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ECONOMIC AND SOCIAL CONSEQUENCES OF NATURAL DISASTERS IN LATIN AMERICA AND THE CARIBBEAN

by

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ECONOMIC AND SOCIAL CONSEQUENCES OF NATURAL DISASTERS IN LATIN AMERICA AND THE CARIBBEAN

1. Introduction

a) General

Disasters have negatively affected mankind since its very beginnings; they can be caused by natural phenomena or by the action of man. Natural disasters are the subject of this paper.

A distinction is to be made between the natural phenomena and their consequences. The first one is "a natural event which threatens both life and property; a disaster is the realization of such a threat".[1] The degree of damages suffered by the population in any given disaster depends on the intensity of the natural phenomenon, the proximity of human settlements to the location or path followed by the phenomenon, and the degree of prevention and preparedness achieved by such human group.

Given their high costs -in social and economic terms- and the frequency with which they occur throughout the world,[2] natural disasters should be recognized as development problems rather than as isolated events. Disaster prevention and planning, as well as preparedness, should be included in long-term development plans.

To achieve this goal, planning and implementing agencies should be aware of the need to incorporate disaster prevention and mitigation criteria to national and sectoral development and investment programmes. The above requires a great effort to present in a clear and qualitative manner the linkages between the ocurrence of natural disasters and the evolution of social and economic conditions. The methodology developed by CEPAL for the evaluation of the effects on natural disasters represents a partial contribution in this direction.

Further work remains to be done in the design of appropriate instruments to be applied in national development planning which

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[1] See John Whittow, Disasters: The Anatomy of Environmental Hazards. Penguin Books Ltd., Hardmonsworth, Middlesex, England, 1980.

[2] For a summarized, overall picture on the time and space distribution of disasters in the world and their direct consequences, see R. Jovel, Natural Disasters and their Impact on the Social and Economic Development of Central America and the Caribbean, International Congress on Urban Emergencies, Cancún, Mexico, 1982.

can be of direct, and efficient, use to national, regional or local authorities.

b) Origin and characteristics of natural disasters

Natural phenomena of meteorological and geological origin frequently, and with varying intensity, cause disasters in the countries of Latin America and the Caribbean. On the one hand, tropical storms traverse the Caribbean every year and directly or indirectly affect the countries of that subregion; similar events affect - albeit less directly- the countries located in the tropical belt of the Pacific Ocean coast. Major modifications in the atmospheric circulation over the Pacific, bring about changes in sea-water characteristics in South America and floods and drought in the Pacific slope of the Continent.[3] Further, the annual North-South displacement of the Inter-Tropical Convergence Zone over the Continent causes frequent flooding in Central America and the northern part of South America. On the other hand, the presence of the "ring of fire" along the Pacific Coast of the Continent, and other minor lines of contact between tectonic plates, cause frequent and intense earthquakes and volcanic eruptions in the region.

The above-mentioned natural phenomena result in disasters of different intensity in the region. They cause losses of life and injuries among the population, damage and disruption to essential services and to social and economic infrastructure, as well as losses of inventories and production. Furthermore, these direct and indirect losses have secondary effects on macro-economic variables which hinder governments' efforts to achieve sustained growth.

Available information in regard to the major natural disasters which have occurred in the world from 1846 through 1978, indicates that 34 such events occurred in Latin America and the Caribbean and that they caused the death of around 1.2 million persons.[4] More detailed information is available on major disasters in the region since 1972 to date.

While mass media have provided live and extensive coverage of the human suffering and destruction brought about by recent disasters, no accurate quantitative estimates of losses caused by disasters are available for the region on a systematic basis.

This paper presents an estimate of social and economic consequences of natural disasters in Latin America and the

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[3] This event is called the El Niño Southern Oscillation (ENSO) phenomenon , and normally occurs once every 3 to 12 years.

[4] Natural Disasters and their Impact... Op. cit.

Caribbean, with a view to justify the undertaking of disaster prevention and planning activities in the region, based on information collected in recent years by the United Nations Economic Commission for Latin America and the Caribbean (ECLAC).

c) ECLAC's work on natural disasters

During the past 18 years ECLAC has accumulated detailed quantitative information on the social and economic impact of selected natural and man-made disasters in the region, as part of its work programme on damage assessment and rehabilitation/reconstruction planning following disasters.

Upon the request of a government affected by a disaster, ECLAC sends a special field mission to undertake an independent assessment of the direct and indirect damages, to estimate their effect on national economic development and their impact on social conditions, and to identify rehabilitation and reconstruction projects.

To undertake such work ECLAC has devised a methodology for the assessment of sectoral damages and for evaluating their impact on over-all economic performance and on living conditions. The field mission is normally composed of specialists in damage assessment available at ECLAC; specialized agencies of the United Nations designate sectoral experts in their field of competence to participate in the mission.

This work assists the affected government in defining its post-disaster priorities and in securing required international cooperation. The international donor community -individual governments and multilateral organizations- utilizes these assessments to orient assistance to the affected country.

2. Analysis of recent, major natural disasters in Latin America and the Caribbean

a) Definition

The effects of natural disasters must be viewed not only in humanitarian terms, but also and primarily in economic and social terms. These effects can be divided in three main categories, as follows:[5]

- the direct effects on the property of the population affected by the disaster;

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[5] See UNDRO, Disaster Prevention and Mitigation: Vol. 7, Economic Aspects, United Nations, New York, N.Y., 1979.

- the indirect effects which result from the decline in production and in the provision of services; and

- the secondary effects which may appear some time after the disaster: decreases in economic growth and development; increased inflation; balance of payment problems; increases in fiscal expenditures and deficit; decreases in monetary reserves, etc.

Direct effects include losses of capital stock and inventories, and -in some cases- of production. Indirect effects include diminished production in the area affected, increased expenditures to provide services or to maintain a given standard of living conditions, etc. In a way, indirect effects can be considered as "losses in the pipeline" of the economic system.

b) Case studies

Following the above-described definition of losses and using a damage-assessment methodology developed by ECLAC, detailed analyses have been made to determine the social and economic consequences of selected major disasters which have occurred in Latin America and the Caribbean during the period 1972-1988.

Analyses were made of detailed information concerning the Managua, Nicaragua (1972), Guatemala (1976), Mexico (1985), San Salvador (1986) and Ecuador (1987) earthquakes, and the eruption and ensuing mudflow of the Nevado del Ruiz volcano in Colombia (1985). Similar analyses were conducted for the cases of hurricane Fifi in Honduras (1974), hurricanes David and Frederick in the Dominican Republic (1979), the floods and drought caused by the El Niño phenomenon in Bolivia, Ecuador and Peru (1982-1983), and by hurricane Joan in Nicaragua (1988).

Tables 1 and 2 present summaries of economic losses caused by each event. To facilitate comparisons between results of the different disasters, damage figures were adjusted for inflation to the year 1987.[6]

i) The 1972 Managua earthquake.[7] An earthquake which was originated in shallow, localized tectonic faults destroyed most of downtown Managua in late 1972. The quake demolished or damaged most commercial and public administration buildings as well as housing

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[6] The damage figures for the case of hurricane Joan are given in U.S. Dollars of 1988.

[7] See ECLAC, Assessment of Damages and Repercussions of the Managua Earthquake on the Nicaraguan Economy, (CEPAL/MEX/73/Nic.1; E/CN.12/AC.64/2/Rev.1) Mexico City, 1973.

and other social infrastructure. In addition, the industrial capacity was heavily affected.

The main social effects included 6,000 deaths, or about 1.4 per cent of Managua's population at the time; more than 20,000 injured persons; and 300,000 were left without shelter (70 per cent of total city population). In addition, some 58,500 persons were rendered temporarily unemployed or subemployed due to the destruction or damage to their places of work.

Direct losses were estimated to be 1,580 million dollars (of 1987). They include the destruction or damage to social -housing, health and education- infrastructure and losses in stock of the commerce and industrial sectors. Indirect losses were estimated at 387 million dollars, including increased costs for the provision of essential services and production losses in the industrial sector mainly. Total losses imposed by this disaster were thus estimated at 1,967 million. (See Table 1).

Secondary effects in the years following the disaster included an increase in public sector deficit of 687 million due to the need to invest in reconstruction and to the reduction of tax revenues; and an increase in the balance of payments deficit of 186 million caused by the need to import equipment and materials for reconstruction purposes. Further secondary effects included the reduction in growth of the gross national product (GNP) and of per capita income in 1973. In addition, consumer prices increased and monetary reserves diminished.

ii) Hurricane Fifi. In 1974, Hurricane Fifi entered into mainland Central America. Its high winds and ensuing floods caused destruction or damage to housing and social infrastructure in marginal urban areas; transport and other physical infrastructure; permanent plantations and annual crop production; and to the natural resources and environment.

In Honduras alone[8] -other countries such as Nicaragua, El Salvador, Guatemala and Belize were also affected- 7,000 persons were killed. Nearly 15,000 more were rendered homeless, figure which represents a small fraction of the population in the area. However, some small villages were entirely destroyed. Insufficient information prevented the estimation of the number of the injuried and of the effects on employment.

Direct losses amounted to 388 million dollars. They included the destruction or damage to housing, health and education services; bridges, ports and roads; and the destruction of some

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[8] See ECLAC, Report on the Damages and Consequences of Hurricane Fifi on the Economy of Honduras, (E/CEPAL/AC.67/2/Rev.1), Mexico City, 1974.

permanent plantations and arable lands which were eroded by the winds. Also included were domestic and commercial inventories. Indirect losses were estimated at 200 million and included losses in banana and annual crop production and higher costs of public sector utilities. Total losses imposed by the hurricane in Honduras alone amounted to 588 million dollars. (See Table 2).

Secondary effects included a 362-million worsening of the balance of payments caused by reductions in agricultural exports and by imports of reconstruction equipment and materials. A negative effect of 224 million in public-sector finances was due to the need to invest in rehabilitation and reconstruction and to the reduction of export tax revenues. (See Table 2).

A further secondary effect was the decrease of GNP growth in subsequent years, which contrasts notably with a vigorous -5 per cent- rate of growth in preceding years.

iii) The Guatemala earthquake of 1976.[9] A strong tremor caused by the displacement of the Caribbean, Cocos and North American tectonic plates, and with epicenters located along a major geologic fault which traverses the country, caused extensive damages in many small villages and medium-sized towns in the interior and in Guatemala City.

It was estimated that 22,800 lives were lost, which makes this earthquake -together with the Nevado del Ruiz eruption in 1985- the most damaging to human life in the recent history of the region. Furthermore, 76,000 persons were injured, and over 1 million people -or nearly 19 per cent of the country's population- lost their homes.

Direct losses were estimated at 1,400 million dollars. They included the destruction to housing and social infrastructure, transport infrastructure, and domestic and commercial inventories. Indirect losses of 35 million were incurred due to commerce and agriculture production losses, and to minor interruptions of water-supply and electricity services. Total losses amounted to 1,437 million dollars. (See Table 1).

Secondary effects on the economy were estimated at 787 million dollars. The fiscal budget was burdened by the need to increase expenditure for rehabilitation and reconstruction projects; and the balance of payment situation deteriorated due to the need to import materials and equipment for relief, rehabilitation and reconstruction activities. (See Table 1).

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[9] See ECLAC, Damages Caused by the Guatemala Earthquake and their Consequences on Economic and Social Development, (CEPAL/MEX/76/Guat.1), Mexico City, 1976.

iv) Hurricanes David and Frederick. In 1979 hurricane David traversed the Dominican Republic; several days later, tropical storm Frederick -later to become a full hurricane- also struck the island Dominica. Haiti and Cuba were also affected.

The combination of very high winds and subsequent flooding resulted in widespread destruction or damage to housing, agricultural infrastructure and production, electricity and water-supply services, physical infrastructure in general and the environment.

The main social effects included the death of only 2,100 persons, thanks to the existence of an early-warning system and evacuation plan. Over 600,000 people rendered homeless, that is, 10 per cent of the country's population. No complete figures were collected concerning injuries and unemployment.[10]

Direct losses were estimated at 842 million. They include 506 million in capital stocks in -in order of decreasing magnitude-the agricultural and livestock sectors, housing, energy and water-supply systems, and transport infrastructure; 230 million worth of cattlestock, commercial and household inventories; and 106 million of banana and crop production. Indirect losses amounted to 215 million and refer to decreased agricultural production and commercial output in subsequent years (185 million), and to increased costs and diminished revenues in the services sectors. Total losses were thus calculated at 1,057 million dollars. (See Table 2).

Secondary impacts on the economy included negative effects in the amount of 464 million in the balance of payments caused by increased imports to attend disaster needs and by reductions in the exports of banana and other crops. There was also a negative effect of 303 million on public-sector finances due to increased spending to attend relief, rehabilitation and reconstruction, and by a reduction of export tax revenues. (See Table 2).

v) The El Niño Phenomenom of 1982-1983.[11] The modification of the general atmospheric circulation over the South Pacific in 1982-83 affected Bolivia, Chile, Ecuador and Perú with different characteristics and intensities. Extensive flooding occurred in the coastal areas of Ecuador and Northern Perú, as well as in the Amazon region of Bolivia. A severe drought affected the Bolivian-

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[10] See ECLAC, Dominican Republic: The Consequences of Hurricanes David and Frederick on the Economy and Living Conditions, (E/CEPAL/G.1098/Rev.1), Mexico City, 1979.

[11] See ECLAC, The Natural Disasters of 1982-1983 in Bolivia, Ecuador and Peru, (E/CEPAL/G.1274), Santiago, 1983.

Peruvian highlands. Sea-water temperature and salinity were adversely modified.

The death toll and the number of injuries were not significant. 298,000 persons -of the marginal urban and rural areas- were rendered homeless by the floods, and a total of 3.7 million persons were directly affected by the partial or total loss of their means of production, absence of health and education services, insufficiency of food and declining nutrition levels, increased morbidity levels, and shortages of agricultural and food inputs.

The drought in the highlands brought the most impoverished population groups in the Continent to brink of famine, and originated further migration to other areas and countries. Pre-disaster conditions in that region were restored only recently.

Individual fishermen and commercial enterprises were greatly affected by diminished fishing production brought about by the changes in the sea-water characteristics. Some fish varieties emigrated elsewhere or died. The annual catch has only recently recovered pre-disaster levels.

Direct losses in Bolivia, Ecuador and Peru were estimated at 1,311 million dollars. They include capital stock and inventory losses in the agricultural, transport, oil production, fishing industry and social infrastructure sectors. Indirect losses amounted to 2,659 million dollars which include losses of production in the agricultural, industry and fishing sectors as well as increased costs and diminished revenues in the transport sector.

Total losses thus amounted to 3,970 million dollars, making this the second most costly single disaster in the region in recent history. (See Table 2). In addition, they represent about 10 per cent of the countries' combined GNP, or 50 per cent of their annual public sector revenues at the time. Bolivia, the weakest economy, was by far the most affected.

Secondary effects on economic development were staggering. In the two-year period of 1982-1983, the negative effect on the balance of payments reached an estimated 621 million dollars, due to decreased fishery, agriculture and livestock exports and to imports of foodstuffs and agricultural inputs. Public sector deficits and their ratio to GNP increased notably. This was due to decreases in value-added and export tax revenues; and to unforeseen expenditures to undertake relief, rehabilitation and reconstruction activities.

Gross national and per capita product growth decreased in the three countries at rates of up to -10 per cent. Consumer prices

rose up to 50 per cent in some cases due mainly to increases in food prices because of production shortages and speculation.

vi) The 1985 Mexico City earthquake.[12] An earthquake of extraordinary magnitude -8.1 on the Richter scale-, originated in the Michoacan gap and its effects magnified by special sub-soil conditions, imposed extensive damages in a populous section of downtown Mexico City in September 1985.

The tremor and subsequent aftershocks resulted in the death of more than 10,000 persons; 30,000 more were physically or psychologically injured. Around 150,000 people were rendered homeless.

Some 33,600 dwellings were destroyed and 65,000 more sustained substantial damages. Health sector facilities were severely crippled as a large number of hospitals and clinics were destroyed or damaged beyond repair. About one-fifth of the capital city's educational establishments were destroyed or badly damaged. Water-supply, electricity and communications services in the downtown section of Mexico City were affected as well.

Direct losses were estimated at 3,793 million dollars. They include infrastructure and inventory losses in public administration buildings; housing, health and education facilities; communications; and small-scale industry and commerce. Indirect losses were estimated at 544 million dollars, and refer to the decrease in revenues and/or increased costs in small-industry and commerce, communications, tourism and personal services sectors. Total losses imposed by the earthquake amounted to 4,337 million dollars, making it the most damaging natural disaster of recent years in the region. (See Table 1).

However, more serious than the staggering amount of absolute losses -which an economy the size of Mexico's would perhaps be able to absorb under normal circumstances since total losses represented only 2.7 per cent of GNP at the time- is the effect of rehabilitation and reconstruction on the main macro-economic variables. It must be borne in mind that the disaster occurred at a time when the Government was applying an austerity policy in public expenditures, when banks were short of liquidity to face the increased demand for credit, and when external restrictions were looming.

In the five years after the earthquake, the negative effect on the balance of payments was expected to reach 8,579 million dollars in spite of considerable re-insurance income and donations from

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[12] See ECLAC, Damage Caused by the Mexico City Earthquake and its Repercussions Upon the Country's Economy, (LC/G.1367), Mexico City, 1985.

abroad. Furthermore, the public-sector deficit was expected to increase by approximately 1,900 million dollars due to rehabilitation and reconstruction expenditure requirements. (See Table 1)

The requirements for reconstruction made the Mexican authorities revise their economic policy to accommodate the increased demands for public funds, credits and imports. Furthermore, priorities for public activities were re-oriented to enable the diversion of resources towards reconstruction, leaving aside the solution of long-standing problems in the capital city.

vii) The Nevado del Ruiz volcanic eruption.[13] In late 1985 mudflows originated by the melting of snow after the eruption of the Nevado del Ruiz volcano in Colombia, caused the death of 22,800 persons. That figure includes more than 90 per cent of the population in the city of Armero. In addition, 5,200 persons were injured and 10,000 more were left homeless. Some 200,000 people were directly or indirectly affected by the disaster. In this most-atypical disaster, the dead exceeded the survivors by a 3 to 2 ratio.

A preliminary estimate places total losses at 224 million dollars. Direct losses of capital stock in social and physical infrastructure -including the total destruction of a city of 25,000 inhabitants- were estimated at 150 million, and 4 million worth of inventories were lost. Indirect losses were estimated at 70 million dollars; they include production losses of 17 million and losses of revenues or increased expenditures to provide basic services. (See Table 1).

Secondary economic effects were not estimated. The true measure of this disaster lies, without a doubt, in the tragedy of human losses.

viii) The 1986 San Salvador earthquake.[14] This disaster caused the death of about 1,200 people; more than 10,000 were injured, and nearly 500,000 suffered partial or total loss of their homes and small shops. The living conditions of the poorest sectors of the population were seriously affected through losses of essential services and sources of income.

The earthquake caused considerable damage to housing and to the basic services of water supply and sewerage, electricity and

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[13] See United Nations, The Nevado del Ruiz Volcano Natural Disaster, (SG/SM.1/1), New York, N.Y., 1985.

[14] See ECLAC, The 1986 San Salvador Earthquake: Damage, Repercussions and Assistance Required, (E/CEPAL/G.1443), Mexico City, 1986.

telecommunications. It totally or partially destroyed a large number of buildings in the health and education sectors, as well as infrastructure, machinery and inventories belonging to the industry and commerce. Moreover, the administrative operation of the government was temporarily interrupted by the destruction of public buildings and by the loss or destruction of archives and communication systems.

A total loss of about 940 million dollars was estimated. Direct damages, including capital stock and inventory losses, were estimated at 710 million; indirect losses amounted to 227 million. The sectors most affected by material losses in infrastructure were those of housing, commerce and public buildings. Commerce was the sector most affected by production losses, while the public utilities were forced to incur in heavy losses due to higher expenditures and diminished revenue.

The San Salvador earthquake had a great impact in the national economy. The total losses amounted to approximately one quarter of the country's gross domestic product or to about 40 per cent of its external debt at the time.

Secondary effects on the economy were felt for several years. Due to the disaster, GDP growth diminished by 2 per cent; the fiscal deficit rose by more than 24 per cent; public administration was severely disrupted, and the external sector experienced a doubling of its current account deficit due to increased imports for reconstruction. In the five years following the disaster, the public sector was expected to suffer a negative effect of 935 million dollars due to increased expenditures, while the external sector position would be affected by some 350 million, due mainly to increased imports for reconstruction. (See Table 1).

The social impact is even more significant. The already considerable housing shortage increased substantially and unemployment rose 26 to 35 per cent in the metropolitan area of San Salvador. There was also a drastic reduction in public health services and facilities. These social consequences of the disaster compounded the poor living conditions of a population suffering from the effects of an internal war.

ix) The March 1987 earthquake in Ecuador.[15] This event caused the death of about 1,000 persons. More than 5,000 people had to be evacuated from the disaster area and be re-housed in temporary shelters. About 3,000 dwellings were completely destroyed and 12,500 more had to be repaired. Several hospitals and health

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[15] See ECLAC, The Natural Disaster of March 1987 in Ecuador and its Impact on Social and Economic Development, (E/CEPAL/G.1465), Santiago, 1987.

centres were also affected. Water-supply and sewerage systems were damaged, as well as a number of educational establishments.

Mudflows caused by the quake and subsequent rains destroyed more than 40 kilometers of the trans-Ecuadorian pipeline used to transport oil from the Amazon region to the refineries and export centres located on the Pacific Coast, as well as the only highway connecting the eastern Provinces with the rest of the country. Moreover, agricultural production was affected by the erosion of arable land caused by landslides, and the floods carried away thousands of heads of livestock and deposited silt over large areas of grazing lands.

The total damage was estimated at 1,000 million dollars. Direct damages to the capital stock and inventories of the country's social and economic sectors were estimated at 186 million. Indirect damages -which include large losses by the petroleum-exporting sector, together with the higher costs incurred to satisfy domestic energy demands, and production losses in the agricultural sector were estimated at 815 million. (See Table 1).

Even though it covered an area with scarce population and infrastructure, the disaster brought about a considerable fall in Ecuador's production and export capacity. It was estimated that the GDP in 1987 would decline by 3 %, instead of the 2.5% growth foreseen before the disaster. The external sector suffered losses of about 790 million due to reduced exports of oil and other products (635 million) and to increased imports for rehabilitation and reconstruction. Public sector finances experienced a deficit of about 397 million due to increased outlays and decreased revenues. (See Table 1). Further deterioration of these macro-economic variables is foreseen for 1988 and subsequent years as an effect of the disaster.

The disaster had harsh consequences on the welfare of some 400,000 people who were directly affected. The brunt of the disaster was borne by population groups living in rural and marginal urban areas located in a number of Provinces where unemployment levels and rates of illiteracy are high and where the provision of basic social services -health, sanitation and education- is limited. In addition, approximately 75,000 persons living in the Amazon region were isolated from the rest of the country for several months; essential supplies needed by the population had to be transported by air and it was impossible to bring their products to the markets.

x) Hurricane Joan.[16] In October 1988 the tenth hurricane of the Caribbean season caused a disaster of major consequences in Nicaragua and imposed damages in neighbouring Costa Rica, Panama, and El Salvador. With sustained winds of up to 217 kilometers per hour, the hurricane entered Nicaraguan territory and destroyed several cities; after traversing the continental divide -and causing extraordinary rainfall and floods- its winds lost force and the meteor became a tropical storm before debouching into the Pacific Ocean.

In Nicaragua, approximately 310,000 persons were evacuated from vulnerable areas before the hurricane struck; they were housed in temporary shelters to protect them from the winds, rains and floods, and to await the re-establishment of minimum environmental and health conditions in their original settlements. About 230,000 low-income peasants and fishermen saw their homes and working capital destroyed or damaged. A total of 2.8 million people were directly or indirectly affected by the disaster.

Direct damages were estimated at 745 million Dollars. They include total or partial destruction of social infrastructure, especially housing; erosion of agricultural soils and devastation of extensive areas of tropical forests; the destruction or damage to economic infrastructure, particularly transport facilities; and damage to the infrastructure as well as losses of agriculture and industrial output. Indirect losses were estimated at 95 million Dollars; they refer to greater expenditures to supply health services, attend necessary emergency and relief operations, and production losses in the near future. Total losses were thus estimated at 840 million. (See Table 2). The losses represent slightly less than 10 per cent of the country's accumulated capital stock or about 40 per cent of the GDP for 1988.

Secondary effects on economic performance will be felt for a number of years. In 1988 alone, the fall of GDP was estimated to increased by 2 percentage points and per capita income will be further eroded. In addition, the already-large fiscal deficit increased due to the additional expenses made to meet emergency requirements. It was expected that the balance of payments would exhibit greater disequilibria as a result of the need to increase imports and the inevitable fall in exports.(See Table 2). No doubt this contributed to a further speed-up of the hyper-inflationary trend which existed before the disaster.

The above considerations are more important in view of the fact that the people most affected by the disaster include about

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[16] See ECLAC, Damage Caused by Hurricane Joan in Nicaragua, its Impact on Economic Development and on Living Conditions, and International Cooperation Requirements for Rehabilitation and Reconstruction, (LC/G.1544), Santiago and Mexico City, 1988.

62,000 low-income peasant families who lost their subsistence crops and their very limited belongings and were now faced with the task of rebuilding their highly fragile family-based economy.

3. The consequences of natural disasters

a) Economic and social effects

A comparison of the losses presented in the precedent section of the paper with the gross natural product (GNP) of the affected countries can give an idea of the relative impact of the disaster in the overall national economies. Most of the disasters analyzed have caused losses with a value which exceeded 5% of the gross national product.[17] It was also observed that the weaker the economic position of the country the greater will be the relative impact of the damages on the national economy. The losses caused by the earthquake that struck Mexico City in 1985, represented only 2.8% of GNP for that year; however, they were larger in absolute terms than those produced by the earthquake that affected San Salvador (1986), or by hurricanes David and Frederick (Dominican Republic, 1979), but which represented over 23% of the GNP of those countries.

Natural disasters can also affect key sectors of a country's economy creating, in addition to the economic losses, restrictions for the evolution of economic growth. The floods and drought of 1982-1983 found Bolivia in the middle of a severe economic crisis. GNP grew by 0.9% in 1981; it fell by -4.4% and -6.5% in the years 1983 and 1984; and then recovered slightly in the following years (-0.3 in 1984 and -0.4 in 1985). At least part of the dramatic fall of the Bolivian GNP in 1982-1983 can be attributed to the effects of the disaster. The disaster affected specially the agricultural sector which represents over 20% of the GNP; the fall of agricultural production in 1983 was 16.4%. The earthquake of 1987 in Ecuador is another example of the effects of a disaster focusing in a particular productive sector. The damages to the oil production and transportation infrastructure disrupted the flow of exports by this sector. Crude oil represents over 50% of the total exports of Ecuador.

The structural composition of the economic losses provides an insight into possible casual relations (not a firm correlation) between the type of natural disaster and its effect on certain

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[17] Gavidia, Jorge. The economic and social effects of recent natural disasters in Ecuador and Nicaragua. Report of the Fourth International Research and Training Seminar on Regional Development Planning for Disaster Prevention. United Nations Centre for Regional Development. Nagoya, Japan, October, 1990.

social and economic sectors. It has been observed that earthquakes have mainly affected the infrastructure of the social sectors (housing, education and health) and, to a lesser extent, transport and communications. However, the effects of hurricanes and other meteorological events have focused on the agricultural sector and also, in a significative manner, on the infrastructure of transport and communications.

Finally, it is necessary to point out that overall deterioration of social conditions in the whole country (through the economic losses) is compounded by the worsening of the living conditions of the population directly affected by the disaster. The largest part of the direct victims of natural disasters in the region belong to the lower income sectors of the population. Thus, disasters tend to exacerbate existing social problems and to restrict the capacity of the governments to attend such needs.

As it can be seen, disasters have longer-term implications whose solution have often required great sacrifices by the affected country's population. In fact, in the cases analyzed, rehabilitation and reconstruction have been made possible through the combination of the following measures, depending on the specific economic position of the affected country:

- reorientation of existing fiscal resources and internal savings;
- reorientation of existing bilateral or multilateral loans; and
- securing of additional foreign financing.

The above measures have resulted in the deferment or cancellation of development projects which had been included in already-approved long-term development plans, and in the delay of improving social conditions in general.

b) The need to reduce losses and their consequences

While the natural phenomena which originate these disasters can not be avoided, it is possible to take measures to reduce their social and economic consequences to more manageable levels and thus to contribute to long-term development. Such measures, while costly themselves, would represent only a small fraction of the present level of losses mentioned above. They include preventive, planning and preparedness measures which are briefly described below.

Disaster prevention measures are designed to prevent natural phenomena from causing or resulting in disasters or at least to limit their consequences.

A first group of prevention measures is related to the forecasting and warning of natural phenomena, and is based on a thorough scientific study of the natural phenomena -their intensity, and chronological and geographical distribution- which may originate disasters. They include the setting up of networks to monitor the development and evolution of meteorological events, and the implementation of early-warning systems in the vicinity of human settlements.[18]

The second set of prevention measures refers to the adoption of technical and legislative regulations, such as zoning laws based on vulnerability analysis and the regulation of building codes, to ensure that buildings are able to withstand the anticipated effects of natural phenomena. The education and training of the population to make people aware of disaster risks and of prevention requirements is also included in these measures.

There are two main areas for action in connection with disaster-related planning. First, physical planning should include disaster vulnerability analyses of all large-scale development works -including human settlements- to decide their optimum location and anti-disaster characteristics. Second, long-term development planning should include potential disaster effects as a new variable -giving due consideration to needs for disaster relief programmes and contingency measures to be adopted in cases of disaster- as well as rehabilitation and reconstruction requirements following a major disaster.

Finally, disaster preparedness involves the adoption of measures to organize and facilitate rescue and relief operations in cases of disasters. They include the formulation of emergency plans, the setting up of effective relief organizations, the training of personnel for these activities, the stockpiling of supplies and the setting up of special funds for relief.

As it has been said before, the efforts to introduce the application of these measures to development planning should begin with the raising of the awareness of policy makers as to the importance of disaster prevention and mitigation principles. It is also necessary to disseminate knowledge and enhance awareness on a broad basis: to the mass media, private enterprises, academic community, etc. The present conference is a great contribution in this respect.

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[18] No similar monitoring and early-warning systems have been developed as yet for disasters of geological origin, except in a few isolated cases of volcanic eruptions.