor, as long as the timber can be recovered and used (UNAT, State Secretariat of the Presidential Office, “*Evaluación de los daños causados por el huracán Mitch en la República de Honduras*”, 17 November 1998, page 9). Another official report states that damage is not substantial (Government of Honduras, Municipality of Tegucigalpa, “*Informe Preliminar: Estimación de daños del huracán Mitch a la infraestructura pública y costos de recuperación*”, 19 November 1998).

Nevertheless, a value has been placed on the damage in this assessment, based on the ECLAC study group’s observations and COHDEFOR’s preliminary assessment (SINAPH, November 1998), in the belief that it should be quantified, even if it is limited.

i) Wind impact. The area where the hurricane struck with the greatest force (4 to 5 on the Saffir/Simpson scale) was near the Islas de la Bahía; Guanaja island was the hardest hit. Roatán was also affected, as was the northern coast (Puerto Cortés, La Ceiba and elsewhere) but to a much lesser degree, since by then the hurricane had subsided into a tropical storm. Photographs taken as part of the Islas de la Bahía Programme clearly indicate the effects of the direct primary impact of the winds on Guanaja, where 20 to 40 per cent of forests were lost, although bushes were not greatly damaged and undergrowth will rapidly sprout again. This impact is extremely important because the island is a natural seedbed of what is perhaps the purest strain of the Honduran pine, which makes it unique in the world.

ii) Ocean impact.

1) Coastal geodynamics. Hydrometeorodynamic effects generate a primary direct impact through large waves and groundswell. No official data are available on the duration and size of the waves, or on the height of the groundswell. Indirect observations (Burgos, B., Islas de la Bahía Environmental Management Programme, personal note, November 1998) indicate that the sea level rose about two metres and photographic evidence shows the devastating effect of waves on the northern coast of Guanaja island, particularly in Mangrove Bight and Northeast Bight, despite the barrier reef. Damage from erosion on the country's northern coast has not been quantified, although overflights made by officials indicate damage and pollution in coastal lagoons.

2) Coastal ecosystems. Existing evidence shows a large deposit of debris on the northern coast, consisting mainly of branches and trunks swept downstream by rivers. Cattle have been found stranded on the Guanaja and Roatán reefs, but there is still no information on submarine reef inspections, tourist attractions, or sedimentation on reefs, although fracturing of the coral structure on Guanaja island has been detected (Burgos, E., personal note, 1998). Coastal currents tend to carry fresh water loaded with sediment from inland floods into the sea, burying benthic marine ecosystems entirely. The small but unique mangroves on this island were extensively damaged, and some were completely uprooted. The situation in the windward sector was also serious, but less so; Callo de Guanaja was not affected by the groundswell that reached Mangrove Bight, which is on the leeward side. As in previous disasters in other places, the damage here is likely to be very considerable. In the case of Cancún (Mexico), as much as two metres of sand was lost on several beaches, while 50 per cent of coral reefs and 90 per cent of mangroves were destroyed (Clark, J.R., 1990, *Management of Environment and Natural Disasters in Coastal Zones*, World Bank).

iii) Impact of rain. No major damage to natural assets has been reported following the direct primary impact of Mitch. However, the small amounts of damage reported all add up and should be taken into account. It will also be necessary to conduct a study to determine the amount of topsoil lost during the storm, which is bound to be enormous.

The effect of rain and wind could have caused the loss of birds on the Islas de la Bahía; furthermore, many mammals may have been killed by the formation of river islands that were subsequently washed away by the currents, particularly in lowland valleys (Choluteca, Aguán, Patuca, Chamelecón and Ulúa).

The direct but secondary consequences are clearly catastrophic, due to the high vulnerability of inhabited areas; the damage is described in other sections of this report. According to studies

carried out by the IDB on the effects of hurricane Georges in the Dominican Republic (Mora, S., personal note, 1998), 16 per cent —and up to 30 per cent in some sectors— of the general damage was due to the vulnerability caused by unsustainable use of land and natural resources, specifically from “deforestation, faulty design and inappropriate location of infrastructure, careless water management and conservation, watershed deterioration, overuse of land and other factors” (IDB, 1998, *op. cit.*). Although these estimates are preliminary and conservative, this factor should unquestionably be taken into account.

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 the food sources (seeds, fruits, etc.) of various species are as yet unknown. No information is available either on the status of small species (batrachians and fish) that are the food sources of mammals, reptiles and other creatures, owing to possible alterations in wetlands (Lake Yojoa and the Catarasca and Brus Laguna coastal lagoons), or on depredation by batrachians (insects, mosquito larvae, etc.) and bats (insects). Certain processes may even have beneficial effects on public health. These unknown factors highlight the importance of scientific studies that are of great practical value.

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.

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 Guatemala and Costa Rica important progress is being made in the area of carbon sequestration. Honduras is considering the possibility of joining the Isthmus Group (SETCO, SAG, AFE-COHDEFOR, SERNA and others, Forestry Agenda of Honduras, Priorities of the Forestry Subsector of Honduras, 1998-2002, document for internal discussion, Tegucigalpa M.D.C., August 1998, page 52), and has studied the ways it could participate in joint implementation (Project for the Establishment of a Joint Implementation Office in Honduras, funded by the Canadian International Development Agency, CIDA; Zelaya, Sergio A., personal note, November 1998).

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, living organisms and natural scenic beauty for scientific, tourism 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 20 shows average values for each type of service. The values estimated by the ECLAC team for this assessment are featured on the right hand side of the table and are very similar to those of Zelaya (personal note, November 1998). Values for Honduras have been taken as similar to those of latifoliate tropical forests, but the subject should be studied in greater depth in the near future to provide a basis for these calculations and for other consequences of land-use management, etc. Water production has also been taken into account in piedmont areas that were affected, albeit to a small extent, by the effects of the storm, as has protection of ecosystems and water production, owing to the importance to tourism of natural attractions (complemented by archaeological sites) in the west, and in areas surrounding the country's densely populated central belt.

Table 21 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 is estimated at US\$48 million, without including an annual discount for differentiated carbon absorption.

River and riverbank systems are protected by law in Honduras and have also been taken into account, since they were greatly affected throughout the country by high flows. Estimates indicate that 3,000 kilometres of rivers with watercourses on a scale of 1, 2 and 3, 20 per cent of which have been altered by human interference (fragmentation, destruction, logging, etc.) were affected. River and riverbank systems are highly productive and their value may be underestimated, since they run through agricultural and livestock-raising areas and produce important benefits.

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 damaged by wind (Guanaja island) 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.

A value of US\$30 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 (76 US cents, 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. A slightly higher value has been given to this service in Honduras, because of the scarcity of protected areas near densely populated areas, which make water a very strategic, vulnerable service.

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. The pine forest on Guanaja island, one of the smallest, most fragile areas in the country, has been taken into account, since it is the seedbed of the purest pine species in the Americas.

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 value for Islas de la Bahía and the Río Plátano reserve may be underestimated.

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, roadbuilding, 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 and management.

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. As Mr. Carlos Flores, President of Honduras, stated on 12 November 1998: "The reconstruction stage is unquestionably the most important because it goes to the core of what we will be and must be from now on. It is not merely a question of repairing the damage or returning to our former state, but rather of taking a new approach to what we have, what we are and what we should be, and of recovering so as to move ahead in a different direction from the past."

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 has undertaken the task of incorporating multidisciplinary approaches in order to gain further understanding of the actions needed to deal with these phenomena.

Table 19

Type of area (extension)	Direct impact a/ and percentage of trees blown down, destroyed or swept away	Remarks
Areas protected by SINAP b/ (10,700 sq km)	Minimum (M-L), 1	Protected hilltops suffered very little damage while agricultural border areas sustained enormous damage (approx. 1:10)
Guanaja island c/ (Forest: 5,720 ha)	Very serious (L), 40	The only area hit by force 4 hurricane winds, which then subsided into a tropical storm
Managed forests, buffer zones for protected areas (2,034 sq km) d/	Minimum to moderate (L), 2	Protected through forestry management plans to allow natural regeneration
Riverside forests (18,000 ha) d/	Very serious (L), 80	Protected by law; damage stemming from overflows, rock deposits and silt

a/ As defined in this study. Minimum=Minor impact, Very serious=Major damage due to winds or flooding; (M)=Damage with recovery over the medium term, (L)=Damage with recovery over the long term.

b/ Contained in: CCAD, 1998, p.130 and in *Síntesis del Perfil Ambiental de Honduras*, 1998, SERNA/PRODESAAMH/ESA, p. 199.

c/ Ecological region, poorly represented in conservation areas (CCAD, 1998, p. 128).

d/ ECLAC estimate based on local maps (*Mapa Político de la República de Honduras*, Graficentro Eds., 1989 and *Mapa de Áreas Protegidas de Honduras*, Honduran Tourism Institute, COHDEFOR and Peace Corps, 1996).

Table 20

ENVIRONMENTAL FORESTRY SERVICES: AVERAGE VALUES

(Dollars per hectare per year)

Environmental service	Primary forest a/	Secondary forest a/	Average value for Honduras b/
Total	58.00	41.76	56.00
Carbon fixing	38.00	29.26	35.00
Water protection	5.00	2.50	9.00
Biodiversity protection	10.00	7.50	9.00
Ecosystem protection	5.00	2.50	3.00

a/ Based on: Echeverría *et al.*, 1996, Carranza *et al.*, 1995: values for Costa Rica.

b/ ECLAC estimates based on results of the Project to Create the Honduras Joint Implementation Office (financed by CIDA).

Table 21

HONDURAS: ESTIMATE OF THE DAMAGE TO ENVIRONMENTAL SERVICES
IN PROTECTED OR PARTIALLY PROTECTED AREAS

(Dollars per year)

Type of area	Affected area (km ²) and damage (%) a/	Equivalent total damage (km ²)	Cost (thousands of dollars) c/					Annual total	Total d/
			CO ₂ capture	Water protection	Biodiversity	Ecosystem protection			
Total	12,942.0	418.2	1,463.7	376.4	376.4	125.5	2,341.9	46,838.4	
Protected areas (2%)	10,700.0	214.0	749.0	192.6	192.6	64.2	1,198.4	23,968.0	
Riverside forests b/ (80%)	150.0	120.0	420.0	108.0	108.0	36.0	672.0	13,440.0	
Guanaja island (40%)	58.0	23.2	81.2	20.9	20.9	7.0	129.9	2,598.4	
Managed natural forests (3%)	2,034.0	61.0	213.5	54.9	54.9	18.3	341.6	6,832.0	

- 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/ The level of human interference in riverside forest was estimated at 20 per cent and does not include the lowest part of the lower river basin and estuary. The system is estimated at 3,000 km.
- c/ The value of the intermediate environmental service between primary and secondary latifoliate forest was used because of the lower productivity of pine forest.
- d/ The overall cost for a 20-year recovery period is more than US\$46 million.

6. Summary of damage

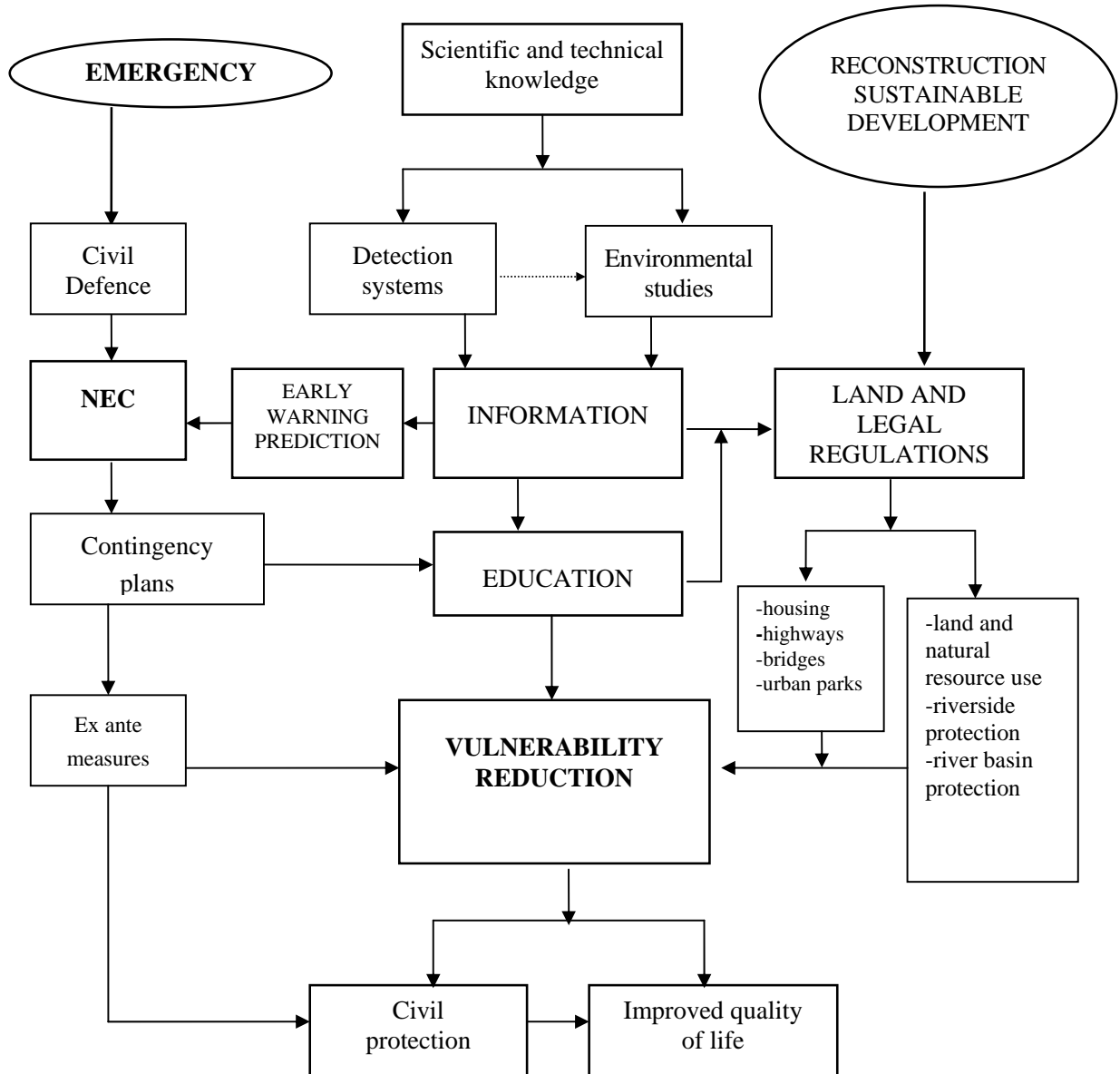
If the estimated damage for each of the sectors described in the previous sections is added together, the total amount of damage in Honduras attributable to hurricane Mitch is US\$ 3.8 billion. Of this total, US\$2.005 billion are for direct damage (49 per cent), and US\$1.8 billion, for indirect damage (51 per cent), which will make its effect felt over a period of at least four years (see Table 22).

The damage can be broken down as follows:

Type of damage	Millions of US\$	Percentages
Assets	2,005	53
Output	1,789	47

Figure 3

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



This shows that the hurricane particularly affected output in the country, and will continue to do so for at least two years. Infrastructure and equipment also suffered considerable damage, and replacement will take four years, especially in the transport sector. There has also been an increase in costs and a fall in revenue in the delivery of certain services, such as water and electricity, and freight and passenger transport due to damage to the road system. The other damage heading covers emergency costs and the most immediate repairs.

The following breakdown by sector allows interesting conclusions to be drawn:

Sectors	Total damage (millions of dollars)	Percentages
Social	439	12
Infrastructure	665	17
Irrigation and drainage	25	1
Productive sectors	2,618	69
Environment	47	1

The worst damage was concentrated in productive sectors (69 per cent of the total), followed by infrastructure (17 per cent) and social sectors (12 per cent). Particular mention should be made to the agricultural sector, with 45 per cent of the total damage, transport (15 per cent), industry and housing (9 per cent each), livestock-raising (7 per cent) and trade (5 per cent).

Table 22

HONDURAS: SUMMARY OF DAMAGE CAUSED BY THE HURRICANE

(Millions of dollars)

Sector and subsectors	Total damage	Direct damage	Indirect damage	Cost of reconstruction	Effect on the balance of payments
National total	3,793.6	2,004.7	1,788.9	2,472.0	1,256.9
<u>Social sectors</u>	<u>439.3</u>	<u>273.4</u>	<u>165.9</u>	<u>592.6</u>	<u>126.2</u>
Housing	344.1	221.0	123.1	484.8	76.1
Health care	62.2	25.6	36.6	66.9	34.7
Education	33.0	26.8	6.2	40.9	15.4
<u>Infrastructure</u>	<u>665.4</u>	<u>343.6</u>	<u>321.8</u>	<u>687.8</u>	<u>428.7</u>
Transport and communications	579.1	282.8	296.3	465.4	394.1
Energy	28.4	9.9	18.5	26.3	6.9
Drinking water and sewerage	57.9	50.9	7.0	196.1	27.7
<u>Irrigation and drainage</u>	<u>24.7</u>	<u>24.5</u>	<u>0.2</u>	<u>39.9</u>	<u>17.8</u>
<u>Productive sectors</u>	<u>2,617.5</u>	<u>1,316.5</u>	<u>1,301.0</u>	<u>1,151.7</u>	<u>684.2</u>
Agriculture	1,722.7	1,044.8	677.9	675.2	448.5
Livestock-raising	258.7	139.7	119.0	163.0	-
Fisheries	46.6	39.7	6.9	12.3	27.5
Forestry	3.4	2.0	1.4	-	-
Industry	376.6	15.8	360.8	63.2	125.2
Trade	209.5	74.5	135.0	238.0	83.0
<u>Environment</u>	<u>46.7</u>	<u>46.7</u>	-	-	-

Source: ECLAC estimates based on official information.

Although the figure of US\$3.8 billion is high in itself, neither the total amount of the damage nor its distribution by type or sector give an accurate idea of the effects of the disaster. However, these effects can be better depicted by the fact that the total damage amounts to 70 per cent of the country's annual gross domestic product.

Lost output (US\$1.8 billion) is equal to 33 per cent of GDP, giving a clearer idea of the damage in the productive sectors. However, these losses will be felt over two years, as stated above. The greatest effects on output (67 per cent) will be seen in 1999 (see Table 23).

Table 23

HONDURAS: RATIO OF VALUE ADDED TO GROSS VALUE
OF OUTPUT IN PRODUCTIVE SECTORS

	VA/GVO (percentages)
Farming	69.0
Mining	63.7
Manufacturing industry	28.4
Electricity and water	45.9
Construction	43.6
Trade, restaurants and hotels	72.3
Transport and communications	55.8
Financial and insurance	68.3
Corporate services and real estate	74.0
Government	74.0
Household services	57.6

Source: Central Bank of Honduras, December 19, 1998.

Note: VA: value added; GVO: gross value of output.

It is also interesting to note that the assets lost amount to seven times the annual product generated by the construction industry, i.e., if all construction work under way ceased, reconstruction after the disaster would take around seven years at the sector's normal rate of output.

It is worth mentioning that Mitch caused three and a half times the amount of damage stemming from hurricane Fifi in 1974, after adjusting for inflation.

Although these figures show what happened, they conceal certain details worth mentioning. Firstly, the amount of damage in the social sectors is high in itself and leads to considerable deterioration of basic living standards in Honduras, which are already low by international standards. Secondly, the main damage was concentrated among the lowest-income groups, whose houses and livelihood, located in marginalised urban and rural areas alike, were destroyed. Thirdly, women and children have been especially affected, because many children were orphaned—and many of the fatalities were minors—and women have had to become heads of households either because their husbands were killed or because they have been forced to leave to find work elsewhere.

Table 24

HONDURAS: LOSSES IN GROSS VALUE OF OUTPUT OF GOODS AND SERVICES AND
IN VALUE ADDED CAUSED BY THE DISASTER

	Gross value of output (GVO)			Value added (VA)	
	Total	1998	1999	1998	1999
<u>Primary activities</u>	<u>805,200</u>	<u>262,229</u>	<u>542,971</u>	<u>180,938</u>	<u>374,650</u>
Farming	805,200	262,229	542,971	180,938	374,650
Agriculture	677,900	244,044	433,856	168,390	299,361
Livestock-raising	119,000	17,000	102,000	11,730	70,380
Fisheries	6,900	985	5,915	680	4,081
Forestry	1,400	200	1,200	138	828
<u>Secondary activities</u>	<u>386,500</u>	<u>297,884</u>	<u>88,616</u>	<u>85,908</u>	<u>28,380</u>
Manufacturing industry	360,800	290,444	70,356	82,486	19,981
Electricity and water	25,700	7,440	18,260	3,422	8,399
Energy	18,500	2,645	15,855	1,217	7,293
Water	7,000	4,767	2,233	2,193	1,027
Irrigation and drainage	200	28	172	13	79
<u>Services</u>	<u>597,200</u>	<u>97,549</u>	<u>499,651</u>	<u>61,053</u>	<u>304,465</u>
Trade, restaurants and hotels	135,000	31,455	103,545	22,742	74,863
Transport and communications	296,300	42,371	253,929	23,643	141,692
Housing ownership	123,100	17,603	105,497	10,139	60,766
Health care	36,600	5,234	31,366	3,873	23,211
Education	6,200	886	5,314	656	3,932
Gross domestic product	1,788,900	657,662	1,131,238	327,899	707,495

Source: ECLAC estimates; the VA/GVO ratios are from the Central Bank of Honduras, December 21, 1998.

Moreover, the total amount of direct damage presented here refers to the current value of assets lost or damaged. Reconstruction will require much larger investment, since replacement costs will be higher; it will also be essential to protect infrastructure and reduce vulnerability to future floods. Reconstruction costs are estimated at US\$2.5 billion over four years, with higher disbursements during the first two years.

Since many of the components needed for reconstruction are not produced domestically — particularly machinery, equipment and other inputs— and exports of several of the country's main commodities will come to a halt, the disaster will exert very strong pressure on the balance of trade and payments. Over the next four years the effect on the balance of payments is estimated at US\$1.257 billion over four years, due to damage to output capacity and the requirements of the reconstruction programme.

The following chapter contains a detailed assessment of macroeconomic issues, such as the effects of the disaster on public finances, price rises, foreign debt, etc.

III. OVERALL EFFECTS OF THE DAMAGE

1. The situation prior to the hurricane

a) Recent economic developments

Honduras has an open economy, highly dependent on exports, with very low long-term per capita GDP growth (0.5 per cent a year). Its institutions have not really been geared to the development of productive activities. Accumulation of human capital, particularly in education, has been poor, and natural resources have been inadequately utilised. Around 73 per cent of the population lives in poverty, and the economy is made up of sectors with relatively low productivity and competitiveness. Economic policy in the nineties has therefore sought to introduce structural changes in the country.

In 1990 a Law on Structural Reordering of the Economy was passed, the object of which was to achieve stabilisation and foster efficiency and competitiveness in national production. After 30 years of a fixed exchange rate, the currency was devalued and a flexible exchange-rate policy was established. Tariff levels and spreads were reduced, sales and income tax levels and rates for certain public services were increased, a public-spending austerity policy was introduced, and central-government real investment dropped drastically. Consumer prices for most goods were liberalised, and measures were taken to deregulate the financial system.

Macroeconomic results for that year were unfavourable. GDP dropped more than 3 per cent in per capita terms. Exports, investment and private consumption stagnated, and open unemployment reached 7 per cent. Inflation rose to an unprecedented 36 per cent. The external imbalance was greater than in 1989, with considerable loss of international reserves. Foreign debt and fiscal deficit to GDP ratios were extremely high —125 per cent and 7 per cent respectively— even though public-sector credit was reduced.

Adjustment programmes and attempts at structural reforms continued from 1991 to 1997 with support from the IMF and other multilateral agencies.; GDP grew 3.7 per cent on average, initially as a result of investment growth and as of 1995, of exports, particularly non-traditional. The investment ratio rose from 6 per cent of GDP to almost 30 per cent, largely financed by domestic investment. Public activity showed a downward trend —almost 5 per cent of GDP— in keeping with the objectives of deregulation and less government interference.

Despite the liberalisation of agriculture, farming activities maintained their cyclical evolution, averaging 3.6 per cent yearly. Basic grains were adversely affected by an unsustainable liberalisation policy that led to a reduction in supply for several years. African palm production has grown substantially, after considerable investments made over a period of several decades. Forestry activities remained stagnant owing to a reduction in timberlands.

The manufacturing industry has registered sustained growth, particularly as of 1995, based on production of foodstuffs, textiles, clothing and chemical products.

Almost one-third of the country's population is economically active, 40 per cent in agriculture. Open unemployment has hovered around 4 per cent during the nineties. About 70 per cent of the economically active population (EAP) work largely in rural subsistence economies, and in non-formal, low productivity and low-wage urban sectors. This has encouraged migration to cities and abroad.

GDP growth has reduced poverty levels by 2 per cent during the nineties. Households below the poverty line are estimated at 73 per cent, and 50 per cent of the population lives in extreme poverty. Urban income distribution has also improved slightly; the poorest 40 per cent gained one percentage point, generating 13.3 per cent of total income in 1994, while the share of the richest 10 per cent dropped one point to 37 per cent. The country faces the obvious challenge of incorporating low-income groups into rapid-growth activities to raise their living standards and productivity.

Wage policy sought to maintain workers' purchasing power, but in 1997 average real wages were 2 per cent lower than at the beginning of the nineties.

Inflation dropped from 36 per cent in 1990 to 12.8 per cent in 1997, in line with fiscal and monetary policy and lower import prices in some years. In 1993 increased public spending and food-supply shortages led to considerable price rises in 1994. In the two years that followed, various factors —currency devaluation, suspension of price controls, higher rates for public services and an increase in the price of fuels— made the consumer price index rise more than 25 per cent a year.

Public accounts maintained a significant imbalance until 1995, although largely financed with foreign funds. Efforts were subsequently made to improve finances, and in 1997 the fiscal deficit dropped to 3 per cent of GDP, partly as a result of tax reform, but above all, by regulating public spending (by reducing public employment); overall government spending was lowered by 3 per cent of GDP.

Monetary policy attempted to contain inflation through high legal reserves, more than 33 per cent on average, and by broadening operations on the open market. In consequence, interest rates went up and private-sector credit expanded, particularly in recent years, driving an upturn in growth rates, and public-sector credit fell sharply.

The least encouraging results were in the foreign sector. The balance-of-payments current account deficit has remained very high, reaching 10.2 per cent of GDP in 1994. Foreign-debt interest payments have been the main factor behind the deficit.⁴¹ Efforts to reduce the trade imbalance have not been very successful, due to the heavy burden of interest payments, and despite the increasing flow of private transfers, which doubled between 1990 and 1997 to US\$345 million.

After a three-year falloff, as of 1993 the value of exports of goods rose to average rates of 17 per cent; as a result of a structural change, slow-growth traditional exports dropped from 78 per cent of the total to 45 per cent, whereas non-traditional exports grew significantly: manufactures, shrimp and fresh fruit have gradually risen to 55 per cent of the total. Almost 50 per cent of foreign sales

⁴¹ The last three years have accounted for more than 100 per cent of the deficit and in 1997 the interest paid almost doubled the current account deficit.

continued to be aimed at the US market, while Central America increased its share from 3 per cent to 15 per cent.

Foreign direct investment has grown, particularly in recent years, in response to the economic policy of fostering liberalisation and competitiveness.

Honduras is excessively indebted; at the beginning of the period under analysis, the balance of the total foreign debt (US\$3.588 billion) and its servicing represented 348 and 60 per cent of exports of goods and services, respectively. In the last few years debt servicing was equivalent to new outlays, so net flows were nil. Some 28 per cent of the debt was private. Arrears amounted to some US\$317 million. The government embarked on a series of renegotiations with its bilateral creditors in the Paris Club and managed to have part of the bilateral debt condoned and concessionary and non-concessionary debt reprogrammed. It contracted new debt with the IDB, the International Bank for Reconstruction and Development (IBRD) and AID. The country's efforts to meet its obligations resulted in a reduction of arrears, which in 1997 totalled US\$120 million.⁴²

b) Expected performance during 1998, prior to the disaster

Honduras has grown at an average annual rate of 4.3 per cent over the past three years, raised per capita income levels, and continued consolidating its stabilisation process; the fiscal deficit was cut and was expected to reach 2 per cent; inflation dropped significantly and the foreign sector was becoming stronger, with sustained growth in exports of goods and an evident decline in the balance of payments current account deficit. During this period the country's international reserves were equivalent to 3.3 months of imports.

In regard to structural reforms, the government was pressing on with the regulation of rates for public services and supervision of the financial system.

The new government, which came into power in early 1998, passed the Law on Stimulation of Production and Competitiveness and Support for Human Development, by means of which certain tax cuts were implemented to encourage foreign and domestic investment. A reduction of the exports income-tax was proposed from 42 to 25 per cent, as was a gradual lowering of tax on assets to bring Honduran businesses into line with the other Central American countries. These measures sought to boost local and foreign investment, thus securing job creation in several areas such as tourism, energy, agroindustry and highway infrastructure. Import tariff rates on raw materials and capital goods dropped. To compensate for the effect of these measures on tax collection, VAT (sales tax) was raised from 7 to 12 per cent. The tax burden was expected to be slightly higher than in 1997 as a result.

The economy performed favourably for the first ten months. Estimates at the beginning of September indicated GDP growth of 5.1 per cent, stimulated by the increase in fixed investment, especially private (11 per cent), and in exports (4 per cent) and private consumption.

⁴² By 1997 the foreign debt balance had grown to US\$4.095 billion (78 per cent of GDP); debt servicing was equivalent to 26 per cent of exports and was 34 per cent higher than government outlays. Honduras was making net transfers abroad.

The agricultural sector was showing growth as a result of cultivating larger areas and introducing new varieties, in response to tax incentives for bananas and coffee. Prices of basic grains favoured increased production. Shrimp production was expanding significantly—it almost doubled over the first six months—in relation to the same period in 1997. The manufacturing industry was witnessing high growth in foods and tobacco, textiles, chemicals and metal industries.

Public policy encouraged private investors on inspiring confidence, while also favouring financial brokerage to the productive sectors through the establishment of second-floor banking services that channel foreign funds from multilateral sources. Financial establishments thus continued to expand their activities (6 per cent) in view of the growing demand from agricultural investors and the promotion of broad brokerage spreads.

Finally, construction, which had already acquired a momentum of its own after years of sluggish performance, stepped up its growth even further (12 per cent), boosted by commercial and hotel buildings.

Inter-annual inflation to October stood at 14.5 per cent and cumulative inflation (January-October) reached 13.4 per cent, almost 2 per cent higher than the same period in 1997. During the first half, the effects of the drought—caused by El Niño phenomenon—on food prices and the 5 per cent increase in sales tax provoked a price rise. Nevertheless, fiscal and monetary policies were contributing to a price slowdown in the second half of the year.

The minimum wage went up by 17 per cent at the beginning of the year, although its real level remained low; two minimum wages are currently needed to acquire a basic food basket. Physicians and teachers received pay rises which became effective during the year, with new increases programmed for 1999.

The in-bond processing industry (maquiladora) has been the most dynamic in job creation. This year 9,000 jobs were created, making a total of 96,000 jobs generated by maquiladora plants.

The foreign sector showed an upward trend, and estimates in October indicated a current-account deficit of 2 per cent of GDP. Exports were expected to grow 15 per cent, particularly in sales of coffee, bananas and textile maquila, and because of higher export prices, which were expected to exceed the drop in volume of various products (shrimp, zinc, meat and timber).

Imports had increased 23 per cent by June and 4 per cent growth was forecast for the end of the year, especially in purchases of machinery, transport-related materials and foodstuffs. Income from petroleum by-products fell as a result of lower international prices.

Reduction of the trade imbalance—partially offset by family transfers—was to be financed by private and banking capital flows, allowing a new increase in reserves.

As has been mentioned, Honduras is a highly indebted country, although sound management has reduced foreign-debt servicing (in relation to exports), which totalled 15 per cent of exports of goods and services. In 1998 the balance rose slightly, to US\$4.146 billion. The interest paid was a little lower than the previous year. Almost 60 per cent of the foreign debt is multilateral, and private debt is very low (4 per cent). Arrears in debt servicing stood at 2 per cent.

Fiscal policy during the first ten months led to an improvement in public finances, which even registered a surplus at the end of the first half. The aim of expenditure policy was to curb spending growth and at the same time increase the share of social spending, particularly on education and nutrition, as well as to promote agricultural activities, especially those focusing on exports.

The flexible exchange-rate policy tended to overvalue the lempira slightly, but this did not affect competitiveness. The lempira had depreciated 3.4 per cent up to October. In March the monetary authorities broadened the range of quotations with respect to the benchmark rate offered in foreign-currency auctions.

In the field of trade, the tariff reduction programme continued to be implemented and the fiscal benefits of foreign trade zones were extended to the entire country. The government went on with its liberalisation policy, signed a free trade agreement with the Dominican Republic and continued negotiations, together with El Salvador and Guatemala, for a similar agreement with Mexico.

The main aim in monetary policy was to reduce inflation through tighter control of monetary aggregates and hence liquidity, intervening through open market operations. Legal reserves diminished by 2 per cent in April. Central government credit continued to drop sharply and private-sector credit increased (51 per cent) over the high levels in 1997. Lending interest rates showed a tendency to drop, although to September the average rate was 30 per cent, and brokerage mark-ups stood at 15 per cent. During the third quarter there was a lack of liquidity in the banking system, but it increased 23 per cent in the fourth quarter, although at a slower rate than in 1997.

Since the early nineties, Honduras has made efforts to introduce structural reforms in order to increase private sector participation and the competitiveness of its exports. In April 1998 an electricity-sector regulating authority was created, which was essential for a policy of rates based on long-term differential costs. Furthermore, a bill was submitted to the Congress for the partial sale of the state telecommunications company (HONDUTEL). The government is also granting concessions to improve services infrastructure in Tegucigalpa, San Pedro Sula, Roatán and La Ceiba airports.

The recently established National Banking Commission intensified its bank regulation and supervision activities, including capital and loan requirements, in keeping with the Basel Committee's criteria on foreign borrowing, and introduced new credit-card regulations.

In addition, the Ministry of Tourism was created, and a new law on internal security and police action was passed.

Table 25

HONDURAS: SUMMARY OF DAMAGE TO THE FOREIGN SECTOR

(Millions of dollars)

Sector/subsector	Reduction in exports	Increase in exports	Effect on the balance of payments
Total	534.4	722.5	1,256.9
Social sectors		126.2	126.2
Housing		76.1	76.1
Health		34.7	34.7
Education		15.4	15.4
Infrastructure		446.5	446.5
Energy		6.9	6.9
Oil		2.5	2.5
Electricity		4.4	4.4
Water and sanitation		27.7	27.7
Urban water mains		23.8	23.8
Sewerage		1.1	1.1
Rural systems		2.8	2.8
Irrigation and drainage		17.8	17.8
Transport		394.1	394.1
Highway subsector		350.8	350.8
Port and airport subsector		3.5	3.5
Communications		39.8	39.8
Economic sectors	534.4	149.8	684.2
Agriculture and natural resources	434.4	41.6	476.0
Agriculture	406.9	41.6	448.5
Livestock-raising		0.0	0.0
Aquaculture and fisheries	27.5		27.5
Industry	100.0	25.2	125.2
National		3.0	3.0
Maquila	100.0	22.2	122.2
Trade		83.0	83.0

Source: Official data and ECLAC calculations, 20 December 1998.

2. The situation after hurricane Mitch

a) General economic effects

Honduras suffered a catastrophe without precedent in its history as a result of the devastation caused by hurricane Mitch. Very preliminary estimates show 7,000 dead, 11,000 missing, around two million homeless with employment and income problems, 35,000 homes destroyed and 50,000

partially affected. Around one-third of the road network was damaged and a considerable number of bridges were destroyed, causing various cities and productive zones to be cut off.

Extensive areas of farmland suffered severe damage, with losses in crops such as bananas, sugar cane and basic grains, and coffee to a lesser extent. The growth of the economy and exports slowed as a result. Tegucigalpa and other cities were beset by drinking-water shortages. Industry suffered lesser effects, although activities were paralysed for several days. Small and very small businesses and some commercial establishments, mainly in the capital, suffered damages to stocks and installations. In general, hurricane Mitch left massive destruction of physical capital—both public and private—in its wake, and also of production, particularly exportable supply.

Table 26

HONDURAS: SOME LEADING ECONOMIC INDICATORS

	1996	1997	1998		1999	
			Before the disaster	After the disaster	Before the disaster	After the disaster
Gross domestic product						
Value a/	6,374	6,699	7,041	6,515.0	7,434	6,073
Growth rates	3.7	5.1	5.1	-2.7	5.6	-6.8
Per capita gross domestic product d/	8,210.9	10,354.5	11,903.5	10,671.1	13,631.4	5,600.7
Exports of goods fob b/	1,422.5	1,535.6	1,763.4	1,571.0	1,744.5	1,402.5
Imports of goods fob b/	1,758.9	2,060.2	2,360.2	2,460.8	2,636.2	3,240.3
Consumer prices c/	23.8	20.2	13.5	16.0	10.0	18.0
Current government revenues d/	8,288.9	10,745.7	13,059.0	12,108.6	14,824.0	11,593.2
Total government spending d/	10,102.7	12,468.5	14,929.1	14,658.9	16,597.3	18,448.9
Fiscal deficit	1,813.8	1,722.8	1,856.1	2,522.7	1,735.3	6,817.7
Fiscal deficit/GDP	3.8	2.8	2.5	3.6	2.1	8.7
	<u>Millions of dollars</u>					
Private-sector credit d/	1,360.5	1,403.8	1,200.2	1,194.4		
Balance of current account	-189.0	-191.3	-105.3	-368.9	-239.1	-1,205.6
Changes in international reserves e/	-174.3	-296.6	-57.3	74.9	22.4	784.2
Total foreign debt	4,123.0	4,095.2	4,146.0	4,146.0	4,019.1	
Foreign debt service	867.3	713.2	736.4	779.3	865.8	775.6
Debt service (as a percentage of exports)	44.9	32.5	30.2	33.2	31.4	33.4

Source: ECLAC, based on Central Bank figures, 21 December 1998.

a/ In millions of constant lempiras.

b/ In millions of current dollars.

c/ Average annual variations.

d/ In millions of current lempiras.

e/ (-) Indicates increase.

The disaster occurred at a time when Honduras was showing sustained growth and consolidating stabilisation, having achieved successes in public finances and a declining inflation rate. It was ready to sign an agreement for an Extended Structural Adjustment Facility with the IMF, which would support its policy of growth based on private investment and effective government regulation by making structural reforms (such as the privatisation of HONDUTEL), reforming the social security system, strengthening banking supervision, establishing stronger poverty alleviation policies, and reinforcing the institutional and legal framework for sound forestry, land and water management.

A preliminary estimate places direct and indirect damages to the economy at just under US\$4 billion, or 70 per cent of the 1998 GDP.⁴³ The sectors with higher capital losses were agriculture, transport and communications (particularly roads) and housing. Livestock-raising, commerce and aquaculture were affected to a lesser extent. Water and sewerage, health care, and education infrastructure sustained extensive damage, and a considerable amount of environmental resources were lost.

Production losses for 1998 and 1999 are estimated at around US\$1.8 billion, particularly in agriculture and livestock-raising (52 per cent), the manufacturing industry (17 per cent), transport and communications (16 per cent) and trade. Losses were also suffered in production of housing services, energy, health care, education and water supply.

b) Effects on economic growth, employment and income

The hurricane set back the economy's favourable performance in 1998. Estimates at the end of September showed 5.1 per cent GDP growth, headed by the expansion of the manufacturing industry, construction, trade and financial services. This evolution was curbed by the damage to the productive apparatus, as a result of which GDP slowed down to 2.7 per cent with the contraction in agriculture (-17 per cent), the drop in trade and manufacturing rates, insurance losses, and lower profits in the financial system. As a result, per capita GDP also dropped. The worst effects will be felt in 1999; economic activities will slow down (-6.8 per cent), with lower growth in practically every sector except construction.

Losses in agriculture were mainly in banana production —the hardest-hit crop— basic grains, African palm and coffee. This in addition to future effects stemming from the destruction of banana plantations, capital goods, machinery, irrigation works, coffee processing plants on the banks of rivers, and arable lands, which will result in a significant decrease in production during 1999 and successive years.

⁴³ Taking into account the destruction of capital goods and production.

Table 27

HONDURAS: GROSS VALUE OF PRODUCTION AND VALUE ADDED IN GOODS
AND SERVICES, INCLUDING LOSSES CAUSED BY THE HURRICANE

(Millions of constant lempiras)

	Value added including losses			Growth rates	
	1997	Before the disaster (1998)	After the disaster (1998)	1998	1999
Commodities sector	2,601	2,281	2,189	-17.1	-4.0
Agricultural	1,666	1,382	1,144	-17.0	-17.2
Manufacturing industry	935	899	1,045	-3.9	16.2
Utilities sector	705	694	481	-1.6	-30.7
Electricity and water	185	200	214	8.1	7.0
Transport and communications	520	495	267	-4.8	-46.1
Services sector	1,502	1,530	1,486	1.9	-2.9
Commerce, restaurants and hotels	653	654	645	0.2	-1.4
Housing ownership	399	399	346	0.0	-13.3
Social and community services	450	477	493	6.0	3.4
Other sectors a/	1,251	1,357	1,365	8.5	0.6
Plus indirect net taxes	639	652	554	2.0	-15.0
Gross domestic product	6,698	6,515	6,073	-2.7	-6.8

Source: ECLAC estimates, 21 December 1998.

a/ Includes working of mines and quarries, construction, financial establishments and public administration.
Included in accordance with Central Bank estimates.

Livestock farming was affected both by flooding and by farms being cut off, which made it impossible for them to market their production, especially dairy produce, in consumer and processing centres. Cattle herds also suffered considerable losses.

The manufacturing industry suffered losses that will diminish its growth in 1998, dropping will drop an estimated 3.9 per cent during 1998, and rising substantially to 16.2 per cent in 1999, spurred by foodstuff, clothing and chemicals production. Work in the important maquiladora industry was only suspended temporarily, although one textile company had to close down its activities because of damage to machinery. In manufacturing, the hardest hit were very small and small businesses, particularly small-scale footwear manufacturers, who lost much of their production and installations. Preliminary estimates indicate that between 30 and 40 per cent of these producers' portfolios have been affected and are likely to default.

Table 28

HONDURAS: EFFECTS OF THE DISASTER ON THE ECONOMIC GROWTH RATE

(Millions of constant lempiras (78))

	Projections					Growth rates			
	1998		1999		1998		1999		
	1997	Before the disaster	After the disaster	Before the disaster	After the disaster	Before the disaster	After the disaster	Before the disaster	After the disaster
<u>Gross domestic product</u>	<u>6,699</u>	<u>7,041</u>	<u>6,515</u>	<u>7,434</u>	<u>6,073</u>	<u>5.1</u>	<u>-2.7</u>	<u>5.6</u>	<u>-6.8</u>
<u>Commodities sector</u>	<u>2,709</u>	<u>2,808</u>	<u>2,399</u>	<u>2,941</u>	<u>2,321</u>	<u>3.6</u>	<u>-11.4</u>	<u>4.7</u>	<u>-3.3</u>
Agriculture	1,666	1,695	1,382	1,740	1,144	1.7	-17.0	2.7	-17.2
Working of mines and quarries	108	118	118	135	132	9.3	9.3	14.4	11.9
Manufacturing industry	935	995	899	1,066	1,045	6.4	-3.9	7.1	16.2
<u>Utilities sector</u>	<u>944</u>	<u>965</u>	<u>975</u>	<u>783</u>	<u>837</u>	<u>8.7</u>	<u>3.3</u>	<u>7.6</u>	<u>-14.2</u>
Construction	239	270	280	302	356	13.0	17.2	11.9	27.1
Electricity and water	185	202	200	220	214	9.2	8.1	8.9	7.0
Transport, storage and communications	520	554	495	582	267	6.5	-4.8	5.0	-46.1
<u>Services sector</u>	<u>2,407</u>	<u>2,498</u>	<u>2,489</u>	<u>2,517</u>	<u>2,361</u>	<u>5.8</u>	<u>3.4</u>	<u>6.3</u>	<u>-5.1</u>
Commerce, restaurants and hotels	653	683	654	678	645	4.6	0.2	6.5	-1.4
Banks, insurance and other financial institutions	606	670	661	710	572	10.6	9.1	6.0	-13.5
Housing ownership	399	415	399	432	346	4.0	0.0	4.1	-13.3
Public administration and defence	299	298	298	323	305	-0.3	-0.3	8.4	2.4
Community, social and personal services	450	482	477	518	493	7.1	6.0	7.5	3.4
<u>Plus indirect net taxes</u>	<u>639</u>	<u>659</u>	<u>652</u>	<u>679</u>	<u>554</u>	<u>3.3</u>	<u>2.0</u>	<u>3.0</u>	<u>-15.0</u>

Source: ECLAC estimates, based on "Gross Domestic Product by Branch of Activity", Central Bank, 20 December 1998.

Construction will be boosted by the demand for investment to rebuild homes, roads, bridges and different types of education and health care infrastructure. This sector will grow at estimated annual rates of 17 and 27 per cent in 1998 and 1999, which will also give impetus to various manufacturing branches.

Despite a certain slowdown, commerce was showing moderate growth rates. The drop in economic activity, the destruction of communication routes and the population's loss of purchasing power will cause a reduction in growth-rate forecasts for 1998 and 1999 (3.9 and 1.7 per cent, respectively).

Growth in the transport and communications sector will also contract owing to lower levels of freight and passenger transport. The destruction and damage to highways and bridges affected transport and productive activities in general, especially agriculture and industry; in particular, it limited access to coffee farms. This situation will make itself felt in 1999, when transport will drop dramatically (-46 per cent).

Financial establishments and insurance companies had been showing sustained growth, with forecasts for higher rates in 1998 and 1999, and were affected to some extent: the former, in their agricultural and business portfolios, and the latter in significant losses stemming from payment of damages to policyholders. Growth rates for those years are now estimated at 9 and -13 per cent, respectively.

c) Effects on the foreign sector and the balance of payments

One of the most affected sectors in the aftermath of the hurricane was the foreign sector, owing to its structural weakness. The recurrent imbalance in the current account had been reduced, but now it is expected to rise to almost 8 per cent of GDP in 1998, and to a similar level in 1999. Exports posted a lower growth rate, and in 1999 they could decrease by 25 due to a 73 per cent drop in banana exports, since plantations will take about two years to recover.

The value of coffee exports will rise sharply this year (36 per cent) due to an increase in volume, despite the losses suffered; in 1999 it will fall off drastically, however, in view of prices and reduced production.

Damage to shrimp breeding facilities will reduce exportable supply in 1998 (-15 per cent) and 1999 (-2 per cent), in addition to the cutback in shrimp fishing resulting from damage to the fishing fleet, which will cause a fall in export earnings.

Table 29

HONDURAS: EFFECTS OF THE DISASTER ON THE BALANCE OF PAYMENTS

(Millions of dollars)

	1998				1999			
	Before the disaster		After the disaster		Before the disaster		After the disaster	
	Revenues	Outlays	Revenues	Outlays	Revenues	Outlays	Revenues	Outlays
Total	2,560.1	2,805.8	2,522.9	2,911.8	2,722.4	3,120.0	2,338.1	3,726.2
Exports of goods fob	1,763.4		1,571.0		1,744.5		1,402.5	
Imports of goods fob		2,360.2		2,460.8		2,636.2		3,240.3
Exports of services including tourism	796.7		771.9		977.9		915.6	
Imports of services		445.6		451.0		483.8		485.9
Insurance and reinsurance			180.0				20.0	

Source: ECLAC estimates, 20 December 1998.

Damage to pineapple plantations is estimated at 30 and 50 per cent of this year's and next year's harvest, as a result of which pineapple exports will decline 34 per cent in 1998 and 49 per cent in 1999. Foreign sales of other commodities such as melon, tobacco, sugar and meat will diminish as a consequence of production and capital-goods losses, which will take several years to recover, as will livestock raising.

Imports will rise sharply in 1998 and 1999, especially capital goods and raw materials, so as to replenish stocks and replace machinery and equipment, transport and building materials, metals, seeds and live animals. Supply shortages due to lower domestic demand will lead to higher imports of basic foods and medicines.

In view of the above, accounts for non-factorial goods and services will suffer a severe imbalance, especially in 1999, when the deficit will almost triple with respect to 1997. Increased remittances will cover around 25 per cent of the deficit. In all, the gap in the current account will reach an unprecedented proportion, just over US\$1.206 billion (20 per cent of GDP).

With regard to the balance-of-payments capital account, incoming capital flows are likely to be lower in 1998, but long-term flows will be reinforced by income from reinsurance payments (some US\$180 million), which will finance the current account balance, and the loss of reserves should amount to some US\$63 million.

Stronger flows of official capital are expected in 1999, along with a reduction in debt service, particularly bilateral. Private direct investment will increase significantly, as will public transfers. Even so, the gap to be financed will total just under US\$700 million. Better conditions will be required in renegotiating the debt, as will more private and public transfers, accumulation of debt arrears and a new drop in international reserves. International cooperation is vital if Honduras is to meet this enormous challenge.

For the past five years, Honduras has been transferring funds abroad through negative net flows with multilateral agencies, which hold 60 per cent of the country's debt portfolio. Obviously one of the effects of the catastrophe on the economy is to reduce its foreign payment capacity, in view of the drop in exports and considerable demand for foreign funds to spend on national reconstruction. The country has received a positive response from creditor countries and, with the IMF's support, is preparing to renegotiate its bilateral debt in the Paris Club, as well as a readjustment of servicing with multilateral organisations, in order to secure relief in its payments and fresh funds for reconstruction.

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d) Implications for public finances

During the first ten months of 1998 public finances performed satisfactorily and the deficit was expected to amount to 2.5 per cent of GDP. The after-effects of the hurricane had a strong impact on revenue expectations and on improved spending. The deficit is now expected to rise to 3.6 per cent in 1998 and 8 per cent in 1999.

⁴⁴ At the IMF's initiative, a trust fund was set up with donor contributions to help cover Honduras' and Nicaragua's multilateral debt service obligations.

During 1998 —and all the more in 1999— tax revenues will be affected by a weakened tax base, which will diminish due to the fall in productive activities; the strongest drop will take place in sales-related and personal income taxes and import tariffs.⁴⁵ The tax burden should fall slightly in 1998 and drop 14.8 per cent in 1999.

Public spending will focus on meeting the most pressing emergency and reconstruction needs, and will expand as a result of repair work; investment will rise significantly in order to rebuild sanitary and education facilities, roads, bridges and water mains. Debt servicing is expected to diminish owing to debt moratoriums and relief. Recurrent expenses will rise due to increased transfers to victims and prior commitments to teachers and municipalities. Total central government expenses will increase a little under 21 per cent in 1998 and 23 per cent in 1999.

Reconstruction expenses will be limited by constraints on government spending, much of which is committed to recurrent outlays. The ENEE and SANAA public enterprises will increase their investment spending, and this will affect the public deficit, since they will be unable to raise their rates.

e) Consequences on employment

One of the hurricane's initial effects was higher unemployment levels, with workers moving from jobs in the formal economy to informal jobs. By mid-November 1998 the Labour Ministry had received requests to suspend labour contracts affecting 23,000 people. In 1999 it is very likely that the drop in productive activity will generate higher unemployment and underemployment levels in agriculture, commerce, transport and banking. Employment in construction is expected to rise due to reconstruction activities.

Already low per-capita income levels will drop still further. Poverty is likely to increase in rural areas, due to problems in securing the purchasing power to acquire staple foods. Damaged cities will also be affected by loss of income, jobs and assets among large sectors of the population.

f) Repercussions on inflation and certain prices

Inflation could reach 16 per cent by the end of 1998; the annual average is expected to be 13 per cent. The government has established temporary controls on the prices of basic goods to prevent speculation. The Central Bank will continue with its goal of controlling inflation. The consumer price index is expected to rise to 18 per cent by December 1999, assuming that imports of consumer goods and inputs can be financed.

⁴⁵ Improvements in tax administration will offset partially this trend.

Honduras has suffered damages on an unprecedented scale. It has not only lost a significant part of its infrastructure, capital assets and two years' production, but its macroeconomic accomplishments in terms of growth and stabilisation have also been affected, with imbalances growing sharper, particularly in the foreign sector. Furthermore, hurricane Mitch had a disastrous effect on low-income groups' assets, jobs and income, forcing them to migrate to other parts of the country or abroad on not finding productive alternatives.

One of the most severe consequences of the hurricane was the raising of the external imbalance to an unprecedented level. As stated above, the current gap is huge, and the chances to cover it are tightly connected to the reconstruction and restoration of the country's productive apparatus. External financing, both internal and external, will be essential.

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

HONDURAS: LIST OF PROJECTS a/

Sector	Title of project	Investment required (Millions of dollars)
1. Agriculture and livestock		
1.1	Reconstruction of destroyed infrastructure in sugarcane cooperatives and independent farmers' associations	21.0
1.2	Training in reforestation for government officials, technicians and farmers	33.0
1.3	Recovery of destroyed banana plantations	200.0
1.4	Recovery of destroyed pineapple plantations	50.0
1.5	Recovery of small and medium-sized farmers' citrus areas	50.0
1.6	Recovery of African palm plantations	10.0
1.7	Loans for small and medium-sized basic grain farmers	60.0
	Sectorial subtotal	424.0
2. Technical assistance		
2.1	Design of disaster-prevention policies and identification of investments	1.0
2.2	Programming of works	100.0
2.3	Strengthening of the management capacity of government officials in executing construction projects	0.3
	Sectorial subtotal	101.3
3. Education		
3.1	Repair and reconstruction of damaged schools	40.0
3.2	Relocation, reconstruction and re-equipment of Tegucigalpa musical facilities	5.0
3.3	Relocation, reconstruction and re-equipment of Public Education Ministry facilities	5.0
	Sectorial subtotal	50.0
4. Emergency		
4.1	Emergency food aid for affected families	7.0
4.2	Emergency disease control	10.0
4.3	Resettlement and housing of victims	10.0
4.4	Emergency animal health plan	0.5
4.5	Emergency road system repair programme	30.0
	Sectorial subtotal	57.5

/Cont.

a/ Identified and prepared by the mission.

Table 1 (Cont.)

Sector	Title of project	Investment required (Millions of dollars)
5. Energy		
5.1	Reconstruction of transmission network	4.4
5.2	Reconstruction of primary and secondary distribution systems in East and South-East regions	6.5
5.3	Reconstruction of primary and secondary distribution systems in the Centre and Choluteca-San Lorenzo regions	7.4
5.4	Reconstruction of primary and secondary distribution systems in the North-West and Atlantic regions	6.2
5.5	Reconstruction of Choluteca substation	1.0
5.6	Purchase of billing system software and hardware	1.2
5.7	Reconstruction of civil works and repair of hydroelectric plants	5.7
	Sectorial subtotal	32.4
6. Trade and industry		
6.1	Rehabilitation and reconstruction of infrastructure and equipment of small and medium-sized industries	7.0
6.2	Rehabilitation and reconstruction of in-bond industry infrastructure and equipment	56.0
6.3	Rehabilitation and reconstruction of trade infrastructure and equipment	220.0
6.4	Recovery of working capital for businessmen in trade and industry	59.0
	Sectorial subtotal	342.0
7. Environment		
7.1	Environmental management and sustainable development of river basins	60.0
7.2	Recovery of green areas on the banks of the Choluteca river	1.0
7.3	Ecological restoration of Guanaja Island	4.0
7.4	Training of human resources in establishing small farming enterprises	2.0
7.5	Installation of real-time networks	0.6
	Sectorial subtotal	67.6
8. Irrigation and drainage		
8.1	Reconstruction of state-owned irrigation and drainage systems	11.0
8.2	Reconstruction of private irrigation and drainage systems	20.0
8.3	Improvement of main river beds	18.0
	Sectorial subtotal	49.0

/Cont.

Table 1 (Cont.)

Sector	Title of project	Investment required (Millions of dollars)
9. Health		
9.1	Improvement of response capacity and reduction of functional vulnerability to disasters	1.0
9.2	Establishment of microenterprises run by women to produce nutritionally improved foods	1.0
9.3	Reinforcement of foreign aid coordination	2.0
9.4	Adoption of comprehensive control measures against malaria, dengue and leptospirosis	6.0
9.5	Strengthening of action plan for prevention and control of diarrhoea-related diseases and cholera	1.0
9.6	Re-establishment of an expanded immunisation programme	2.5
9.7	Rehabilitation of health care infrastructure	25.0
9.8	Construction of a new Honduran Social Security Institute hospital in Tegucigalpa	50.0
	Sectorial subtotal	88.5
10. Water		
10.1	Reconstruction of the Tegucigalpa and Comayagüela drinking water systems	120.0
10.2	Reconstruction of drinking water systems in the 46 cities managed by SANAA	50.0
10.3	Reconstruction of rural drinking water systems	15.0
10.4	Purchase of software and hardware for SANAA billing system	1.2
10.5	Reconstruction of SANAA's water purification systems	1.2
10.6	Reconstruction of Choluteca and Puerto Cortés drinking water and sewerage systems	15.0
10.7	Programme to repair and rebuild sewerage systems in Tegucigalpa and intermediate cities	1.3
10.8	Programme to rebuild water, latrine and septic tank systems in rural areas	4.0
	Sectorial subtotal	207.7
11. Transport		
11.1	Road planning and feasibility studies	3.0
11.2	Planning and feasibility studies to extend highway and secondary road systems	1.5
11.3	Diagnosis and establishment of design parameters for structures damaged by hurricane Mitch	0.5
11.4	Road reconstruction programme	440.0

/Cont.

Table 1 (Cont.)

Sector	Title of project	Investment required (Millions of dollars)
11.5	Programme to repair and rebuild major structures	51.0
11.6	Repair and re-equipping of national port facilities	3.6
	Sectorial subtotal	499.6
12. Housing		
12.1	Land use plan for sustainable national development	1.0
12.2	Urban housing construction programme for low-income families affected by hurricane Mitch	75.0
12.3	Rural housing construction programme for low-income families affected by hurricane Mitch	25.0
12.4	Housing repair programme for low-income families affected by hurricane Mitch	80.0
	Sectorial subtotal	181.0
	TOTAL	2,100.6