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DAMAGE CAUSED BY HURRICANE JOAN IN NICARAGUA. ITS EFFECTS ON ECONOMIC  
DEVELOPMENT AND LIVING CONDITIONS, AND REQUIREMENTS  
FOR REHABILITATION AND RECONSTRUCTION

Note by the Secretariat

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## SUMMARY

Living conditions in Nicaragua and the country's economic development have once again felt the impact of an extraordinary and destructive natural phenomenon. The damage caused by hurricane Joan on this occasion compounds the after-effects, which have yet to be entirely overcome, of the earthquake which destroyed the city of Managua in 1972, of a number of droughts and floods that have occurred during the present decade, and of the damage resulting from the civil war that reached its climax in 1979.

The disaster caused by the hurricane in October came at a time when the Nicaraguan economy was showing signs of increasing weakness as it continued to undergo a semi-permanent crisis brought on, in part, by the marked deterioration of the external sector --which has been severely hurt by the economic blockade imposed by the United States since 1985-- and by the need, in recent years, to allocate to defence a large share of the country's scarce resources. Some of the characteristic features of this crisis are large external imbalances and acute fiscal deficits which have been met mainly through monetary issuing. These phenomena have been the underlying cause of serious distortions in the structure of relative prices, the intensification of inflationary pressures, and the fall of real wages.

These circumstances have made it necessary for the Government of Nicaragua to lower or postpone a number of the targets included in the programme adopted in 1979 whose aim was to establish a more equitable distribution of the benefits of development among the population.

In an effort to turn this situation around, in 1988 the government undertook economic reforms in combination with a stringent adjustment programme. Its purposes in doing so were to reduce the fiscal deficit in terms of the gross domestic product by cutting back the subsidy to production which was implicit in the negative interest rates, public investment and current expenditure, as well as to set a single exchange rate so that exports would become profitable once again and to correct existing distortions in the relative prices of products for domestic consumption vis-à-vis exports.

Although some progress was made (which was, however, accompanied by greater imbalances in other items), the results of the efforts being made to re-establish macroeconomic equilibria will only be evident in the medium term.

Furthermore, before the hurricane occurred, a decrease of imports of goods and services in real terms had been projected for 1988, along with a consequent sharp decline in domestic supply. A slowdown in the growth rate of all the component variables of overall demand was also expected. In addition,

a drop of around 7% in the gross domestic product was forecast, which would bring per capita income back down to its 1957 levels.

Although the number of casualties caused by the hurricane (148 dead, 100 missing and 184 injured) was extraordinarily low, thanks to the efficiency of the preventive measures undertaken and to the enormous capacity for social organization displayed by the country, the economic and social impacts have been truly disastrous. This is especially the case in the central Atlantic region and in some areas on the Pacific slope.

It is estimated that approximately 310 000 persons had to be evacuated from their homes and housed in temporary shelters to protect them from the wind, rains and floods and to await the re-establishment of minimum environmental health and hygiene conditions in the settlements that were destroyed or damaged. About 230 000 people in low-income peasant sectors saw their homes and working capital either destroyed or damaged. In all, a total of 2.8 million people were affected either directly or indirectly, including those who lost all or part of their crops and plantations, those who found themselves cut off in isolated areas and those who experienced some type of difficulty due to the damage done to means of transport.

The total damage is estimated at US\$840 million; this includes US\$524 million in damage to capital stock (62% of the total damage), US\$162 million (19%) to natural resources, and production losses of US\$154 million (19%).

The direct damage --which is calculated at US\$745 million-- includes the total or partial destruction of social infrastructure, especially housing (41% of the total); soil erosion and the devastation of extensive tracts of tropical forests (22%); the destruction or impairment of economic infrastructure, particularly transport facilities (20%); and damage to infrastructure and decreases in agricultural and industrial output (16%).

The indirect damage is estimated to amount to US\$95 million and corresponds to the greater expense involved in supplying health and housing services (45% of the total) and in carrying out emergency operations (37%), as well as to production losses and the income that will be forgone during the rehabilitation period.

In order to provide a better idea of what these figures mean, it should be noted that the losses in capital stock represented 10% of the entire country's accumulated stock and that the capital and production losses are equivalent to approximately 40% of the country's gross domestic product for 1988.\*/

The Nicaraguan economy has sustained heavy losses during the past 16 years, due to other natural disasters, armed conflicts and the trade blockade.

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\*/ Losses caused by the 1986 San Salvador earthquake represented about one-fourth of GDP; those of the Mexico City earthquake in 1985 --while four times as much-- represented only 2% of GDP.

The recent disaster will have a number of effects on the performance of the Nicaraguan economy in 1988. Firstly, it will increase by 2% the fall in the gross domestic product, thereby further reducing per capita income. Secondly, it will add to the already large fiscal deficit as a result of the expenditures made by the government in order to meet emergency requirements.

In 1989 and the following years, even though the recovery of some production activities and growth in the construction sector can be expected, public sector finances will deteriorate further due to the new investments required for rehabilitation and reconstruction, and the balance of payments will exhibit greater disequilibria as a result of the increased need for imports and the inevitable drop in exports. This will lead to a further speed-up of the trend towards hyperinflation which existed before the disaster.

The government will be forced to revise its goals as regards the re-establishment of macroeconomic equilibria. Moreover, it is clear that the country does not have the capacity, on its own, to carry out all of the necessary rehabilitation and reconstruction work while at the same time undertaking the long-term efforts required to achieve sustained development and to improve the living conditions of the population. The urgent need to undertake such rehabilitation and reconstruction work could make it necessary to postpone major economic and social development programmes which were underway or which were about to be initiated. This might well have social and political repercussions which an effort should be made to avoid.

This is all the more important in view of the fact that the people most affected by the disaster include about 62 000 low-income peasant families, who lost their subsistence crops and their very limited capital stocks and belongings and who are now faced with the task of rebuilding their highly fragile family-based economy.

All these circumstances make solidarity and co-operation on the part of the international community more necessary than ever if Nicaragua is to be able to cope with the problems caused by this latest disaster as well as to proceed with its efforts to bring about an adjustment and structural change.

Specific technical and economic co-operation project profiles (amounting to a total of approximately US\$500 million) which could be financed by the international community in order to help carry out the tasks of rehabilitation and reconstruction have been prepared. This assistance—which should be in addition to, rather than instead of, the aid now received by the country in connection with its regular development programmes—should include donations and soft-term loans. Furthermore, the donors should expedite their procedures for project evaluation and approval and make these processes more flexible in view of the urgency of the need for their assistance. Moreover, given the severe shortage of foreign exchange and the limited availability of some inputs, it should be possible to use the loans for the importation of such components.

## I. INTRODUCTION

### 1. Background

#### a) General information

1. Natural disasters of various origins and severities frequently occur in the countries of Latin America and the Caribbean. In an average year, the damage caused by such natural disasters includes 5 600 deaths and an estimated US\$1.2 billion in material and production losses. These damages have an adverse impact on the population's living conditions and hinder the countries' efforts to achieve sustained economic growth.1/

2. In October 1988 a hurricane passed through Nicaraguan territory, causing considerable damage to the country's social and economic infrastructure, productive sectors and natural resources. In addition to its direct impact on the population (loss of life, the destruction and damage of housing and other social infrastructure, and a loss or decrease in family incomes and capital), this latest disaster had a very severe effect on the main macroeconomic variables at a time when the economy was undergoing an exacting adjustment and stabilization process aimed at bringing its imbalances under control. Worse still, the disaster compounded the negative repercussions of the armed conflict and trade embargo which have been beleaguering the country for a number of years.

3. Even under normal conditions of economic activity, it would have been difficult for Nicaragua to absorb the damage associated with this disaster. Given the current situation, the country is in need of special and generous co-operation from the international community in order to undertake the required rehabilitation and reconstruction work.2/

#### b) Purposes of this report

4. This report has been prepared at the express request of the Government of Nicaragua. Its aim is to help orient action by the international community towards co-operation in the stages of rehabilitation and reconstruction. To this end, the report identifies the social and economic sectors most severely affected by the disaster which are regarded as priority areas during the post-emergency period.

5. This identification of priority tasks or areas is based on a systematic quantitative assessment of all the direct and indirect damage caused by the disaster, as well as of its impact on the country's economic development and on the living conditions of the affected population.

6. In this connection, the report will include a series of rehabilitation and reconstruction project ideas and profiles which represent specific requirements for international co-operation. Later on, the government will prepare specific documents for each one of these project profiles.

c) The mission

7. The report covers the work carried out, in close co-operation with the Government of Nicaragua, by an interdisciplinary mission organized and directed by the Secretariat of the Economic Commission for Latin America and the Caribbean. The mission was carried out by experts in the various areas relating to the work at hand. The services of these experts, who had had experience with similar disasters, were made available by ECLAC itself and by other organizations of the United Nations system.

8. The mission was provided with valuable financial and logistical support by the United Nations Development Programme (UNDP) and benefitted from the direct participation of personnel from the United Nations Centre for Human Settlements (UNCHS), the Pan American Health Organization of the World Health Organization (PAHO/WHO) and the Joint ECLAC/FAO Agriculture Division. The mission also received valuable assistance from the office of the World Food Programme (WFP) in Nicaragua, as well as from experts working on national technical co-operation projects financed by UNDP.

9. The mission established contact and co-ordinated its activities with representatives, staff members and experts of a number of multilateral organizations, subregional integration bodies and bilateral co-operation institutions.

10. In order to carry out its assignment, between 2 and 15 November the mission held numerous meetings and consultations with national and regional offices associated with the affected sectors. It obtained the available information and documentation concerning conditions prior to the hurricane and its most direct repercussions. Field visits were undertaken in order to observe the effects of this natural disaster first hand and to estimate the extent of the damage.

11. This report is, therefore, the result of an independent assessment, made as objectively as possible, of the effects of the disaster.

2. Description of the phenomenon and its overall effects

12. The natural disaster which occurred in Nicaragua in October 1988 was caused by the tenth hurricane of the Caribbean season.<sup>3/</sup> The meteor formed as a low-pressure area off the north-western coast of Africa. From there, it moved in the direction of the American continent at a speed of nearly

15 kilometres per hour; it continued to build to the point where, on 13 October, it was designated as a tropical storm and given the name of Joan.

13. As it moved west, Joan passed over the northern coast of Venezuela and Colombia, where it was the cause of considerable casualties and damage. During the first hour of 18 October (Greenwich Mean Time) Joan became a full hurricane, reaching a maximum sustained wind velocity of 178 kilometres per hour 4/ (see map 1).

14. Between 18 and 21 October, hurricane Joan continued to move slowly westward, causing heavy rains in Panama and Costa Rica. Shortly before 4:00 AM on 22 October (local time), it touched land in Nicaragua at Bluefields, after having crossed over Corn Island, with a maximum sustained wind velocity of 217 kilometres per hour and gusts of up to 250.

15. The hurricane then continued westward along the 12th parallel, with its wind intensity diminishing as it moved away from the ocean which had fed it and came up against the Amerrisque mountain range. It crossed the continental divide after having subsided to the intensity of a tropical storm once again (at which point it was re-baptized as Myriam), moved over Lake Nicaragua and then passed to the south of Managua, moving out into the Pacific Ocean during the early morning hours of 23 October.

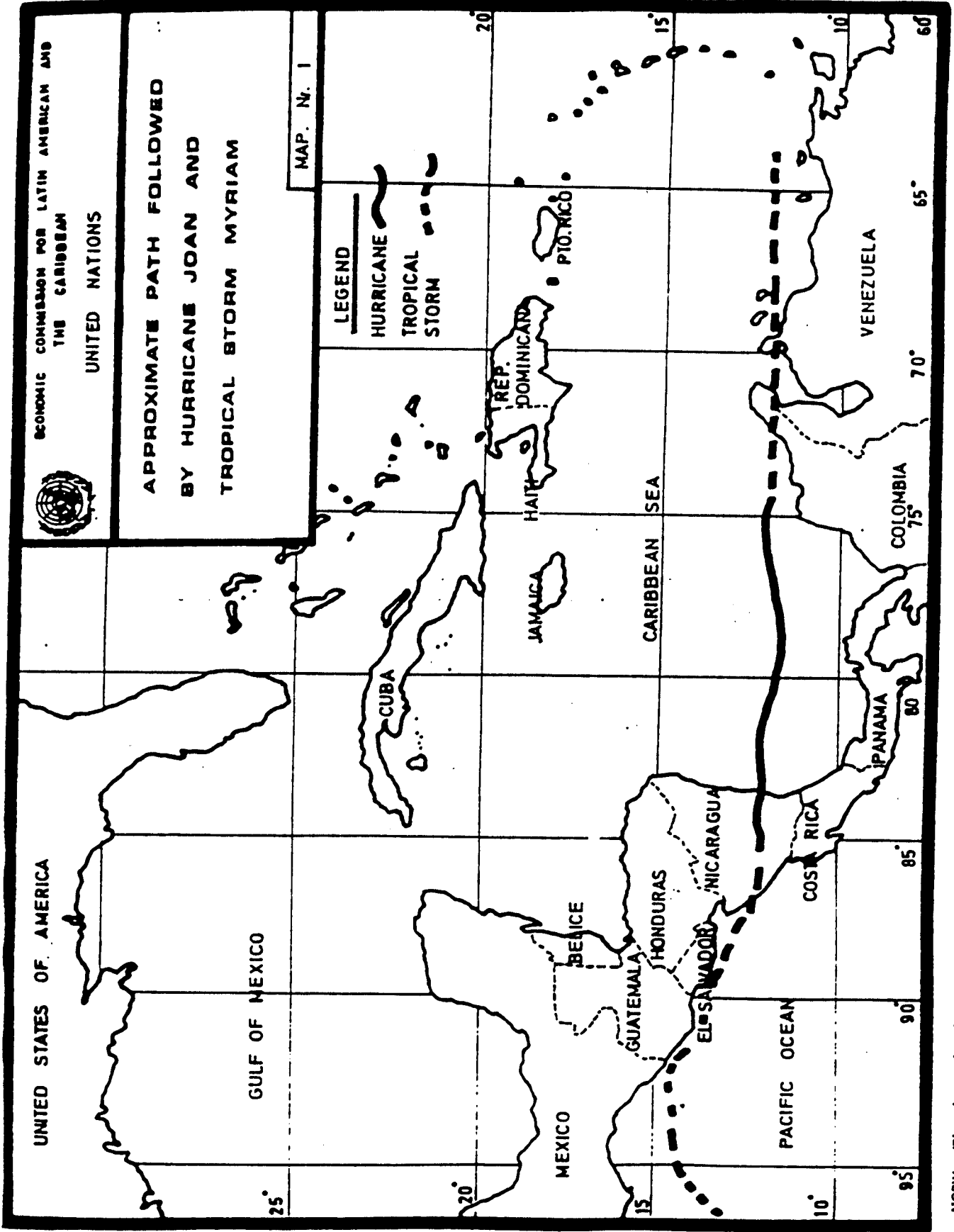
16. There, the storm gathered strength once again and began to travel towards the north-east, passing off the coasts of El Salvador and Guatemala, where it also caused some damage. On 26 October, near the Mexican coast, its winds slowed, turning the storm into what is classified as a tropical depression; it then continued its advance, reaching storm strength again near the end of the month. After that it gradually weakened until it finally died out.5/

17. The hurricane had different types of effects on Nicaragua. Firstly, its strong winds destroyed the localities of Corn Island and Bluefields, as well as vast stretches of forests located inland on the Atlantic slope. Although they slowed gradually, the winds also severely eroded the soil of the Amerrisque range on both sides of the continental divide. In addition, the heavy rains (which in some places amounted to over 400 millimetres in 24 hours) caused by the hurricane mixed with sediments and felled trees, causing rivers to overflow their banks and flooding a number of cities (such as El Rama) and extensive tracts of farmland, which resulted in the destruction of infrastructure and the flooding of land, plantations and crops.

18. On the Pacific slope, most of the damage was caused by flash floods, although the winds also occasioned some losses. Moreover, high tides combined with the rise in river levels to increase the flooding.

19. Although Joan is the only hurricane in recent history to have traversed Nicaraguan territory with such strong winds, available statistics indicate that it is not a unique or isolated event, and it would therefore be advisable to undertake preventive action in the future.6/





NOTE: The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.

### 3. Action taken to deal with the emergency

20. A number of effective measures were taken in Nicaragua to protect the population beginning several days before the hurricane reached the country.

21. Starting on 18 October, when staff members of the National Meteorological Service realized that the storm might turn in the direction of Nicaragua, various civil defence schemes were put into action. The following day, authorities began to evacuate the population of Bluefields and other localities in the Atlantic zone to more secure sites inland. Measures were taken to safeguard the equipment, machinery and tools belonging to the fishermen of the area, and all available vessels were used to transport the people to less vulnerable locations. In total, some 300 000 people were evacuated and provided with temporary shelter in various public buildings.

22. At the same time, a number of steps were taken to safeguard and assemble transport vehicles and the fishing fleet, to protect port facilities and the storage infrastructure for food and other basic supplies, to suspend civilian flights and to protect aircraft, etc.

23. These preparations were successful, inasmuch as when the hurricane hit on 22 October, the population and a great deal of property were protected. The loss of life was relatively small thanks to this foresight, and the damage to equipment and perishable materials was limited.

24. After the storm moved away from Nicaraguan territory, operations were begun to rescue people in isolated areas, as well as their personal effects and household goods whenever feasible. Community-based social organizations were very effective in helping to carry out these activities, and a very strong spirit of solidarity characterized the effort.

25. The authorities acted decisively in carrying out the tasks required to provide food and minimum services to the population housed in temporary shelters and to restore basic services to the population centres affected by the storm. Brigades were organized to clear away and remove the rubble and to re-open access routes to the zones that had been cut off.

26. The government appealed to the international community to co-operate in this emergency effort. To this end, it established direct contact with the ambassadors and representatives of countries with which it maintains bilateral relations, as well as with the United Nations.

27. Subsequently, the evacuees began to be returned to their homes, and an emergency programme was initiated to restore sanitary conditions. Assistance has been provided for the most essential repairs to housing, and enough food has been supplied to permit the people to subsist for several weeks.

28. This has been done using the government's own resources for the most part, along with some international assistance which has reached the country. As of the end of October, such aid amounted to 2 300 tons of provisions and medicines, together with a small amount of cash contributions. By 4 November, 63% of this humanitarian assistance had been distributed; the remainder was

being catalogued for its subsequent distribution to the most seriously affected zones.

29. It is therefore clear that on this occasion assistance has been provided in a highly effective manner to the Nicaraguan population both before and after the disaster and that the limited international aid which has been made available to the country has been distributed rapidly and efficiently. Nevertheless, a great deal still needs to be done in order to re-establish a minimum of normality in the areas that were most severely affected by the hurricane.

## II. ASSESSMENT OF THE DAMAGE

### 1. Introduction

30. Estimates of the damage were prepared on the basis of incomplete data, since the calculations were carried out just a few days after the disaster, when the national authorities were still in the process of meeting the most urgent needs associated with the emergency. It was decided, however, that precision should be sacrificed in view of the pressing need to provide some guidelines for any international aid which might be forthcoming to help with the work of rehabilitation and reconstruction.

31. The information which was available was preliminary in nature. These data were furnished by authorized government and local sources, as well as by recognized trade unions and professional associations. In all cases the information was supplemented and adjusted on the basis of the direct assessment made by ECLAC.

32. The damage assessment was prepared by processing the above information using a special methodology developed by ECLAC in connection with numerous similar disasters. The direct damage to capital stock and inventories was calculated on the basis of the replacement cost of the property that was destroyed and the cost of repairing those items that were damaged. Estimates were also prepared of the indirect damage, such as production losses in the immediate future as a result of direct damage, the higher costs that will be incurred, and the lower revenues that will be received in exchange for the supply of services.

33. The amount of the damage was calculated in terms of the local currency (at October 1988 prices) and was then converted into dollars on the basis of an exchange rate of 320 córdobas to the dollar.<sup>7</sup> The figures for exports and imports were calculated directly in dollars at the prevailing international prices.

34. It is believed that, despite the above-mentioned limitations, the results of this assessment provide an approximate idea of the amount of damage and may be confidently used in establishing guidelines for the provision of international assistance.

## 2. The affected population

35. As mentioned in the preceding chapter, the population began to prepare for the hurricane several days before it hit Nicaragua thanks to the preparedness and preventive measures taken by the government. This doubtlessly helped to ensure that the casualties (148 dead, 100 missing, and 184 injured) were much lower than what might have been expected after a disaster of this type.

36. Government figures indicate that 311 000 persons were evacuated from their homes and transported to shelters in secure locations. By mid-November a large percentage of these people had returned to their homes, while about 60 000 (most of them women and children) were still waiting for minimum environmental, health and sanitary conditions to be restored in the towns where they lived.

37. It is estimated that 230 000 people lost their homes, household goods and work tools. Their geographic distribution is shown in table 1.

38. The analyses conducted provide a basis for estimating that around 2.8 million people were affected either directly or indirectly by the disaster; this includes those made homeless by the hurricane as well as those who found themselves cut off in isolated locations, people who sustained the loss of crops or plantations, damage to transport infrastructure, etc. Their geographic distribution is indicated in table 1 and map 2.8/

39. The population group which sustained the greatest amount of damage was the peasantry of the Atlantic zone, who suffered losses of housing, capital stock and their means of livelihood. It is estimated that around 22 000 peasant families find themselves in this situation, while another 40 000 sustained less extensive losses. Self-employed fishermen and small-scale merchants in the Atlantic coastal area were also affected.

## 3. Social sectors

### a) Housing

40. Housing was one of the sectors that was most seriously affected by the hurricane and by the other natural phenomena which ensued. The strong winds tore off or destroyed roofs, windows and walls, and furniture and household goods were destroyed or damaged when the rivers overflowed their banks. A number of landslides and mudslides also destroyed or damaged housing.

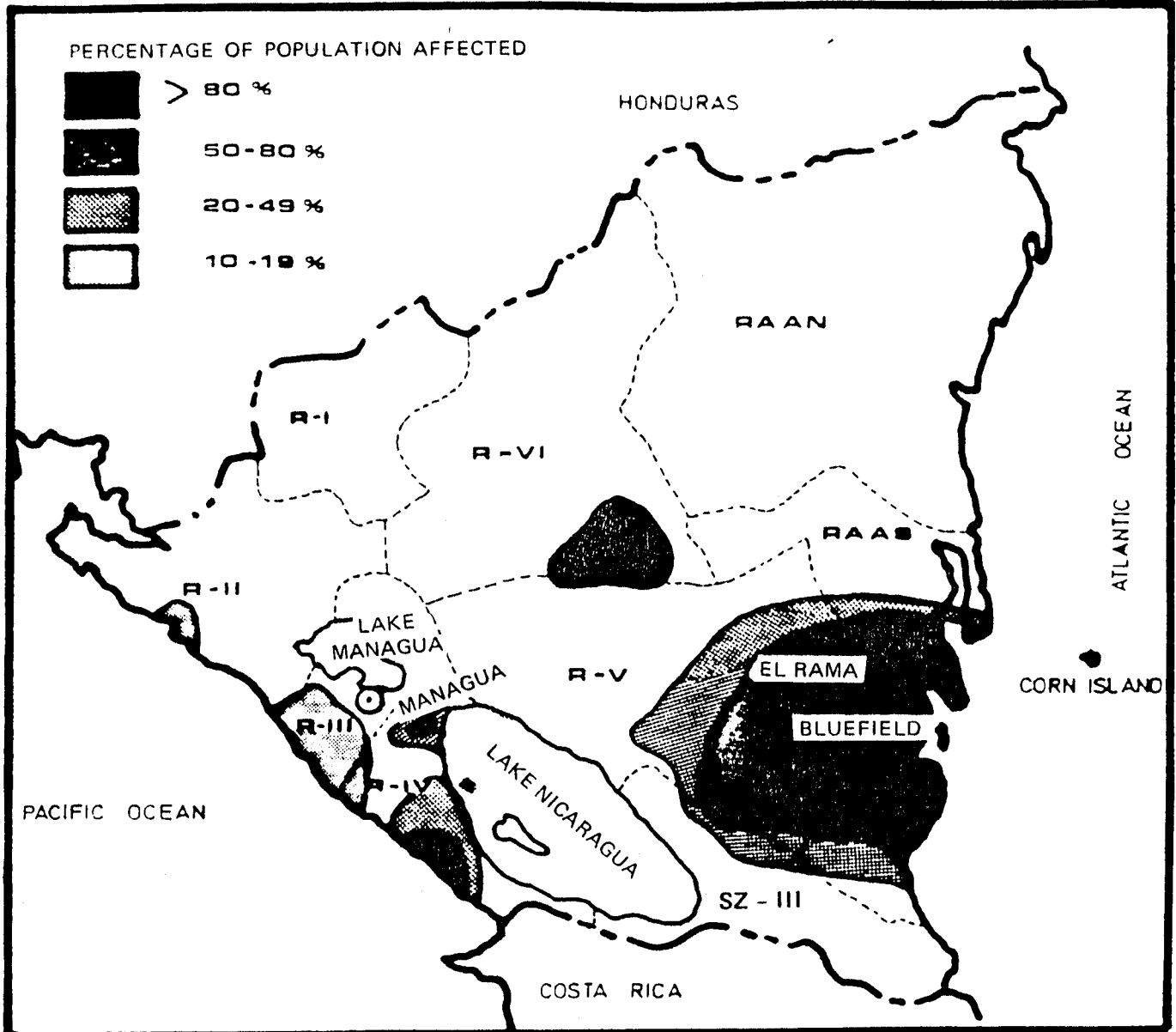
41. It is estimated that a total of 46 500 housing units were affected to various degrees and that, of these, approximately 23 200 were destroyed. In the urban sector, 8 700 housing units were total losses and 8 200 sustained some damage; in the rural areas, 14 500 housing units were destroyed and about 15 100 were damaged. In the urban centres of Bluefields, El Rama and Corn Island, a very large percentage of the buildings were completely destroyed, and much of the furniture and personal effects of the population were also lost.

Table 1

## NICARAGUA: POPULATION AFFECTED BY HURRICANE JOAN

	Total population			Evacuated population		Affected population		Casualties		
	Total (1)	In affected municipalities (2)	Percentages of total (2/1) (3)	Number (4)	Percentages (4/2) (5)	Number (6)	Percentages (6/2) (7)	Dead (8)	Injured (9)	Missing (10)
<u>Country total</u>	<u>3 633 469</u>	<u>2 793 415</u>	<u>76.9</u>	<u>311 372</u>	<u>11.1</u>	<u>231 562</u>	<u>8.3</u>	<u>148</u>	<u>184</u>	<u>100</u>
Region I	353 359	132 887	37.6	3 046	2.3	2 316	1.7	1	-	-
Region II	632 021	484 524	76.7	31 121	6.4	25	-	2	-	-
Region III	979 075	963 371	98.4	103 331	10.7	4 516	0.04	2	-	3
Region IV	651 642	462 020	70.9	33 062	7.2	27 333	5.9	24	9	9
Region V	333 305	298 279	89.5	38 123	12.8	107 730	36.1	16	48	23
Region VI	453 765	259 836	57.3	19 120	7.4	7 275	2.8	66	11	1
Autonomous region North Atlantic	116 350	95 398	82.0	12 000	12.6	-	-	-	-	-
Autonomous region South Atlantic	72 556	62 256	85.8	61 044	98.0	70 894	113.9	34	116	64
Special zone III	41 396	34 844	84.2	10 525	30.2	11 473	32.9	3	-	-

**Source:** Total and regional population for 1988: Nation Institute of Statistics and the Census (INEC), *Anuario estadístico de Nicaragua, 1987*, in press, table 1.2.7. Adjustments for the municipalities of Bluefields and El Rama: ECLAC estimates, on the basis of information provided by INETER. Municipalities and their populations, by urban-rural area: ECLAC estimates based on figures taken from the electoral register (1984) and the *Anuario Estadístico, 1978*, calculated by the Standard of Living Unit of the Department of Planning and the Budget (SPP). Affected municipalities: ECLAC estimates based on various reports from official and extra-official institutions. Evacuated population: official sources. Affected population: SPP, Quantitative Evaluation of Damage caused by Hurricane Joan, Managua, 11 November 1988, p. 7. It is very probable that the number of affected persons given for Bluefields includes neighbouring population. Casualties: reports of regional delegations of the Office of the President and SPP.



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POPULATION AFFECTED BY  
HURRICANE JOAN  
IN NICARAGUA

MAP. Nr. 2

Note. The boundaries shown on this map do not imply official endorsement or acceptance by the United Nations.

66. The necessary seeds for next year's sowing were also lost, and suitable varieties will have to be promptly imported. The following volumes of seeds will be necessary: 23 200 quintals of maize; 71 800 quintals of beans; 2 800 quintals of rice; 175 000 cocoa seeds; 270 quintals of soybean; and 900 quintals of sesame seed.

67. Additionally, a government experimental farm devoted to research on and the adaptation and production of seeds for various crops grown in the wet tropics was completely destroyed. Its value exceeds the material cost of replacing the farm's facilities and inventories, since more than 10 years of research and development were also lost.

68. To sum up, direct damage to the agricultural and livestock sector is about US\$78 million. This includes damage to production infrastructure, inventories, and crops that were ready for harvest, as well as the livestock herd. Indirect damage, including production losses, reaches US\$2 million. Thus total damage to this sector will be US\$80 million (see table 4).

b) Industrial sector

69. i) Fisheries. In the Atlantic region, the hurricane affected fishing activity which provides work and income to a large number of persons and generates foreign exchange through the export of significant volumes of shrimp and lobster.

70. The sector suffered heavy losses in infrastructure through damage to or destruction of buildings, machinery, and equipment, as well as to the docks of the companies which freeze and process these products. Also six shrimp boats and some 150 smaller boats, motors and tools belonging to self-employed fishermen were sunk or damaged.

71. Additionally, it is estimated that the production and exports corresponding to a three-month period will be lost because of the direct damage mentioned above and because there is no power with which to operate the processing plants.

72. Direct damage is therefore estimated at US\$15 million, and indirect damage at an additional US\$6 million. Apart from this, the deficit in the balance of payments will grow as a result of a reduction in exports, calculated at US\$8 million (see table 4).

73. ii) Wood industry. As a result of the winds, rain and floods, the national wood-processing capacity has been reduced by 5%. Specifically, infrastructure was damaged and the equipment and machinery got wet at a sawmill located in Bluefields, and the small sawmills located near El Rama were destroyed.

74. The estimated cost of replacing or rehabilitating this installed capacity for wood processing reaches US\$2.5 million, and indirect losses in the form of timber which cannot be processed are calculated at another US\$120 000 (see table 4).



42. Most of the damaged housing was one-family dwellings that were not solidly built enough to withstand hurricane winds and that were located in areas prone to flooding. The main construction flaws that were observed related to the anchoring of walls to roofs and foundations. Other faults were associated with the utilization of unsatisfactory building materials.

43. The above-mentioned losses come on top of a pre-existing housing deficit, which will make it even more difficult to resolve the problems in this sector. By way of illustration, the housing deficit was estimated to amount to about 240 000 units as of 1986, while the natural growth of the population was generating an additional demand for approximately 17 000 units per year.

44. Based on the number of housing units lost and the unit cost of housing of a type suited to each of the affected zones, estimates of the replacement cost were prepared.<sup>9/</sup> The cost of repairing the dwellings which sustained only partial damage was estimated as a percentage of the cost that would be incurred if the units had to be replaced entirely.

45. The furniture and household goods contained in the destroyed or damaged housing were appraised at 10% and 20%, respectively, of the cost of constructing the urban and rural dwellings in question; it was further assumed that 30% of such property was destroyed.

46. It will be necessary to relocate a portion of some settlements that are in high-risk areas. In addition to the expense of rebuilding the housing that was destroyed, this will involve incurring indirect costs in order to purchase land and install the infrastructure for essential public services. Other indirect damages include the additional losses of income to be sustained by homeowners during the construction of replacement units and the added expense of temporary housing for their inhabitants during this period.

47. The direct damage suffered in the housing sector amounts to US\$284 million, while the indirect damage is calculated at US\$12 million. Consequently, the total losses in the sector are estimated at US\$296 million <sup>10/</sup> (see table 2).

#### b) Health

48. The winds, rain and flooding damaged infrastructure in the health sector. A number of hospitals (having a combined total of 216 beds) and health centres were destroyed or damaged; in addition, medical equipment and supplies that were located in these buildings were ruined. Finally, land and river transport equipment used to provide medical care in rural areas of the Atlantic zone was also destroyed.

49. This exacerbated the pre-existing shortage of equipment in hospitals and clinics and added to the already large number of cases of malaria and other diseases in the Atlantic zone.

Table 2

## NICARAGUA: DAMAGE TO SOCIAL SECTORS

Sector and subsector	Millions of córdobas			Millions of dollars <sup>a/</sup>			Effect on the external sector <sup>b/</sup>
	Total	Direct	Indirect	Total	Direct	Indirect	
<u>Total</u>	<u>111 107</u>	<u>97 417</u>	<u>13 689</u>	<u>347.21</u>	<u>304.43</u>	<u>42.78</u>	<u>152.25</u>
<u>Housing</u>	<u>94 921</u>	<u>90 982</u>	<u>3 939</u>	<u>296.63</u>	<u>284.32</u>	<u>12.31</u>	<u>122.38</u>
Replacement of 23 200 dwellings	65 011	65 011	-	203.16	203.16	-	89.39
Repair of 23 300 dwellings	22 445	22 445	-	70.14	70.14	-	30.86
Household goods	3 526	3 526	-	11.02	11.02	-	1.87
Relocation of 965 dwellings	237	-	237	0.74	-	0.74	0.26
Loss of income from uninhabitable housing	3 047	-	3 047	9.52	-	9.52	-
Cost of temporary lodging	655	-	655	2.05	-	2.05	-
<u>Health</u>	<u>14 147</u>	<u>4 397</u>	<u>9 750</u>	<u>44.21</u>	<u>13.74</u>	<u>30.47</u>	<u>28.17</u>
Reconstruction or repair of hospitals and health centres	2 119	1 977	142	6.62	6.18	0.44	2.07
Replacement of equipment	1 878	1 878	-	5.87	5.87	-	5.04
Medicines lost	542	542	-	1.69	1.69	-	1.46
Emergency care	3 053	-	3 053	9.54	-	9.54	5.37
Epidemic monitoring and control campaign	2 785	-	2 785	8.70	-	8.70	7.66
Environmental sanitation campaign	1 970	-	1 970	6.16	-	6.16	1.26
Immunization programme	1 800	-	1 800	5.62	-	5.62	5.31
<u>Education</u>	<u>2 038</u>	<u>2 038</u>	<u>-</u>	<u>6.37</u>	<u>6.37</u>	<u>-</u>	<u>1.70</u>
Rebuilding of 258 schools	1 162	1 162	-	3.63	3.63	-	1.09
Repair of 447 schools	603	603	-	1.88	1.88	-	0.56
Replacement of furniture and equipment	273	273	-	0.85	0.85	-	0.05

Source: ECLAC, on the basis of official figures and own estimates.

a/ Based on a rate of 320 córdobas per United States dollar.

b/ Value of imported materials required.

50. Following the hurricane, medical and health care has had to be provided, by dint of great effort, under substandard conditions. The incidence of infecto-contagious diseases, especially diarrhea, and of respiratory ailments has increased considerably, and the danger of an increase in the cases of malaria and the spread of this disease to other areas makes it necessary to undertake special prevention campaigns.

51. The direct costs of repairing or rebuilding hospitals and health centres and of re-equipping and replacing stocks of medicines amount to approximately US\$14 million. The indirect costs involved in providing immediate emergency care and of carrying out disease-prevention and environmental campaigns are estimated at US\$30 million. The total amount of damage sustained by this sector is therefore calculated at US\$44 million (see table 2).

#### c) Education

52. The country's educational infrastructure was also affected by the disaster, with a total of 705 classrooms in urban (43%) and rural (57%) zones being either destroyed or damaged. Furniture and educational materials contained in these schools, as well as school records, were also destroyed or damaged. Given this situation, the authorities decided to shorten the school year.

53. Educational activities were completely suspended in the Atlantic zone, since schools were used as temporary shelters for the evacuees and the homeless.

54. The direct damage, which includes the cost of replacing or repairing school buildings and replacing equipment and furniture, is calculated at US\$6 million. No estimates were made of the indirect damage (see table 2).

### 4. Productive sectors

#### a) The agricultural and livestock sector

55. i) Agriculture. The agricultural sector sustained damage both to its capital stock and inventories, and to output of products for domestic consumption and for export in various areas in both the Atlantic and Pacific zones of the country.

56. Products for domestic consumption were affected in various ways. In general, the peasants who produce basic grains for their own consumption lost their crops of beans, rice, maize and sorghum, which were on the point of being harvested before the arrival of the hurricane and the subsequent floods. Commercial grain producers, who had already harvested their crops, lost a portion of the products they had in storage.

57. The coconut plantations located on Corn Island and in other areas of the Atlantic zone were totally destroyed, and, as a result, this zone's coconut oil production capacity was lost. Extensive banana plantings were also

destroyed. Only a very small percentage of the plantations of African palm —which will begin producing in 1989— suffered damage.

58. Overall losses in terms of these products were quite substantial at the national level, particularly because very good harvests were expected due to the favourable weather conditions that had prevailed prior to the hurricane. It may, however, be possible to undertake wetland planting (apante) beginning in December and thereby make up for some of what was lost.

59. Electrical installations and some canals in a number of irrigation systems used for rice production in the central zone of the country were damaged, as were many family-owned threshers used in processing this crop.

60. Export products were less seriously affected than were those for domestic consumption since these production areas were not in the direct path of the hurricane. Damage to coffee plantations was minimal: 1 400 hectares were damaged and about 150 000 quintals of coffee beans were lost. Nevertheless, the rain speeded up the ripening of the crop and, as a result, the harvest period will be moved forward; this is expected to occasion problems due to transport difficulties caused by damage to roads and bridges. Losses in banana plantations will prevent the export of some 800 000 boxes in 1988 and 1989. Damage to sugar cane plantations will cause a decrease in production which is estimated at 57 600 tons of sugar cane. Finally, less significant quantities of cotton, cocoa, sesame seeds and other products were lost.

61. Losses in export crops were only a minimal fraction of exportable production, and therefore no problems are anticipated for the following agricultural year in regaining production volumes. It will, however, adversely affect the external sector by reducing the amount of exports.

62. ii) Livestock. Peasant stock-raising activities were severely affected, and about 15 700 head of cattle, 20 000 pigs, and approximately 456 000 poultry were killed. Large-scale livestock producers were able to save their animals, but fencing and other related infrastructure were damaged.

63. At the national level, the losses in this sector do not pose a serious problem. Nevertheless, small-scale producers were seriously affected, since their herds of livestock were almost entirely wiped out and, as was said above they also lost their homes, personal effects and working tools.

64. iii) Food and agricultural inputs. Because of the above-mentioned decrease in the availability of products for domestic consumption, the balance of food demand and supply for the period from the present until August 1989 —the time of the next harvest— suggests that there will be a serious food shortage which will have to be covered with imports. Some donations are already being received which will make it possible to lower these requirements.

65. Specifically, it is estimated that the following deficits will have to be covered: 36 900 tons of maize; 24 000 tons of beans; 59 400 tons of rice, and 35 600 tons of sorghum (see table 3).

Table 3  
NICARAGUA: FOOD BALANCE AFTER THE HURRICANE <sup>a/</sup>

	Product (tons)			
	Maize	Beans	Rice	Sorghum
Inventories as of 31 October 1988	-	-	8 399	1 861
Expected output after the hurricane	268 791	50 054	68 254	69 044
Donations pledged as of 1 November 1988	-	-	44 946	-
Actual supply	268 791	50 054	121 599	70 905
Demand through August 1989 <sup>b/</sup>	305 670	74 062	181 032	106 491
Food deficit	36 879	24 008	59 433	35 586

Source: ECLAC, on the basis of official figures.

<sup>a/</sup> For the period from 1 November 1988 to 1 August 1989.

<sup>b/</sup> Estimated on the basis of apparent per capita consumption for 1980-1987 and on a national population estimate of 3 681 000.

Table 4

## NICARAGUA: DAMAGE TO PRODUCTIVE SECTORS

Sector, subsector, branch and product	Millions of córdobas			Millions of dollars <sup>a/</sup>			Effect on the external sector <sup>b/</sup>
	Total	Direct	Indirect	Total	Direct	Indirect	
<b>Total</b>	<b>42 915</b>	<b>38 237</b>	<b>4 678</b>	<b>134.11</b>	<b>119.49</b>	<b>14.62</b>	<b>78.87</b>
<b>Agriculture</b>	<b>22 579</b>	<b>22 579</b>	<b>-</b>	<b>70.56</b>	<b>70.56</b>	<b>-</b>	<b>62.08</b>
Infrastructure and plantations	7 581	7 581	-	23.69	23.69	-	5.70 <sup>c/</sup>
Production for domestic consumption	10 403	10 403	-	32.51	32.51	-	42.02 <sup>c/</sup>
Maize	1 782	1 782	-	5.57	5.57	-	
Beans	2 147	2 147	-	6.71	6.71	-	
Milled rice	3 146	3 146	-	9.83	9.83	-	
Sorghum	314	314	-	0.98	0.98	-	
Bananas	3 014	3 014	-	9.42	9.42	-	
Production for export	4 595	4 595	-	14.36	14.36	-	14.36 <sup>d/</sup>
Ginned cotton	342	342	-	1.07	1.07	-	
Sugar cane	403	403	-	1.26	1.26	-	
Coffee	3 440	3 440	-	10.75	10.75	-	
Bananas	410	410	-	1.28	1.28	-	
<b>Livestock</b>	<b>3 257</b>	<b>2 595</b>	<b>662</b>	<b>10.18</b>	<b>8.11</b>	<b>2.07</b>	<b>1.50</b>
Infrastructure	1 600	1 600	-	5.00	5.00	-	1.50 <sup>c/</sup>
Cattle	861	458	403	2.69	1.43	1.26	-
Pigs	419	419	-	1.31	1.31	-	-
Poultry	377	118	259	1.18	0.37	0.81	-
<b>Industry</b>	<b>9 677</b>	<b>7 261</b>	<b>2 416</b>	<b>30.24</b>	<b>22.69</b>	<b>7.55</b>	<b>8.49</b>
Fisheries	6 675	4 755	1 920	20.86	14.86	6.00	7.77 <sup>e/</sup>
Wood and lumber industry	838	800	38	2.62	2.50	0.12	-
Agroindustry	2 058	1 600	458	6.43	5.00	1.43	0.72 <sup>d/</sup>
Manufacturing	106	106	-	0.33	0.33	-	-
<b>Commerce</b>	<b>7 402</b>	<b>5 802</b>	<b>1 600</b>	<b>23.13</b>	<b>18.13</b>	<b>5.00</b>	<b>6.80<sup>c/</sup></b>

Source: ECLAC, on the basis of official figures and own estimates.

a/ Based on a rate of 320 córdobas per United States dollar.

b/ Value of required imports or of exports which will not be made.

c/ Additional import requirements.

d/ Exports which cannot be made.

e/ Includes US\$4.8 million of forgone exports and US\$2.9 million of additional import requirements.

75. Although this damage is relatively slight in terms of total national wood processing activity, it has happened precisely when it is necessary to make a major effort to process all the timber from the forests which were seriously affected by the hurricane, as will be seen below. Nevertheless, the repairs are expected to be relatively easy to carry out and the capacity of the industry can therefore be recovered, and even expanded, relatively quickly.

76. iii) Agroindustry. The buildings of a sugar mill located between Bluefields and El Rama were destroyed and its equipment and machinery were damaged by rain. Although this damage will be relatively easy to repair, indirect losses will also be incurred due to the smaller volume of sugar cane that will be processed because of the damage to the cane plantation, and this will affect the balance of payments.

77. There was also damage, although of a lesser amount and significance, to small food-oil factories and family-run rice processing plants.

78. Direct damage to the infrastructure of this subsector is estimated at US\$5 million. Indirect damage to production is calculated at US\$1.4 million, and the effect on the external sector resulting from a reduction in sugar exports is estimated at US\$720 000 (see table 4).

79. iv) Manufacturing industry. Some industrial plants located in the Pacific region suffered minor damage to their infrastructure which will fortunately have only slight effects on production.

80. In synthesis, the industrial sector suffered direct damage to, inter alia, buildings, machinery, and equipment, boats, and some inventories, which can readily be repaired at an estimated cost of US\$23 million. Additionally, indirect losses due to the suspension of production in various subsectors or industrial branches for a period of up to three months will add up to some US\$8 million more (see table 4).

c) Commercial sector

81. Strong winds and floods damaged both the infrastructure and inventories of the commercial sector, and the supply of various products was therefore interrupted in the Atlantic zone. There was total or partial damage to silos, warehouses and stocks of State and private companies and to those of small business establishments. Inventories of basic consumer goods were lost as well as inputs, tools, and spare parts.

82. The total amount of this direct damage is estimated at US\$18 million. Indirect losses, including lower sales and higher costs for the sector during a three-month period, add up to some US\$5 million more (see table 4).

## 5. Infrastructure

### a) Transport and communications sector

83. Nicaraguan transport infrastructure is only partially developed. The fact that this sector exhibits generally low levels of service and efficiency and suffers significant weaknesses --especially in terms of the total number of vehicles and the supply of operating inputs-- causes the cost of moving goods and persons to be high and places some constraints on efforts to foster the development of economic and social activities. The disaster made these limitations more obvious and, of course, aggravated the shortcomings of the sector.

84. i) Roadways. It is estimated that the rains and floods damaged approximately 600 kilometres and destroyed 70 kilometres of main and secondary roadways and also affected 1 758 kilometres of tertiary or production road networks.

85. High river stages destroyed 30 bridges having a combined length of 881 linear metres and damaged another 31 (580 metres). In some cases the metal, reinforced concrete and wooden structures were destroyed or damaged; in other cases, the bridge approaches were damaged.

86. ii) Railways. This subsector was affected by erosion and the undermining of some sections of track and approaches, as well as by landslides onto the railway line. This damage will be relatively easy to repair.

87. iii) Ports and water transport. As a result of the strong winds and rising rivers, docks and equipment at some sea and river ports in the Atlantic region were damaged. The shipping fleet was also affected, with three tugboats, various cargo ships and numerous small boats, some with outboard motors, being either sunk or damaged.

88. Direct damage in the above-mentioned subsectors has resulted in higher transport costs, especially in connection with the shipping of coffee and other harvests from some agricultural zones to bulking, processing, consumption, and export centres. This is because it will be necessary to resort to alternate modes or routes involving greater unit costs.

89. iv) Communications. The telephone systems in the Bluefields, El Bluff and El Rama urban areas were virtually destroyed. This includes considerable damage to the external plant, telephone exchanges, power generating systems, microwave equipment, and buildings of the sector. Similar damage was sustained in other smaller urban areas in the Atlantic region.

90. Due to the above, about 800 subscribers in these locations will be without telephone service for several months; this means that the telephone company will also suffer a loss of revenues.

91. Telegraphic and mail services suffered only minor damage, which has already been repaired.



92. To sum up, direct damage to the transport and communications sector has been estimated at US\$148 million, and indirect damage resulting from greater transport costs and the impossibility of providing telephone service will amount to approximately US\$1.2 million. This damage will have a negative effect on the external sector because it will make it necessary to import US\$63 million of equipment and materials (see table 5).

b) Water supply and sanitation

93. In the Atlantic region, which was most affected by the disaster, integrated water-supply systems exist only in Bluefields and El Rama; the rest of the population is supplied through open individual or household wells. There are no collective sewage disposal systems; septic tanks or latrines are used.

94. On the Atlantic watershed, drinking water sources were contaminated by latrine and septic tank overflow resulting from rising water levels; the intake works for the water-supply systems were damaged, and water distribution networks were destroyed or suffered breaks. In some places on the Pacific watershed, buildings, stabilization pools and pumping equipment were damaged.

95. As a result, the urban population in the Atlantic watershed has been drinking water of a totally insufficient quality, a situation which is being remedied by the authorities through the distribution of casks of treated water. Programmes are also being carried out to clean and disinfect wells in rural zones and to rehabilitate latrines and septic tanks.

96. The amount of direct damage, measured in terms of the cost of replacing or repairing the damaged and destroyed systems is estimated at US\$697 500. The loss of income to the companies of the sector is minimal, in view of the low level of the existing rates, which were subsidized; nevertheless, other indirect costs involved in providing a minimum supply of drinking water and other related expenses have been estimated at US\$90 000 (see table 5).

c) Energy

97. Infrastructure for the production, processing, storage, and supply of energy was affected in the areas traversed by the hurricane. Although the damage is considerable, it affects only a small fraction of the installed national energy capacity.

98. The electricity supply system suffered damage to its buildings, transmission systems and distribution networks. There was partial damage to the buildings which housed the electromechanical equipment of Corn Island and Bluefields, to the intake system for cooling the thermoelectric plant in Managua, and to some of the works of one hydroelectric plant. The transmission system was affected as a result of the damage sustained by a power transformer at the Managua plant, which will have to be replaced, and by various transmission lines and towers which were destroyed or damaged. The primary and secondary distribution networks at Bluefields, El Rama, and other sites were totally or partially destroyed. The cost of replacing or

Table 5

## NICARAGUA: DAMAGE TO INFRASTRUCTURE

Sector and subsector	Millions of córdobas			Millions of dollars <sup>a/</sup>			Effect on the external sector <sup>b/</sup>
	Total	Direct	Indirect	Total	Direct	Indirect	
<u>Total</u>	<u>52 991</u>	<u>51 094</u>	<u>1 897</u>	<u>165.60</u>	<u>159.67</u>	<u>5.93</u>	<u>68.35</u>
<u>Transport and communications</u>	<u>47 794</u>	<u>47 402</u>	<u>392</u>	<u>149.36</u>	<u>148.13</u>	<u>1.23</u>	<u>63.10</u>
Roads	43 135	42 751	384	134.80	133.60	1.20	55.22
Main and secondary highways	32 504	32 504	...	101.58	101.58	...	
Production roads	6 320	6 320	...	19.75	19.75	...	
Bridges	3 926	3 926	...	12.27	12.27	...	
Railways	164	164	-	0.51	0.51	-	0.34
Ports and water transport	4 270	4 270	c/	13.34	13.34	c/	7.04
Ports and docks	3 280	3 280	...	10.25	10.25	...	
Boats	660	660	...	2.06	2.06	...	
Equipment and facilities	330	330	...	1.03	1.03	...	
Telecommunications	225	217	8	0.70	0.68	0.02	0.49
<u>Drinking water and sanitation</u>	<u>250</u>	<u>220</u>	<u>30</u>	<u>0.78</u>	<u>0.69</u>	<u>0.09</u>	<u>0.40</u>
<u>Energy</u>	<u>2 632</u>	<u>1 157</u>	<u>1 475</u>	<u>8.23</u>	<u>3.62</u>	<u>4.61</u>	<u>2.68</u>
Electricity	1 625	1 025	600	5.08	3.20	1.88	2.30
Buildings	93	93	-	0.29	0.29	-	
Transmission system	452	452	-	1.41	1.41	-	
Distribution system	1 080	480	600 <sup>d/</sup>	3.38	1.50	1.50 <sup>d/</sup>	
Hydrocarbons	1 007	132	875	3.15	0.41	2.73	0.38
Facilities	116	116	-	0.36	0.36	-	
Lubricant inventories	16	16	-	0.05	0.05	-	
Loss of potential sales <sup>d/</sup>	675	-	675	2.11	-	2.11	
Loss of potential taxes <sup>d/</sup>	200	-	200	0.63	-	0.63	
<u>Urban buildings and infrastructure</u>	<u>2 315</u>	<u>2 315</u>	-	<u>7.23</u>	<u>7.23</u>	-	<u>2.17</u>

Source: ECLAC, on the basis of official figures and own estimates.

a/ Based on a rate of 320 córdobas per United States dollar.

b/ Value of imports required.

c/ This damage is included in the agricultural sector.

d/ Estimates on the basis of a six-month rehabilitation period.

rehabilitating this infrastructure is calculated at US\$3 million. Additionally, the cost of the energy which will not be supplied to the affected regions during a period of six months was estimated at US\$1.9 million.

99. The supply of hydrocarbons was affected by the damage to the fuel storage and distribution infrastructure in El Bluff, Bluefields and El Rama and the loss of fuel stocks at one storage plant. These losses are estimated at US\$400 000. The decrease in fuel sales and in tax revenues from the sale of these products in the same region over a period of six months will amount to approximately US\$2.7 million.

100. To sum up, the total amount of direct damage in the sector as a whole is calculated at US\$3.6 million and the total indirect damage at an additional US\$4.6 million (see table 5).

d) Urban infrastructure and buildings

101. The wind, rains, and floods also damaged urban infrastructure and buildings which are not included in the sectors discussed above. This includes destruction of or damage to churches, homes for the aged, child care centres, army buildings, recreation sites, parks and urban roads.

102. The amount of this direct damage has been estimated at US\$7 million, 84% of which corresponds to the Bluefields, El Rama and Corn Island urban areas. It is calculated that it will be necessary to import US\$2 million in construction materials to repair this infrastructure (see table 5).

6. Natural resources and the environment

103. The wind, rain, and the ensuing flooding of rivers directly damaged the soil and vegetative cover over a wide area of the country and induced indirect effects on the environment. This had a seriously adverse effect on the natural resources and environment of the country.

104. In the first place, it is estimated that some 10 000 hectares of agricultural land was eroded or had its topsoil completely washed away by winds and high river stages, and that approximately another 80 000 hectares, located in the low parts of the river basins, received sediment deposits carried by the currents. In the second place, about 500 000 hectares of forests --mainly latifoliate species-- in the Atlantic watershed were totally or partially destroyed by winds. Additionally, large tracts of land in the upland areas of many river basins suffered partial or total loss of their vegetative cover. All this results in the direct destruction of soil and forest resources --whose extent is very significant for the country-- as well as a decrease in the productivity of the land which was partially affected.

105. Other significant indirect damage had immediate effects as well. Firstly, the salinity and temperature of rivers and estuaries were modified, causing the migration or death of some aquatic organisms and a reduction in

the fish and shellfish catch. Secondly, as a result of the loss of or decrease in vegetative cover, there has been a reduction in the availability of food for wildlife.

106. It is predicted that in the medium term soil erosion and deforestation will adversely modify the hydrological cycle, causing a decreased retention and infiltration of rainwater and an increase in the volume of surface runoff and the magnitude of river flow peaks. These indirect effects cannot be quantified, but they will have a negative impact on the environment and should therefore be thoroughly analysed in order to promptly define and carry out adequate corrective measures.

107. Provisional estimates of the damage done to the country's natural resources place the direct losses at US\$162 million. This includes the loss of 10 000 hectares of agricultural land, which has been valued at US\$56 million by means of indirect calculations based on a quantification of the lost output over a period of ten years.<sup>11/</sup> It also includes a loss of US\$106 million in forestry resources, estimated on the basis of the income which will not be received from logging.<sup>12/</sup>

108. The possible reductions in productivity of silted soils and the value of the above-mentioned indirect effects were not quantified.

#### 7. Costs of emergency assistance

109. Several days before the hurricane reached Nicaragua, the government initiated activities to protect the population, moving the people to safer locations. Later, the government continued devoting significant amounts to the provision of lodging, food and essential services to the population, as well as to re-opening blocked or damaged roads as quickly as possible.

110. This has involved unforeseen disbursements (the exact amount of which is not yet known), which have been financed entirely from the national budget. Provisional estimates based on the invoices submitted by the various ministries and public institutions to the Office of the President of the Republic up to 15 November 1988 place these expenditures at US\$28 million.

111. Donations of emergency equipment and materials valued, on the basis of provisional estimates, at an additional US\$3 million have been received from abroad. This would put the cost of the emergency, up to the middle of November, at US\$31 million. This figure will surely increase in the coming months, however, because of the need to continue providing emergency attention to the population and to undertake the most urgent rehabilitation activities.

#### 8. Summary of the damage

112. Despite the preliminary nature of the above estimates --resulting from the lack of totally reliable quantitative data because of the short period which has elapsed since the disaster--, it is possible to estimate the order of magnitude of the damage caused by the hurricane and related phenomena and

to identify the sectors which were most affected and which therefore require priority attention as regards rehabilitation or reconstruction. Subsequent information will make it possible to refine and supplement the figures and conclusions presented in this report.

113. It is estimated that the total damage amounts to US\$840 million. Of this figure, approximately 62% (US\$524 million) corresponds to losses of capital stock; 19% (US\$162 million) to losses of natural resources; and the remaining 19% (US\$154 million) to production losses and greater expenditures or lower revenues for public enterprises (see table 6).

114. The direct damage caused by the disaster totals US\$745 million and was mainly sustained by social sectors, including housing, health, and education (41%); land and forest resources (22%); transport infrastructure (20%); and productive sectors, especially agriculture and livestock (16%).

115. The indirect damage amounts to US\$95 million and includes greater expenditures on health and housing (45%), estimated emergency expenditures (37% of the total), production losses and foregone income from the provision of some services.

116. To better understand the magnitude of the damage, it should be noted that the capital stock and production losses equal approximately 40% of the gross domestic product of the country for 1988.

117. The indirect damage was relatively slight compared with the direct losses, which is the reverse of the usual result of this type of disaster. This is because the hurricane occurred at a time when a significant proportion of the principal crops had already been harvested.

118. Unlike other recent natural disasters in Latin America and the Caribbean, the direct damage caused by hurricane Joan in Nicaragua will not be partially compensated for by insurance and reinsurance payments. This damage therefore represents a net loss in capital stock for the national economy.

119. It should be pointed out that the amount of the damage mentioned above represents the cost of replacing or repairing the affected goods and production losses. Investment requirements for reconstruction, however, will undoubtedly be greater because of the need to provide higher quality replacements for some assets and because inflation may raise unit costs during the reconstruction period.

Table 6

## NICARAGUA: SUMMARY OF DAMAGE CAUSED BY THE DISASTER

Sector and subsector	Millions of córdobas			Millions of dollars <sup>a/</sup>			Effect on the external sector <sup>b/</sup>
	Total	Direct	Indirect	Total	Direct	Indirect	
<u>Total</u>	<u>268 773</u>	<u>238 508</u>	<u>30 264</u>	<u>839.92</u>	<u>745.34</u>	<u>94.58</u>	<u>308.86</u>
<u>Social sectors</u>	<u>111 107</u>	<u>97 417</u>	<u>13 689</u>	<u>347.21</u>	<u>304.43</u>	<u>42.78</u>	<u>152.25</u>
Housing	94 921	90 982	3 939	296.63	284.32	12.31	122.38
Health	14 147	4 397	9 750	44.21	13.74	30.47	28.17
Education	2 038	2 038	-	6.37	6.37	-	1.70
<u>Productive sectors</u>	<u>42 915</u>	<u>38 237</u>	<u>4 678</u>	<u>134.11</u>	<u>119.49</u>	<u>14.62</u>	<u>78.87</u>
Agriculture and livestock	25 836	25 174	662	80.74	78.67	2.07	63.58
Industry	9 677	7 261	2 416	30.24	22.69	7.55	8.49
Commerce	7 402	5 802	1 600	23.13	18.13	5.00	6.80
<u>Infrastructure</u>	<u>52 991</u>	<u>51 094</u>	<u>1 897</u>	<u>165.60</u>	<u>159.67</u>	<u>5.93</u>	<u>68.36</u>
Transport and communications	47 794	47 402	392	149.36	148.13	1.23	63.10
Water and sanitation	250	220	30	0.78	0.69	0.09	0.40
Energy	2 632	1 157	1 475	8.23	3.62	4.61	2.69
Urban infrastructure	2 315	2 315	-	7.23	7.23	-	2.17
<u>Natural resources</u>	<u>51 760</u>	<u>51 760</u>	<u>-</u>	<u>161.75</u>	<u>161.75</u>	<u>-</u>	<u>-</u>
Land	17 760	17 760	-	55.50	55.50	-	-
Forests	34 000	34 000	-	106.25	106.25	-	-
<u>Emergency expenditures</u>	<u>10 000</u>	<u>-</u>	<u>10 000</u>	<u>31.25</u>	<u>-</u>	<u>31.25</u>	<u>9.38</u>

Source: ECLAC, on the basis of official figures and own estimates.

<sup>a/</sup> Based on a rate of 320 córdobas per United States dollar.

<sup>b/</sup> Value of required imports or of exports which cannot be made.

### III. EFFECTS ON DEVELOPMENT

#### 1. Effects on economic development

##### a) The situation prior to the hurricane

120. i) Recent economic performance. For various reasons, Nicaragua's economic performance has been showing signs of increasing weakness during the present decade within the context of an almost permanent crisis, which in the early part of the year continued to underscore the existence of serious problems in the economic system.<sup>13/</sup> The main features of this crisis have been a high fiscal deficit and unusually large exchange losses,<sup>14/</sup> which have been the primary causes of the extraordinary level of currency issues; the severe distortion of relative prices, of the various rates of exchange and of the persistent downward trend in the level of real wages and salaries in the formal sector; an intensification of the price spiral --which has been of a hyperinflationary nature since 1987-- and, finally, a severe shortage of foreign exchange and inadequate supplies of basic goods. In 1987, therefore, per capita income fell below its level of more than 30 years ago.

121. In view of this very complex situation and despite government efforts to overcome it, the country is now further than ever away from achieving the targets oriented towards the creation of a more equitable society which were set out in the programme formulated by the government in 1979. The government's ability to effectively manage economic policy began to diminish several years ago as a result of the serious obstacles it encountered. Still foremost among these obstacles are the military conflict which has been going on for eight years <sup>15/</sup> now and the trade blockade by the United States.

122. There is no doubt that the need to allocate human and financial resources to defence activities, to the detriment of the country's productive sectors, is one of the reasons why the level of activity in almost all sectors of the economy is low.

123. The severe macroeconomic imbalances currently affecting the Nicaraguan economy may be attributed to a number of causes. The imbalance in public finances is due, inter alia, to the fact that major investments have been undertaken which take a long time to mature. Moreover, the expenditures incurred in increasing the supply of educational and health services have put pressure on the limited resources available and have added increasing amounts to the fiscal deficit. The availability of external resources has been declining dramatically owing to the reduction in the supply of

exportable goods (whose current level is barely that of 1981) and the difficulties encountered in gaining access to sources of credit.

124. This deficit, combined with huge currency exchange losses, has given rise to a rapid monetization of the economy. The increase in the means of payment, together with the limitations affecting the supply of goods and services, has led in the last few years to continuous rises in prices, which have been becoming even sharper during the last few months of this year. This trend has had a negative impact on the standard of living of large sections of the population, as well as regressive effects which are conducive to speculation.

125. Indeed, the low level of domestic production of basic goods has made it difficult to provide an adequate supply of goods to the population and has hindered efforts to stock a sufficient amount of some basic items at official prices; this, in turn, has encouraged the creation of an extensive speculative market in goods and the proliferation of an informal employment sector. In addition, the exchange rate policy, which for several years had been based on an overvalued official exchange rate, gave rise to the emergence of a free market for foreign currency which operated at a rate of exchange that at one point was 200 times higher than the official rate.

126. ii) Economic performance in 1988. In February 1988, the authorities embarked upon a strict adjustment programme. The measures adopted were aimed at achieving a reduction of the deficit in terms of the gross domestic product and a contraction of the investments undertaken by the National Investment Fund (FNI), as well as the establishment of a single exchange rate which would restore the profitability of exports and thus help correct the severe distortions in relative prices between products for domestic consumption and those for export.<sup>16/</sup>

127. Although the new monetary policy eliminated exchange losses and managed --to some extent-- to neutralize the excess currency in circulation which had been building up since 1983,<sup>17/</sup> it failed to bring about the planned reduction in the global deficit. On the one hand, revenues --general sales tax and income tax-- declined in real terms on account of the reduction in economic activity and, on the other, operational costs continued to increase.

128. Moreover, some of the other measures adopted as part of the adjustment programme did not yield the desired results. In the first place, the administrative reorganization of the State apparatus did not produce the expected savings, and certain subsidies which were to be eliminated continued to be granted. Secondly, readjustments in wages and salaries required continuous increases in expenditure.<sup>18/</sup> Thirdly, the devaluation of the córdoba had direct consequences for the current investment budget.

129. Although the economic reform programme attached high priority to the control of inflation, the general rate of price increases has continued to be hyperinflationary.<sup>19/</sup>

130. Even before the hurricane struck, in addition to the aforementioned recession in economic activity, a contraction (also in real terms) was expected for 1988 as a whole in imports of goods and services and,



consequently, a very marked reduction in domestic supply was projected as well. With respect to overall demand, a decline was expected in the growth rate of all the variables, including that of investment in construction, an activity in which positive rates of increase have generally been recorded (see table 7). As set forth in the adjustment programme, public investments have been limited to on-going projects only.

131. Private consumption was expected to undergo a further and rapid decline in 1988 despite the positive, though very fleeting, effect of some measures adopted early in the year which increased the purchasing power of wages. The reappearance of inflationary pressures caused the incomes of wage-earners to deteriorate once again and hence had a dampening effect on private consumption.

132. The level of activity in almost all the productive sectors has been declining. As regards agricultural products for export, output fell in all cases. In contrast, an expansion was projected in virtually all items for domestic consumption, with the sole exception of sorghum.

133. It was expected that the value added in the manufacturing sector would again fall in 1988, although less markedly than in the preceding year. Prior to the hurricane, a contraction of 20% was forecast in almost all branches of production as the full impact of the difficulties which the Nicaraguan economy has been experiencing for years in connection with the modernization of its industrial infrastructure began to become evident.20/

134. The adjustment programme had some negative implications for the manufacturing industry. In the first place, the abrupt demonetization of the economy in February created liquidity problems for business enterprises. Secondly, due to the successive devaluations, larger outlays are required to pay for imports.

b) The situation after the hurricane

135. i) Economic activity. The hurricane struck in the month of October when the country, as mentioned before, was in an extremely precarious economic situation. Within this context, the financial restructuring measures adopted during the year, which were in themselves very difficult to implement, continued to require a highly disciplined and stringent application of the country's economic policy, particularly in respect of expenditure. The disaster further reduced the manoeuvring room of the authorities in their efforts to proceed within the general guidelines of the adjustment programme that was being implemented.

136. While preliminary estimates of the effects of the hurricane on the gross domestic product for the present year --according to which it will fall by 9% instead of by slightly more than 7%, as had been previously calculated-- indicate that those effects were severe, they do not reflect its full impact, since some of its repercussions will begin to be felt only in 1989. The consequences on the different sectors of the economy are very different. Without doubt, the effect on output has been most severe in the agricultural sector, particularly in the production of basic grains (see table 7).

Table 7

NICARAGUA: EFFECTS OF HURRICANE JOAN ON GROSS DOMESTIC  
PRODUCT GROWTH

	Millions of 1980 córdobas			Growth rates		
	1987	1988		1987	1988	
		Before the hurricane	After the hurricane		Before the hurricane	After the hurricane
<u>Gross domestic product</u>	<u>21 027.1</u>	<u>19 485.3</u>	<u>19 106.9</u>	<u>-1.0</u>	<u>-7.3</u>	<u>-9.1</u>
<u>Primary activities</u>	<u>4 572.9</u>	<u>4 417.1</u>	<u>4 130.3</u>	<u>-3.2</u>	<u>-3.4</u>	<u>-9.7</u>
Agriculture	2 991.9	2 740.6	2 471.3	0.9	-8.4	-17.4
Livestock	1 423.8	1 509.3	1 495.0	-12.6	6.0	5.0
Forestry	45.7	50.3	50.3	12.0	10.0	10.0
Fishing	111.4	117.0	113.7	22.2	5.0	2.0
<u>Secondary activities</u>	<u>6 430.8</u>	<u>5 224.6</u>	<u>5 220.6</u>	<u>-0.8</u>	<u>-18.8</u>	<u>-18.8</u>
Manufacturing	5 578.5	4 462.8	4 436.5	-1.6	-20.0	-20.5
Construction	746.1	671.5	693.9	7.0	-10.0	-7.0
Mining	106.2	90.3	90.3	-7.9	-15.0	-15.0
<u>Tertiary activities</u>	<u>10 023.4</u>	<u>9 843.7</u>	<u>9 756.0</u>	<u>-0.2</u>	<u>-1.8</u>	<u>-2.7</u>
Commerce	3 668.0	3 521.0	3 450.0	-0.4	-4.0	-6.0
General government	2 496.5	2 496.5	2 496.5	-0.5	-	-
Transport and communications	1 035.4	1 027.1	1 027.1	-2.0	-0.8	-0.8
Banks and insurance	620.9	614.0	614.0	-0.4	-1.1	-1.1
Electricity and drinking water	464.8	474.1	470.3	-0.8	2.0	1.2
Ownership of dwellings	830.0	830.0	817.5	5.0	-	-1.5
Other services	907.8	880.6	880.6	-0.4	-3.0	-3.0

Source: ECLAC, on the basis of data provided by the Department of Planning and the Budget (SPP).

137. In response to this new emergency situation, the priorities of economic policy were rapidly modified so as to attach greater importance to the supply of foodstuffs, medicines and other basic goods whose scarcity in the short term can be described as having reached dramatic proportions in a number of cases. In order to ensure the production of foodstuffs not only in the affected zone, but also nationwide, unprecedented efforts, which could intensify the country's financial imbalances, are required.

138. In 1988 production in the agricultural sector is expected to decline by 17%, a sharper drop than previously expected (a little over 8%). In the case of export products, earnings from coffee production will decrease as a result both of the direct losses sustained on the plantations and of damage to access roads.

139. In view of its decision to respond immediately to the needs of the affected population, the government is restructuring its priorities in such a way as to reincorporate peasants into the productive process in the shortest time possible, its goal being to achieve the recovery of the agricultural sector by August 1989. Another high priority task is that of hastening the repair of roadways to facilitate the harvesting of the coffee crop.

140. In the fisheries sector, the natural disaster will reduce the rate of growth much more than previously expected (2% instead of 5%), because of the damage to its infrastructure.

141. Income generated by industrial activities, which had already undergone a substantial decline since the early part of the year, will show a further slight decrease as a result of damage to sugar mills, rice mills and sawmills. Moreover, the damage to the electricity system will also affect manufacturing output.

142. The only economic sector in which activity is expected to decline less than was previously projected is the construction sector, as a logical consequence of the rehabilitation work.

143. It is difficult to predict how the gross domestic product will evolve in quantitative terms over the next year, bearing in mind that financial imbalances will become more pronounced and that the adjustment programme that was underway will --as discussed earlier-- be the object of major changes in emphasis, whose precise nature has not yet been fully determined, as a consequence of the ravages caused by the passage of the hurricane. Nonetheless, even at this early date it can be said that production for export will be reduced due to the damage sustained by the plantations and to problems in harvesting.

144. ii) Public sector finances. The emergency measures and the subsequent assistance which will have to be provided to the affected areas make it even more difficult to reduce the fiscal deficit.

145. In the public sector, the adverse effects of the natural disaster will be severe in the remaining three months of 1988. According to preliminary calculations, emergency expenditures will increase the central government deficit by more than 13% over and above the original estimate. These

expenditures include 950 million córdobas in direct disbursements by the central government in response to the emergency (which could turn out to be even more after the data are consolidated) and the payment of more than 8 billion córdobas by the end of the year for the rehabilitation of roads, mainly in the coffee-producing districts (see table 8).

146. In the medium term, the financial position of the central government is expected to worsen. On the one hand, the greater expenditures related to rehabilitation and reconstruction will create strong pressures for an increase in domestic financing, unless resources are made available from abroad. On the other hand, no increases in tax revenues are expected until economic activity in general, and exports in particular, recover (see table 8).

147. iii) The external sector. As regards exports for the 1988 calendar year, the projected figure of US\$218 million may not change significantly, since the major part of some exports, such as those of coffee, have already been carried out. The level of imports of goods --estimated at US\$833 million-- is likely to increase, depending on the volume of foreign assistance which may arrive.

148. The full impact of the damage will be felt in 1989, inasmuch as a decrease in potential exports of approximately US\$27 million is expected. On the other hand, the imports required for reconstruction during 1989 are expected to reach about US\$74 million (see table 8).

149. The possibilities of financing a trade deficit higher than that of last year will be limited due to the greater decrease in foreign exchange earnings from exports and the difficulties which may well be encountered in attempting to obtain lines of credit for an amount 8% higher than in 1988.

150. The prospects in the medium term are similarly bleak. On the one hand, the volume of exports is expected to decrease on account of the damage sustained by products intended for the international market. On the other hand, it will be necessary to import considerable quantities of equipment and materials in order to carry out the reconstruction work (see table 8).

151. iv) Price levels. While in quantitative terms the effects of the hurricane on gross domestic product do not exceed 2%, it must be recognized that they limit the options for controlling inflation.

152. It seems unavoidable that the effects of the hurricane will further accelerate the rate of inflation in the economy. Firstly, the food shortages that will be experienced due to the damage done to basic grain crops will place severe pressures on prices from April to July.

153. Secondly, the adjustment programme --one of whose objectives was to control inflation-- will be even more difficult to implement. Indeed, emergency expenditures are increasing the operational costs of the public sector, raising its direct expenditures and adding to the deficit of the central government, which, as already mentioned, has primarily been financed through the issuing of currency.

Table 8

## NICARAGUA: SHORT- AND MEDIUM-TERM EFFECTS OF THE DISASTER ON THE PUBLIC AND EXTERNAL SECTORS

	1988		1989	1990	1991	1992	1993	1994
	Before the hurricane	After the hurricane						
<u>Public finances</u> <sup>a/</sup>								
(millions of córdobas)								
Current expenditures	110 395	119 345 <sup>b/</sup>						
Capital expenditures	17 723	17 723						
Total expenditures	128 118	137 068						
Fiscal deficit	67 214	76 164						
Increase in capital expenditure			60 900	46 200	33 200	22 200	16 600	5 500
Percentages of 1988 capital expenditures			243	161	87	25	-6	-68
<u>External sector</u>								
(millions of dollars)								
Exports of goods	218	218						
Imports of goods	883	883						
Trade deficit	665	665						
Loss of potential exports			27	-	-	-	-	-
Additional import requirements			74	56	39	27	20	7
Percentage of 1988 imports			8	6	4	3	2	-

Source: ECLAC, on the basis of official figures.

a/ Central government only. Figures are given in córdobas at October 1988 values.

b/ Includes emergency expenditures reported by 15 November, plus the increase in expenditure by the Ministry of Communications and Transport for road repairs.

154. Finally, the speculative factor, which had declined somewhat as a result of the application of the monetary measures already discussed, will probably gain ground again.

155. In short, in all probability the disaster will have the following immediate consequences on the principal macroeconomic variables: it will increase the decline in the gross domestic product for 1988 by about 2%, thereby reducing the already low level of per capita income, and it will augment the government deficit as a result of expenditures to meet emergency requirements, but it will not immediately bring about a significant increase in the external sector deficit on account of a larger volume of imports. In the medium term --if no co-operation or financing is received from abroad--, while it is feasible to expect a recovery in some productive sectors, public sector finances may well deteriorate even further as a consequence of the additional investments required for rehabilitation and reconstruction tasks, and the balance of payments will exhibit greater imbalances because of the need to import and the inevitable decrease in exports. All of this could reinforce the inflationary trend which was in evidence before the disaster.

156. Without doubt, the government will be obliged to re-examine its goals of restoring macroeconomic balances, which will require more drastic measures and greater sacrifice on the part of the entire population.

## 2. Effects on living conditions

157. The population in the areas most directly affected by the hurricane is unfortunately that which has the lowest indexes for food and nutrition, health, education, social security, access to water and sewerage services, etc. (see table 9), despite the strenuous efforts in the field of social welfare undertaken by the government since 1979.

158. As indicated in table 10, only between 3% and 5% of the accumulated capital assets of these sectors was lost. However, their replacement entails serious problems due to the volume of investment required and the capacity existing in the country to finance it.

159. Were it possible to allocate to reconstruction activities all the resources which are earmarked each year for public social investment, the destroyed assets could be replaced within a period of from 0.1 to 38 years, depending on the sector in question. On the other hand, if only those resources which traditionally have been assigned to social investment in the zones affected by the hurricane were to be used for reconstruction, then the replacement period would be even longer and would range from 2 to 376 years, depending on the sector (see table 10).

Table 9

NICARAGUA: STANDARD OF LIVING INDICATORS IN THE MOST AFFECTED REGIONS <sup>a/</sup>

Indicators (1987)	Country total	Region IV	Region V	Region VI:	South Atlantic Autonomous Region	Special Zone III
<u>Food and nutrition</u>						
Annual farm egg sales (units per capita)	49	92	8	5	...	...
Annual sales of chicken meat (pounds per capita) <sup>b/</sup>	6.6	31	0.08	0.27	...	...
Value of ENABAS sales of basic grains (thousands of córdobas per capita)	22.5	31.9	18.1	14.7	...	1.3
<u>Health</u>						
Hospital beds per 100 000 inhabitants	135	132	104	100	166	163
Number of health stations (per 100 000 rural inhabitants)	27	25	22	20	36	60
Malaria. Positive blood samples per 100 000 inhabitants	466	83	379	849	2 119	305
<u>Drinking water and sanitation</u>						
Drinking water. Population served (percentages of the total population)	49	54	24	34	2.4	14.6
Drinking water connections per 10 000 inhabitants	647	778	265	333	39	170
Sewer connections per 1 000 inhabitants	27	12	0.46	-	-	-
<u>Transport and communications</u>						
All-weather highways (kilometres per 10 000 inhabitants)	13.3	11.1	20.1	28	9.5	19.3
Telephone exchange capacity (capacity per 10 000 inhabitants)	172.5	100.0	64.5	70.2	41.3	24.3
<u>Education</u>						
Public and private primary schools (per 100 000 inhabitants)	105	91	158	164	73	119
Students enrolled in primary schools (per 10 000 inhabitants)	1 624	1 653	1 432	1 518	1 338	1 326
Public library users (percentage of population)	6.4	8.8	2.3	8.8	8.4	-

Table 9 (concl.)

Indicators (1987)	Country total	Region IV	Region V	Region VI	South Atlantic Autonomous Region	Special Zone III
<b>Social security</b>						
Population covered by INSSBI (each 1 000 inhabitants)	105	51	32	46	64	52
Child development centres (each 10 000 inhabitants)	11	10	1	5	13	13

Source: ECLAC, on the basis of information from the *Anuario Estadístico de Nicaragua, 1987*, in press; National Institute of Statistics and the Census (INEC), 1988. Several tables.

a/ The location of each region is given in map 2.

b/ The figure for Region V corresponds to 1983; for Region VI, to 1984.



Table 10

## NICARAGUA: INDICATORS OF THE SOCIAL COST OF THE HURRICANE

Sector	Percentage of damage to accumulated stock <i>a/</i>	Reconstruction period (years)		Examples of construction deferred due to reallocation of funds to reconstruction <i>d/</i>
		Allocating all sector investment <i>b/</i>	Allocating investment earmarked for affected regions <i>c/</i>	
Health	3.1	4.2	61	10 fully-equipped health centres (with new beds)
Education	4.8	2.2	24	370 new schools (furnished)
Housing	2.7	37.5	376	17 648 new medium standard dwellings
Water and sanitation	...	0.1	2	2 292 <sup>e/</sup> household drinking water connections

Source: ECLAC, based on information provided by the Department of Planning and the Budget (SPP), Ministry of Health (MINSAs), Ministry of Education (MED), National Institute of Statistics and the Census (INEC), Nicaraguan Institute for Land Studies (INETER), Nicaraguan Institute of Water Supply and Sewerage (INAA) and reports by regional Presidential delegates.

- a/* Based on October 1988 prices. Data on the value of accumulated capital stock in the water and sanitation sector were not available.
- b/* Assuming that the entire national investments of the sector were assigned to reconstruction; estimates based on actual 1981-1988 figures.
- c/* Assuming that only the traditional levels of investment (1981-1988) in the regions affected by the hurricane were assigned to reconstruction.
- d/* Examples of new construction which will not be undertaken in the sector because of the need to allocate all such funds to reconstruction.
- e/* Includes the cost of associated public service facilities.

160. Even assuming that the entire national investment budget could be devoted to replacing the assets which had been available to the various social sectors, it is clear that it could well take many years to attain an acceptable level of normalcy in the living conditions of the population affected by the hurricane.

161. This further underscores the need for the international community to express its solidarity and to co-operate with the Nicaraguan people in order to avoid a further deterioration in their living conditions.

#### IV. INTERNATIONAL CO-OPERATION REQUIREMENTS

##### 1. Justification

162. As mentioned in the foregoing sections, the natural disaster caused by hurricane Joan resulted in considerable direct damage and will produce a number of adverse effects in the medium term.

163. Fortunately, the loss of life was not as great as might have been expected, thanks to the efforts made by the government to evacuate and protect the population. Nonetheless, there was considerable damage in terms of the nation's capital assets, its natural resources and the production of goods for export and for domestic consumption. The greatest losses of all, however, were sustained by the most disadvantaged groups of peasants and small-scale tradespeople, whose living conditions and family-based economies were the most seriously affected by the natural disaster.

164. The country is now required to make unforeseen expenditures in order to rehabilitate and replace --instead of increasing-- its capital assets, at unit costs that will be much higher than the original value of the assets which were damaged or destroyed.

165. This occurs precisely at a time when the Nicaraguan economy is severely depressed due to the fact that its external sector is being seriously affected by the continuance of the economic blockade on its exports and by other unfavourable conditions and as a result of the need to allocate a considerable proportion of public expenditure to defence. In addition, it occurs at a time when the government has already embarked upon a programme of adjustment and stabilization aimed at restoring basic macroeconomic balances, the first results of which have barely begun to be felt.

166. Emergency expenditures and the requirements of rehabilitation and reconstruction will place even greater burdens on public sector finances --since expenditures will necessarily increase and public-sector revenues decline-- and on the balance of payments as a consequence of the increase in imports and the decrease in exports.

167. Even if Nicaragua were to earmark for reconstruction all the financial resources which it has traditionally allocated to investment, it would still take many years to build its capital assets back up to the level that existed prior to the disaster. Moreover, this would mean leaving aside important economic and social development projects which are under execution or which were about to be initiated.

168. This shows that Nicaragua does not have the capacity to attend, simultaneously and by itself, to both the requirements of reconstruction and the long-term efforts required to achieve sustained development and improve the living conditions of its population. There is, therefore, no doubt that the solidarity and co-operation of the international community are indispensable in order to reduce the sacrifices of the Nicaraguan population.

## 2. Objectives and characteristics of the co-operation required

169. An assessment of the damage caused and of the economic and social consequences of the disaster has made it possible to define the following objectives with regard to international co-operation:

- a) To restore the assets and economy of the peasantry, and the general living conditions in the affected regions;
- b) To replace the capital assets and the natural resources which were destroyed or damaged; and
- c) To restore --and even to improve-- the productive and export capacity of the affected sectors.

170. The amount of the co-operation required to fulfill these objectives is estimated to be approximately US\$500 million, spread over a period of from three to five years beginning in 1989. Such co-operation should be additional to --and not a replacement for-- the co-operation currently being received by the country for its regular development programmes and projects.

171. Such co-operation should consist of donations and very soft-term loans as regards repayment periods, grace periods and interest rates if it is to achieve its expected results.

172. In view of the severe shortage of foreign exchange and of the limited availability of strategic inputs --such as fuel and cement-- for reconstruction, it should also be possible to use such loans to finance the importation of these project components which would normally be paid for by disbursements in local currency.

173. Finally, donors --whether bilateral or international sources-- should expedite their traditional procedures for the evaluation of projects and approval of loans and donations, as well as make them more flexible, in view of the urgent need to undertake the tasks of rehabilitation and reconstruction.

### 3. Specific co-operation requirements

174. It is not necessary to wait until complete rehabilitation and reconstruction programmes and projects have been drawn up in order to be able to indicate the fields in which international co-operation is required as soon as possible. The diagnostic study presented in this document clearly identifies the areas, sectors and geographic districts which should be given priority attention. In addition, the government is engaged in the formulation of requests for the financing of specific projects within the framework of the above-mentioned priorities.

175. The annex to this document describes proposed technical and financial co-operation projects relating to the various stages of rehabilitation and reconstruction. This does not mean, however, that they should follow a strict chronological order since, in many cases, they will have to be undertaken simultaneously on a complementary basis.

176. In practice, the co-operation activities involved in the rehabilitation work differ from those envisaged in connection with the task of reconstruction in that the former will have to be concluded within a maximum period of nine months in order to permit the resumption of both national and family-based economic activity, whereas the latter could be completed within a longer time period.

177. During the rehabilitation phase, co-operation is required in supplying foodstuffs as well as inputs to ensure next year's production, the maintenance of minimum health conditions, and the rehabilitation of roads and bridges in order to permit the timely transport of crops; technical co-operation is also needed to reorient economic policies and to formulate reconstruction projects.

178. During the reconstruction phase, co-operation will be required to rebuild or repair the assets destroyed in all sectors of the Nicaraguan economy. Although the project profiles for the reconstruction phase are presented by economic sector, it is necessary to bear in mind that these are not isolated initiatives. In fact, a comprehensive geographical logic underlies these projects whereby a number of different projects, in combination with one another, would permit the reconstruction of given localities, as in the cases of Bluefields, El Rama and Corn Island, among others.

179. In the annex to this report, project profiles are presented for each one of these phases in order to illustrate the concrete needs for co-operation in connection with rehabilitation and reconstruction which the international community could provide. The annex also includes a number of projects or initiatives designed to prevent or reduce the damage which similar phenomena could cause in the future.

Notes

1/ See R. Jovel, Economic and Social Consequences of Recent, Major Natural Disasters in Latin America and the Caribbean, International Seminar on Regional Development Planning for Disaster Prevention, Nagoya, Japan, 1986.

2/ The population's needs during this emergency period are being met by means of prodigious efforts on the part of the Nicaraguan government, along with some limited international assistance. Nonetheless, due to the nature of the disaster, immediate rehabilitation activities (that will take until August 1989) must be undertaken, as will be discussed in a later section.

3/ It was preceded by hurricane Gilbert, which caused heavy damage in Jamaica, Mexico and the United States.

4/ Tropical cyclones are classified according to their wind velocity, as follows: tropical depression: up to 55 kilometres per hour; tropical storm: 55 to 117 kilometres per hour; and hurricane: over 117 kilometres per hour.

5/ Direct communication from the Director of the National Hurricane Center in Miami.

6/ According to information and statistics provided by the National Hurricane Center, numerous hurricanes and tropical storms have traversed Nicaraguan territory as they moved westward, with those of 1911, 1933 and Irene in 1971 deserving special mention. Only four of them have actually reached the Pacific, and only two (Irene and another in 1887) appear to have crossed the Isthmus on a course located to the south of latitude 12°.

7/ This was the official exchange rate at the time of the disaster.

8/ This table was prepared on the basis of data taken from recent population surveys conducted by the municipalities, as well as from reports concerning the population sectors which sustained various types of damage during or after the disaster.

9/ The average replacement cost for an urban housing unit having 65 square metres of floor space is estimated at 4.8 million córdobas, while such a unit in rural zones is calculated to have a replacement cost of 1.5 million córdobas.

10/ A total of 44% of the cost corresponds to imported materials. This should be borne in mind when selecting reconstruction technologies.

11/ The following figures were used for these calculations: coffee: 2 000 hectares at US\$1 250/ha per production year; basic grains: 1 500 hectares at US\$750/ha per production year; basic grains: 2 500 hectares at US\$500/ha per production year, and highlands: 4 000 hectares at US\$200/ha per production year.

12/ This estimate is based on a charge of US\$12 per cubic metre of wood and on the assumption that 17 cubic metres of usable timber exist per hectare over an area of 500 000 hectares.

13/ See ECLAC, Notas para el estudio económico de América Latina y el Caribe, 1987, Nicaragua (IC/MEX/L.76), March 1988.

14/ Up to February 1988, the monetary authorities were absorbing heavy currency exchange losses as a result of the subsidization of imports, which, for the most part, were paid for at the official exchange rate, whereas the exchange rate paid to exporters was higher and operated as a support price.

15/ It is estimated that during the period 1980-1987 --according to official figures up to the month of August 1988-- the armed conflict had resulted in a total of 56 700 casualties as well as very considerable property damage and production losses.

16/ During the month of February the official exchange rate was abruptly devalued; if the currency conversion is taken into account, the parity was changed from 0.07 to 10 new córdobas. After minor modifications, the córdoba stood at 80 córdobas to the dollar in the month June and subsequently rose to 180 in August and September, 320 in October and 550 in November. While up to July the parallel exchange rate did not exceed the official rate by a great deal, the gap began to widen after July to the point where a rate of 2 000 córdobas to the dollar was reached in early November.

17/ The currency conversion provided for the exchange of 1 000 old córdobas for one new córdoba up to an amount not exceeding 10 million old córdobas. Bank deposits were converted in the same way, except that an adjustment factor was applied to such deposits in accordance with the length of time that had elapsed since the deposit was made.

18/ While these wage increases amounted to 30% in June, 140% in September, 35% in October and 78% in November, on the whole they were nonetheless far below the increase in consumer prices.

19/ This has largely been due to the fact that the measures designed to correct price distortions, which have principally been based on the exchange rate policy and the relaxation of price controls, have had an immediate inflationary effect.

20/ The marked obsolescence of equipment, as well as the damage caused by the use of raw materials of inappropriate specifications, has seriously affected the functioning of the industrial sector in Nicaragua. In turn, this sector was required to adapt to the new economic policy adopted in February and reinforced in June, which has made its adjustment difficult in the short term.